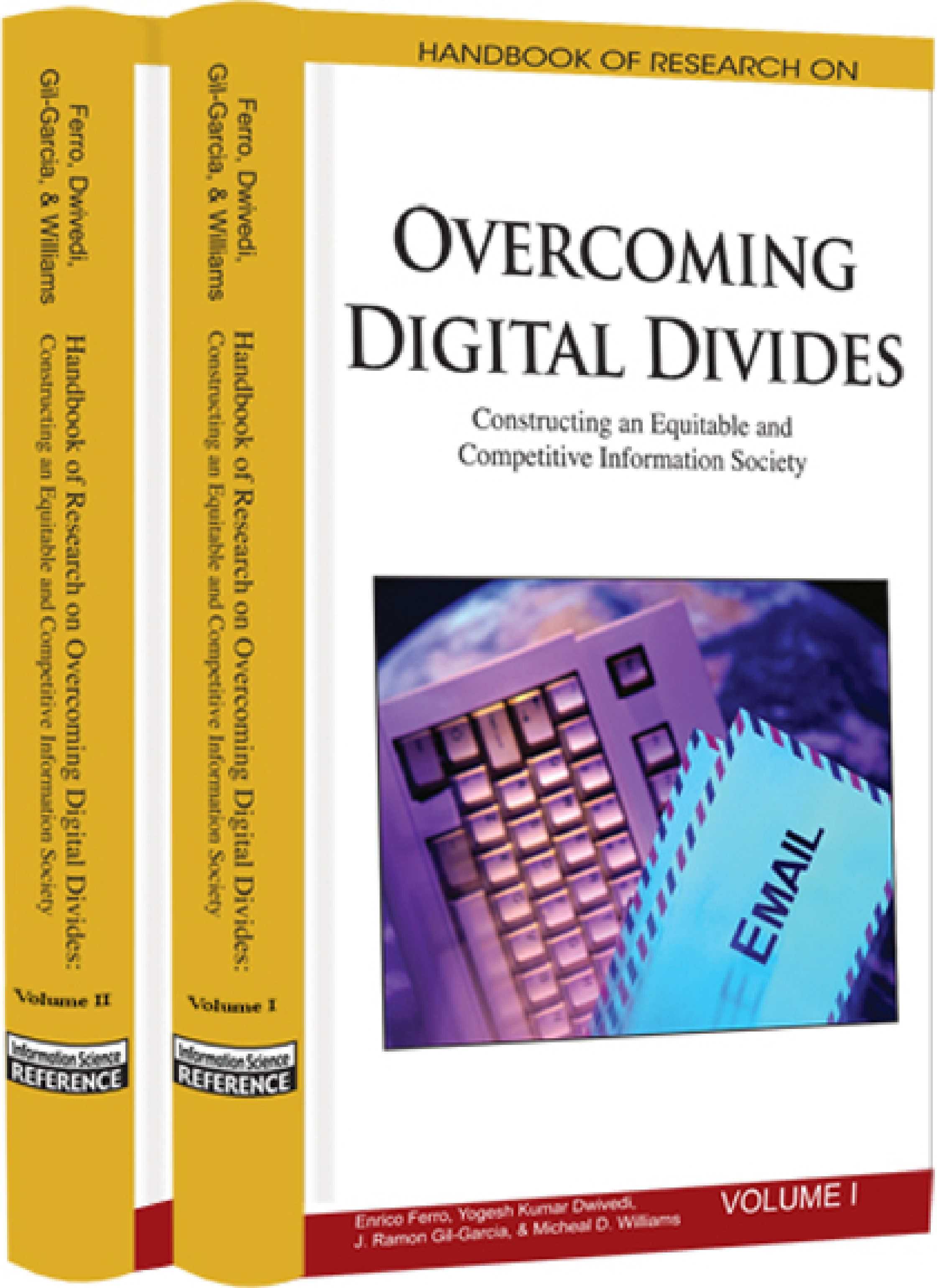
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Constructing an Equitable and
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Constructing an Equitable and Competitive Information Society

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Dedication

To Elisa, the happiness of my heart and the love of my life.
Enrico Ferro

To my *Priya Anuj* Avaneesh K. Dwivedi.
Yogesh K. Dwivedi

To my *Amores* Nadia, Dante, and Julieta, with all my love.
J. Ramon Gil-Garcia

To Nelly Jones and Elizabeth Williams, in loving memory.
Michael D. Williams

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an effective strategy to reduce digital backwardness. The characteristics of each pattern of digitalization can be also usefully employed to understand whether past interventions, especially in the area of competition policy, have been successful in addressing country-specific issues.

This chapter examines the nature of digital divide in Turkey. To this end, after a brief summary of the literature, first, the dimensions of digital divide in the country are explained. Then, various initiatives by the government, private firms, NGOs, and international organizations to combat digital divide are presented. Next, in the discussion section, issues for further discussion regarding digital divide in Turkey are listed. The chapter ends with the examination of the issues regarding the future prospects for overcoming digital divide in Turkey and developing countries elsewhere.

The rapid uptake of technology offers potentially innovative approaches to promoting mental health amongst young people, addressing a significant public health challenge. The advent of Web 2.0 has seen a shift from text heavy content to the development of communities that foster connectivity. This area of research, its potential to engage young people at risk of isolation, and the mental health benefits it may have, has received little attention. This chapter considers evidence regarding technology's role in mental health promotion, particularly for marginalised young people. Results are presented from an Australian study, "Bridging the Digital Divide," which investigated technology access and utilisation by young people experiencing marginalisation. Finally, Australian policy regarding the digital divide and Internet safety is reviewed. The authors conclude that policy responses should move beyond just access and safety and explore innovative ways of ensuring safe and supportive online communities accessible for all young people.

The United States has the world's largest national population of Internet users, roughly 170 million people, or 70% of the adult population. However, the deep class and racial inequalities within the U.S. are mirrored in access to cyberspace. This chapter examines the nature of the U.S. digital divide, differentiating between Internet access and usage, using data from 1995 to 2005. Although Internet usage has grown among all sociodemographic groups, substantial differences by income and ethnicity persist. The chapter also examines discrepancies in access to broadband technologies.

Section 2
Digital Divides and Inequalities

Division 1
Digital Divides and Disabilities

An essential, and rapidly-developing, aspect of electronic government is the growing use of online resources for government activities such as e-rulemaking, citizen participation, and the provision of information, referral, and assistance for users with needs for service delivery. Major developments in the use of electronic government resources for services needed by the elder and disability populations are the primary focus of this chapter. We focus here on the results of a large-scale statewide survey of residents of the state of Iowa, and on the findings from evaluations of aging and disability resource Websites in the United States and in other countries. Current and future trends in service delivery that may help to bridge digital divides for the elder and disability populations are discussed.

Much of the discourse on the digital divide focuses on issues of information disparity and accessibility, frequently in socioeconomic terms. This perspective overlooks an important aspect of the digital divide, the lack of access and missed opportunities faced by persons with disabilities, referred to here as the "disability divide." Barriers to access and knowledgeable use of information and communication technology (ICT) represent more than simple exclusion from information to encompass social segregation and devaluation. At its most insidious, barriers to ICTs limit full community engagement in employment activities. This chapter examines the ramification of the impact of digital divide on the nature of employment and participation in the workplace, using ICT to conduct telework, and explores challenges to social policy with respect to 'reasonable' accommodations. In the absence of practices, structures, and policies targeting the distributive work environment, telework is much less likely to close the digital divide for persons with a disability. This suggests the need to explore and develop potential policy options to close the disability divide.

a number of experimental performance tests among a cross-section of the Dutch population. The tests focus on the use of online government information. The main result of the experimental test is that the average Dutch population performs fairly well in operational and formal Internet skills but much worse in information and strategic skills. However, there are significant differences between people with different age and educational background; no gender differences have been observed. The final sections of this chapter deal with ways to overcome these differences of skill. Two main strategies are discussed: improving the information provision of government Web sites and improving the digital skills of citizens or users by all kinds of educational means.

Differences in digital skills lie at the heart of social inequality in advanced knowledge societies. The Internet access 'markets' in these societies are close to reaching saturation point, giving almost everyone access to the Net. By contrast, differences in digital skills appear to be widening over time. This chapter focuses on The Netherlands, where above all the elderly, people with a lower education level, people who are economically inactive and members of ethnic minorities lag behind. It addresses the mechanisms that underlie differences in digital skills between population groups. A lack of financial and cognitive resources seems to be of particular importance. Based on a diffusion of innovations framework the paper goes beyond the largely descriptive research on the digital divide and considers the consequences of differences in digital skills. These differences influence the labour market performance of those at a digital disadvantage and also has an impact on their personal lives.

A computer-based learning (CBL) program in the New Jersey women's prison system is helping to bridge the digital divide among the incarcerated. The hallmark of this program is a computer-based learning process that begins in the prison environment and follows an inmate through the corrections system and into the community. The program provides access to computers through computer labs, use of computers in coursework, and computer ownership upon release into the community. Access to information technology helps to develop skills that will be useful for offender's chances of employment upon reentry and may even help to reduce recidivism rates.

With the increasing spread of information and communications technologies (ICTs) globally, there is heightened debate about the continuing disparities of access and usage. The dialogue has proceeded in many respects oblivious of the centrality of information literacies in capacity building measures to redress the digital divide. This chapter examines both the concepts of the digital divide and information literacies and regards them as highly compatible in their application to the global south following a detailed analysis of issues such as orality and literacy, globalization from below and effective access to technology networks. The chapter concludes with a range of recommendations relating to reforms in strategic thinking and policy planning. The call for heightened emphasis on education including information literacies forms the centerpiece of an analysis grounded in both theory and empirical research.

In assessing the integration of the Internet into society, scholars have documented that certain sectors of the population are disadvantaged by their lack of physical access to computer resources. The disadvantaged have traditionally included the less educated, nonwhites, females, the elderly, lower income people and third world citizens. Scholars are now beginning to go beyond basic issues of access to address differences in Internet experiences among Internet users. However, few digital divide researchers focus on the importance and impacts of the various types of connections people use to log onto the Internet. Among U.S. Internet users, we examine which is more important in determining Internet use, the traditional digital divide factors or type of connection. This study examines a wide range of online activities that provide vital information and services for Internet users. We find that connection disparities explain more variance in time spent online engaged in essential tasks, than most other long-established digital divide measures.

Under the Bush Administration, the U.S. failed to close the digital divide and fell behind on broadband. In 2001, 54 percent of households did not have the Internet. In late 2007, 49 percent of households did not have broadband. About 25 percent of households with incomes below $25,000 per year had broadband in 2007; whereas over 80 percent of households with incomes above $75,000 did. In 2001, the U.S. ranked third in the world in the penetration of broadband, but had fallen to 15th by 2007. A variety of measures of performance and econometric models that control for economic and social factors show a dozen nations are ahead of the U.S. The laissez faire policy pursued by the Bush administration let a duopoly of cable and telephone companies dribble out broadband at slow speed and high prices. In contrast, the nations that passed the U.S. implemented much more aggressive policies to promote broadband and instead of relying on weak intermodal competition, they required the dominant networks to be open to competition in Internet services. This kept the price down and stimulated adoption and innovation.

The research on the digital divide usually analyzes the differences between those who have access to information technology and those who have not. This approach typically considers information technology a homogeneous set of technologies. In this chapter, we will break this assumption establishing different subsets of information technologies according to their impact on the task productivity and the firm's demand for high skilled labour. This new focus reveals that depending on the information technology used by the firm to perform a given task, the demand for high skilled and low skilled workers may vary and consequently their wages and income, producing in some cases a new and till now unobserved digital divide.

This chapter contains two main messages: First, the concept of the 'digital divide' should be seen as part of the problem rather than as part of the solution. Therefore, the sooner this concept-and with it the binary categories and the 'one size fits all' simplified model of 'development'-is discarded the better. Second, the main recommendation for strategies to be adopted in ICT4D projects is that focus should be on the information and communication needs of poor people rather than on technologies; beneficiaries should be actively involved in identification of their needs, in decision making about ways and means to satisfy the identified needs, about purchase of equipment and inputs and about implementation of solutions. Only by actively pursuing participatory design and participatory 'development' can the goal of achieving a free, fair and equal 'information society,' benefitting poor and rich people alike, be reached.

This chapter offers a survey of recent literature on access gaps that focuses on pro-poor market solutions provided by mobile applications. The emerging literature on mobile uses in developing countries has focused on the benefits of voice and text messaging. However, there is little academic research on mobile applications such as m-banking. While a large number of low income people have access to mobile phones, these groups are excluded from the financial market. M-banking offers the opportunity to diminish this financial exclusion by offering access to credit and to savings which are key tools capable of transforming the livelihoods of the poor and the efficiency of the market. Accessibility is the major barrier for the expansion of mobile adoption by the poor. There is an important role for regulators to play in enabling an appropriate environment for the increase in the mobile penetration as well as business models for m-banking.

The major objective of this chapter was to test the effect of online time and adoption time on the frequency of transactional use of the Internet. Transactional use of the Internet includes activities such as buying

This account explores the use of ICT to overcome social exclusion by means of e-participation initiatives in two spheres-health promotion and local democratic participation. They offer a contrast in terms of how we think about inclusion because the intended outcomes of their e-enablement may differ. Their construction as private or public goods affects the scope for intermediaries to act as agents of digital inclusion. In e-health, digital inclusion is often a recruitment issue, since online discussion serves as a meeting-place where people provide mutual support to others who are co-present, whereas in local e-democracy, inclusion is a representation issue, since online discussion is a narrative, reflecting on the political life of a territorial community. As a textual Internet is more amenable to intermediation than a spatial Internet, the possibilities for deploying ICT for social inclusion were enhanced when members of the e-health virtual community began to 'publicise' the discursive goods they produced, which became translatable into community health benefits via intermediation and channel integration.

This chapter examines whether government officials' deployment of resources to broaden Internet access and participation is influenced by officials' communication preferences and socioeconomic factors. The concern that the Internet explosion has alienated and marginalized some citizens from the democratic process and civic life has generated intellectual debate and led governments and other sectors to take measures to bridge the gap created by the digital divide. Although several studies have been conducted on the subject, few are yet to be done on the influence of government officials' communication preferences and socioeconomic factors on resource deployment to broaden access and participation. Drawing on the theories of technological diffusion and determinism, as well as developmental and democratic theories, we argue that officials' communication preferences and socioeconomic factors will be important in broadening Internet access and participation. Survey data, local government Web site contents and census data were analyzed. Results reveal that officials are not eager to commit resources to activities that broaden access and participation because they generally prefer to communicate with citizens via traditional channels. In addition, the sizes of the elderly and Black population, as well as the relative affluence of cities, do influence the presence of deliberative features on city Web sites.

Over the past few years the concepts of government and governance have been dramatically transformed. Not only is this due to increasing pressures and expectations that the way we are governed should reflect modern methods of efficiency and effectiveness, but also that government should be more open to democratic accountability. The following chapter will introduce the social impact dimension of e-democracy while proposing concrete directions and incentives that should be provided for engagement through electronic means. The intention is to highlight the fact that technology is the result of a combination of tools, social practices, social organizations, and cultural meanings. It not only represents social arrangements, but also has the potential to facilitate and / or limit different types of interaction.

Section 5
Approaches to Study Digital Divides

It is widely acknowledged that the label "digital divide" can be partially misleading, because it emphasizes a binary dichotomy ("haves vs. have nots") and a mere technological dimension (in terms of physical availability of devices or conduits). Behind the dichotomous model, however, lie different use and adoption strategies. People cannot be described as being either in or out. Evaluating the complex relationships between technological, social, and human factors raises a number of questions, mainly related to the role of technology in social development. Moreover, we should also reconsider what is commonly meant by information and communication technology. In this chapter, I will try to introduce a multilevel model for analyzing the digital divide, focusing on effective access and new media literacy. The focus will be shifted from technology to humans. In every ICT for development project, local context and local needs should be regarded as the key factors.

This chapter addresses a problem that centers on the persistent disparities in computer use and access among citizens of varying cultural backgrounds. The chapter begins with discussion about the digital divide among ethnic minorities, particularly African-Americans and Hispanic-Americans (Latinos), in the United States. This chapter defines "access" as having a computer interface that facilitates user learning. One proposed human factors intervention for this problem of access is in recognizing and accounting for culture's influence on cognition. This discussion is grounded in the development and employment of computer interface metaphor designs that are culturally valid for target user groups. We also provide examples of challenges that users may encounter when inappropriate interface metaphor are built into a computer interface design. Finally, the chapter highlights various human factors interventions and considerations that will provide a pathway to achieving greater levels of e-inclusivity and for providing citizens with equitable access to information.

Foreword

Here is a book for those who would deepen their understanding of inequalities in the information age. As countries throughout the globe face economic hardship not seen since the 1930s, the publication of this carefully developed research handbook on the digital divide deepens our awareness of the stark and trenchant inequalities between those who are engaged in the excitement of the networked public sphere and the networked economy and those who are being left behind. A neoclassical economic perspective might lead one to predict that market forces and maturation of innovative technologies will lead to prices and availability that will eventually erode the divide. Yet the current period of economic distress sounds a clear signal that the invisible hand of the market requires considerable guidance. And the lag between those countries in a leading role and those barely beginning to catch up appears to show little sign of diminishing. Even in the Unites States, in spite of aggressive pursuit of technological leadership as part of global competition, until recently there was little attention to equity of access. By contrast, the European Commission in its Strategic Plan i2010 constructs digital equality as a central dimension of its strategy. While some countries have embraced the importance of a knowledge society and information economy, others fail to comprehend the fundamental importance of connection to networks that underlie every major global economic and political system.

What was originally viewed as a challenge in access to computers and to the Internet is now understood as a far more complex array of inequalities. Indeed, by bringing together perspectives drawn from several disciplines and modes of inquiry, this volume considers digital inequalities from the vantage points of e-commerce, e-business, e-government, e-democracy, and e-health, to name just some of the societal dimensions considered in the following chapters. Indeed, given the ubiquity of digital technologies in society, economy, and polity, one might argue that consideration of digital inequalities reduces simply to an examination of inequalities in the information age.

The reader of this exciting handbook of research is taken on a richly rewarding journey that begins with important overviews to provide a grasp of the overall landscape. The particularities of regional and country cases allow readers to consider distinct political economies and their relationship to global digital developments. As the concept of digital divide is applied to those groups that experience it with more or less acuity, the reader experiences yet another layer of complexity as the journey moves from those with disabilities to consideration of race, gender, and ethnicity and their intricate intersections with digital literacy and access. Many countries have sought to use digital technologies to strengthen economic vitality as well as to deepen democracy and civil society. Yet the task before developing countries–wrestling with basic infrastructure needs, pricing abnormalities, and other challenges—has often followed a different set of rules than that of counties in the technological lead. Finally, the journey taken in this handbook of research juxtaposes several modes of inquiry–from qualitative narrative to econometric analysis--all of which hold promise to extend and refine research on the digital divide.

As decision makers and scholars strive to understand and ameliorate digital inequalities, this handbook is likely to provide a rich guide to locales, methodological approaches, and current knowledge. Surely, the road ahead demands the type of roadmap found herein.

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Foreword

Social and economic exclusion should, more than ever before, be central to our efforts to build a sustainable, fair, and prosperous world. Economic turmoil, climate change, and globalisation not only affect nations and populations as a whole, but also strike at the heart of families and affect individuals, and most often those that were already at risk of being left behind.

In today's world, and certainly in tomorrow's, the digital world and the 'real' world increasingly blend together. Information and communication technologies (ICT) get intimately interwoven with everyday activities such as education, work, social support, shopping, and human communication. Not being able to fully take part in the information society, the digital divide, will become as much a barrier to economic and social participation as not being able to fully receive education or being in poverty–and often these factors go together.

Nevertheless, digital exclusion is still very much around. Global digital divides, for example, disparities in access to the internet, are striking, and also inside the more connected countries there are significant lags in access to, accessibility of, motivation and skills to use, and actual usage of information technology. The groups concerned are notably those with low income or education, old age, or disability.

Gradually, we are getting more evidence about the extent of the relationship between digital exclusion and economic/social exclusion. This book is an important contribution to this evidence base. We need such evidence, as policy makers, as disadvantaged users and user representatives, as business people, and as academics.

Policy makers have been moving digital inclusion more central to their information society/digital economy agendas. They recognise the vicious cycle between digital exclusion and economic/social exclusion. Or, formulating this more positively: actions to promote digital inclusion and social and economic inclusion may leverage each other, creating a virtuous cycle. Again, more evidence of this expectation. At the micro-level we need well-documented good practices cases that inspire replication and adaptation. At the macro-level we need bridges between digital inclusion and finance, economics, social affairs, health, or education.

The European Commission has, during the past decade, in its eEurope and i2010 information society policies, given much attention to digital inclusion. Action plans are now being implemented that address widespread broadband connectivity (and the economic crisis has triggered further plans to support broadband roll-out), accessibility of ICT for people with disabilities, ICT-enabled independent living for elderly persons, inclusive e-government services, and digital literacy. A recent Commission Staff Working Paper has closely linked the digital inclusion agenda to the EU's Renewed Social Agenda.

The implementation of these policies and their further development require a continued and critical analysis of digital divides and their-evolving-interplay with economic and social exclusion in general.

The Commission provided an indicative assessment of the (significant) economic benefits of digital inclusion as part of its 2007 e-inclusion policy[1]. An extensive collection of good practice cases, amongst them the 2008 European e-Inclusion Award winners, has been established[2]. But these pieces of evidence need to be enriched and further quantified.

In this respect, the focus on economic impact is very important indeed, but in the spirit of Putnam's seminal work on social capital we also need to strengthen evidence on the impact of digital inclusion on community involvement, social cohesion, and social capital in general, as well the contribution of digitally-enabled social capital to better health, better quality of life when ageing, lower levels of crime, better education results, and so forth.

Finally, there are important questions arising from the study of digital divides concerning ethics and digital inclusion, for example, is there a right to opt out from the information society, governance and the transformative potential of digital inclusion, for example, to what extent can and will users at risk of exclusion become shapers of technologies and policies themselves, motivation to be digitally included, for example, for which immediate needs is digital access and digital literacy really relevant, partnerships that are needed more than in other fields because the market dynamics is often not present, and sustainable inclusive ICT business models.

This book makes an important contribution to strengthening our evidence base, advancing answers, and posing new questions. The insights of the authors can help all of us to deliver on the promise of digital inclusion.

ENDNOTES

1 See www.ec.europa.einclusion.
2 See www.epractice.eu
3 Paul Timmers is head of the unit ICT for Inclusion at the European Commission. Opinions expressed here are the author's and do not necessarily represent the views of the European Commission.

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Preface

The digital divide is often characterized as being the inequality in the relationship between information and communication technologies (ICT) and groups of individuals who are situated within a complex arrangement of social, environmental, political, and economic issues. Over the past fifteen years, the theme has received significant press coverage, attracting the attention of both the academic and the political world. Reasons for such levels of interest are primarily due to two important issues related to the reduction of information gaps. From a national, regional or local perspective, the elimination of the digital divide is perceived as being a key ingredient in the construction of a socially equitable information society. Indeed, not having access–or having a disadvantaged access–to information in a knowledge-based economy is generally considered to be a major handicap. From a global perspective, the race for competitiveness requires that regions and nations learn how to harness the intellectual potential present in their territories. In this respect, the creation of an "e-inclusive" society represents a key strategic goal that governments need to achieve in order to survive increasing international competitive pressure. The need to bridge the information gaps becomes even more pressing if we consider the ever increasing importance of user generated contents in national economies. In such a scenario, it is extremely important to work toward the creation of a society able to contribute to an economy moving towards a participative paradigm.

As a result, the theme of digital division has moved higher on lists of priorities. In Europe, for instance, the elimination of the digital divide represents a key pillar of the Strategic Plan i2010. In contrast, the United States at one time had a robust framework, but now pays relatively little attention to digital inequality as a policy area, possibly presuming that the problem does not exist anymore, or hoping that market forces will close these gaps[1].

Analysis of previous reviews[2,3] on the state of the art of digital divide literature highlighted a very complex picture, characterized by: the existence of schools of thought proposing significantly different views of the digital divide and its potential evolution; the existence of a multiplicity of gaps related to both demand and supply aspects of the digital divide; a variety of theoretical lenses and units of analysis (individual, enterprise, and state/country) that may be used to interpret and analyse the phenomenon; the necessity to better understand the relationship between the digital divide and other complementary phenomena such as e-commerce, e-business, e-government, e-democracy, e-health, and so forth; and finally, a fragmentation in the analysis of the phenomenon produced by different—often disjointed– scientific communities.

The production of a publication bringing together contributions from different disciplines and analysing the phenomenon from diverse perspectives could thus be beneficial for the advancement of research activity in this field. Moreover, the presence of many different schools of thought naturally requires some discussion in the search for common ground (i.e., understanding if the results of different approaches depend on the technologies analyzed or the context in which these technologies are embedded).

Finally, the cross-sectional nature of ICT establishes links between different aspects of society that cannot be overlooked. Consequently, the digital divide should not be analysed as an isolated phenomenon, but should be considered alongside numerous other ICT-related issues.

The situation apparent from the current literature reveals the complexity of the theme and calls for a systematization of contributions that help comprehend the phenomenon. Therefore, the overall mission of this *Handbook of Research on Overcoming Digital Divides*: *Constructing an Equitable and Competitive Information Society* is to contribute toward a greater understanding of this complexity and to offer a comprehensive, integrative, and global view of what has been called the digital divide. Specifically, it aims to focus on the following key objectives:

- Provide a representation of the phenomenon that is as complete as possible (integrative, global, comprehensive, etc.) by bringing together scholars from different disciplines and geographical regions.
- Study the interaction of the digital divide with complementary, intertwined phenomena such as e-government, e-business, e-democracy, and e-health, among others.
- Analyze the digital divide in various contexts (e.g., organisational, societal, national, local/regional) and explore the relationships between these contexts and how these interactions affect the overall results.
- Improve current understanding about what scientific paradigms have been used in the monitoring and analysis of policies aimed at reducing the digital divide and other related inequalities.
- Outline possible evolutions of the digital divide: (1) From hard to soft aspects, (2) From access to use, and so forth.
- Explore the extent to which existing knowledge and policies on the digital divide are adequate or limited to different national and cultural contexts.

Existing publications on the digital divide tend to provide fragmented and monodisciplinary views of the phenomenon. As mentioned above, due to the emergence of new forms of ICT and related applications, new manifestations of the digital divide continue to emerge, thus widening the existing gap. It is apparent that in order to capture the evolving and dynamic nature of the digital divide, we require new approaches, theories, and empirical research, and this handbook attempts to assist in this aspect.

Consequently, the handbook is intended to further existing knowledge on the digital divide in presenting treatments of the concept from a contemporary and diverse yet integrative perspective.

The main contribution of the handbook is to provide a comprehensive, integrative and global assessment of the digital divide as a policy domain and social phenomenon. The handbook presents a research roadmap that clearly identifies current topics and suggests future areas for fruitful analysis and research. The handbook also evaluates the adequacy of existing policies, anticipates needs, and, where possible, identifies if a policy refocus is also desirable. In the broader scheme, the handbook presents various insights in order to set out the foundations for a new policy analysis paradigm that better fits the specificities of ICT.

Finally, the handbook contributes to the refinement of existing theories on adoption, diffusion, and digital divides (e.g., Diffusion of Innovations, TAM, TPB, Institutional Theory, Stakeholder Theory, Adaptive Structuration Theory, Social Network Theory, Social Inclusion and Exclusion Theory, Usage

& Gratification Theory) and the development of new frameworks to better understand the digital divide, as well as the adoption, use, and impacts of emerging technologies and their applications.

The handbook is organized into 35 chapters, co-authored by 66 contributors from 50 different institutions/organizations located in 13 countries (Australia, China, Denmark, Greece, Italy, Jamaica, Mexico, Netherlands, Spain, South Korea, Turkey, United Kingdom, and USA). Such geographical and institutional variety indicates that the handbook has drawn on a collection of wide and diverse perspectives. The 35 chapters have been organized into five sections, namely:

- The Digital Divide as a Social Problem (7 contributions);
- Digital Divides and Inequalities (15 contributions);
- Digital Divides, Competitiveness, and Development (4 contributions);
- Digital Divides, E-Government, and E-Democracy (5 contributions);
- Approaches to Study Digital Divides (4 contributions).

Section 1 examines, analyzes, and frames the digital divide as a social problem and complex phenomenon in several different ways. This section is further organized into two divisions. A total of three chapters dedicated on presenting overviews, followed by a subsection, including four chapters, focused on some regional and country cases (such as case from Turkey, United States, and developing countries).

Section 2, entitled "Digital Divides and Inequalities," examines the forms, causes, and consequences of inequalities in access and use of information and communication technologies. Individual, social, cultural, technological, and political factors are considered in this section and some of their specific manifestations are described and analyzed such as disabilities, education, gender, race, digital skills, and access to broadband. This section is further organized in four divisions. The first division, entitled "Digital Divides and Disabilities," includes three chapters, followed by the second division which includes four chapters examining the role of various demographics (such as gender, age, income, education, etc.) in relation to digital divides. The third division includes four chapters dedicated on identifying relationships between digital divides and digital literacy. Finally, the fourth division, entitled "Digital Divides and Broadband Access," presents an insightful discussion on some important factors such as infrastructure, access, and skills.

Section 3, entitled "Digital Divides, Competitiveness, and Development," examines the relationships between the access and use of information and communication technologies, productivity, efficiency, and development, including individual, social, and economic development. This section includes four chapters dealing with various issues on the theme of the section. Such studies are largely excluded from previous collections and collations on digital divides.

Section 4, entitled "Digital Divides, E-Government, and E-Democracy," examines the opportunities, challenges, and successes of e-government and e-democracy in relation to the digital divides. The policies for access and development of information and communication technologies are analyzed as tools for participation, inclusion, and equity. Based on some cases, the five chapters placed within this section offer models and strategies to deal with the digital divide in this respect, as well as a description of the potential next steps.

Finally, Section 5, entitled "Approaches to Study Digital Divides," consists of four chapters presenting various perspectives and methodological approaches to the investigation of digital divides.

Considering the richness and depth of the content, we firmly believe that this handbook will be an excellent resource for readers who wish to learn about the multifaceted nature of the contemporary digital divide, as well as those interested in finding out when and how to apply various theories and approaches in order to investigate the diverse research issues related to the digital divide. The target audience for the handbook therefore includes researchers and practitioners within the management discipline in general, and within the information systems field in particular. This resource is equally valuable for policy makers (such as politicians and legislators), non governmental organizations, public sector managers, policy analysts, and voluntary sector organizations/charities.

Concluding, we are convinced that the articles contained in this handbook testify to the complexity and the global relevance of the digital divide. They present insightful accounts of how the digital divide can take many forms and shapes, and may constitute a significant hurdle in the development of socioeconomic systems toward information societies. We sincerely hope that this Handbook will make a positive contribution to the study of the digital divide. In order to achieve further research progress and improvements in the understanding of the subject matter, we welcome feedback and comments about this handbook from readers. Comments and constructive suggestions can be sent to the editors care of IGI Global at the address provided at the beginning of the handbook.

Sincerely,

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ENDNOTES

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The Editors

Section 1
The Digital Divide as a Social Problem

Division 1
Overview of the Digital Divide

Chapter 1
Beyond Digital Divide:
Toward an Agenda for Change

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ABSTRACT

This chapter discusses how digital exclusion continues to present a serious and significant threat to the successful establishment of developed and developing countries as 'information societies.' Based on a review of recent research and theoretical work, the chapter considers a number of different reasons why digital exclusion remains a complex and entrenched social problem, highlighting the need to recognise the mediating role of economic, cultural, and social forms of capital in shaping individuals' engagements with ICT. From this basis, the chapter proposes a hierarchical framework of digital exclusion based around conceptual 'stages' of ICT use. Using this framework, the argument is made that policymakers, technologists, and other information society stakeholders face a considerable challenge to match the social affordances of ICTs with the everyday needs, interests, and desires of individuals. In this sense, digital exclusion continues to demand a complex set of policy responses which go far beyond simply increasing levels of hardware provision and support, and then assuming any 'gaps' to have been 'bridged.' The chapter concludes by highlighting a number of possible directions for future action.

INTRODUCTION

The 'digital divide' quickly became one of the political and academic 'hot-topics' of the 1990s. A series of influential surveys and studies in the US and Europe highlighted a sustained empirical picture of inequalities in the use of information and communication technologies (ICTs) – in particular the computer and internet. This digital division was popularly seen as occurring between cadres of technological 'haves' and 'have-nots' or 'information rich' and 'information poor'. Although dramatic, these initial portrayals of the digital divide reflected (albeit crudely) the emerging trend that, even in countries with relatively high levels of ICT use, specific social groups were significantly less likely to be engaging with new technologies.

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Now, after 15 years of debate, analysis and discussion the notion of the digital divide is undergoing something of a reassessment. On one hand, some commentators are now dismissing the digital divide as a relic of the 1990s. By 2010, we are assured, "only the homeless and the jobless will be webless" (Sutherland 2004, p.7). This (re) presentation of the digital divide as 'yesterday's problem' has been noticeably accelerated by the migration of the internet to platforms such as digital television and mobile telephony. In fact, it is beginning to be argued that the only digital dilemma of the 2000s is that of having *too much* access to ICTs. Thus technological enthusiasts are concerning themselves with the need to periodically disconnect themselves from information and technology (as evinced in the growing support for the 'techno-Sabbath' concept, where people are encouraged to take a technology-free day out every week). As Esther Dyson reasons, "it used to be you could not get enough access. [now] we just have to learn to turn it off" (cited in Townsend 2004, p.7).

Yet many other commentators see the digital divide as gaining, rather than losing, significance in contemporary society. This concern stems from the apparently persistent levels of unequal engagement with ICTs in both developed and developing nations. Against this background the chapter now goes on to address a number of objectives. Firstly, it presents a review of recent research and theoretical work in the area of digital exclusion and the digital divide, and considers a number of different reasons why digital exclusion remains a complex and entrenched social problem. Secondly, the chapter proposes a hierarchical framework of digital exclusion based around conceptual 'stages' of ICT use. Thirdly, the chapter considers the challenges that that policy makers, technologists and other information society stakeholders face in formulating future policies and interventions.

BACKGROUND: THE PLACE OF ICT USE IN TWENTY-FIRST CENTURY SOCIETY

It is accepted by most commentators that we now live in a fast-changing 'runaway world' where the economic, social, cultural and political foundations of societies are being redefined on a continual basis (Giddens 2000). The much-heralded globalization of society is now apparent in a variety of forms, such as a shrinking of space, acceleration of time and reconfiguration of social relations along international lines. Although traditional structures such as the nation-state continue to play significant roles in the governance of society, their influence is increasingly being challenged by other entities such as the transnational corporation.

Most commentators also accept that this recasting of social relations is borne not only of economic, cultural and political changes but also of the changing technological world in which we are living. This is perhaps most clear in the rise of the *information society* and the attendant *knowledge economy*, where the production, management and consumption of information and knowledge are seen to now be at the core of economic productivity and societal development (Bangemann et al. 1994). Clearly, one of the key accelerators of these new forms of society and economy has been the rapid development of new telecommunications and computerized technologies over the past three decades. The global flows of data, services and people that characterize the global knowledge economy have been underpinned by information and communications technology. From e-commerce to e-government, ICTs such as the internet and other global telecommunications systems are major conduits through which contemporary society is acted out.

A defining characteristic of these ICTs have proved to be their ability to bring people and places together, thus underpinning the 'time/space compression' outlined above (Harvey 1989). In his influential analysis of the rise of the so-called 'network society', Manuel Castells (1996) outlined how the dominant functions and processes in contemporary society are now organized increasingly around networks rather than physical boundaries - what Castells termed the 'space of flows' (i.e. the movement of information or money) rather than the space of places (i.e. their original location). Crucially Castells saw the rising importance of networks in society as brought about by the coincidence of new technological developments with the restructuring of capitalism and nation states in the 1980s. Now ICTs can be said to be firmly at the heart of the interconnected logic that can be said to characterize twenty-first century life.

This technology-based reconfiguration has been evident in the transformation of most, if not all, areas of society over the past decade. Employment, education, leisure, health, welfare, politics and civic participation all now take place in ways and in locations that would have been unimaginable a generation ago, often with technology at their heart. Of course, we should be wary of seeing these developments as heralding a total transformation of society. Many of these 'online' developments replicate rather than replace existing 'offline' practices and activities (Woolgar 2002). Yet one noticeable shift has been the increasingly decentred and individualized nature of life in this globalised, networked, knowledge-focused world. Free to live beyond the confines of the nation-state, local community or family, the onus is placed on the individual citizen to make their way in the world. For some commentators these changes are wholly beneficial, 'freeing' societies and their citizens from the interference of the nation-state and other regulatory bodies and allowing the (re)distribution of services and wealth along more efficient and market-driven lines (see Stromquist 2002).

Whilst the globalised nature of contemporary society can prove empowering for some individuals and groups, it also undeniably has led to increased fragmentation, marginalization and dis-empowerment. The global opportunities of the twenty-first century such as low cost air travel and deregulation of international trade barriers belie the persistence and reinforcement of many distinctly twentieth century inequalities, limited opportunities and social problems. Whereas some individuals benefit from their new-found agency, others fare less well from being decoupled from the familiar anchors of the welfare state, nuclear family and so on. We cannot afford to see contemporary society as offering homogenous benefits for all. Individuals, groups, organizations and countries can be as connected or isolated, as advantaged or disadvantaged in the globalised technology-driven age as before. Crucially these inequalities are also being reconfigured along different lines – in particular within as well as between social groups.

Whilst debate rages over whether society in the early twenty-first century is necessarily better or worse than before, we can be certain that we are experiencing a different form of society. In particular the changes outlined above imply a vast set of expected new practices and ways of operating within a less linear, structured and predictable logic of society. In the world of work, for example, the expectation of a 'job for life' has long passed. An individual's employability is seen to rest on their ability to adapt to different demands and circumstances on a 'just-in-time' basis. Employees are expected to be flexible in their working practices and skill-sets – operating when and where required, as opposed to clocking-in from nine-to-five in the same location. Practices such as remote teleworking, video-conferencing and flexi-time are now common features of the workplace.

Similarly, in terms of civic and political engagement, individuals are expected to engage with government and other public services in a variety of technology-mediated ways. Governments of all (over)developed nations are making strident efforts to use ICT to provide public services that enrich citizen's lives, stimulate public participation in the community, strengthen democracy and reach out to people at risk of social, economic or digital exclusion. As such ICTs are positioned as a means of (re)engaging the public with the civic and political arenas – chiming with the general enthusiasm amongst policymakers for what Newman (2008) terms the political potential of "cyber-publics" – where ICTs can be used to offer new forms of engagement through a proliferation of spaces and sites in which the public are participated to participate. As the UK Prime Minister reasoned recently:

Technology will empower even more. And just as I look at what we can do in the public sector in Britain to empower people in healthcare with greater access to information for self-medication and everything else, in education greater access to information for people to study at home and to draw on the lectures and the lessons that come through the internet from schools, and colleges, and universities; in crime, for people to map the areas where crime is happening and to be far more aware on a day to day, sometimes hour to hour basis of what is happening in their neighbourhoods. All these great advances that are possible will empower people with new opportunities for the future (Gordon Brown 2008).

All of these new practices and 'ways-of-being' imply a revised set of expected competencies and abilities which are required if one is to be an 'effective' and successful member of society. In a physical sense, individuals are required to be more mobile now than ever before (Urry 2000). Alongside the basic skills of numeracy and literacy, individuals are required to develop different forms of information and technological literacies (Bawden 2001). Successfully negotiating the ever-changing opportunities and choices on offer requires the development of a capacity for constant self-evaluation and self-awareness, alongside a lightness of touch and constant re-evaluation of one's actions (Beck-Gernsheim 1996, Bauman 2005). The successful individual is therefore required to be reflective and reflexive, building upon and learning from past experiences and reacting to new opportunities and circumstances.

Crucially ICT is seen to be an integral element of these new ways-of-being, playing important roles in underpinning an individual's reflexive judgment and social action. The life of the reflexively modern individual is likely to be bound up with an array of technological possibilities from mobile-phone based communication to the online sharing of information. Through these technologically-facilitated channels, reflexivity is therefore "no longer about distanciated decision-making [now] there is no distance at all between knowledge and action" (Lash 2002, p.156). Of course many of the competencies seen as essential to contemporary life – such as communication, reflexivity, team-work, adaptability and so on – are underpinned by decidedly non-technological practices and contexts. Nevertheless, the fact remains that ICTs provide an integral context for these actions. Whilst ICT use is certainly not a pre-requisite to surviving in twenty-first century society, it is almost certainly an integral element of thriving in twenty-first century society.

RECOGNISING THE MULTIPLE LEVELS OF 'ICT USE'

Before we continue this discussion further, it is necessary to establish what is meant by 'ICT use' – a distinction often glossed over by those commentating on the digital divide. In this respect, ICT use encompasses a number of integral roles in twenty-first century life. At a basic level, what one knows, who one interacts with, and what one is able to do is contingent upon being connected adequately to the information flows of contemporary society. For example, computer-mediated communication and mobile telecommunications technologies are at the heart of many social interactions, however mundane or life-changing. Similarly, the worldwide web is a key setting where individuals access and interact with information. ICTs now play an integral role in people's purchasing of goods and services, their employment and education, their involvement in civic or political affairs as well as consumption of leisure and entertainment services. Indeed, ICTs now lie at the heart of most of the activities which are seen to constitute 'social inclusion' - from playing an active role in one's neighborhood and community to maintaining one's personal finances. As outlined previously, the inclusive role of ICT has recently been reinforced by the widespread turn towards e-government. Technologies such as the internet, digital TV and mobile telephony are now important means of accessing and interacting with local government, health and welfare services, the criminal justice system and other areas of government. In all these instances, ICT use is implicated increasingly in what it means to be socially, economically, culturally and politically involved in twenty-first century society.

Yet in recognizing the importance of 'ICT use', we must be clear of its multiple components. As our discussion so far has implied, any talk of 'ICT access and use' in contemporary society refers to much more than access to a desktop PC, having basic keyboard skills and a familiarity with Microsoft windows applications. Crucially, the digital activities and interactions outlined above can take place via a range of different types of ICT. The convergence of new media platforms such as digital television, mobile telephony, games technologies and other portable devices has led to a multi-modality of technology access and use. There are a wider number of ICT devices upon which one may, for example, use the internet. However, it is important to recognize that the technical and social qualities of such use can vary considerably across different platforms – for example, the difference between searching the worldwide web on a mobile telephone and on a desktop PC. Alongside this variety of ICT hardware we also need to acknowledge the importance of people's connections into information and telecommunications networks. 'Plugging in' to the digital landscape is now contingent on a range of types and levels of connectivity. Whilst the connectivity debate which raged within Europe and North American during the late 1990s and early 2000s centered around the necessity of 'broadband' rather than 'narrowband' access to the internet, other spectrums of connectively now exist, including wireless and satellite-based connections, all with varying speeds and quality of data transmission and all suitable for different types of users.

Crucially, being able to use these ICT configurations is reliant on a variety of competencies and literacies above and beyond basic 'technological literacy' of being able to operate common ICT tools effectively. This much broader view of 'multi-literacies' sees individuals requiring the language, number and technical skills which give them access to the evolving digital world, alongside a set of creative and critical skills and understanding required to productively engage with technology use in their lives (New London Group 1996). As Andy Carvin (2000) has outlined, these competencies include the ability to be 'information literate' (the ability to discern the quality of content), 'adaptively literate' (the ability to develop new skills whilst using ICTs) and 'occupationally literate' (the ability to apply these skills in business, education or domestic environments). These competencies are underpinned by levels of basic literacy in reading and writing and the functional literacy of being able to put these skills to daily use. Crucially, then, the various forms of 'digital literacies' required of the individual ICT user both mirror but also go beyond the traditional twentieth century literacies of 'lettered representation' (Kress 2003, Lankshear et al. 2000, Marsh 2006). As Thoman and Jolls (2005, p.4) conclude:

No longer is it enough to be able to read the printed word; children, youth, and adults, too, need the ability to both critically interpret the *powerful images of a multimedia culture and express themselves in multiple media forms.*

SO WHAT IS DIGITAL EXCLUSION …. AND WHY DOES IT MATTER?

It should be clear from our discussion so far that ICT use is an important element of effective participation in twenty-first century society. Given the integral part that ICTs play in national development, organizational growth and individual welfare, governments cannot afford to under estimate the importance of what was referred to during the 1990s as the 'digital divide'. Now, more than ever before, intervening in the digital divide offers a timely and powerful opportunity for policymakers to force positive social change – creating opportunities for the technologically-based empowerment of individuals and their eventual increased social inclusion and long-term security (Norris 2001, Wilhelm 2004). Perhaps the most important area of inclusion that this affords is in the area of civic and political engagement - as Coleman (2004) argues, the internet and other ICTs are key tools to 'connect Parliament to the Public'.

As the past ten years of digital divide policymaking has proved, it cannot be assumed that engineering such changes will be an easy task. As we have just discussed, 'ICT use' is a multi-faceted concept that encompasses a variety of activities and practices, via a range of hardware platforms and means of connectivity, requiring a number of different competencies and resulting in a number of outcomes. It follows that the ambition of any efforts to ensure the fair and equitable use of ICT use within and between nation-states must reach well beyond issues of technological resourcing and availability of content. In this sense there is a need to move beyond a conventional understanding of the 'digital divide' as a simple case of 'technology haves' and 'technology have nots' and begin to address the area of digital inclusion in more nuanced terms.

For example, alongside the user/non-use divide a little discussed facet of the digital divide debate is the substantial proportion of 'ordinary' users of ICTs who nevertheless do not make best use of digital technology. Indeed, the tendency to view the digitally excluded purely in terms of 'non-users' of technology has prompted a narrow alignment of the digital divide with general concerns over social exclusion and deprivation. As we shall go on to discuss, the issues underlying the digital divide impinge on the ICT (non)use of individuals from all social backgrounds. In this sense the digital divide should not be viewed merely as a sub-set of general patterns of social exclusion. Although many people who could be considered to be digitally excluded would also be considered as being more generally socially excluded, the two categories are not mutually inclusive. In tackling the digital divide we must consider the substantial but 'hidden' digital exclusion of individuals who may well have relatively high levels of income and educational background, who nevertheless gain little from their engagement with ICTs.

Moreover, any disparities in use should not be assumed to be static in nature, with individuals tending to drop in and out of ICT engagement at different stages in the life course as their circumstances change (Anderson 2005). Whilst at a primary level digital exclusion is obviously predicated upon an individual either having or not having adequate access to the necessary hardware, software and network connections, more attention needs to be paid to issues surrounding the dynamics of the use of ICT. As Mark Warschauer (2003, p.46) has argued, "the key issue is not unequal access to computers but rather the unequal ways that computers are used".

From this perspective, a number of authors have begun to map out multi-dimensional definitions of digital exclusion that encompass the multiple levels of ICT use outlined in the previous section. For instance, Lievrouw and Farb (2003) propose four basic elements of digital equity above and beyond matters of physical access to resources –

namely skills, content, values and context. Similarly, Yu (2006) discusses 'ICT use' in terms of skills, literacies, support and outcomes of activity and practice (such as the differences in outcomes between ICT-based entertainment as opposed to education). Also of use is Jan van Dijk's (2005, p.21) delineation between the motivations behind making use of ICTs, possession of operational, information and strategic ICT skills, and the nature of usage (e.g. usage time, the number and diversity of applications). Crucially, van Dijk sees the success of these stages of engagement with ICTs as contingent on the following aspects of resourcing:

- Temporal resources (time to spend on different activities in life);
- Material resources above and beyond ICT equipment and services (e.g. income and all kinds of property);
- Mental resources (knowledge, general social and technical skills above and beyond specific ICT skills);
- Social resources (social network positions and relationships – e.g. in the workplace, home or community);
- Cultural resources (cultural assets, such as status and forms of credentials).

Implicit to all these models of ICT use are the surrounding social, cultural and cognitive contexts of the activity or practice that ICT is being used for, as well as the overall relevance and utility of the activity itself. This combination of technological possibilities, user capabilities and understandings, and the wider social context is sometimes described in terms of the 'affordances' of ICTs (Norman 1999). In this sense facilitating such affordances of ICTs relies both on the technology providers (to produce and provide content which is of use to the user) and the individual users themselves (to perceive content to be useful and feel compelled to make use of it). We can see how these issues are crucial to the effectiveness of any 'e-policy' intervention. For instance, the reason that high proportions of adults populations across some developed nations such as the UK chose not to vote in elections are not necessarily linked to the inconvenience of having to physically cast a vote in a ballot box.

Aside from issues of user cognition, these individual perceptions and understandings of the affordances of ICT use are likely to be organizationally and socially based (Cushman and Klecun 2006). If the wider cultural context of use (such as the workplace, school or home) does not fit well with the culture of the ICT application, then use will not easily follow. As such ICT use is not just based on the individual being able to 'understand' the potential benefits of ICT use, but how well ICT-based activity 'fits' with the wider contexts within which they are operating. Again we can see how these issues also underpin the relative effectiveness of e-policy interventions. To view the digital divide as a matter simply of successfully 'marketing' the benefits of ICT-based services and applications to the individual is to ignore the wider issues that must also be addressed. In this sense an integral aspect of ICT (non)use is that of individual agency and choice. Above and beyond having the necessary access to resources, digital inclusion is therefore predicated on the ability to make an informed choice when and when not to make use of ICTs. Digital inclusion is not therefore simply a matter of ensuring that all individuals make use of ICTs throughout their day-to-day lives, but a matter of ensuring that all individuals are able to make what could be referred to as '*smart*' use of ICTs, i.e. using ICTs as and when appropriate. In this sense not making use of ICTs can be a positive outcome for some people in some situations, providing that the individual is exercising an empowered 'digital choice' not to do so (see Dutton 2005, Selwyn 2006).

The complex, socially-rooted nature of these issues has prompted an understandable reticence amongst sections of the policy community and IT industry to feel that they are able to engineer any sustained, meaningful change when it comes to individuals' ICT use. Some in the policy community and IT industry are resigned to see inequalities in ICT use as a natural and unavoidable phenomenon, akin to all forms of inequality in a functioning and 'effective' market economy. Other more techno-utopian stakeholders continue to store considerable faith in the power of market forces to eventually lead to full 'diffusion' of ICT use, assuming that ICT use will naturally spread from 'early adopters' (mostly male, white, affluent, well-educated) to subsequent 'majorities' of users in the due course of time (Rogers 1995). As such, some in the policy community and IT industry now consider the digital divide as a 'dead' issue not worthy of policy intervention (see Strover 2003, Compaine 2001). There have even been suggestions of late that the digital divide is a relic of the 1990s, nothing more than "a last century anxiety" (Brown 2005, p.13).

RECOGNISING THE CONTINUED IMPORTANCE OF DIGITAL EXCLUSION

We would argue strongly against abandoning digital exclusion as a viable area for social intervention. There is little ground to be either resigned or complacent when it comes to digital inequalities. Instead there is considerable evidence that the digital divide is neither disappearing through the machinations of the market or being rendered obsolete by advances in technological development. Nor, as we have argued above, are digital inequalities rigidly following the entrenched lines of general inequality and social injustice. As such we would contend that the digital divide continues to be one of the most important social issues of our time. Moreover, it is a social issue which can be addressed by policymakers and other concerned stakeholders in the information society/knowledge economy – albeit requiring a carefully thought-through approach to any intervention.

As a basis to this discussion it is worthwhile taking some time to consider the patterning of digital exclusion in more detail. In doing so there is a wealth of empirical evidence on which we can draw. Led by high-profile surveys administered by the likes of the '*World Internet Project'* and Pew *'Internet in American Life'* project, a host of large-scale and well-executed studies have sought to map the digital inequalities in developed and developing countries alike. Building upon a series of ground-breaking US surveys in the 1990s which first brought the issue of the digital divide to political prominence – such as the NTIA's 'Falling through the net' reports and the 'UCLA internet report' - a succession of studies and surveys show specific social groups to remain significantly less likely than others to engage with new technologies (e.g. Roe and Broos 2005, Dutton et al. 2005, Kaiser Family Foundation 2005, Chinn and Fairlie 2004, Holloway 2005, Chakraborty and Bosman 2005, Demoussis and Giannakopoulos 2006, Roe and Broos 2005, Peter and Valkenburga 2006, Cotten and Jelenewicz 2006, Willis and Tranter 2006). Such is the recurring importance of variables such as age, socio-economic status, education, family composition, gender and geography, that the Pew study was led to observe that "demography is destiny when it comes to predicting who will go online" (Pew 2003, p.41). This conclusion has been reinforced year on year by a variety of digital divide surveys and statistical analyses produced by governments, the IT industry, charitable foundations and market researchers the world over.

Whilst there is some variation to the magnitude of difference, the social groups most likely to be characterized as being 'digitally excluded' in these data are most commonly delineated in terms of gender, age, income, race, educational background, geography and disability. This nature of this patterning can be seen in the context of the UK, for example, in the latest data from the Office of National Statistics (2007). These data show that 61 percent of households in the UK could access

Table 1. Households with Internet access UK, 2007 (ONS 2007)

Year	Percentage of households
2002	46
2003	50
2004	51
2005	55
2006	57
2007	61

the internet, marking a slight but steady rise from previous years [table 1]. However, these baseline data were noticeably delineated by a number of factors. In terms of regional variation, for example, around half of households in Northern Ireland and the Northeast of England but only one third of households in the capital city of London were found to lack internet access [table 2]. Similarly, one-third of adults who had never made use of the internet were more likely to be female, from

Table 3. Percentage of adult population (age 16 years or over) who has never made use of the internet (ONS 2007)

Gender	
Men	23
Women	31
Age-groups	
16–24 years	4
25–44 years	13
45–54 years	19
55–64 years	35
65+ years	71
Income*	
Up to £10400	51
£10401 – £14559	38
£14560 – £20799	25
£20800 - £36399	12
£36400 +	6

* NB. analysis by income from 2006 dataset

Table 2. Households with no internet access by region and type of connection, UK, 2007 (ONS 2007)

Northern Ireland	48
Yorkshire and the Humber	48
North East	48
West Midlands	44
North West	44
Wales	43
East Midlands	41
Scotland	40
South East	35
East of England	33
South West	31
London	31

older age groups and/or residing in lower-income households [table 3], again replicating patterns evident in data from previous years.

The significance of these factors is confirmed – to a greater or lesser extent – by a burgeoning body of academic literature conducted by scholars around the world. The breadth of this digital divide literature was recently illustrated in a comprehensive systematic review of 192 English-language research reports by Liangzhi Yu (2006). This analysis confirmed the following factors as emerging from the recent literature as associated with the non-use of ICTs within countries: (See Table 4)

The identification of these trends is useful, although it should be noted that most of the research literature to date has been primarily concerned with ICT access and general levels of 'use', and therefore lacks the multi-layered realities of ICT use that we have outlined above. As such we should be wary of the diminishing importance of certain variables in terms of these 'headline' statistics (e.g. the apparent disappearance of the gendered digital divide). In fact, beyond these basic levels of access and being a 'user' or 'non-user', other studies of ICT use suggest that all of these variables continue

Table 4. (Source: Yu 2006, p.240-241)

Age	Increased age associated with decreased levels of access, limited modes of use and patterns of connecting. Age differences are especially pronounced in those individuals aged 60 years and over.
Culture / Social participation	Communities and individuals with higher levels of social contacts tend to make more use of ICTs.
Education	Lower levels of education are also shown to be associated with digital divides concerning access to and use of a range of ICTs.
Family structure	Family composition, adult caring responsibilities (i.e. for an older parent) tend to be associated with less contact with ICT. Conversely, the presence of school-age children within the household tend to increase contact with ICT.
Gender	Whilst gender differences were associated with digital divides during the 1990s, more recent academic research seems to indicate declining gender differences in ICT access and basic levels of engagement.
Geography/ rural-urban location	Levels of ICT use generally less in rural and inner-city areas, although often differences are not evident once other socio-economic variables are taken into account.
Income/ socio-economic status	Lower levels of income are consistently shown to be associated with digital divides concerning access to and use of a range of ICTs.
Race	Some US studies report lower levels of access and use amongst African-American and Latino populations However, many studies report that then racial differences in ICT use disappear when issues of income and education are taken into consideration.

to influence the nature, quality and outcomes of an individual's ICT engagement.

Taking the example of differences between men and women's use of the internet, a robust body of qualitative research suggests that despite the apparently diminishing divide between the sexes in terms of the quantity of access and basic internet use (as opposed to non-use), gender remains an important factor in terms of the quality and nature of an individual's engagement (see Liff and Shepard 2004, van Dijk 2006). For instance recent studies of (non)use of the internet in everyday settings such as the home, workplace, and classroom highlight a host of deep-rooted ways in which gender continues to fundamentally mediate engagement with new technologies, regardless of an individual's age or technological background (e.g. Cranmer 2006, Lally 2003).

Concerns continue to be raised by social scientists over the gendered nature of a host of technological uses, including the playing of computer games (Melissa and Newcombe 2005), the use of mobile telephony (Lemish and Cohen 2005), and computer-mediated shopping (Dittmar et al. 2004). These studies have shown, for example, how women's engagement with ICTs is often compromised by their roles as partner, sister, daughter, student, or employee. These compromises are experienced in terms of when and where women get to use technologies, as well as who gets to use technology and with what outcomes. As with all areas of contemporary society, it seems that ICT use continues to be a highly gendered area of life, even if this is now not always immediately obvious from the basic access and usage data. Crucially, these issues have been found to impact on the ICT of women from all socio-economic and educational backgrounds. These more subtle continuations of inequality are not unique to gender; the same conclusions can be drawn for the continued influence on ICT use of all the major variables within Yu's typology, alongside other variables such as physical disability and other health-related factors.

The bearing of these inequalities between different social groups on the outcomes of ICT use continues to be significant. If individuals from underserved social groups such as older adults, the unemployed and/or carers are experiencing quantitatively and qualitatively diminished forms of ICT use then there is a danger that they will further fall behind those individuals who, in contrast, could be said to be 'super served' by ICTs. From this empirical background, we can therefore conclude that ICT use continues to be a source of significant social inequality in enduring ways. As such it is clear that the digital divide is a multi-faceted social problem, requiring a multi-faceted intervention. As Yu (2006, p.235) concludes:

nearly all related studies agree that the fundamental solution lies beyond a mere consideration of information availability and infrastructure; they call for governments to interfere with the deep-rooted factors which have directly or indirectly caused this situation .

TOWARDS AN ALTERED UNDERSTANDING OF DIGITAL INCLUSION

On the basis of this evidence, we would argue that there is a pressing imperative for e-government stakeholders to develop a wide-ranging and ambitious agenda which sets out to address the multiple layers of the digital divide. It should be clear from our discussion so far that digital exclusion is not set to simply diminish or disappear of its own accord. Instead it continues to demand a complex set of policy responses which go far beyond simply increasing levels of hardware provision and then assuming the 'gap' to have been 'bridged'. We would contend that the time is right for countries to develop renewed and revised portfolios of interventions and initiatives that builds upon but moves beyond the past decade of digital divide policy-making. In short there is a need for policymakers, technologists and other stake-holders in the information society to work together on how best to achieve the following aim …

Enabling all individuals to make informed and empowered choices about the uses of ICTs whilst ensuring these individuals have ready access to the resources required to enable them to act on these choices

To date, much activity in the area of addressing digital exclusion has centered on the latter half of this aim: i.e. "ensuring that individuals have ready access to the resources required to use ICTs". In particular, government activities have focused on the area of widening access to ICT resources, skills and support for the socially disadvantaged, as well as the provision of public services through ICT to all citizens. These objectives have been pursued through a series of high-profile initiatives since the 1990s ensuring that public services are accessible to and usable by everyone via ICT. This has focused on the better design of services, using many different ways to connect with citizens (such as the Internet, mobile phones, kiosks, digital television), enabling citizen's digital literacy (through formal and informal trainings) and effectively promoting ICT services to increase uptake.

Yet there are signs that the momentum from this policy work of the last ten years is declining. In particular there is clearly scope to extend the focus of current digital exclusion initiatives to encompass all sectors of society, not just those considered to be generally socially disadvantaged. Moreover, there is a need for the policy community to begin to give serious consideration to the first half of our stated aim – i.e. "enabling all individuals to make informed and empowered choices about the uses of ICTs". In a reflexive, globalised society where individuals are expected to take responsibility for their own actions, this is arguably the most important aspect of the digital divide. The key question to consider is whether government, public sector organizations and other concerned stakeholders have the capacity to support and strengthen individuals' capacity to make these choices when it comes to ICT.

With this in mind we conclude this chapter with a 'charter for change' – outlining a list of basic entitlements relating to ICTs and ICT-based services which we would suggest that every individual in the twenty-first century digital age can reasonably expect. These four entitlements which we suggest that every individual in the current digital age can reasonably expect are as follows:

- **Entitlement one:** All individuals are able to exercise an empowered and informed choice about their use or non-use of ICT-based practices;
- **Entitlement two:** All individuals have ready access to the requisite social and technical support, skills and know-how to support their use of ICT-based practices;
- **Entitlement three:** All individuals have ready access to ICT-based content and services which are relevant and useful to their needs and interests;
- **Entitlement four:** All individuals have ready access to a full range of ICT hardware and software required to engage with ICT-based practices.

Underpinning these entitlements, we also propose a set of six challenges to our basic assumptions about the digital exclusion which should inform future discussion and action:

- **Challenge one:** to start from premise that individuals from all sectors of society can be digitally excluded – not just those who are considered socially disadvantaged in general, or just those who make no use of ICT;
- **Challenge two:** to remember that there is a diverse and wide range of technologies which can be considered as ICTs – not just computers and the internet;
- **Challenge three:** to draw upon the diverse and wide range of activities for which ICTs can be used;
- **Challenge four:** to strive to extend the range of ICT-mediated activities through the involvement of all social groups in the production of digital content and services;
- **Challenge five:** to find ways to make the full range of ICT-based activities visible and viable to all individuals – regardless of their current engagement with ICT;
- **Challenge six:** to seek to match the affordances of ICTs with the everyday needs, interests and desires of individuals.

FUTURE TRENDS

From this background we now conclude by highlighting a number of areas and issues that will require consideration and clarification before any sustained progress can be made. This, we hope, can provide a basis for an informed and innovative debate over the forthcoming months.

Who Should Take a Lead?

In many (over)developed countries there is a sense that the issue of the digital divide is lacking a central advocate and co-ordinating presence within national government. Indeed, there appears to now be less ‘joined-up’ concern within government over the wider issues underlying the digital divide, especially for those individuals who would not be necessarily classed as disadvantaged in other aspects of their life. This lack of general profile within government contrasts with the number of public and private sector organizations working in the area of digital inclusion – from charitable organizations to private sector interests. The continuation of this de-centralized model of digital divide intervention may well be desirable (see Rajagoplan and Sarkar 2008), but the question should nevertheless be raised as to whether responsibility needs to given to dedicated sectors of central government. Is there a need for distinct Ministries for Digital Exclusion or else a direct remit being given to existing departments? Is it not the case, as Wilhelm (2004, p.40) argues, that “the body politic must be willing to show resolve over the long haul, and charismatic leadership is essential to show the way forward". Conversely, should central government pull further back from leading in this area? What roles can be played by media and communication regulators and other state organizations?

Another issue which merits consideration is the increased involvement of individual citizens in the digital divide debate. For instance, William Davies has argued for the establishment of a high-profile, democratized debate over the capabilities of ICTs and the purposes of digitization. Increased involvement of the 'citizen voice' within the digital divide debate could shape outcomes in ways which are both meaningful and relevant to the public and therefore standing more chance of success (Davies 2005). Is this politicizing (with a small 'p') of the digital divide debate a desirable direction to pursue? If so, how may such a debate be stimulated, maintained and acted upon within and between nations? These questions of the politics of the digital divide are all issues which should be addressed as a matter of urgency.

How Do We Ensure Ready Access to Hardware and Software?

As we have established, ensuring that individuals have adequate access to hardware and software is a pre-requisite to tackling the digital divide. To date government strategy has largely focused on the provision of communal internet access points in public locations such as schools, libraries, museums and other community settings. Such a 'community technology centre' approach has achieved varied success in widening meaningful access to those individuals and social groups otherwise lacking internet and computer access in domestic or workplace settings (see Smith and Cook 2002, Hall Aitken Associates 2002, Selwyn et al. 2005). But are other options available, especially considering that ICT resources now span beyond desktop computers and fixed internet connectivity? For instance, can and should government provide access to personalized and mobile technologies or digital interactive television in similar ways?

There are a number of alternative options to the community technology centre approach which could also be considered. For instance, there could be a place for government intervention in areas of ICT provision where there has been 'market failure' to distribute ICT access. Such intervention may take the form of direct state provision of ICT resources to under-served populations, or else the use of tax incentives or reduced tariffs on ICT goods to stimulate the domestic, workplace and education markets for ICTs. There are other 'low-cost computing' strategies which can be revisited (James 2001), not least the redistribution of reconditioned hardware and software to underserved populations. In Europe, for example, this area of recycling looks set to increase in significance in light of the implementation of the EC Waste Electrical and Electronic Equipment directive which provides an incentive for the re-use rather than disposal of hardware. With this mind, is there scope to build upon the philanthropic spirit of giving citizens ownership of ICTs free of charge (such as in the UK 'Computers Within Reach' and 'Wired-Up Communities' programmes) whilst being mindful of the logistical and administrative problems experienced during these pilot initiatives (Halcyon Consultants 2003)? Similarly, what viable opportunities are there for the production of ICT resources by public/private partnerships – thus drawing on the expertise of the IT industry? Whilst it remains only one aspect of the digital divide, ensuring adequate quantity and quality of access for all remains an important issue to address.

How Do We Ensure Ready Access to Relevant Content and Services?

Digital inclusion is also predicated upon ensuring that individuals have adequate access to meaningful and relevant content and services. To date government digital divide strategies have largely focused on the provision of public sector services and information. Yet how can we best ensure that the production and distribution of government information and services is underpinned by social justice principles and promotes genuinely open access to information and knowledge? A key area for debate here is the relative virtues of 'top-down' provision of information and services as opposed to the 'bottom-up' creation of content. Should the official production of information and services move beyond its primary foci of education, employability and interaction with government services? As Wilhelm (2004, p.xii) contends, "isn't it the responsibility of governments of, by, and for the people to meet people where they are, not where they would like them to be?". With this in mind, is there a role for the official provision and support of ICT uses which are based around more creative or frivolous uses of technology? Should 'top-down' official content be reshaped for different social groups? For example, should digital content emanating from the middle-class mainstream society be repackaged for other sectors of society, such as the elderly or ethnic minority groups (see Hargittai 2003)? What role is there for community online networks and other forms of bespoke content production by individuals (Borgida et al. 2002)? How can digital content and software be designed with social justice issues in mind (see Grant 2008)?

How Do We Ensure Ready Access to Skills, Social and Technical Support and Know-How?

A further important element of digital inclusion is ensuring that the social context of ICT use allows individuals to be informed about their choices, and provides trust-worthy support when using ICTs. At present, most governmental effort in this area has been directed at the formal provision of ICT skills and support, most notably in the provision of ICTs skills training, and the training of staff in community technology centers to support users. Yet are there ways to make more extensive and imaginative use of these ICT skills training programmes? One possibility would be the cascading of skills and know-how back into deprived communities, thereby using ICT training to build the social capital of communities. Efforts could be made, for example, to encourage and support those individuals who have received ICT skills development as part of their formal education and training to return to their communities and support other individuals in their informal social networks in their ICT use (see, for example, see Newholm's (2008) discussion of developing 'helping networks' and co-operatives in social housing communities).

Furthermore, it is observed that people often prefer what they see as 'dis-interested' sources of advice rather than 'interested' ones, i.e. those that can offer 'impartial advice' (Introna and Nissenbaum 2000). Aside from the formal provision of skills and support is there scope for supporting the informal networks which individuals draw upon for advice and support, especially family and work networks? Could ICT retailers and suppliers and other ICT professionals be supported in playing more sustained supportive roles for individual users which are not commercially-driven? Are there ways in which the informal and sometimes non-legal neighborhood contacts used to supply software and advice to individuals can be built upon – therefore tapping into the so-called 'grey-ware culture' (Sundaram 2004) which underpins much domestic ICT use?

How Do We Ensure Individuals can Exercise an Empowered Choice?

Underlying all these issues is the most challenging but perhaps most important area for consideration. Amidst all these suggestions for intervention it should be recognized that public-sector support for individuals' ICT use can only go so far. In light of our opening discussion concerning the individualized nature of contemporary society, any government intervention in the digital divide must start from the assumption that the successful individual is reflective and reflexive, building upon and learning from past experiences and reacting to new opportunities and circumstances. In this sense individuals must ultimately take responsibility for their ICT engagement, acting in a reflexive manner towards ICT use. Yet how can individuals be as empowered, informed and effective as possible in making these choices and engaging with ICT?

With this in mind, a new strand of the digital divide debate needs to be opened up amongst academics, policymakers, technologists and other stakeholders as to how to enable informed choices and support the actions of individuals as knowledgeable users or non-users of ICTs (see Cushman and Klecun 2006). It could be that an empowering of users would result from the democratizing of the digital divide debate as suggested earlier. Such public recapturing of the discourses surrounding ICTs in society could lead to the opening up of the 'black box' of ICTs to individual users, so that ICT use becomes less of a prescribed means to prescribed ends, and more a set of tools and practices which the majority of individuals feel that they have some control over and part in shaping (see also Schofield Clark et al. 2004, Mansell 2002). Nevertheless, there is an obvious need for the development of some tangible actions and interventions in this area above all others.

CONCLUSION

This chapter is intended to act as a starting point for action. As is often the case with such writing, it raises far more questions than answers and has highlighted many problems whilst offering few potential solutions. It is not the point of this chapter to suggest any tangible examples of possible solutions. Whilst specific policy solutions are emerging to improve the lives and life chances of disadvantaged people and the places in which they live (see for example Grant 2008, Digital Inclusion Team 2008) this chapter is arguing for a reassessment and realignment of policy priorities. As such we hope that the issues and arguments raised in this chapter can act as the catalyst for a sustained period of debate, discussion and development concerning digital exclusion and the establishment of more equitable information societies. Whilst it is trite to talk of 'digital divide 2.0', in many ways this chapter is arguing for a wholesale re-imagining of digital exclusion as a social issue, and a wholesale rethinking of the policy responses which are required. Although digital exclusion is often seen as an individual problem it undoubtedly requires collective solutions.

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KEY TERMS AND DEFINITIONS

Digital Access: The ability to draw upon the means with which to use ICTs: this includes the full range of ICT hardware and software required to engage with ICT-based practices; ICT-based content and services which are relevant and useful to an individual's needs and interests; the requisite social and technical support, skills and know-how to support an individual's use of ICT-based practices.

Digital Exclusion: The inability for an individual to make empowered and informed choice about their use or non-use of ICT-based practices. As such individuals from all sectors of society can be digitally excluded – not just those who are considered socially disadvantaged in general, or just those who make no use of ICT.

Information and Communication Technology: Information and Communications Technology (ICT) refers to a range of digital technological applications such as computer hardware and software, digital broadcast technologies, mobile telephony and, most prominently, the internet.

Chapter 2
The Digital Divide, Framing and Mapping the Phenomenon

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ABSTRACT

This chapter explores the global dimension of the digital divide. It frames the concept and maps the status and the causes of the phenomenon today. The first part investigates how the digital divide can be measured, framing the question and some of the trends foreseen by scholars on the phenomenon. The second part provides the current status of the digital divide, mapping the distribution of the usage of the Internet worldwide with some national indicators and measuring how economic factors cause some of the digital inequalities. The chapter then maps the worldwide unequal distribution of some of the infrastructure of the Internet. By comparing the different measures of the digital divide, the chapter finally provides some conclusions on the expectations regarding the trend of the phenomenon.

INTRODUCTION

Since the declaration of the digital revolution, many hypotheses on its impact have been proposed. Today, new technologies affect our daily life, influencing most of our activities as part of a worldwide political and economic equilibrium. However, despite their pervasiveness, new technologies do not influence regions equally across the world and do not include all of society in their processes in the same way. This existing difference in the use of information technology takes the name of *Digital Divide*.

Though the phenomenon is as old as the digital advent, a generally accepted definition of the Digital Divide does not yet exist. Official reports published on the subject by international organizations - Millennium Report, 2000; Okinawa Charter, 2000; DOTForce, 2001; Plain of Action, 2003 - do not clarify what the Digital Divide is. Each of them emphasizes a different aspect of the issue. The general literature is also ambiguous in this regard. Some authors stress the economic aspects of the so-called "digital revolution" (Castells, 1996; Chinn

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& Fairlie, 2006; Parayil, 2006), focusing on economic causes of the Digital Divide and on the role that new technologies could have in overcoming economic inequalities. Sociologists explore the relation between digital access and social factors (Bimber, 2000; Bucy, 2000; Hargittai, Robinson & Di Maggio, 2003; Wilson, Wallin & Reiser, 2003). Others, meanwhile, focus on the role of digital technology in governance in facilitating the development of democratic dynamics (Chadwick, 2006; Norris, 2001; Stowers, 1999).

This chapter frames the Global dimension of the Digital Divide, mapping its current status and exploring some of the possible causes of it.

First I begin with a historical overview of the evolution of the Internet, focusing on how it developed from a North American instrument into a worldwide communication system. This highlights some of the historical factors that contribute to the current worldwide digital inequality.

In the second part of this chapter, I explore the analysis and the instrument provided by scholars for exploring the phenomenon. Once explored how the Internet became a global instrument connecting worldwide countries, and how this is happening unequally worldwide, some questions arise: what are the current dimensions of the global Digital Divide? How can it be measured? How can we explain its current status?

In order to address these questions, in the third part of this chapter I map the current status of worldwide digital inequality, exploring different national indicators in the distribution of internet users and the infrastructure of the Internet. In order to explore the causes of this inequality, I focus on its relation to economic characteristics in each country.

THE SPREAD OF THE INTERNET: FROM A NATIONAL TO A WORLDWIDE PHENOMENON

At its advent, the Internet was not global in nature. The main infrastructure and expertise of the Internet were originally developed on a national scale. It became a global phenomenon only gradually, after a 30 year long process. I consider it an important preliminary step for this research to explore the history of the Internet and how it became global. I argue that this is useful for understanding the Internet's network structure, and how the very nature of its structure has served to extend its impact worldwide.

It is a commonly held notion that the Internet, as a project financed by the American Department of Defence, was an instrument of communication designed to survive a nuclear attack. However, the earliest idea of the Internet was formulated by computer scientists who had nothing to do with military research (Hanson, 2008). Rather, the Internet was created by people who believed in the power of computers for creating social cooperation in order to amplify human thinking and communication capacity (Rheingold, 2000).

The intellectual origin of the Internet may be found in the memos written by J.C.R. Licklider, a computer scientist based at MIT. Licklider had also a social psychology background. This influenced his focus on how computers could increase the power of the human intellect, improving the performance of scientific thinking (Margolis & Resnick, 2000). He claimed that this would have been possible through what he defined in his notes series as a "Intergalactic Computer Network". This involved a worldwide set of computers linked as a network, through which data and programs would be accessible from everywhere (Leiner, 2000). In these words, Licklider describes the origin of the Internet and in 1958, he became the first director of the Advanced Projects Research Agency (ARPA).

The Cold War largely influenced innovation processes after the Second World War. Communication was already considered a serious priority for national security in the United States. Within this context the American Defense Department established the ARPA. Its research focused on improving communication processes via computer networks.

In May 1961 three microwave relay stations owned by the American Telephone and Telegraph Company in Utah were sabotaged by an explosion, causing disruptions in communications. The American National Defense registered many problems in communications as a result as well. This event raised concerns about the vulnerability of the American communication system, highlighting the existing high risk in the event of nuclear attack (Barney, 2000; Hafner & Lyon, 1996). The research carried out by Paul Baran and Donald Davies provided the solution for this system's shortcoming. Both had the idea to build a communication structure similar to urban plans. These are not centralized networks. The main roads in a city normally lead to central squares. However, if the central square is inaccessible or the main thoroughfares are blocked, it is still possible to reach the desired area of the city via other streets, bypassing the central square. This is the idea of a distributed network run through a packet switching system (Barney, 2000).

Baran and Davies were in fact working separately on this idea. Baran developed the idea of packet switching working in the United States at the RAND Corporation, a non-profit organization conducting military research. This was part of the study on designing a communication system able to survive a nuclear war. He published his study in 1964 without funding.

Meanwhile, Davies developed the same idea working with a team in the National Physical Laboratory in England. His purpose was to increase the economic efficiency of data communication in the United Kingdom. He did not succeed in convincing sponsors about the efficiency of his idea, and was also not funded for his work (Hanson, 2008).

The ideas of Baran and Davis nonetheless circulated quickly. In 1966, ARPA decided to apply this as the model for a new communication system, bypassing possible obstructions in transferring information (Salus, 1995).

In October of 1967, the plan for ARPANet was presented at a symposium in the United States. In November of 1969, the first ARPANet link was established between the four ARPA sites: The University of California at Los Angeles (UCLA), Stanford Research Institute (Palo Alto, California), the University of Utah and the University of Santa Barbara (California).

This marked the birth of the ARPANet, the structure allowing the transmission of data. It became operational in the early 1970s. Yet, it would still be a number of years before ARPANet could be defined as the Internet. Since it was born, various protocols of transmission were developed which depended upon the aim of the data transmission. Many of these were introduced through a "hack", including the first e-Mail in 1970 (Barney, 2000).

The American Department of Defense paid little attention to the project until its first successful experiments were carried out and it became a full operative networking system. In 1975 the managing of ARPANet was transferred to the American Defense Communications Agency. As a result of this transfer, restrictions were imposed on the use of the new communication system. However, increasing interest in using ARPANet for non-military purpose forced the decision, made in 1982, to split ARPANet into two networks. MILNet has been adopted for military use under strict control, while ARPANet was again used for its original goal of connecting researchers (Hanson, 2008).

ARPANet started to become an international entity in 1973, when the connection outside the US was established to Norwegian Seismic Array (NORSAR) in Norway. Shortly thereafter, a connection was made to Great Britain.

However, it was not until 1978 that a serious improvement of data transmission was realized with the implementation of the "Transmission Control Protocol/Internet Protocol," (TCP/IP) which made the interaction between networks more flexible. The ARPANet switched to this protocol in 1983. Since that time, both North American and European research centers have been implementing their own local networks simultaneously, marking a dramatic proliferation in the number of computer networks linked together. Other networks were created in order to connect people working on the same programming projects, such as Usenet (for Unix programmers), Fidonet (for Ms-Dos users). The use of Local Area Networks (LAN) grew rapidly as well, mainly within universities and campuses (Barney, 2000).

In 1986 the National Science Foundation established the NSFNet. This was a backbone aiming to connect the entire higher education community. This marked a dramatic increase in the building of regional networks. At the same time, the NSF encouraged the private sector to build its own networks. The resulting proliferation of commercial networks created a competitive market. The privatization policy promoted by the NSF was so successful that in 1995 the NSFNet backbone was dismantled. The American Government was no longer the controller of the Internet and it was opened up to all (Hanson, 2008).

This marked the birth of the network of networks. Connecting European and Asiatic local networks, this network rapidly become transnational (Barney, 2000). The ARPA sites were connected through the NSFNet, making the ARPANet unnecessary. It ceased to exist in 1990 (Hanson, 2008). What we know today as the Internet was finally born.

Until that time, the ownership of the NSFNet by the US Government was an obstacle to the linking of the many worldwide local networks already established outside of the United States. This is why it should not be a surprise that once the NSF ceased its role of managing the Internet, this marked a dramatic rise in connections between the existing worldwide local networks. These increased to more than 40% of the total number (Abbate, 2001). Even so, a problem of compatibility of these many networks persisted until all the local networks began switching to the TCP/IP protocol. This, however, happened differently worldwide.

The issue of incompatibility was particularly salient in Europe. The development of the Internet in Europe began in 1984, when the CERN installed the TCP/IP protocol for improving the performance of its local network. Nonetheless, it remained disconnected from the rest of the Internet because of the resistance in Europe of the use of the TCP/IP. The CERN opened its first external TCP/IP connections in 1989. The same year, the Réseaux Internet Protocol Européens (RIPE) was created in order to administer the Internet Protocol (IP) networks.

In 1989, Australian universities unified their networking infrastructures using IP protocols as well. The Australian Academic and Research Network (AARNET) was established in the same year for managing the Australian IP addresses.

In Asia, internet penetration began in the late 1980s. Japan connected to NSFNet in 1989. Meanwhile, the People's Republic of China had the first TCP/IP college network in 1991. However, it was not until 1995 that the Beijing Electro-Spectrometer Collaboration was connected to Stanford University's Linar Accelerator Center. This marked the inclusion of China into the increasingly globalized internet.

Africa connected to the Internet in 1990. In 1996 a United States Agency for International Development (USAID) funded a project, the Leland Initiative, to work on developing full internet connectivity for the continent.

Latin America and the Caribbean area became independent in managing their own IP allocation only in 2001, when the Latin American and Caribbean Internet Addresses Registry (LACNIC). Before that, the Latin American network was still managed by the North America's Internet Registry (ARIN).

FRAMING THE DIGITAL DIVIDE

In spite of the fact that the Internet is commonly defined as a new technology, it has, in fact, been developing for more than 45 years. Exploring its history highlights the reasons for which the infrastructures of the Internet and its use were developed in the United States earlier than in other places across the world. These considerations are useful for explaining part of the existing worldwide digital inequalities mapped below.

This also explains why the first definition of the Digital Divide referred to the existing divergences in access to digital technologies within the American national context. The growing importance of digital technologies for social activities encouraged the American government to promote campaigns analyzing the dimension of the existing digital gap. Consequently, politics on bridging the Digital Divide were activated involving also private companies. The divergence highlighted by the research singles out a digital gap existing in relation to several social factors: level of education; economic conditions; gender; race; age; and rural and urban locations.

All this happened in 1994, when the Clinton-Gore administration understood the necessity of investing in building the new information highway. The goal was to allow the entire American society to enjoy the digital revolution. However, the issue under discussion was defined as "Digital Divide" only a year later, when the National Telecommunications and Information Administration (NTIA),[1] the main institution on communication policies, published "A survey of the «Have nots» in Rural and Urban America". It was the first essay of the series titled "Falling through the Net",[2] and it was the first research on the Digital Divide.

The American path in approaching and analyzing its own internal inequalities in reference to access to digital technologies gave the first empirical and analytical instruments to explore the social dimension of the Digital Divide. When the use of the Internet spread globally, very similar paths of research were taken by other countries, providing similar pictures of the problem and arriving at similar conclusions on the internal Digital Divide.

However, today digital technologies have gone beyond American borders, making the Internet a transnational phenomenon and concretizing more than other technologies what scholars have greeted as the advent of the Global Village (McLuhan, 1962). McLuhan defines the process by which electronic mass media has overcome space and time in human communication, allowing people to interact and live on a global scale. Today, the Internet is the media that makes the world a "village", more than any other technology. However, this is happening unequally worldwide. This is why today it is common to address the topic of the Digital Divide as a worldwide phenomenon.

Here, I analyse the Digital Divide from a global perspective, taking into account the digital gap existing between all regions of the world. To explore the global dimension of the Digital Divide means to highlight the different levels of access of the Internet worldwide, investigating the reasons for these inequalities.

Researching the Causes of the Digital Divide

Like other technological revolutions, the digital revolution is bringing about a new dominant condition in society. In order to investigate the impact of the Digital Divide, it is necessary to focus on this last aspect. Manuel Castells (2001) suggests that to identify these new conditions it is necessary to understand how to get the best result out of the accumulation of wealth and power.

Castells (2001) mentions that historical transitions of this kind are always shaped by those who are in a position of advantage or control. This conclusion does not imply a judgement of value, but intends to underline a process that finds confirmation in history. Currently, economic dynamics, which have been reorganized by the new technological infrastructure, remain coherent with this scenario. The same can be said of the subaltern role attributed by the current political-economical framework to those countries not active in *informatisation* processes. These considerations stress the importance of exploring the global Digital Divide by highlighting how it affects these countries in the long-term.

The current information flows have introduced and intensified new economic and, then, political dynamics. For this reason, for developing countries to have access to digital technologies it has become important to participate in the global economy (Hayward, 1995). Cyber-pessimists alert that the Digital Divide is a factor increasing the already existing economic inequalities. In this scenario, the idea is that the marginalization of non-digitalized areas of the world will grow (Castells, 1996).

It is generally agreed between researchers on this issue that the global dimension of the Digital Divide is mainly linked to economic factors existing between geographical areas. There is agreement on the idea that the Digital Divide is a consequence of an already existing economic gap. The Digital Divide exists for the same reasons that have caused other kinds of inequalities in the world (Van Dijk, 2005). This is why several authors do not agree about defining the Digital Divide as a new problem; in their opinion, it is a component of a more general inequality that is increased with the internet. Franda (2002) argues that the introduction of the Internet has not impoverished poorer countries, but that it is increasing the existing worldwide economic inequalities because the Internet has facilitated the creation of new sources and enriched conditions only in richer countries. Others believe that widening the Digital Divide could resolve the same causes which have generated it (Barma, 2005). A number of reports were published on the issue: the *Millennium Report* by the United Nations (Annan, 2000), the *Okinawa Charter* (G8, 2000), the *Digital Opportunity Task Force* (DotForce, 2001), *Plan d'Action* (UN, 2003). These studies focus on the role that new technologies could have to improve the economic conditions of the poorest countries thanks to digital instruments and the new conditions of the current world market. Improvement could happen thanks to an instrumental use of the new technologies to increase trade exchanges to other regions of the world. For example, it would be possible to use the Internet to create connections between local sellers and buyers from everywhere, skipping expensive forms of intermediation. These documents argued also that the Internet – and in particularly the World Wide Web - is a useful instrument to sponsor local products and available skills (ITU, 1999). The characteristics of the so-defined *new economy* can give the possibility to the poorest countries to create their own immaterial industries (Annan, 2000; Norris, 2001; UN, 2003). This point is related to the idea that the new conditions introduced by digital technologies enable overcoming the barriers of the industrial era, creating good reasons to promote local immaterial industries, like software industries and the service sector. The case of Bangalore Valley in India, where a great pole of informatics' industries is born, is an example confirming this trend (Parthasarathy, 2005).

However, other considerations should be made. More in-depth analyses of the global dimension of the Digital Divide provide a less enthusiastic picture of the situation than expected by some scholars (Barma, 2005; Lall, 1999). Despite the possible role of the Internet in enriching poor countries as well, a topical question arises: How do we explain the unequal use of the Internet that we observe? Hargittai's study (1999) suggests that the economic wealth of a country, measured by per capita Gross National Product (GNP), is one of the main predictors to understand the worldwide digital inequalities. The International Telecommunications Union's analysis (ITU) also highlights the existing correlation between the number of Internet Hosts per country to the general levels of socio-economic development using the UN Human Development Index (ITU, 1999). Rodriguez and Wilson's research (2000) commissioned by the World Bank arrived at the same conclusion. Norris' analysis (2001) supports these positions, proposing additional reasons. One of them refers to the broader process of research and development within each country, mainly investments in science and technology. In order to explore in depth the issue, she compares the number of on-line population with the percentage of the Gross Domestic Product (GDP) spent on research and development (Norris, 2001). This regression highlights how countries that invest a higher percentage of their own GDP have a high number of their population on-line. This data decreases according to the decreasing of investments. Norris (2001) also argues that the development of human capital is crucial for explaining the diffusion of the so-defined Information Society. Investments in digital skills and education are another important factor of internet access. For example, several studies highlight how educated people are quicker to adapt to new digital instruments (Rogers, 1995). At the same time, data provided by Freedom House,[3] a non-governmental organization monitoring freedom in the world, are useful to stress the relationship between digital access and freedom of expression in each country (Norris, 2001). Close to this perspective, Milner (2006) focuses on the influence of political institutions in the challenge to the Digital Divide. The author argues that they have a role in overcoming the digital gap where there is a democratic condition, otherwise they slow down the widening process in order to maintain political power and to obstruct possible new political actors.

In his publication "Internet Galaxy", Castells (2001) proposes to map the worldwide digital infrastructure. The distribution of routers, which create connections between the various nodes of the net, and the management of the bandwidth, which determines the rapidity of access to the net, play a determinant role in maintaining the Digital Divide. The study suggests interesting configurations, highlighting how the availability of bandwidth for the United States puts this country in a central position in providing and receiving information.

In order to explain the distribution of the infrastructure of the Internet, Zook (2005) has mapped the Internet according to the economic geography referring to internet production. This kind of map highlights how companies within several production activities contribute to intensifying telematic infrastructures across the territory. In the same way, by exploring the issue at the country level, it is possible to explain why the Digital Divide between rural and metropolitan areas is so wide. Mapping the owners of web sites, Zook (2005) singles out the distribution and percentage of concentration of companies having a web site. This data shows how the concentration of these domains is around only a few groups of American cities. Zook (2005) concludes that the telematic concentration coincides with the high density of the most important sources of information. These are public structures, headquarters of major media networks, universities, financial institutions and technological poles. This condition brings a closer contact with the information economy, and this means a higher concentration of information providers in New York, Los Angeles and Washington DC. Included in the list, San Francisco Bay and Seattle host technological infrastructures and a great concentration of information knowledge, such as Silicon Valley in San Francisco and Microsoft in Seattle, and therefore also have a high contact with the info-economy. The work of Zook highlights how the existence of financial and economic structures, but especially the local existence of venture capitals, are one of the main factors explaining the development of digital infrastructure.

Regarding the impact of the Digital Divide for the poorest countries, it is clear that their passive role in the so-defined Network Society (Castells, 1994) coincides today with exclusion from the most complex economic and global dynamics, with the consequent negative long-term effects for the poorest countries generated by this condition. Norris (2001) concludes that in the first decade of the internet age *"the availability of the Internet has […] reinforced existing economic inequalities, rather than overcoming or transforming them"* (pp.66). Moreover, Norris (2001) affirms, *"the situation may change within the next few decades"* (pp.67).

The question now arises: Whether this is confirmed today? What about the current global dimension of the Digital Divide?

Some Trends Foreseen in the Digital Divide

Today internet usage is still expanding. This is why the debate is still open. Yet many analyses provide predictions regarding the future of internet usage. Among these forecasts, it is possible to identify two main positions on the issue: *normalization* and *diffusion* theory.

The first position can be categorized as an optimistic expectation. Resnick (1998) predicts that, at least in post-industrial societies, the differences in rates of internet access will gradually decrease as usage broadens and becomes more ubiquitous over time. This expectation arises because of the historical diffusion witnessed with respect to pre-internet media, such as television and radio. The convergence of public and commercial services on the Internet has made this a mass communication medium; its popularity should increase as has happened in the past for older mass media. This condition would create an open market which would also obviate the need for governmental assistance in overcoming the Digital Divide. This open market would increase competition, allowing the prices of both internet services and the requisite hardware for accessing to it to fall. Therefore, under *normalization*, all of these considerations together lead to a prediction that in the future the Internet distribution within each country will increase until approximately 90-95% of the entire national population are internet users (Resnick, 1998).

The second theory providing predictions on the future dimensions of the Digital Divide is that of *diffusion*. This theory is proposed by Everett Rogers (1996). The author bases his theory on an analysis of several cases studies on the introduction of earlier technologies. These were, for example: the introduction of television, as mass media; the steam engine, as technology for productivity; gunpowder in military strategy, and others. In all cases, the introduction of a new technology has directly involved a few "early adopters", with knowledge and wealth being the sufficient conditions for these early adopters. For successful innovations, demand increases. This causes costs of production (as well as the risks associated with innovation) to fall. These are the conditions for increasing an innovation's diffusion as people increasingly become users of that technology. Chadwick (2006) highlights the fact that by applying this model, such as occurred for earlier technologies, to the diffusion of internet use, we can identify an *S-curve* trend for the levels of its diffusion as well. On the bottom-left part of the curve the Internet is used by a small group of people with higher socioeconomic status. People with higher levels of education and social status also have access to financial and information resources necessary for using the technology (Rogers, 1996). Following this trend, adoption of the new technology continues until market saturation eventually occurs, which causes the falling of both demand and, then, the prices of internet access and for the hardware allowing this. These will be the conditions necessary for enlarging the group of technology adopters, including people living in different social conditions. From this optimistic analysis, all societies will converge on a saturation point of internet use (Chadwick, 1996), on the top-right part of the curve.

However, Norris (2001) provides an alternative interpretation of the S-curve model. The author defines this as a pessimistic expectation. Within the framework of this alternative interpretation, no convergence will occur regarding internet use. This is because people adopting the new technology, the Internet in our case, reinforce their economic advantages. This means that people who are already in powerful socioeconomic conditions when compared with others, will increase their advantages at a faster rate than the others, maintaining, or even increasing, the stratification in using the Internet (Chadwick, 2006).

This begs an additional question: which of these theories better predicts the trend of the Digital Divide? Are we witnessing a narrowing process of stratification in using the Internet, as predicted by the normalization theory?

MAPPING THE DIGITAL DIVIDE AND ITS CAUSES TODAY

Methodological Notes

It is possible to trace as many kinds of maps of the Digital Divide as there exist different perspectives of analysis. Each of them may focus on specific aspects, giving the possibility to single out the local causes of digital inequality. Mapping the distribution of the Network Society is one of the main instruments for exploring the global dimension of the Digital Divide. It is useful to provide a picture of the dimension of the issue and, at the same time, to put into perspective the gap existing between geographical areas. Today, methodology in mapping distribution of internet usage has improved significantly. In order to have a clearer picture of the global dimension of the Digital Divide, highlighting the trend of the phenomenon, researchers single out different indicators to map the geography of the Internet, including: distribution of Internet Hosts (Hargittai, 1999; Jordan, 2001), bandwidth (Abramson, 2000; Malecki, 2002; Townsend, 2001), IP addresses (Cheswick & Burch, 1998; Dodge & Shiode, 1998), links between web pages (Brunn & Dodge, 2001), domain names (Moss & Townsend, 1997; Kolko 1999; Zook, 2005), and lists of web sites (Paltridge, 1997).

In what follows, I map the global dimension of the Digital Divide comparing a variety of national indicators of 190 countries, through two complementary perspectives of analysis. In order to measure its dimension, several indicators must be taken into consideration in relation to a variety of national indicators (e.g., population on-line, number of Hosts, indices of economic development, etc.). Within the framework of the research on the Network Society, one particular challenge arises in that statistics on Internet usage provided by international agencies such as the United Nations, UNESCO, and similar organizations, are not updated as quickly as the speed at which the technologies evolve (Norris, 2001). Researchers have often addressed this issue by using data available from private companies. In order to map the global dimension of the Digital Divide, I make use of these private sources as well. Below, I introduce these data sources and the indicators that I use in my research.

Internet Users. Until recently, NUA was the company whose data served as the source most widely used in order to map the number of people that access the Internet around the world. This was a company that collected data for commercial use, using surveys from a wide range of market research.[4] However, NUA stopped updating its database in 2002. In order to overcome this, I use Internet World Stats[5] as the source for my data. Internet World Stats is also a private company that gathers data that are combined from two main sources: the Information and Telecommunications Union (ITU)[6] and Nielsen/NetRatings,[7] a private company leader in internet rating. Data are updated monthly and today it is largely used for research and projects focused on measuring the Digital Divide.

Internet Penetration Rate. The map of the population accessing the Internet is important for exploring the on-line population worldwide.

However, in order to explore the impact of the Internet in each country, it is necessary to investigate how its use is spread between the citizens living in these countries. The Internet Penetration Rate (IPR) measures this. The *IPR* is expressed by putting in relation the number of internet users in each country and its demographic data: in other words, dividing the number of internet users by the country's population. Yet, Internet World Stats is the source here. It uses World Gazetteer[8] as its source for country's population.

Economic causes. Thus far, I have argued how the global Digital Divide is related to existing economic inequalities. In order to test this expectation I explore whether any relationship exists between the distribution of the Internet population worldwide and the economic factors facing each country. I use the Purchasing Power Parity Gross Domestic Product per capita (PPP GDP xCapita) to represent economic factors. The World Economic Outlook Database 2007 published by the International Monetary Fund (IMF)[9] is the source here. I place this data in relation to the population of on-line internet users. This regression demonstrates whether a correlation exists between these variables: whether access to information technologies is still related to economic factors.

Internet Hosts. Internet Hosting is a service provided by private companies. The "host" stores web services, making these available on the internet. Mapping the host availability for each country is indicative of the unequal distribution of internet managers. I map the geographical distribution of the Internet Hosts globally using the CIA World Factbook[10] as source. Data published on-line are updated every two weeks.

Furthermore, in order to verify whether the distribution of Internet Hosts is also related to economic factors, I place the Internet Hosts variable in relation to PPP GDP xCapita.

Internet Protocols (IP). Another indicator useful for measuring the active use of the internet is the worldwide distribution of Internet Protocols (IPs). The IP address is assigned to nodes of the Internet. Internet Host servers, Internet Providers, and Web Sites are all nodes. The IPs make all of these accessible via the Internet. Measuring the distribution of allocated IPs for each country provides information indicative of the number of permanent active internet users living in each of these countries. Here also, a private company gathers these data. I use Domain Tools[11] as a source for mapping the distribution of the IPs. Furthermore, in order to weight the IPs allocation to the population of each country I relate this value to the national population, provided also here by World Gazeteer. This will allow me to provide the IP Penetration Rate (IPPR).

As a result of this empirical analysis, it is possible to map the distribution of internet users and how this distribution relates to the economic factors of the users' home countries.

Below, I first investigate the worldwide distribution of the internet users and the impact of economic factors on this inequality.

Second, I explore the unequal distribution of the infrastructure of the Internet, mapping the worldwide Internet Hosts and the allocation of the geographical IP addresses.

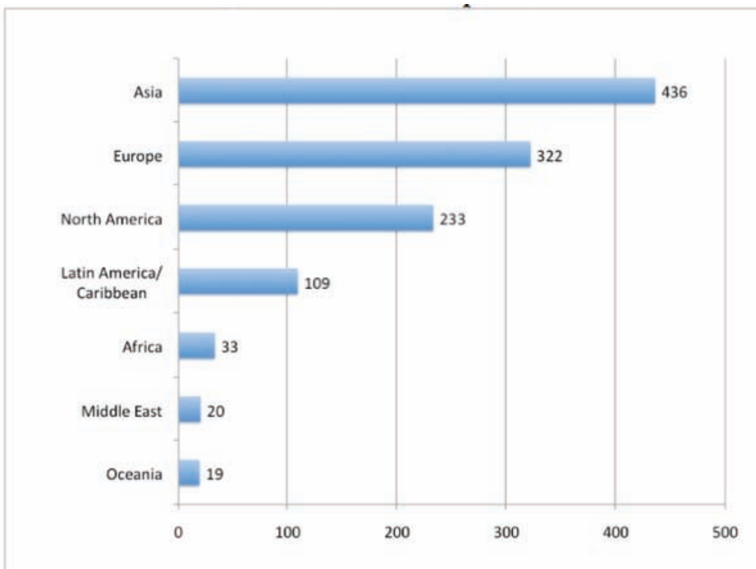
Worldwide Internet Population

Internet Users

The mapping most widely-used to evaluate the size of the global dimension of the Digital Divide is that of the geography of internet users distributed. Essentially, this mapping is a census of the population which has access to the Internet. Here, I assess the current status of this aspect of the Digital Divide.

The data given in November 2007 reported approximately 1,200 million of internet users (Figure 1). Of these, 233 million are in the United States and Canada and 322 million are in Europe. In the Oceania area, we see that 19 million users are connected. Asia hosts 436 million internet users, as the

Figure 1. Worldwide Internet population, x million (Source: Internet World Stats, November 2007)



continent with the highest population of internet users. Particularly significant are the 162 million users in China, although this figure is modest when it is compared to the size of the Chinese population. This reasoning can also be applied to the 42 million users in India. The remaining worldwide internet users are distributed between 109 million in Latin America, 20 million in the Middle East, and 33 million on the African continent.

The graph below (Figure 2) shows the relative value of the worldwide distribution of internet users. This map is obtained by making the on-line population of each country relative to the entire worldwide internet population.

Figure 2. Worldwide Internet users distribution, % (Source: Internet World Stats, November 2007)

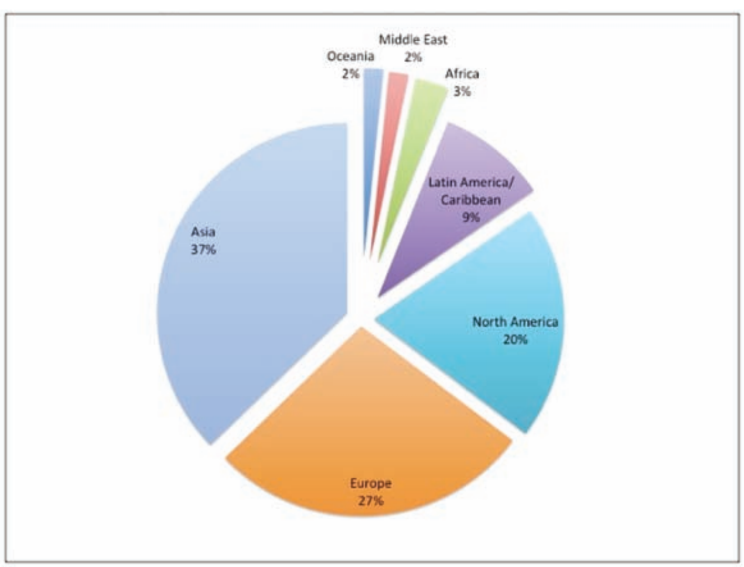
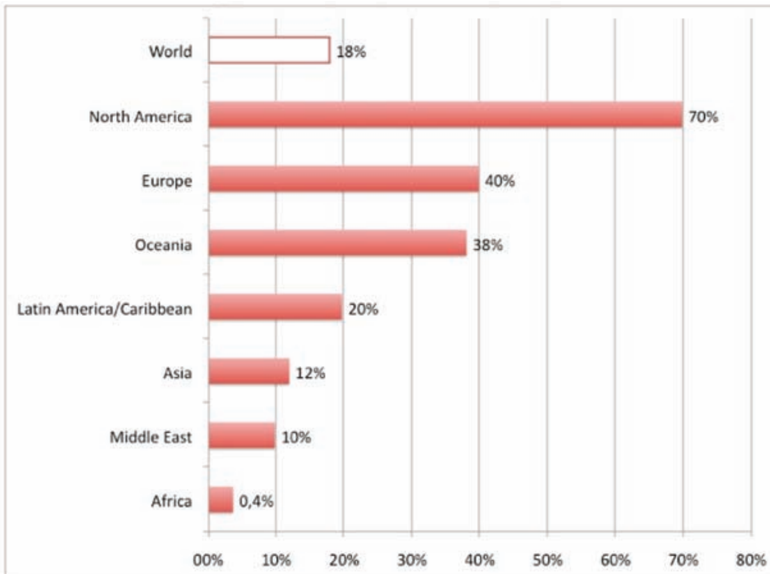


Figure 3. Worldwide Internet penetration, % (Source: Internet World Stats, November 2007)



Comparing these data with previous ones ten years older, this graph reveals the rise of a new trend. Most of the internet population is no longer living in North America. Today, 37% of them live in the Asian region. 27% live in Europe, and North America hosts 20% of the worldwide internet population. China is the country with the second highest number of internet users (162 million), behind the United States (210 million), and followed by Japan (86 million). According to this data, it should be not a surprise that the second language of the Internet is Chinese (Internet World Stats, 2007).

Internet Penetration Rate

In order to explore how the Internet is a determining influence for each country, we should investigate how its population use it. This is made possible by measuring how the Internet is spread across each country. The Internet Penetration Rate (IPR) measures the percentage of citizens in each country using the Internet, allowing us to make the internet population relative to its worldwide distribution.

Figure 3 more clearly illustrates the level of internet diffusion within each geographical area. First, it highlights the fact that only 18% of the world's population has access to the Internet. Moreover, it brings to light the fact that North America has the least amount of inequality of access to the Internet within its population; 70% has internet access. This is almost double the penetration rate of 40% in Europe, which is also approximately the same value as Oceania's per capita level of internet use (38%). Western countries have the highest IPR compared to other geographical areas of the world. Asia is the most populated region of the world, which explains why it also has the highest number of internet users. However, Asian countries have a very low value IPR, highlighting significant internal inequality of internet access. This is certainly the case for China, which, while registering the highest number of internet users as the most populated country in the world, only 11% of its population uses the Internet. Comparing this value with other countries, China is far from the 38% IPR seen in Europe (Figure 3). Analyzing the IPR by country, Iceland leads the ranking of the

Table 1. Regression Internet penetration on PPP GDP xcapita

Internet Penetration	
PPP GDP xCapita	$1.439 \times 10^{-3*}$ (.000)
Constant	2.066 (1.212)

$^{*}p \leq .001$ Standard errors in Parenthesis

IPR, with 86,3% of its population using the Internet. Sweden (75,6%) and New Zealand (74,9%) rank second and third, respectively. While the United States has the highest percentage of its population on line, this is only 70% of its entire population. Hong Kong has a lower internal Digital Divide, in that total internet users comprise 68% of its population. Japan (67%), South Korea (66%), Singapore (66%) and Thailand (63%) all have very similar IPR values. With the exception of Israel having a high IPR (51%), countries in the Middle East have a very low IPR. Excluding countries with very small population sizes (less than 300 million inhabitants), Chile is the country with the lowest internal Digital Divide in Latin America (41%). In Africa, Morocco is the country with the highest value of IPR (15%). However, in approximately 50% of the 190 compared countries, less than 10% of their respective populations use the Internet. Exploring the bottom 30 countries of this ranking have the IPR of less than 1%.

This kind of data collection gives us a snapshot of the situation of world internet access in an exact time frame. However, if we need to find causes and then some possible strategies for overcoming the Digital Divide, this map is not enough. In order to explore the reasons for digital inequalities, the data should be placed in relation with other indicators, as we see below.

Causes of the Digital Divide: Economic

So far, I have argued how the global Digital Divide is commonly referred to as the existing worldwide economic gap. I expect that today the relation between the internet distribution and the economic status of each country remains unchanged compared to other previous analyses on the topic. In order to test this expectation, below, I explore the relation between the Purchasing Power Parity Gross Domestic Product per capita (PPP GDP xCapita)[12] and the on-line population of each country already mapped.

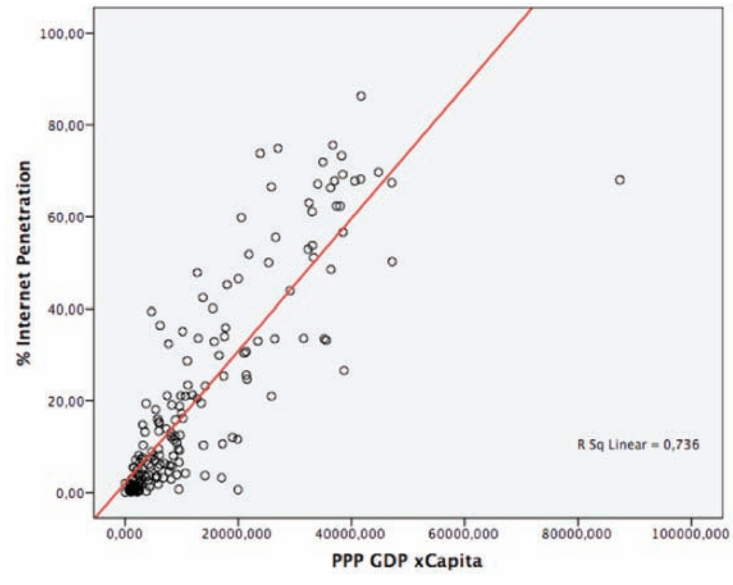
In order to investigate how economic factors affect worldwide internet distribution, I use these as dependent variables. I regress the value of the GDP PPP xCapita on the Internet Penetration Rate as the independent variable.

Following this analytical approach, the regression performed provides high significant data with interesting evidence. Figure 5 shows how a significant positive relationship exists between the independent variable (PPP GDP xCapita) and the dependent variable (Internet Penetration Rate). A simple regression for the 190 countries explored in this analysis shows a strong and significant effect of PPP GDP xCapita on the Internet Penetration Rate. The PPP GDP xCapita explains almost 75% of the variation of the worldwide Internet distribution (R=0.736 Sig.p.000). This result confirms the expectation so far proposed: economic factors are still the main cause of the current global Digital Divide.

Mapping the Infrastructure of the Internet

While mapping the distribution of the internet users demonstrates from where people use the Internet, mapping some of the infrastructures of the Internet indicates where the internet services and the managers of the Internet are geographically based. Here, I use two indicators for exploring this aspect of the Digital Divide: the worldwide distribution of Internet Hosts and the worldwide allocation of IP addresses. Internet Hosting is a service for storing the contents and the services of the Internet. An IP address is a permanent identification assigned to the nodes of the Inter-

Figure 4. Worldwide Internet hosts distribution, x million (Source: CIA World Factbook, November 2007)



net. This makes the Internet contents stored by Internet Hosts accessible through the Internet. By mapping these two indicators we can better grasp the nature of the worldwide inequality in managing the services, and, more generally, the contents of the Internet.

Internet Hosts

The graph (Figure 5) shows that North America manages approximately 200 million Internet Hosts. This is 61% of the worldwide Internet Hosts, and it is almost 4 times more than the hosts based in Europe. These are 60 million, representing 18% worldwide. The Asian region with its 40 million hosts (13%) is not so far behind Europe. Latin America manages aproximately 15 million, which consists of 4% of the total number of worldwide Internet Hosts. 9 million, or 3%, are located in Oceania. Meanwhile, the Middle East (1,5 million) and Africa (800 thousand) have a very low number of Internet Hosts, respectively 0,5% and 0,2%.

So far I have highlighted the correlation between economic factors and the distribution of worldwide internet users. But is there also a correlation between economic factors and the worldwide host distribution?

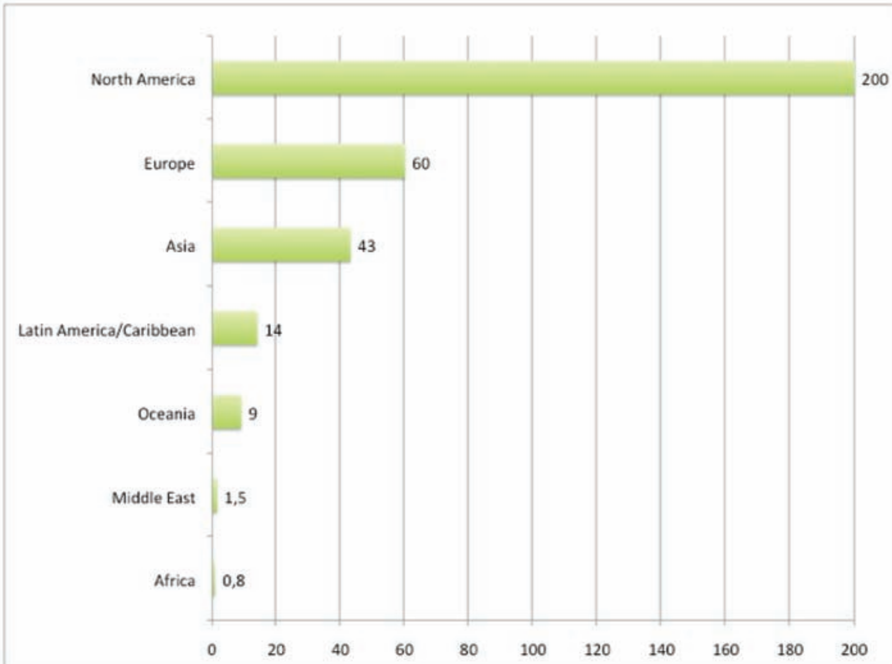
In order to verify whether the distribution of Internet Hosts is also related to economic factors, I place the Internet Hosts variable in relation to PPP GDP xCapita. Verifying this relationship gives evidence of economic causality on the global distribution of the infrastructure of the Internet.

Table 2 shows the existing correlation between the PPP GDP xCapita and the distribution of Internet Hosts within each country, measured by the Host Penetration variable. The correlation of 68% is significant at the 0,01 level (two tailed). This brings us to conclude that economic factors affect also the distribution of internet infrastructure.

IP Allocations

The figure above (Figure 6) looks very similar to the one depicting worldwide distribution of

Figure 5. Worldwide IP allocation – x million (source: DomainTools, March 2008).



Internet Hosts; 54% of worldwide IP addresses are concentrated in North America (1477 million). This value is double that of 26% allocated in Europe (720 million). The Asian continent hosts 15% of the IPs worldwide (398 million): this means a quarter of the number of hosts in North America. The number of hosts decline sharply for the remaining parts of the world: 2% in South America (65 million), 1,5% in Oceania (39 million), 0,6% in Africa (18 million) and 0,5% in Middle East (13 million).

For the same reasons already explained regarding the importance of the Internet Penetration Rate, the measurement of IP allocation rates on the size of the entire population of each country is also important. Following this approach, the IP Penetration Rate (IPPR) is obtained by the relation of both these indicators and the value is expressed in percentage terms.

Table 2. Correlation PPP GDP xcapita and Internet hosts

Pearson Correlation	**PPP GDP xCapita**
Internet Host	***.680*****
N	***177***

**. Correlation is significant at the 0,01 level (2-tailed).

Here United States is the country with the highest value of IPPR. This is 464%, meaning that the allocated IP addresses in United States are approximately four and a half times more than its population. European countries are next highest in IPPR values. While the United Kingdom has a very similar IPPR to that of Unites States (438%), this rate decreases significantly with Norway (285%), Switzerland (261%) and Iceland (248%). Not so far from the values of Japan (110%), Singapore (106) and Hong Kong (102%), South Korea has the highest IPPR than the rest of Asia (114%). As for the IPR, Israel with its 86% IPPR is the only Middle Eastern country that appears among the Top 30 countries. In Africa the value of the IPPR is very low in all countries. In South Africa the rate is 23%, which is the highest IPPR in Africa.

CONCLUSION

The question of defining and mapping the global dimension of the Digital Divide today was the starting point of this chapter. The history of the Internet was useful for exploring the process of shaping the global network linking countries worldwide. Framing the research and some of the expectations so far proposed by scholars on the phenomenon was important for introducing some of the causes and the effects of the Digital Divide. Focusing on specific aspects of the phenomenon, the maps provided enable us to investigate the current status of the existing digital inequalities around the world. The analysis highlights that the Digital Divide is still highly correlated with economic factors.

In spite of these confirmations, this chapter also brings to light important news for further research on the topic. The investigation stresses that most of the population of internet users does not live in North America anymore. Rather, today the Asian continent has become the region with the highest population of internet users. This allows us to answer the question about which expectations theory on *normalization* and *diffusion* is the more appropriate for explaining the current status of the global dimension of the Digital Divide. The data here proposed shows how the gap in accessing the Internet is following a *normalization* trend in its distribution. On the other hand, measuring indicators of the infrastructure of the Internet, as the Internet Hosts and the *IP* worldwide allocation, a less optimistic scenario comes to light. This shows an overwhelming hegemony of the United States in managing the Internet's infrastructure.

I argue that this would be a trend likely to find further confirmation in the future. The distribution of internet users is strictly related to the physical distribution of the population worldwide. By contrast, the infrastructure of the Internet which offers on-line services and contents worldwide is likely to remain centralized in a restricted area. We have seen that this restricted area is where the Internet is already largely developed for the economical and historical reasons we already mentioned.

I argue that while the distribution of internet users will normalize, the managing of the Internet risks remaining centralized, with internet users dependent on it. If we frame the Digital Divide as the gap in the *use* of the Internet, then research on the topic today must not focus only on how many people have *access* to the Internet. Rather, we are in a stage of diffusion of internet *use* in which we should pay attention also to the worldwide inequality in *managing* the Internet. In this chapter, I described a scenario which highlights the necessity to take note that we will achieve a real overcoming of the Digital Divide only when all the world's geographical areas have not only *access* to the Internet as has been claimed until now, but also the possibility to use it and manage it at the same level as in other parts of the world, according to real local needs and cultural specificities. Only when this condition is satisfied, will we be able to realistically address the challenges of the Digital Divide.

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KEY TERMS AND DEFINITIONS

Digital Divide: The gap between those who actively use and contribute to the internet, and those who are only influenced by it.

Internet Host: A computer storing the contents and the services of the internet.

Internet Infrastructure: Technological facilities which enable access to the internet.

Internet Penetration: The relationship between the number of Internet users in each country and its demographic data.

Internet User: People accessing the Internet.

Internet: A computer network infrastructure which exchanges data carrying various services, such as file transfer, peer to peer networks, emails, on-line chat, VoIP services and the World Wide Web.

IP Address: The permanent identification address assigned to the nodes of the internet, making its contents stored by Internet Hosts accessible through the internet.

Network Society: The current configuration of society in which human activities, experiences and power are affected by the network nature of the Internet.

ENDNOTES

1 www.ntia.doc.gov ;

2 www.ntia.doc.gov/ntiahome/fallingthru.html ;

3 www.freedomhouse.org ;

4 www.nua.ie ;

5 www.internetworldstats.com ;

6 www.itu.int ;

7 www.nielsen-netratings.com ;

8 www.world-gazetteer.com ;

9 www.imf.org ;

10 cia.gov/library/publications/the-world-factbook/index.html ;

11 www.domaintools.com ;

12 Source: International Monetary Fund, November 2007, www.imf.org ;

Chapter 3
Policy as a Bridge across the Global Digital Divide

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ABSTRACT

This chapter assesses how public policy can be used to bridge the global digital divide, especially in developing nations. First, the chapter characterizes the Internet technologies encompassed within the digital divide according to dimensions of individual socioeconomic characteristics and service provider infrastructure characteristics. Then, the chapter develops a set of technology policy dimensions as they affect those two dimensions, using case vignettes from India to illustrate policy actions. Finally, the chapter makes policy action recommendations to bridge the digital divide, including investments in education and literacy, e-governance, intermediary services, infrastructure, and regulation.

INTRODUCTION

This chapter assesses how public policy can be used to bridge the global digital divide, especially in developing nations. First, the chapter summarizes current understandings of the digital divide, and then characterizes the Internet technologies encompassed within the phenomenon. These characteristics are organized according to the dimensions of individual socioeconomic characteristics and service provider infrastructure characteristics. In this, the chapter aims to contribute to the overall understanding of the digital divide as a global phenomenon, especially by adding the dimension of service provider infrastructure to the description of the global digital divide. Second, the chapter develops set of technology policy aspects as they affect those two dimensions, using examples from India to illustrate policy actions. Thus, the chapter attempts to contribute to our overall understanding of technology policy, as well as to identify those aspects of policy that are relevant in the context of the digital divide. Finally, the chapter makes policy action recommendations to bridge the digital divide.

The global digital divide is defined here to mean the gap between those who have ability to access

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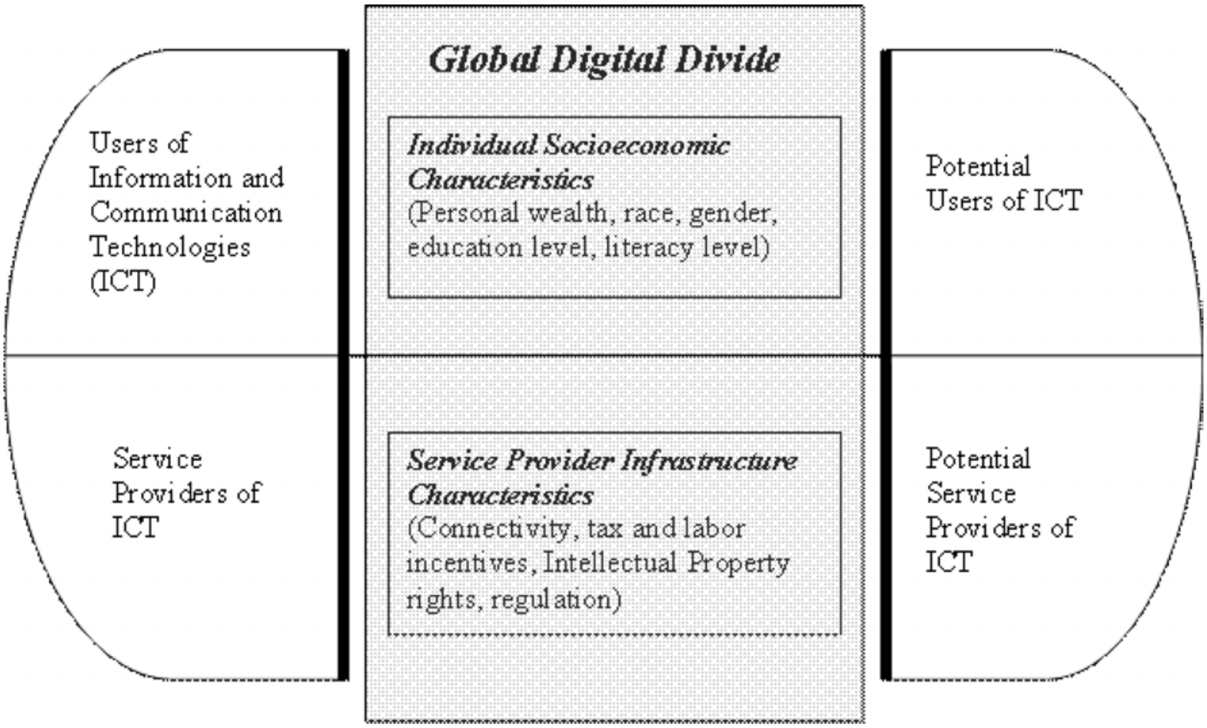
Figure 1. Characteristics of the global digital divide



and use information and communication technology (ICT) and those who do not. This definition is fundamentally consistent with numerous other definitions (Bagchi, 2005; Chinn & Fairlie, 2007; James, 2004; others). ICT can be understood to include both telephony (such as landline and mobile) and computing-based Internet technologies. In both the United States and India, telephony is distinct from Internet technology, in terms of both characteristics and relevant policy, and much has been written about telephony. This chapter devotes itself to better understanding the digital divide through characterizing the Internet technology component of ICT.

Access to ICT can have long-lasting benefits for quality of life as individuals can use ICT to develop personal interests, further education, receive job training and, ultimately, enhance their ability to enjoy their lives (Chandrasekhar, 2003). As Chandrasekhar points out, "… a widening digital divide can only widen social divisions and tensions." (2003, p. 82). In addition, those who suffer from adverse effects of globalization (poor, illiterate, uneducated and unskilled laborers) tend to fall into the same segment of the population that is on the have-not side of the divide. As such, globalization has only served to add to the widening of the digital divide by compounding the great inequities forced on the poorer sector of the population (Chary, 2007). Thus, the implications of the digital divide on social equity can be so grave that governments simply cannot afford to ignore what may be the most important social justice issue of the day. Therefore, we hope here to achieve a more nuanced understanding of the global digital divide, which can be used by governments to take more targeted policy actions aimed at bridging the digital divide.

BACKGROUND

The characteristics of the global digital divide can be generally grouped into two basic categories (See Figure 1). The first category describes the characteristics of the individuals who are affected by the digital divide – that is, those who fall on either side of that gap in the ability to access and use: users and potential users. The second category of characteristics describes those institutions (private or public) offering the required services to users. These service providers (and potential service providers) may be offering backbone services (such as network capacity) or last-mile services (such as end-user access) (Chandrasekhar, 2003). The combination of these two categories helps us better understand and define the global phenomenon known as the digital divide.

As a note, the digital divide is a dynamic phenomenon, changing with time (Bagchi, 2005). Therefore, while we hope to attain a conceptual understanding of the characteristics of the digital divide, how we measure the digital divide must be revisited continually to accommodate the evolution of the phenomenon.

Individual Socioeconomic Characteristics

Those individuals who fall on either side of the digital divide are separated by having access to and use of the Internet. Certainly, access and use are not mutually exclusive. In fact, having access to technology tends to facilitate the use of it (Hoffman & Novak, 1998). How we measure access and use, however, is complicated. Two common measures of access to and use of the Internet are penetration rates of computer ownership and Internet subscription (Chinn & Fairlie, 2006; Grondeau, 2007; Hawkins & Hawkins, 2003).

In 2001, the United States ranked among the highest in the world with 62.50 computers per 100 people and 50.15 Internet subscribers per 100 people while India ranking considerably lower at .58 computers per 100 people and .68 Internet subscribers per 100 people (Chinn & Fairlie, 2006; Indiastat, 2003). In India, the divide also manifests along urban and rural lines. Of those who subscribe to the Internet, more than three quarters live in major urban areas (Chandrasekhar, 2003).

Users are divided from potential users by personal wealth, education and literacy levels, race and gender, among other factors. Globally, the users on either side of the digital divide are separated by personal wealth, education and literacy levels. Personal wealth, often measured by per-capita income, is a major contributing factor to the digital divide (Bagchi, 2005). Personal wealth as a contributing factor to the digital divide is fairly intuitive, since it is reasonable that those with greater personal wealth can better afford for either ownership of or access to Internet technologies.

It is important to note that while income is an important contributor, it is not the only one.

Increased schooling, which is associated with increased income, is also associated with increased computer ownership (Chinn & Fairlie, 2007). Further, educational and literacy differences and between races in the U.S. also help explain differences in access to computers even when no ownership is implied, such as in work environments (Hoffman & Novak, 1998).

The digital divide also manifests along racial and gender lines. Some scholars suggest the digital divide has already begun to affect the social fabric in undesirable ways (Hoffman & Novak, 1998). Smith (2005) points out that women and African Americans in the United States are socialized to have higher levels of anxiety and lower levels of confidence with computer and software-related management skills while Fairlie (2003) reports only a portion of the differences in American computer ownership (between races) is explained by income. The effects of race (as defined by caste membership) on the digital divide in India are less documented and understood. However, it is well documented that men tend to be able to use and access the Internet more than women in India (James, 2004). In addition, the design of Internet services and software is not free from gender bias. Those who design systems make de facto decisions on priorities for system development. Designer communities dominated by men may well prioritize the needs of male users, and consequently design to those needs (Oudshoorn, Rommes & Stienstra, 2004).

In a developed country such as the United States, computer ownership and Internet subscription rates may be a fairly accurate measure of Internet usage. However, in developing countries such as India, using computing penetration and Internet subscribers to measure access to and use of the Internet is problematic. India is a country of disparate demographics. Over 40% of India's 1 billion strong population live in poverty, defined by the Indian government to be less that $.40 a day (Indiastat, 2003). In addition, literacy levels and education levels are significantly lower than in the United States (Indiastat, 2003). Internet usage, by definition, requires linguistic skills since the Internet is a written medium.

However, the recent technology boom has yielded a tech-savvy middle class numbering 300 million. In India, the appearance of this middle class and the rapid spread of independently-owned Internet kiosks -- which provide affordable Internet access without computer ownership -- has shifted a massive portion of the population from the have not side of the divide to the have side. Some scholars estimate that Internet users number as many as four times the number of Internet subscribers in India (Raven, Huang & Kim, 2007). A separate survey found that over 40% of those who used the Internet accessed it from public places, such as Internet cafes (Chandrasekhar, 2003).

Service Provider Infrastructure Characteristics

Organizations providing (or desiring to provide) the services necessary to build and offer Internet technology are divided by the infrastructure on which they operate. The infrastructure could be literal, in that limited connectivity and technology can prohibit the provision of such services (Seshagiri, 1999). Backbone network technology is the infrastructure which provides the bandwidth between exchange points. Backbone technology may include telephone lines (for dial-up access), cellular towers (for mobile data access) broadband networks (such as cable, DSL or fiber optic lines) or satellite technologies. In addition to backbone technology, the infrastructure also includes last-mile or end-user services, which are access points (at home, cafes, businesses) through which end users may access the Internet. Without backbone technology, service providers are clearly highly limited in the End User services they can offer (Seshagiri, 1999). India's telephone line density, for example, is fairly low. In 2003, India had about 5 telephone lines per 100 people (Indiastat, 2003). By comparison, the United States stands at 57 telephone lines per 100 people.

The infrastructure that service providers require can also be social and legal. In India's poorer areas, basic needs such as water, electricity and sustainable agriculture often outweigh demands for digital services (Kenny, 2003). Therefore, the demand for Internet access services might be considerably lower than in urban areas where disposable personal wealth tends to be higher (Malhotra & Singh, 2007). In a quasi-free market economy, service providers are simply not incented to enter the market in rural areas. Historically, governments have used deregulation and tax incentives and exemptions to correct this market failure. Certainly, countries which offer lower levels of regulation and higher levels of tax and labor incentives provide a more attractive environment in which service providers can operate (Mistry, 2005).

This desire to avoid the burden of regulation, however, does not seem to apply to those types of regulation which protects service provider interests, such as regulation protecting intellectual property rights. Since service providers have a natural interest in protecting their intellectual property and development, particularly in competitive industries such as software development, countries with less protection seem to drive away service providers (Bagchi, 2005). The protection of intellectual property rights is also a major contributor to the digital divide. Bagchi's study, which uses interpersonal trust as a measure of this protection, concludes that the greater the interpersonal trust in society, the slower the digital divide would grow and the narrower the digital divide becomes over time. In addition, service provider avoidance of regulatory burden seems not to apply service quality regulation (Chinn & Fairlie, 2007). This can be explained by arguing that higher service quality tends to attract and retain customers, which in turn offsets the distortion effect of the regulatory burden.

METHODOLOGY

The analysis is performed as follows: First, contemporary academic literature was used to develop a working understanding of the various components of the Internet technologies that are encompassed within the digital divide, as presented in the previous section. Second, governmental and nongovernmental organizations and scholars have documented the development and implementation of technology policy in India. Such documents will form the basis for descriptions of the policy, with units of analysis being mainly state and central government actions. Third, the study will assess aspects of technology policy within the context of the developed understanding of the global digital divide to make recommendations of aspects of technology policy which may be used to bridge the digital divide.

This chapter uses case study vignettes from India to illustrate policy actions. Since this chapter deals with contemporary policy actions to understand how and why policy interacts with the global digital divide, case study methodology is the most appropriate choice (Stake, 1998). The case study uses a combination of an embedded and holistic design. A holistic design focuses on the global or overall nature of the case study, while the embedded design focuses on subunits (Yin, 1994). In this case, the dissertation analyzes subunits (state and central government level policy actions from India) to draw conclusions about the overall use of policy to bridge the global digital divide. In addition, this case study, like many others, is built around interest in a specific contemporary phenomenon: policy as a bridge across the global digital divide.

The choice of Indian case vignettes is particularly timely and appropriate. First, the rapidity with which the middle class who have access to technology and feel a high level of comfort in using it has grown serves to highlight those characteristics of those one either side of the divide. Second, the relationship between nations such India and traditionally more developed nations is changing radically under the pressures of globalization, especially with respect to the outsourcing of technology development and production. As a result, technology policy actions in India can have far-reaching consequences across the globe. Third, since India is a democracy with relatively open government practices (as compared to, for example, China), the documentation of government policies are easier to obtain, analyze and assess against the implementation of those policies.

POLICY ISSUES AND SOLUTIONS IN THE CONTEXT OF THE GLOBAL DIGITAL DIVIDE

Technology policy is understood here to mean whatever governments do or do not do which affects the provision and use of technology. Technology policy affects both service providers and users. However, since the digital divide is a socio-economic phenomenon, especially with respect to users of ICT, policy which affects users transcends technology policy. Social and economic policies which affect basic social infrastructure (such as education, literacy and personal wealth) clearly have an impact on the digital divide. With respect to the digital divide, social and economic policies effectively become technology policy.

Some authors suggest the policy emphasis has been too greatly placed on the Internet component of the digital divide. Kenny argues that providing while improving communication infrastructure, especially for the poor, should be a policy goal, improving access to the Internet may not the highest priority within that infrastructure. He suggests that the priority is rather in providing "a system of well-regulated, competitive communication services" (Kenny, p. 77).

While such a system would be of tremendous benefit to impoverished communities, many developing communities have leapfrogged over this requirement. Mobile telephony has penetrated rural global markets at faster rates than standard telephony, especially in quasi-open markets like India. And while telephony can serve basic communications needs, in terms of informational services, as well as educational uses, Internet-based technologies offer almost limitless possibilities, making Internet-based communications far more attractive to many consumers. In turn, the higher demand makes this a far more desirable investment for companies and governments.

Derthick & Quirk (1985) offer one model of studying how policy can interact with technologically-based communications, especially with regards to goals of ensuring a competitive environment for those suppliers trying to meet such demand. Using the trucking, airline and telecommunications industries, they systematically examine both the economic and social motivations behind pro-competitive (de)regulation. Pro-competitive policy champions have claimed that competition makes the economy more efficient. Economists have charged that the social costs of regulation far outweigh the benefits and that regulation actually stunts the growth and prosperity of industries. One example of regulation increasing public costs that Derthick and Quirk discuss is where congressional hearings on the Civil Aeronautics Board unearthed that flights in non-regulated areas were cheaper than comparable ones in regulated areas (1985, pp. 43-4). In Internet-based technologies, which are currently largely deregulated, introducing policy solutions to issues of the digital divide can have similar cost repercussions. But, if policy is also a reflection of what is and is not important to society as a whole (Dye, 1978), then any cost increases resulting from policy actions may well be outweighed by the benefits associated with greater social equity.

One major caveat in applying telecommunications policy findings to Internet-based technology is that telecommunications had been considered a natural monopoly for much of its early history, while Internet-based technologies are highly competitive and have relatively low barriers to entry. Until the 1990's, the general thinking of economists was that because of this prohibitive entry cost, the telecommunications market, along with other public works and utilities such as railroads or electricity, was a natural monopoly (Derthick & Quirk, 1985). The concept of market failure has its roots in private sector economic literature and has been imported into policy studies, usually to analyze and explain causes of government policy intervention. Market failure, at its most basic level, can be defined as a market not operating at efficiency. A natural monopoly, in economic terms, is one where the per-unit costs in the industry diminish as the number of customers increase over time and where no combination of two or more firms could produce the product or service for less cost. Simply put, the market functions most efficiently as a monopoly, and therefore, this natural monopoly is not a market failure (Weimer and Vining, 1989).

Beginning in the 1990s, such engineer-economists as Adam Thierer (1994) and Kenneth Train (1994) wrote about the death of the natural monopoly in telecommunications. Changing technology and changing customer needs, they claimed, had completely altered the definition of competition and costs in the local telecommunications market. The entry costs to providing local service would not be prohibitive if incumbent providers were required to lease out their existing lines to newcomers (Thierer, 1990). In addition, competition to local service might now take forms other than the traditional phone service over landlines. Innovative wireless, internet-based and cable technologies could be commercialized to provide cost-effective and reliable services to residential customers (Merdian, 2000). The telecommunications market was no longer a natural monopoly and should not, they argued, be regulated as such. By this argument, Internet-based technology has much in common with telecommunications as it exists today.

Our history with telecommunications shows us that making and implementing technology policy, whether successfully or not, sometimes requires a particular intersection of different policy streams (Kingdon, 2003). Some of Derthick and Quirk's conclusions regarding these streams in telecommunications can have parallel implications in Internet-based policy. For example, economic reasons alone are insufficient to explain the motivations behind technology policies. Political leadership, policy entrepreneurs and academic think tanks can play crucial roles promoting technology policy action. In telecommunications, for instance, prior to those policy actions which resulted in opening up the market to competition, informed opinion across areas of study converged in support of those policy actions. Then, politicians and bureaucrats in positions of leadership actively supported the movement. In addition, congressional action was not required for certainly policy actions to occur although in some instances, Congress acted anyway. Finally -- and perhaps, most importantly -- these industries and the lobbies representing them, who had always been vociferously opposed to deregulation, had only a limited effect on policy development. Through various politicians, activists and journalists, policy actions became equated to fighting corrupt government agencies that were perceived to be captive to big business interests. In addition, such policies became metaphorical for curbing the growth of big, inefficient government even though in some cases, de-regulation did not mean the removal of legislation. It actually meant more legislation to protect against predatory behavior from incumbents. Thus, economic drivers merge with social and philosophical ones to drive these policies.

These findings would suggest that if policy interventions to increase access to and use of Internet-based technologies were championed by thought leaders as a necessary mechanism to address social equity issues, then economic considerations may well be mitigated by the perception that such government actions are simply necessary.

Policy Aspects Affecting Users

We categorize major obstacles to bridging the digital divide from a user perspective, along with examples of current policy actions taken to overcome those obstacles, into four major areas. These areas are lack of education, literacy, affordable access and a social context within which individuals may learn to use ICT.

There is little doubt that education levels must be increased if we are to promote access and use of Internet technologies (Hoffman & Novak, 1998). Fundamentally, education exposes individuals to information, affording people with the ability to then develop knowledge of opportunities, formulate options and increase their own well-being. Since education and income levels are well understood to be positively correlated, an investment in education eventually leads to the development of greater personal wealth. Since the gap in personal wealth explains a significant portion of the digital divide (Bagchi, 2005; Chinn & Fairlie, 2007; Kiiski & Pohjola, 2002), increased investment in education can directly lead to a narrowing of the digital divide. In India, owing to high levels of poverty, government spending on education infrastructure is directly related to improving equity and narrowing the digital divide (Chandra, Fealey & Rau, 2006). This is partly explained by the fact that government investment in education in developing countries is particularly significant in predicting Internet diffusion (Kiiski & Pohjola, 2002).

While investment in education is a necessary long term investment, immediate policy measures may be taken to provide some benefits of Internet use to those who face linguistic and literacy barriers. For example, the Indian government has developed and deployed the Simputer, a portable "simple computer" which converts text to speech in several Indian languages as well as in English. The Simputer is used by fishermen in the Bay of Bengal to access weather conditions (Meall, 2001). Thus, rural workers who may not have high literacy levels can use Internet services to enhance their own safety and productivity.

A second example of such immediate policy measures is the offering of intermediary services. James points out that "…there are all kinds of ways in which poor, illiterate persons in developing countries benefit from the Internet without any use of computers and Internet connectivity" (James, 2004, 172). In India, intermediary services such as offices or kiosks where staff enter government transactions on behalf of rural clients or "e-post" services (which transform paper mail first to e-mail for faster transit between post offices and then back to paper mail for delivery) benefit an estimated 4 million people (James, 2004). Empirical studies have shown that public investment in human capital may go toward bridging the divide (Chinn & Fairlie).

In addition to the investment in human capital, investments in physical infrastructure are necessary to combat the general lack of connectivity and access. In India, rural areas are inhabited heavily --over 70% of the population live in rural areas -- but only one quarter of Internet subscribers live in rural areas (Indiastat, 2003). There are significant differences in basic human well-being between rural and urban areas (Mistry, 2005). In rural areas, electricity and telephone access are significantly lower than in urban areas (Chinn & Fairlie, 2007). These obstacles cause significant issues in widening the digital divide (Lu, 2001).

The continuing gap in Internet access and use in developing countries indicate that these policy initiatives, while laudable, have simply not been enough. "Subsidizing Internet access in rural areas, financing community Internet cafes, providing Internet-based services and electronic governance" (Mistry, 2005, p. 40) are further initiatives that governments can undertake. Two examples of such initiatives in India are described here.

Building on a successful program in the past where telephone kiosks with subsidized long distance calling capability were set up to bring communication access to rural areas, the Indian government has set up Community Information Centers with subsidized Internet access to rural areas (Mistry, 2005). Providing such subsidized access is part of an initiative ambitiously entitled "IT For All" (Seshagiri, 1999).

In India, policy initiatives to provide affordable access to the Internet, as well to increase ICT education, have also included providing village schools with network and computing technologies and providing ICT development and education in Indian languages (Mistry, 2005), thereby reducing any linguistic barriers. In addition to the obvious advantages of promoting basic literacy and education levels, these initiatives have the added advantage of exposing rural children to the use of ICT at earlier ages and mitigating any effects of socialized anxiety associated with ICT use.

Government can also include the use of ICT in the social context simply by providing e-governance services (James, 2001). Certainly, cultures and politics can play a role in increasing Internet usage (Walsham & Sahay, 1999; Raven, Huang & Kim, 2007). However, some indicators (such as the e-readiness indicator Networked Readiness Index) can be shown to favor particular groups, especially powerful interest groups, in how the digital divide "problem" is defined in policy circles (Luyt, 2006). By necessity, then, the resulting policy solutions are not necessarily socially inclusive. However, ICT has great potential as a powerful tool to create a more inclusive society (Wilhem, 2004), suggesting that governments can use ICT to promote equity goals.

Certainly, the growing use of e-governance is gaining ground globally. Developing countries across the globe, such as those in Latin America and Africa, are also using policies to increase use of ICT in e-governance. (Ani, Uchendu & Atseye, 2007; Arocena & Senker, 2003; Hawkins & Hawkins, 2003). The Indian government has increased its own use of ICT both in quantity and scope (Raven, Huang & Kim, 2007).

In the past, various district and state governments within India have tried to use ICT to implement GIS systems, albeit with very limited success (Walsham & Sahay, 1999). However, other e-governance services have met with greater success. These include "Bhoomi" in the state of Karnataka, a service which computerizes land records (the word Bhoomi translates to land or earth). Providing farmers with such direct access to records not only reduces transaction times, fees and errors but also mitigates the distortion effects of any corruption in the bureaucracy (James, 2004). Other Karnataka projects include "Khajane" and "Therige," which are intended to provide financial services to pensioners and taxpayers (Mistry, 2005).

Another example of how ICT is used to mitigate corruption and enhance accuracy is the use of networked check points in the state of Gujarat. The check points use video signals to automatically check license plates against records to ensure the plates are valid and up to date (Mistry, 2005). As part of its shift toward e-governance, the Indian government has mandated government spending on IT purchases (up to 3% of budgets), strategic long-term plans for ICT use in public agencies and ministries, and training for personnel (Seshagiri, 1999).

Policy Aspects Affecting Service Providers

There are four major roadblocks to service providers offering Internet access and other services to demographics that currently do not have access to such services. These are lack of physical infrastructure for connectivity, tax and regulatory burdens on ICT industries, protection of service provider interests in the law and regulatory burdens on associated industries.

Since the cost to a private organization of building an initial connectivity infrastructure – laying down cable and lines – can be prohibitive, policy interventions are required to build the necessary infrastructure. The complete infrastructure required to incent service providers to enter the market encompasses both backbone technology and last-mile services (Seshagiri, 1999). At the moment, backbone connectivity in India is not an issue. Although India does not have access to as high a speed as other countries, the lack of penetration of Internet usage has left the bandwidth largely underutilized (Chandrasekhar, 2003). In the future, however, if Internet usage penetration does grow, the need for greater backbone capacity might emerge (Nair et al, 2005). Such policy interventions can be a combination of regulatory and economic policy.

In one policy action, the Indian government established a Department of Information Technology, whose mandate is to develop the technology infrastructure while reducing costs and barriers to entry through deregulation (Mistry, 2005). These encouraging policies have shown significant growth for Internet Service Providers in India, up to 27% over the years (Raven, Huang & Kim, 2007). Leveraging the fact that the cost of computing technology is driven downward by market forces, one Indian government initiative uses low-cost technology to reach rural populations by providing low-cost computers along with smaller telephone exchanges (Raven, Huang & Kim, 2007; Walsham & Sahay, 1999).

It is unclear, however, how widespread and sustainable such initiatives are. Certainly, the initiatives have not become widespread enough that the majority of the Indian population is able to take advantage of ICT. India's e-readiness index – a combination of adoption, social and business environments – reflects its widely varied demographic (Raven, Huang & Kim, 2007). India is listed in the bottom quartile of countries measured, in spite of its technology clusters and outsourcing triumphs, suggesting the government's initiatives have not achieved great penetration.

However, how successful ICT technologies can be in fostering an inclusive society depends on many factors. Developing countries' access to low-cost technologies is certainly one of those factors (James, 2003). The government can combine incentives to service providers for infrastructure development with state-subsidized or state-provided direct end-user access for rural areas (Raven, Huang & Kim, 2007). For example, India has incented private and nonprofit organizations to provide backbone access to privately owned kiosks. N-Logue, for example, uses wireless systems to connect several village kiosks within short distances (James, 2003). By providing low-cost backbone technology to these privately owned kiosks, the nonprofit helps private entrepreneurs provide affordable Internet access to villages.

Similar to the provision of an infrastructure, the cost of regulation and tax can become insurmountable barriers to entry, even in a free-market economy (Genus & Nor, 2005). Policy actions lowering those barriers to entry can have immediate and tangible results. In the 1980's, India implemented policy statements specifically geared toward developing technology industries, encouraging domestic innovation and foreign investment and training workforce (Grondeau, 2007). Beginning in the 1990s and continuing today, India adopted significant measures to liberalize and deregulate technology industries (Grondeau, 2007). Certainly, India's liberalizing policy reforms have greatly opened up its markets to the global economy (Mistry, 2005). In the 12 years following telecommunications policy deregulation in 1991, telephone line density has increased from 1.39 to 5 lines per 100 people (Chandrasekhar, 2003), suggesting past liberalization policies have yielded successful results.

The Indian government has also adopted a more progressive tax incentive policy, offering 60% depreciation on hardware and 100% allowable depreciation on software, exemptions on customs bonds on exports of ICT services, to encourage the adoption and use of IT in both private and public sectors (Seshagiri, 1999). The government has also actively encouraged growth of the ICT sector by subsidizing land costs, reducing government fees and charges and exempting ICT companies from tariffs and regulations (Mistry, 2005). In addition, the government has provided incentives for job creation. Clearly, this is an example of a successful policy action by the Indian government, since the export of ICT services is growing at an estimated annual rate of 35% to 44% (Chandrasekhar, 2003; Mistry 2005). Since 1990, foriegn exchange reserves have increased tenfold over the course of 10 years (IndiaStat, 2003) and 83% of American companies expect to outsource ICT services to India (Chandrasekhar, 2003).

India has also rescinded any monopolistic protections for Internet service provision and has gone further in providing exemptions to license fees for the first five years and reduced license fees for the next five years (Seshagiri, 1999). If this liberalization can be extended to backbone infrastructure service providers as well as end-user Internet service providers, the government may well incent the development and innovation of lower cost backbone technologies. In short, these tax policy actions allow market forces to speed and direct Internet diffusion (Walsham & Sahay).

Regulatory policy actions, however, have had more complex consequences. Studies have yielded ambiguous results regarding regulatory policy affecting competition in telecommunications. One study that spanned 1995 to 2000 concluded there is no relationship between the two (Kiiski & Pohjola, 2002). Another study shows that regulated quality is a statistically significant contributor to the digital divide, with regulation negatively affecting ICT adoption (Chinn & Fairlie, 2005).

While over-regulation may stifle innovation, under-regulation may introduce uncertainty into the ICT service provision environment, discouraging service providers from entering the market (Wallsten, 2005). Regulatory quality significantly affects Internet penetration – in some regions of the world, one third of the divide in ICT use can be explained by a lack of regulatory quality or by inefficient regulation (Chinn & Fairlie, 2007). One explanation for these results is that service providers seek protection and an environment of trust in which to operate. Regulation of quality builds consumer trust, while protection of intellectual property rights is integral to building service provider trust. In this regard, one Indian policy action, the Information Technology Act, has brought some parts of Indian law to be consistent with international standards in offering digital signature protection and cyber crime protection (Seshagiri, 1999).

Internet services are generally demand-based. That is, if perceived demand for Internet services is low – and such a perception is often the case in developing countries -- then governments may not offer the kinds of policies and incentives that draw service providers and establish a culture and tradition of entrepreneurship (Raven, Huang & Kim, 2007). However, India's policies in this regard have also been extremely progressive. The Indian government has a system of exemptions in place to limit regulatory control, and resulting transaction costs, over ICT companies (Miller, 2001). This has, in turn, encouraged foreign investment and outsourcing.

Regulation is important to ICT industries not only as it directly applies to the industry, but also as it applies to associated industries, such as finance and banking. For example, India's state-run Reserve Bank of India regulates the banking industry. Among its regulatory responsibilities is publishing guidelines on what online services financial institutions may offer. At the moment, only informational services are permitted, although the Reserve Bank is considering permitting transactional services (Malhotra & Singh, 2007). Legitimate concerns include that uneducated people may not have enough trust yet in banking as a whole, let alone mobile and Internet banking (Malhotra & Singh, 2007). However, heavy regulation prevents the market from establishing whether sufficient demand exists, perhaps among other demographics. Internet banking, for example, diffuses horizontally. Adoption of Internet banking by similar institutions increases the probability of adoption by banks (Malhotra & Singh, 2007). As long as the regulatory burden on associated industries like banking and financial services are lifted, even the possibility of reaching new demographics with Internet-based services remains unrealized.

In addition, deregulation has certainly been highly influential as a driver of ICT industry growth. In another example, India has created "ICT clusters" in cities such as Bangalore and Hyderabad where corporate compounds host development offices and call centers. These compounds are often miniature compounds providing housing, food and services specifically catering to workers in ICT fields (Grondeau, 2007). Too much of an emphasis on policies aimed toward service providers can come at the cost of equity and infrastructure policies aimed at benefiting the user (Arocena and Senker, 2003). Therefore, it is important to note that the policy aspects affecting service providers dovetails with the importance of education policies, since education has been key to attracting businesses to India. India has been ranked as having the third largest pool of scientific and technical workers in the world, with more than 200,000 people trained each year in these fields (Grondeau, 2007). The trained technology workers in India also tend to have a working knowledge of English (Raven, Huang & Kim, 2007). And, of course, these services are generally provided at a fraction of the cost of Western European or American labor, giving India a significant global advantage in attracting foreign investments (Chandrasekhar, 2003). Therefore, investment in education has a direct effect on ICT economic growth.

FUTURE TRENDS

First, newer products and services ICT-related industries such as computing and software development have tended to require more bandwidth and capacity to operate (James, 2001). Although backbone capacity is currently not an issue (Chandrasekhar, 2003), the advent of such capacity-hogging devices and programs suggest that greater Internet penetration might lead to an increased need for greater backbone capacity (Nair et al, 2005). In addition, if policy actions are successful in even partially bridging the digital divide, greater end-user demand will contribute to the need for greater backbone capacity. Given that building connectivity infrastructure generally requires more extensive and expensive capital investments than expanding last-mile services, additional policy interventions may well be required to attract and retain infrastructure suppliers.

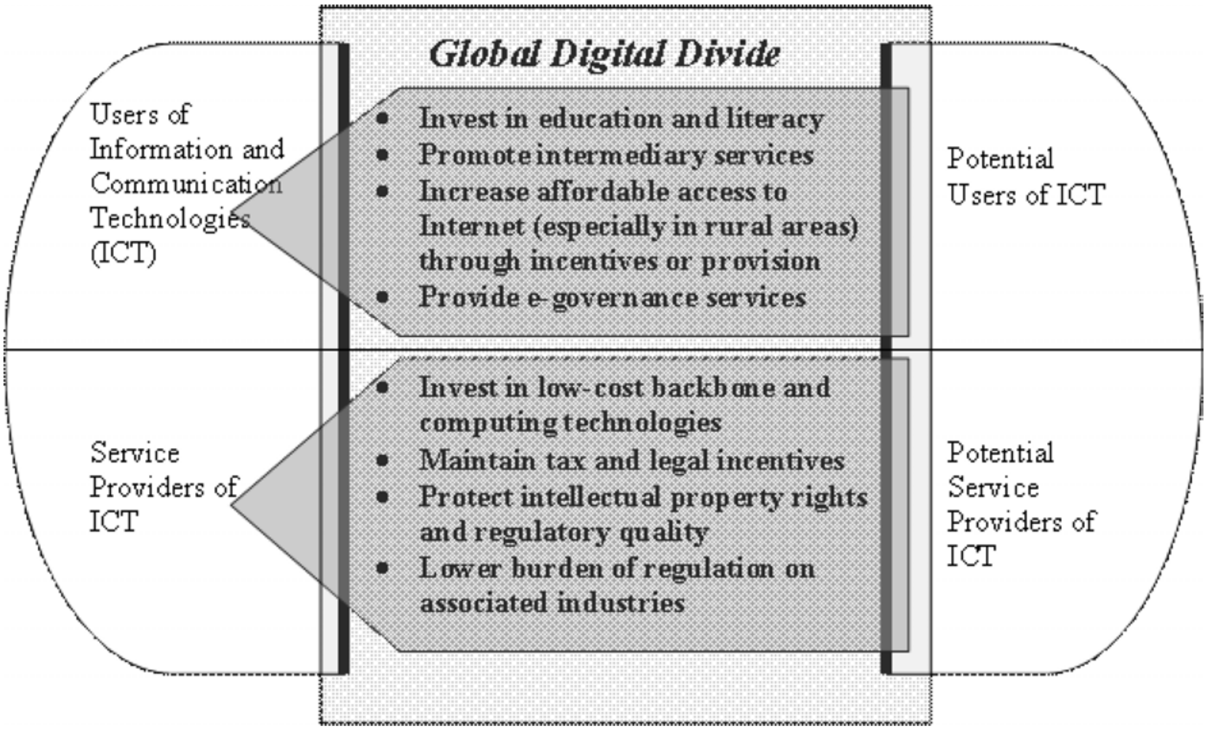
Second, globalization continues to rapidly diffuse informational capitalism throughout the world. Informational capitalism, which refers to the portions of globalization which are directly linked to the growth and diffusion of privately-owned ICT providers, has led to an even greater skew in wealth distribution in developing nations (Parayil, 2005; Chary, 2007). The interplay between ICT and globalization has led major international organizations, to articulate the rapidly worsening effects of the digital divide. A United Nations Development Programme address pointed out that the Internet is "… the two edged sword that is leading the process of globalization: wounding those who don't quickly enough grasp how to use it by leaving them ever further behind…" (Brown, 2000, 2) while clearing the path to better services and higher levels of efficiency for those who can take advantage of ICT (Brown, 2000 & 2003). That is, ICT continues not only to drive the process of globalization, but also to heighten those socially inequitable consequences of globalization. Thanks to globalization, "…those on the wrong side of the digital divide are not only not better off — they are actually worse off" (Chary, 2007, p. 184). As a result of globalization unfettered by human rights and labor law considerations, the digital divide continues to widen and deepen, especially in developing countries.

Third, the continuing growth of demand for Internet-based services suggests that the tangible economic benefits of both e-business (Genus & Nor, 2005) and e-governance (Hawkins & Hawkins, 2003) will only continue to grow. Even in the brief history of Internet-based technology policy, deregulation has proven tremendously effective in reducing barriers to entry for new Internet service providers (Wallsten, 2005). With this opportunity for governments to increase competition and lower costs also comes the chance to use policy actions to guide this explosive growth (Riggins & Dewan, 2005) along socially responsible lines, especially in developing nations. In most of the developing world, the technology market is nowhere close to saturation, suggesting that policy actions may still have an effective role in ensuring that economic growth does not occur at the cost of social equity.

CONCLUSION

This chapter has examined some of the characteristics of the global digital divide, as it applies

Figure 2. Recommended policy actions to bridge digital divide



to Internet technologies. In terms of individual socioeconomic characteristics, users are separated from potential users by personal wealth, education, literacy, race and gender. Service providers are divided by infrastructure characteristics such as connectivity in the physical infrastructure, tax and labor incentives, protection of intellectual property rights and regulation. While policy is not by any means the only influence on Internet adoption, policy can be a powerful tool in diffusing Internet usage (Mistry, 2005). To begin to bridge the digital divide, some policy actions are recommended (See Figure 2).

To narrow the digital divide for individuals, governments must invest in education and literacy, as long-term strategy. Clearly, improving education and literacy rates are not new policy issues that developing nations face. However, the continuing influx of financial resources as a result of technology globalization may well provide developing nations with greater immediate flexibility in investing in education and literacy. In addition, such investment has additional, very tangible returns in that an educated workforce is essential to retain those outsourced businesses and to attract new ones.

In the short term, offering intermediary services can mitigate linguistic and education barriers and benefit that demographic of the population which is currently on the have-not side of the digital divide. These intermediary services can be implemented with minimal initial time and resource investments but with potentially substantial intangible social equity gains. A policy combining such investment in low-cost technologies with incentives and partnerships can promote the provision of affordable access, especially to rural areas, while encouraging local sustainable economic growth. Subsidized low-cost technology (such as wireless last-mile services) which allows local entrepreneurs to open independent kiosks can reach those for whom electricity access or computer ownership is prohibitive. In addition, some of those who have not been able to take advantage of ICT because of language or literacy barriers may, in fact, never be able to do so. They may, for example, think of themselves as beyond the reach of a youth-oriented education system. For that demographic, intermediary services might be more than a short-term solution. Such services may be their only feasible route to enjoying better access to government and business services. Finally, e-governance initiatives can be used not only to promote efficiency and effectiveness but also to bring ICT use into focus as part of the social context. Whether accessed through cheaper provision of end-user services or intermediary services, better usage of e-governance services can have significant impact in including ICT use as a viable and accessible tool for subsequent generations.

To encourage potential service providers to enter the ICT market, in addition to investing in low-cost technologies to build a physical infrastructure, offering legal and tax incentives can attract service providers that may not otherwise enter into the low-value ICT markets. Preserving an environment of trust by protecting quality of service and intellectual property rights can also contribute to lowering perceived barriers to entry. Finally, lowering the regulatory burden on associated industries can set free demand forces, which can, in turn, drive up the service provider supply.

This chapter has aimed to present an understanding of the digital divide phenomenon on the global level, analyze the digital divide in the context of technology policy and contribute to our understanding of aspects of technology policy that bridge the digital divide. It is also hoped that this chapter has developed an understanding of some of the existing knowledge in the intersection of the fields of technology policy and the global digital divide and ultimately, contributed to that knowledge. While no policy prescription can be completely exhaustive, our analysis of case vignettes has served to illustrate that in combination, governments can combine these policy actions to have a substantial impact on bridging the digital divide and ensuring greater social equity.

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KEY TERMS AND DEFINITIONS

(ICT) User: Individuals who have access to and utilize ICT.

Backbone: Bandwidth and capacity required within the network to transport data. Typically, runs between exchange facilities.

Digital Divide: The gap between those who have ability to access and use ICT and those who do not.

End-User/Last-Mile Services: Services through which users can access the Internet (such as from home, at a cybercafé or a kiosk). Typically runs from exchange facilities to homes and businesses.

ICT: Information and communication technology, encompassing computing, Internet, traditional telephony and mobile telephony.

Service Provider: Organizations (public and private) providing backbone and end user services required for the users to access and use ICT.

Technology Policy: What governments choose to do or not to do regarding the provision and use of ICT.

Division 2
Regional and Country Cases

Chapter 4
The Evolution of the Digital Divide across Developing Countries: Theoretical Issues and Empirical Investigation

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ABSTRACT

This chapter aims at investigating the evolution of the digital divide within a set of developing countries between the years 2000 and 2005. In doing so, it moves away from the traditional analysis of the digital divide, which compares developed countries and developing countries, and examines the existing gap within a relatively homogeneous group of countries. On the basis of the theoretical and empirical contributions from scholars in different disciplines, we select a series of socioeconomic and technological indicators and provide an empirical assessment of the digitalization patterns in a set of 51 low income and lower-middle income countries. By means of cluster analysis techniques, we identify three emerging patterns of the digital divide and derive a series of policy implications, related to the implementation of an effective strategy to reduce digital backwardness. The characteristics of each pattern of digitalization can be also usefully employed to understand whether past interventions, especially in the area of competition policy, have been successful in addressing country-specific issues.

INTRODUCTION

As stated in European Council (2000), in order to achieve a better economic performance it is necessary to create a society with a greater social cohesion and less exclusion. In this respect, the diffusion of new information and communication technologies (ICT) constitutes a relevant opportunity, providing that the risk of creating an ever-widening gap between those who have access to the new knowledge and those who do not is avoided. The problem of the

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relation between the access to and the availability of ICTs and the participation in the development of the information society is widely recognised. The digital divide can be defined as "The gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICT) and to their use of the Internet for a wide variety of activities" (OECD, 2001). This definition of the digital divide concerns the accessibility and availability of information and communications infrastructure, technologies, applications and services. Some studies also focus on the conditions of accessibility and availability of appropriate content and/or of the knowledge and skills required to develop and use the services. More generally, the digital divide can be defined as "the gap between the businesses and consumers enjoying the advantages of the Information age and those still awaiting its benefits" (WITSA, 2000) or "the divide which separates the haves from the have-nots in the sphere of information" (UNCTAD, 2006). There are many studies on the issue of the digital divide in Europe and worldwide regarding the accessibility or affordability of ICT, but usually they do not consider the impacts of usage patterns and users' choices on information exclusion boundaries. There are also many studies forecasting the number of Internet users via PC, via digital TV, or via mobile networks, but they are not concerned with the number of people who are likely to remain non-u-users.

Most programmes prepared by national governments and by international organizations have dedicated a substantial amount of time and financial resources to the issue of the digital divide. A large part of these proposals have concentrated on the definition of policy issues related to the digital gap, more than on the development of research projects for the assessment of its actual magnitude and for the identification of appropriate evaluation techniques. Furthermore, the digital divide has been often analyzed by comparing developed and developing countries: the researches have underlined the existence of relevant differences between these two broad geographical areas, but have not been able to explain them in terms of different speeds of diffusion of digital technologies (Kenny, 2001). Indeed, most of the existing studies dealing with the digital gap between developed and developing countries adopt an approach according to which the digital divide tends to be largely explained by the different levels of economic, technological and social development. This type of analysis reaches the conclusion that there is the need for policies directed at reducing these differences. However, the actual implementation of specific policies in this context is quite complex, since the digital gap may be the driver, but also the result of the differences in the economic and social development. On the contrary, measuring the digital divide between countries that are quite similar in terms of economic, technological and social conditions implies that the emerging differences are only marginally influenced by other variables than those specifically related to the diffusion of the digital technologies. This allows us to understand the real meaning of the digital divide and to derive important policy implications.

This paper aims at investigating the evolution of the digital divide within a set of developing countries between the years 2000 and 2005. In doing so, it moves away from the traditional analysis of the digital divide, which compares developed countries and developing countries, and examines the existing gap within a relatively homogeneous group of countries. Starting from the background literature (section 2), we provide an empirical assessment of the digitalization patterns in a set of 51 low income and lower-middle income countries (sections 3 and 4). By means of cluster analysis techniques, we identify three emerging patterns of the digital divide and derive a series of policy implications, related to the implementation of an effective strategy to reduce digital backwardness. Section 5 will conclude and will exploit the information on each pattern of digitalization to understand whether past policy interventions have been successful in addressing country-specific issues.

BACKGROUND

The concept of the digital divide has been in depth analyzed both by academics and by international institutions concerned with the existence of gaps in the digitalization process across different countries in the world. Many scholars have put forward different categorizations of the digital divide, according to the subject of analysis (individuals, organizations, countries) and to the type of the divide (Dewan and Riggins, 2005). Furthermore, as the digital divide is strictly linked to the process of technological diffusion, the existing research has carried out the analysis of the digital divide by considering also the stage of technology life cycle.

The analysis of the digital divide can refer to individuals, organizations and countries. At the individual level, the digital divide identifies the gap among people who have opportunities to access and use the ICT, and people who are excluded. Usually the main variables accounting for these differences are socio-economic factors such as gender, age, nationality, education, income, technological skills. However, one could consider also other factors related more to the individual propensity towards the use of ICT than to the socio-economic context. In this respect, the literature has concentrated on the design of efficient public policies to overcome the digital gap and to the identification of technologies that diffuse more easily (O'Neil and Backer, 2003; Cotten and Gupta, 2004). At the firm level, the digital divide represents the gap among firms within a sector in the adoption and exploitation of ICT, which can be considered a determinant of the competitive advantage (Jarvenpaa and Ives, 1991; Iacovou et al., 1995). Firm size, profitability, corporate governance, and geographical location often explain the existence of the digital divide (Leonard-Barton and Deschamps, 1988; Forman et al., 2005). At the global level, the literature examines the access and use of ICT within different countries (see for example NTIA, 1995) and focuses on the analysis of the determinants of the digital gap in terms of economic, social and institutional factors.

With reference to the type of the divide, we can distinguish between the divide concerning the access to ICT and the divide concerning the use of ICT. The literature has discussed these two different concepts referring respectively to the first level and the second level digital divide (Kraut et al., 1999; Eamon, 2004; Dewan and Riggins, 2005). With the increasing availability of ICT, the most recent analyzes, especially at the micro level of individuals and firms, has focused on the second level digital divide (Howard et al., 2001; Hargittai, 2002). However, at the global level there is still room for an empirical investigation of the first level digital divide, especially when studying developing countries that still lack the basic ICT infrastructure.

When discussing the notion of the digital divide, a crucial aspect concerns the technology life cycle. Several theoretical contributions have tried to distinguish the different stages of the digitalization (Abramson, 2000; Atrostic et al., 2000; Mesenbourg, 2000; University of Texas, 1999 and 2000; Ganley et al., 2005). In this context, one of the most influential contributions is the framework elaborated by the OECD Task Force on the digital economy (Colecchia, 2000) that analyzes the strategic relevance of the dimensions of digitalization in different phases of the technological development of digital platforms. At the beginning of the use/application of the technology, the differences between countries or regions are explained by the speed of adoption. In the second stage, when the technology has reached a critical mass of users and is accepted as a common standard, the differences between countries or regions are still in part explained by the speed of adoption, i.e. by their basic infrastructure conditions, but even more by the intensity of adoption, which becomes increasingly important in the process of measurement. In the third stage, when the technology becomes mature, the measurement priorities become more directed at the qualitative aspects. In this respect, the phenomena related to the impact of digitalization on the social and economic activities, on the structure of production and consumption, and on the employment become increasingly relevant. Following Kauffman and Kumar (2005), different dimensions of the impact of ICT can be identified: an economic dimension, which has to do with the impact of ICT on productivity, growth, trade and employment; a social dimension, which refers to the way in which ICT improve the quality of life; a knowledge dimension, which concerns the role of ICT in generating knowledge. At a more micro level, it is possible to identify three different stages of ICT diffusion. The first concerns the introduction of ICT in the market; the second refers to the access to ICT by users (individuals or firms); the third relates to the use of the technology itself. Van Dijk and Hacker (2000) distinguish between the possession gap - i.e. the gap between those who have and those who have not access to ICT-related infrastructure - and the usage gap - i.e. the gap between people who benefit from the use of the ICT applications for work, education etc., and people who use ICT mostly for entertainment purposes.

In terms of measurement approaches concerning the digital divide across countries, for the scope of our analysis, we are particularly interested in the studies that have examined the patterns of digitalization, either by investigating the determinants of ICT adoption and diffusion, or by constructing composite indexes of digitalization. Within the first group of studies, Caselli and Coleman (2001) investigate the main determinants of PC diffusion and found that the human capital, the degree of intellectual property rights protection and trade openness, and the government share of GDP have a positive impact, while the share of agriculture value added has a negative effect. Pohjola (2003) looks at the factors affecting the per-capita investments in computer hardware and the use of PC, and finds that they are positively correlated with the income and the stock of human capital, while they are negatively correlated with the share of agriculture and with the relative price of computers. Dasgupta et al. (2001) examine the role of structural variables in affecting the level of Internet intensity and the degree of Internet connectivity, and find that the share of urban population and the competition policies are crucial factors, while the level of GDP does not have a significant role. Chen and Wellman (2004) examine the factors explaining the percentage of online population and find that income, education, age and geographical location are the most important variables.

With specific reference to the developing countries, the literature has examined possible policy tools to foster the diffusion of ICT. Ganley et al. (2005) stress the importance of promoting competition policies in the telecom sector to lower prices, of implementing education policies to increase the average degree of education among the population, and of stimulating trade openness. In a similar way, Wallsten (2003) analyzes the role of regulation in the Internet sector and finds that the existence of barriers to entry of Internet service providers and the provision of price-control policies limit competition and, as a consequence, the rate of Internet diffusion. Baliamoune-Lutz (2003) examines the links between the ICT diffusion and per capita income, trade and financial indicators, education, and freedom indicators in a series of developing countries and finds that the income and the government trade policies influence the diffusion of PC and Internet hosts, while the freedom indicators have and ambiguous effect and education does not play an important role. Finally, a group of scholars has more recently examined the factors affecting the diffusion of wireless technologies as a means of communicating and connecting to the Internet (Rice and Katz, 2003).In this line of research, Kauffman and Techatassanasoontorn (2005) show that the income, the development of telecom infrastructure and price determine the diffusion of these technologies.

A second strand of literature has focused on the development of composite indexes to study the pattern of digitalization and to identify possible sources of the digital divide (Wolcott, 2001; Corrocher and Ordanini, 2002; Selhofer and Husing, 2002; Datta and Jain 2004). In various ways, these scholars combine different indicators of ICT readiness and intensity and to measure country-specific ICT diffusion patterns. These indexes have clear limitations due to the arbitrary choice of the indicators to be included and of the aggregation procedures. Furthermore, these indexes might be problematic when it comes to the process of data collection across many different countries. However, they represent a useful framework for the analysis of the digital divide, since they take into consideration the existence of several layers in the digital economy and consider the complex and multidimensional phenomena associated with the diffusion of the digital technologies.

METHODOLOGY AND DESCRIPTIVE EVIDENCE

The aim of our empirical analysis is to investigate the evolution of the digital divide in a set of developing countries. To this scope, on the basis of the background literature, we consider two broad groups of variables as the starting point for the empirical investigation: technological indicators and structural socio-economic variables. In order to refine the choice of our variables, we first refer to the paper by Ganley et al. (2005), which classifies the independent variables in three groups: economic variables, i.e. those related to the GDP and prices of the technology, which affect the adoption of ICT; demographic variables, i.e. those related to the characteristics of the population (e.g. % of urban population as suggested by Forman et al. (2005)), which affect the access to technology; context variables, i.e. those related to the existence of the basic infrastructure, which allow users to harness the benefits of ICT. Then we take into account the framework developed by Chen and Wellman (2004), which represents a useful tool for the analysis of the different types of digital divide, starting from the basic distinction between the access and the use of ICT. As far as the access is concerned, it is possible to distinguish between the technological access, which refers to the technological endowment (broadband infrastructure; type of hardware and software), and the social access, which concerns the individual characteristics that allow more or less access to the technologies (e.g. income, ICT skills, and education). Similarly, with reference to the use, the authors distinguish between the technological literacy, which represents the individuals' skills in the use of the technology, and the social use, which refers to the type of activities performed with the ICT – e.g. email, searching the web. It is possible to combine together the two taxonomies and obtain 12 different sub-groups of variables.

We can first examine the interaction between context variables and technological access: here we refer to the technological indicators that are affected by specific context factors. For example, the development of the ICT infrastructure affects the type of Internet connection but, at the same time, it depends upon the overall infrastructure development of a specific geographical area. Combining economic variables and technological access, on the one hand, and demographic variables and technological access, on the other, we can identify economic and demographical indicators that affect technological adoption. In this framework, the price of hardware can be classified as an economic variable, while the geographical location would be a demographic variable. If we then look at the combination between social access and the other three types of variables, we can identify the drivers of the technological adoption (given the opportunity of accessing the technologies). In this group, it is possible to consider competition policy as a

Table 1. List of indicators

Indicator	Explanatory Power
Gross National Product per capita	Social access – economic variable
Agriculture value added on GDP	Social access – context variable
Percentage of trade on GDP	Social access – context variable
Percentage on incoming FDI con GDP	Social access – context variable
Private investment in telecoms on GDP	Social access – context variable
Gross enrolment rate	Social access – Demographic variable
Unite price for the fixed line telephone service	Technological access – economic variable
Cost of a 3 minute call by mobile phone	Technological access – economic variable
Main telephone line per 1000 inhabitants	Technological access – context variable
Percentage of urban population	Technological access – Demographic variable
Telephone subscriptions per 1000 inhabitants	Digital development
Internet subscriptions per 1000 inhabitants	Digital development
Internet usage per 1000 inhabitants	Digital development
Mobile subscriptions per 1000 inhabitants	Digital development

context variable, income as an economic variable and age or education as demographic variables explaining the social access.

Similarly, if we concentrate on the social use, it is reasonable to argue that the users' involvement in communities is a context variable impacting on social use; the income can again be considered as an economic variable; the age and education are demographic variables affecting the social use. Finally, in terms of the technological literacy, an example of context variables is the availability of training programs within firms, while in terms of economic variables one could consider the use of on-line banking and in terms of demographic variables, one could measure the individual ICT skills.

In the present analysis we consider the digital divide at the country level and on the basis of the previous literature review we collect information on 16 indicators between 2000 and 2005 for 51 low income countries (countries with a gross national income per capita of $935 or less) and lower-middle income countries (countries with a gross national income per capita between $936 and $3,705) (Table 1).

As far as the combination technological access – economic variables is concerned, we have chosen two price-related indicators: the unit price for the fixed telephone services and the cost of a 3 minutes mobile phone call. Second, the combination technological access – context variables is represented by the number of main telephone lines per 100 inhabitants, which is a proxy for the development of ICT infrastructure. Third, in order to represent the combination technological access – demographic variables, we have selected the percentage of urban population over total population.

Turning to the variables related to the social access to ICT, in order to represent the combination social access – economic variables, we have included the level of per capita income. With reference to the combination social access – context variables, we have considered a series of indicators representing the degree of trade openness (percentage of international trade on GDP and percentage of incoming FDI on GDP), the investments in ICT (percentage of investments in telecommunications over GDP) and the agriculture value added on GDP. Finally,

Table 2. Factor analysis

	Technological Intensity	Socio-Economic Development	Trade Openness	Concentration in the Telecom Sector
Internet use	0.78	.	.	.
Internet sub	0.77	.	.	.
Telephone sub	0.73	0.47	.	.
Mobile sub	0.68	.	.	.
GDP	0.65	0.60	.	.
Telecom investments	0.62	.	.	.
Sec. Education	0.35	0.71	.	.
Ter. Education	0.33	0.69	0.37	.
Prim. Education	.	0.67	.	.
Telephone lines	0.46	0.60	.	-0.31
Urban population	0.52	0.59	.	.
Agriculture	-0.52	-0.62	.	.
FDI	.	.	0.74	.
Trade	.	0.34	0.54	.
Price fixed telecom	.	.	.	0.83
Price mobile telecom	.	.	0.46	0.65

for the combination social access – demographic variables, we have chosen the level of primary, secondary and tertiary education.

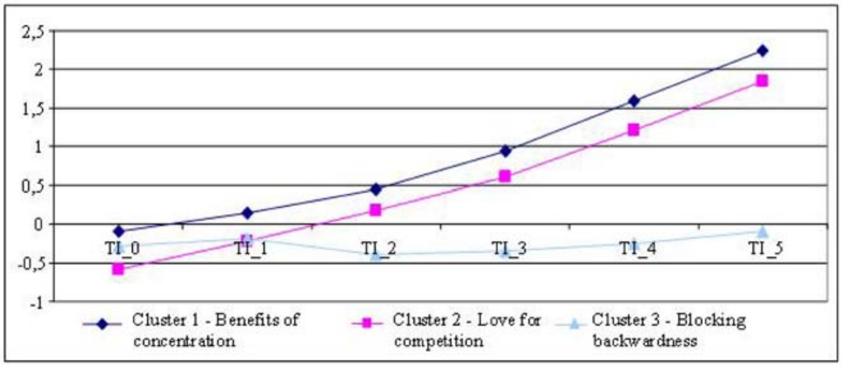
In terms of digital development, we consider the following four variables: fixed telephone subscriptions per 1000 inhabitants; Internet subscriptions per 1000 inhabitants; Internet usage per 1000 inhabitants; mobile telecom subscriptions per 1000 inhabitants. We have chosen these indicators, since in most developing countries it is not possible to observe long time series of the variables related to the social use.

FACTOR ANALYSIS

Some of the variables listed above provide a similar contribution to the analysis. For example the three variables of education offer a detailed insight on the level of education in each country at the first, secondary and tertiary level and have a very similar explanatory power of the patterns of the digital divide. For this reason, we synthesize the set of variables in order to exclude possible information redundancy. To this aim, we perform a factor analysis with Varimax rotation. Table 2 illustrates the results.

We have extracted four factors, which explain 65.2% of the total variance. The first factor – technological intensity - is highly correlated with the digital divide variables that indicate the level of access to the new technologies such as Internet, fixed and mobile telephony and is also positively correlated with the GDP per capita and with the level of private investment in telecommunications. The second factor – socio-economic development - is characterized by a positive relation with the education rate, the level of urban population, and the telephone infrastructure development. On the contrary, the importance of agricultural sector in the economy negatively influences this factor. The third factor – trade openness - is highly and positively correlated with the trade indicators such as the rate of FDI inflows in the country and the

Figure 1. Clusters' conditioned means for technological intensity



contribution of trade to GDP. Finally, the fourth factor – concentration in the telecom sector – is explained by the price indicators of fixed and mobile telecom services. Prices can be here considered as a proxy for the level of concentration in the industry. Both indicators have a positive correlation with the fourth factor, suggesting that the two segments of mobile phone services and fixed telephone services behave in the same way.

To sum up, the factor analysis proved to be useful to eliminate multicollinearity problems and redundancy of information and revealed that the digital development of developing countries is associated with:

- Technological intensity
- Socio-economic development
- Trade openness
- Concentration in the telecom sector

EMPIRICAL ANALYSIS

In order to identify the digitalization patterns within the set of selected countries, we carry out a cluster analysis on the factor loadings of the above described factors, with the exception of trade openness. When we simultaneously take into consideration the three factors - technological intensity, socio-economic development and concentration in the telecom sector – it is possible to aggregate the countries in three macro-groups (for the list of countries in each cluster, see the Table A2 in the Appendix). In particular, the Ward method of

Figure 2. Cluster's conditioned means for socio-economic development

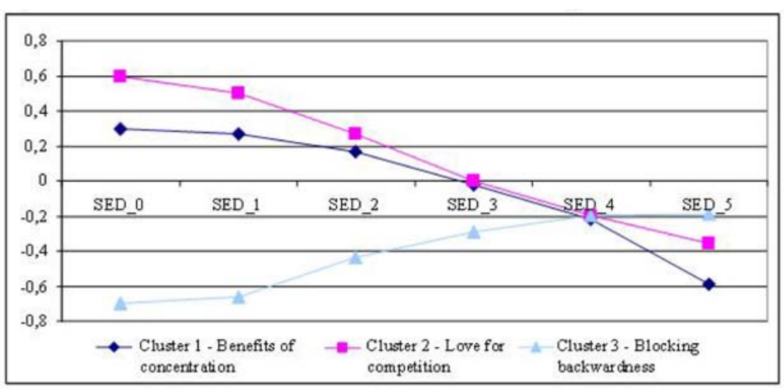
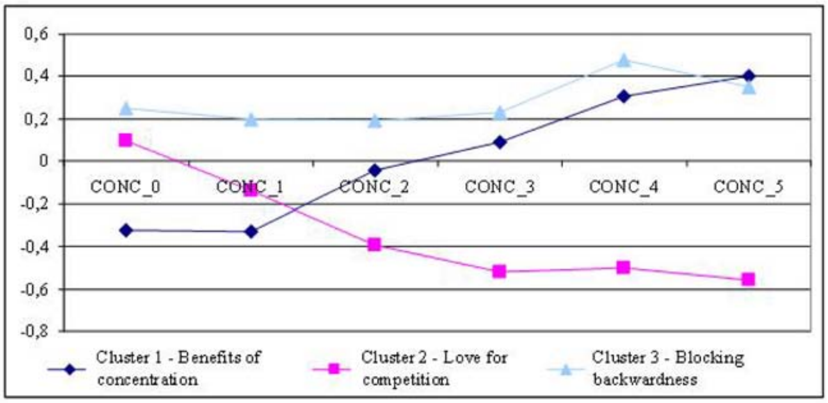


Figure 3. Cluster's conditioned means for concentration in the telecom sector



agglomeration reveals the existence of three clusters, with 19, 17 and 15 observations respectively. Figures 1, 2 and 3 illustrate the conditioned means for each of the factors across the clusters.

With reference to the factor technological intensity (Figure 1), the difference among the first and the second cluster is negligible, as both series are growing at a similar rate. On the contrary, cluster 3 gathers all those countries which display a low and constant rate of technological development.

Figure 2 shows the conditional means of the factor socio-economic development across the three clusters. Cluster 1 gathers all the countries that have only recently experienced a process of economic growth and structural change, going from a rural economy to a modern economy, with an increasing role for manufacturing and services sectors. Cluster 2 gathers all the countries that have been industrializing from a longer time. Cluster 3 represents left-behind countries, where agriculture is still extremely important for economic development.

The trend of the conditioned means of the concentration in the telecom sector (Figure 3) is particularly interesting for the scope of our analysis. The first cluster gathers all the countries that present an increasing level of concentration over time. The second cluster instead includes all the countries that display a decreasing level of concentration over time, due to the entrance of foreign or local competitors in the market. Finally, the third cluster includes countries with a very high and stable degree of concentration over time.

It is interesting to underline that there is no location effect driving the clustering of different countries, since the different geographical areas are evenly represented across the three clusters. On the contrary, the income effect is more pronounced, since low income countries are more present in cluster 3 than in cluster 1 and in cluster 2.

On the basis of the above described trends, we can identify distinct patterns of digitalization and label consequently the three clusters. The first cluster groups the countries that present the highest level of technological intensity, which appears to be increasing over time. It includes 74% of the lower-middle income countries. The countries in this cluster are characterized by favourable conditions of socio-economic development, which helps the diffusion of new technologies. The telecom sector presents an increasing level of concentration over time, witnessing a lower number of new entrants and a process of consolidation in the market. The first cluster includes countries like Jamaica, Thailand and Jordan, which are indeed experiencing a sustained technological progress that can contribute to reduce the digital divide, at least in terms of access to the technology. The economic structure of these countries and the increasing concentration in the telecom sector constitute two important drivers of the diffusion of ICT. We label the first cluster Benefits of concentration.

The second cluster includes countries with a level of technological intensity, which is lower than the one observed in the first cluster, but is growing over time. Countries in cluster 2 are experiencing an increasing diffusion of the new technologies, which also results in the reduction of the digital divide in terms of technological and social access. Furthermore, here we find countries like China, Ukraine, and Egypt that have recently started a process of structural change, heavily investing in manufacturing and services sectors. The sustained rate of socio-economic development allows these countries to progressively close the economic and technological gap with the most industrialized ones. In cluster 2, the level of concentration in the telecom sector has decreased over time, indicating the presence of a growing number of firms competing in the market. The countries of the second cluster therefore present a digitalization path which is substantially different from the countries in cluster 1, since in this case the diffusion of ICT has been supported by a competitive telecom sector and by a strong interaction between domestic firms and foreign firms. Furthermore, the high level of competition in the telecom sector is also responsible for the price reduction in the telecom services, which has allowed the majority of the population the access to ICT. The second cluster can be labelled Love for competition. Also in this cluster, most countries fall in the lower-middle income group (71%).

The third cluster – blocking backwardness - collects all the countries such as Tanzania, Mozambique, Cameroon, and India, with a rather negative performance in all the three factors. Most of the countries in this cluster (66.7%) belong to the group of low income countries. The digital divide in these countries still remains an unsolved problem. Indeed, if we look at the trend of the factor technological intensity for this group of countries, we observe that the level of technological development has remained almost unchanged over time. Together with the lack of technical progress, these countries register an increasing importance of the agricultural value added as compared to manufacturing and service value added, reflecting poor socio-economic conditions, which hinder the processes of digitalization and technological catching-up. As far as the telecom sector is concerned, in this cluster we observe a very high and stable level of concentration over time, suggesting the existence of a state monopoly, which is likely to hamper once more the process of technological diffusion.

Since the most significant differences across the three clusters lie in the factor concentration in the telecom sector, we provide more insights on this issue by performing a cluster analysis on this specific factor. The results show the existence of five different clusters, within the set of countries under investigation. Their development patterns seem to confirm the differences highlighted before with reference to the competition policies. The first cluster – mature countries - includes 15 countries (e.g. Cameroon, Jamaica and Morocco) with an increasing level of concentration between 2000 and 2005. This suggests that, in these countries, the number of companies operating in the telecom sector has diminished over time, while their size has probably increased, as it happens in the maturity phase of an industry life cycle (Abernathy and Utterback, 1978). The second cluster – internationalized countries - agglomerates 14 countries and presents a low and decreasing level of concentration in the telecom sector. Good examples are China and India, which received a high quantity of forward direct investments and developed a strong and competitive telecom sector. The third and fourth clusters, unstable countries and transition countries, are populated by seven and eight developing countries respectively. These two groups of countries present trends that have no major economic significance, since the degree of concentration varies widely in the short period of time taken into consideration. This is probably due to the high level of uncertainty that investors experience in these countries, which is mainly related to the weak institutional stability and to the ineffectiveness of their governments. Finally, the fifth cluster – non-competitive countries - includes seven countries (e.g. Ecuador, Peru and Pakistan) that present a constant and high level of concentration in the telecom sector between 2000 and 2005. In these countries, the telecom sector tends to be dominated by publicly owned monopolists. The trends of this one-factor cluster analysis have a close match with our previous findings. In particular, the presence of three patterns - concentration, growing competition and permanent monopoly - is a further evidence of the gap that characterizes the different developing countries in relation to the evolution of the telecom industry.

It is important to underline that the per capita income has a considerable influence both in the factor technological intensity and in the factor socio-economic development. This means that the level of GDP stimulates both the economic and the technological development in terms of access to new technologies. However, the availability of economic resources is a necessary but not sufficient condition for the diffusion of ICT, as the cases of Jamaica and Tunisia show. Indeed, while both countries present high levels of socio-economic development and technological intensity, Jamaica has a lower income than Tunisia, but is the most technologically advanced country in the sample. On the other hand Tunisia is the second richest nation in the sample, but displays a lower level of technological development.

To summarize, by means of a cluster analysis on the three factors - technological intensity, socio-economic development and concentration in the telecom sector – we have identified three patterns of digitalization:

1. **Benefits of concentration**: the countries in this cluster are in a stage of economic transition and present a quite concentrated telecom sector, which has nonetheless guaranteed a considerable amount of technological investments. Furthermore, the access to the new technologies is increasingly made available to the majority of the population.
2. **Love for competition**: the countries in this cluster show a growing level of technological diffusion and have started a process of industrialization, which is stimulating the economic growth. Contrarily to cluster 1, the countries this cluster 2 are characterized by a very competitive telecom sector.
3. **Blocking backwardness**: the countries in this cluster are still left behind both in terms of socio-economic development and in terms of technological diffusion. Moreover, the telecom sector appears to be very concentrated: differently from cluster 1, however, the scarce competition is the result of the presence of state-owned monopolies rather than the outcome of a competitive selection stimulating the diffusion of ICT.

FUTURE TRENDS AND CONCLUSIONS

The present work aimed at analyzing the different structures of digital development in developing countries. On the basis of the literature on the first and second level digital divide, i.e. the divide in terms of access and utilization of the ICT, we have investigated a set of 51 developing countries between 2000 and 2005. First, our empirical analysis has highlighted four factors of digitalization: technological intensity, socio-economic development, concentration in the telecom sector and trade openness. Second, the cluster analysis on the factor loadings of technological intensity, socio-economic development and concentration in the telecom sector has revealed the existence of three digitalization patterns: benefits of concentration, love for competition, and blocking backwardness.

The countries belonging to the cluster benefits of concentration present the highest and most growing levels of technological development and a very concentrated telecom sector. Their economy is in transition, with an increasing contribution of manufacturing and service sectors to the GDP. The second cluster - love for competition - groups all the developing countries that are relatively ahead in terms of economic development and have been experiencing a sustained technological progress. In this cluster, the telecom sector is very competitive, mostly due to the entry of foreign companies in the market. Finally, the third cluster - blocking backwardness - is characterized by developing countries that are lagging behind both in technological and in economic terms and that present a very concentrated telecom sector, with a state-owned monopoly ruling the market.

It is important to underline that our analysis has highlighted the relevance of the GDP not only as a major determinant of the level of socio-economic development, but also as a crucial factor sustaining the technological progress. Generally speaking, the countries with a low level of digitalization are also the poorest ones. However, increasing the level of GDP is far from being a sufficient condition to overcome the digital divide. Another fundamental component for the digital evolution of developing countries is the implementation of technological policies both at the level of international organizations and at the level of the local governments. Unfortunately, our data set did not allow us to investigate in depth this issue, which nonetheless remains an important topic future research.

What stands out as a very important result of our analysis is the presence of two possible winning paths to the digital development within developing countries. Both the cluster benefits of concentration and the cluster love for competition present very high levels of technological intensity. However the competitive structure in the telecom sector within these two groups of countries has developed over time in an opposite way. As a result, it is reasonable to argue that the strain to reach a high level of technological development in the ICT field and to close the digital gap with the most advanced countries can be compatible either with the existence of large telecom monopolists, or with a high degree of competition among many telecom operators. This means that, in presence of two possible strategies of competition policy to address the issue of digital divide in the developing countries, policy makers will have to make their choice according to the country-specific socio-economic conditions. Even more than this, the cluster benefits of concentration displays the highest level of technological development, which suggests that the economic and technological advancement within developing countries tends to be associated with a growing concentration in the telecom sector. This has important policy implications, as it sheds some light on the role of competition policy in fostering the process of digitalization. In particular, our analysis illustrates that, as far as developing countries are concerned, stimulating competition in the telecom sector might not necessarily represent the first best strategy to promote development. Indeed, maintaining a monopolistic structure in the telecom service industry, at least for a limited period of time, can help the development of the infrastructure and the process of technological diffusion, therefore being beneficial for the process of catching up in digital technologies.

A final consideration refers to the overall level of digital development across low income and lower-middle income countries. On the one hand, the growth of the technological intensity for most of the countries taken in consideration can be interpreted as the beginning of a development path that is likely to reduce the digital divide between developing and developed countries. Interestingly, among these countries, some have pursued development strategies based upon competition in the

ICT sector, while others have faced a process of concentration in the market, which has stimulated the process of diffusion of ICT. On the other hand, 30% of the countries in our sample do not present evidence of technological development, both in terms of access to the new technologies and in terms of ICT use. This has to do with a more general level of economic backwardness. Within these countries, international and local policy makers, as well as other important public and private actors involved in the digital environment should actively sustain the process of digitalization, implementing policies and strategies directed at reducing the digital divide. However, the priorities may vary considerably between national governments and international organizations. At a local level, for instance, policy makers may prefer focussing on specific issues related to the digital development - e.g. the development of specific infrastructures - while at an international level institutions are generally interested in pursuing an even pattern of digitalization across different geographical areas.

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KEY TERMS AND DEFINITIONS

Concentration in the Telecom Sector: A factor including the variables of the digital divide related to the price of fixed and mobile communication services.

Digital Divide: The gap between people with access to information and communication technologies and skills to use them, and people without access and skills.

First Level Digital Divide: The digital divide concerning the access to ICT.

Low Income Countries: Countries with a gross national income per capita of $935 or less (in 2007)

Lower-Middle Income Countries: Countries with a gross national income per capita between $936 and $3,705 (in 2007)

Second Level Digital Divide: The digital divide concerning the use of ICT.

Socio-Economic Development: A factor including the variables of the digital divide that refer to the education level, the percentage of urban population, and the development of the telephone infrastructure.

Technological Intensity: A factor including the variables of the digital divide that indicate the level of access to new the technologies such as Internet, telephone and mobile phones.

APPENDIX

Figure 4. List of selected developing countries

	Country	Region	Income Group
1	Albania	Europe & Central Asia	Lower middle income
2	Armenia	Europe & Central Asia	Lower middle income
3	Azerbaijan	Europe & Central Asia	Lower middle income
4	Bangladesh	South Asia	Low income
5	Belarus	Europe & Central Asia	Lower middle income
6	Benin	Sub-Saharan Africa	Low income
7	Bolivia	Latin America & Caribbean	Lower middle income
8	Burundi	Sub-Saharan Africa	Low income
9	Cambodia	East Asia & Pacific	Low income
10	Cameroon	Sub-Saharan Africa	Lower middle income
11	China	East Asia & Pacific	Lower middle income
12	Colombia	Latin America & Caribbean	Lower middle income
13	Ecuador	Latin America & Caribbean	Lower middle income
14	Egypt, Arab Rep.	Middle East & North Africa	Lower middle income
15	El Salvador	Latin America & Caribbean	Lower middle income
16	Georgia	Europe & Central Asia	Lower middle income
17	Ghana	Sub-Saharan Africa	Low income
18	Guatemala	Latin America & Caribbean	Lower middle income
19	Guyana	Latin America & Caribbean	Lower middle income
20	Honduras	Latin America & Caribbean	Lower middle income
21	India	South Asia	Low income
22	Indonesia	East Asia & Pacific	Lower middle income
23	Jamaica	Latin America & Caribbean	Lower middle income
24	Jordan	Middle East & North Africa	Lower middle income
25	Kenya	Sub-Saharan Africa	Low income
26	Kyrgyz Republic	Europe & Central Asia	Low income
27	Macedonia, FYR	Europe & Central Asia	Lower middle income
28	Madagascar	Sub-Saharan Africa	Low income
29	Malawi	Sub-Saharan Africa	Low income
30	Moldova	Europe & Central Asia	Lower middle income
31	Mongolia	East Asia & Pacific	Low income
32	Morocco	Middle East & North Africa	Lower middle income
33	Mozambique	Sub-Saharan Africa	Low income
34	Nicaragua	Latin America & Caribbean	Lower middle income
35	Niger	Sub-Saharan Africa	Low income
36	Pakistan	South Asia	Low income
37	Paraguay	Latin America & Caribbean	Lower middle income
38	Peru	Latin America & Caribbean	Lower middle income
39	Philippines	East Asia & Pacific	Lower middle income
40	Senegal	Sub-Saharan Africa	Low income
41	Sri Lanka	South Asia	Lower middle income
42	Sudan	Sub-Saharan Africa	Low income
43	Swaziland	Sub-Saharan Africa	Lower middle income
44	Syrian Arab Republic	Middle East & North Africa	Lower middle income
45	Tanzania	Sub-Saharan Africa	Low income
46	Thailand	East Asia & Pacific	Lower middle income
47	Togo	Sub-Saharan Africa	Low income
48	Tunisia	Middle East & North Africa	Lower middle income
49	Uganda	Sub-Saharan Africa	Low income
50	Ukraine	Europe & Central Asia	Lower middle income
51	Yemen, Rep.	Middle East & North Africa	Low income

Figure 5. Countries by cluster

CLUSTER 1	CLUSTER 2	CLUSTER 3
Belarus	Albania	Benin
Colombia	Armenia	Bolivia
Ecuador	Azerbaijan	Burundi
Guatemala	Bangladesh	Cambodia
Indonesia	China	Cameroon
Jamaica	Egypt, Arab Rep.	Honduras
Jordan	El Salvador	India
Kenya	Georgia	Macedonia, FYR
Moldova	Ghana	Madagascar
Mongolia	Guyana	Mozambique
Morocco	Kyrgyz Republic	Nicaragua
Peru	Malawi	Niger
Sri Lanka	Pakistan	Senegal
Sudan	Paraguay	Tanzania
Swaziland	Philippines	Yemen, Rep.
Syrian Arab Republic	Tunisia	
Thailand	Ukraine	
Togo		
Uganda		

Chapter 5
Digital Divide in Turkey: A General Assessment

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ABSTRACT

This chapter examines the nature of digital divide in Turkey. To this end, after a brief summary of the literature, first, the dimensions of digital divide in the country are explained. Then, various initiatives by the government, private firms, NGOs, and international organizations to combat digital divide are presented. Next, in the discussion section, issues for further discussion regarding digital divide in Turkey are listed. The chapter ends with the examination of the issues regarding the future prospects for overcoming digital divide in Turkey and developing countries elsewhere.

INTRODUCTION

Increasing access to and use of information and communication technologies (ICTs) in developing countries is a phenomenon, which is hailed by many as a positive development that would stimulate a knowledge-based economy and society in these countries. The underlying assumption is that higher levels of and more equitable access to ICTs would stimulate economic growth, enhance national, regional, organizational and individual competitiveness, enable democratic participation and foster social equality. However, digital divide, that is, the division of the globe in general and individual countries, regions, organizations, and individuals in particular as "technology haves" and "have-nots", is casting a long shadow on these hopes.

Turkey, as a candidate country to the European Union (EU), strives for overcoming the digital divide problem as part of a strategic objective of the i2010 Strategic Plan, parallel to its membership negotiation and integration processes with the EU. To this end, different dimensions of digital divide in Turkey, such as gender, education level, location (urban-rural), and age are evaluated in this chapter, by using the current academic literature, statistical figures provided by Turkish government agencies, and examining strategy documents and

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current legislation, such as Turkey's Information Society Strategy and Action Plan documents, and the Universal Service Law.

This chapter evaluates digital divide in Turkey in terms of different dimensions of the problem, the proposed solutions and their implementations. These solutions are; using Internet cafes as access points by providing them with tax breaks, establishing Public Internet Access Points (PIAPs) by the help of municipal or national government agencies, setting up Internet centers for disadvantaged people, such as people with disabilities and housewives, using computers and Internet connections in community centers, libraries and schools for providing citizen access, encouraging people to access information via 3rd generation (3G)-enabled mobile phones, and finally government agencies cooperating with non-governmental organizations and private firms in order to provide education opportunities for citizens so that they can fully utilize computer and Internet access, once they are provided. The chapter concludes with the problems of implementation and future prospects for overcoming digital divide in Turkey and developing countries elsewhere.

BACKGROUND

Although some argue that there is no consensus on its definition, extent or impact (Dewan & Riggins, 2005: 299), the concept of digital divide can be basically defined as the difference between nation-states, regions, organizations (or businesses) and individuals in access to and value-adding use of information and communication technologies (ICTs) for a wide variety of activities (OECD, 2001: 5; Kaufman, 2005: 293). The most important determinants of the occurrence of this gap between the users and non-users of ICTs are listed as education level, geographical location, age, gender and race (Bikson & Panos, 1999: 31-41; Neu, Anderson & Bikson, 1999: xxii). Different solutions have been proposed to overcome digital divide. Some of these can be listed as using taxes (subsidies), tariffs, trade & legislation, and funding for public access points (Dewan & Riggins, 2005: 299).

An excellent summary of the academic literature on different levels of the digital divide phenomenon was done by Dewan & Riggins (2005). This chapter deals mostly with the individual and nation-state levels of the digital divide phenomenon in Turkey and the solutions proposed so as to overcome this problem.

Digital divide at the nation-state (global) level is a serious concern as it divides the world as technology haves and have-nots, with grave economic and social repercussions. Studies show that a variety of factors are to blame for this gap in the use of technology: In a review of 71 developed and developing countries, Pick & Azari (2008) found out that scientific and technical capacity, foreign direct investment, government prioritization of ICT, public spending on education, and quality of math/science education are all important determinants of the global digital divide. In a review of 80 developing countries, Crenshaw & Robison (2006) came to the conclusion that foreign investments, major urban agglomerations, manufacturing exports, non-governmental organization presence, tourism, democratic openness, property rights and income all affect the rate of Internet diffusion throughout the world. Demoussis & Giannakopulous (2006) arrived at similar findings at the European level, when they determined that household income, cost of access, demographics, media use, regional characteristics, and individual level general skill acquisition are determinants of Internet use and its extent.

Although providing access to ICTs is required to combat digital divide, only access is not sufficient to overcome the problem and to make it possible for people to materialize the benefits expected of value-added ICT use. When evaluating the effects of digital divide, Kaufman (2005: 294) emphasizes that there are two levels: First order effects of digital divide represent unequal access

Table 1. Availability of ICT Equipments in Households (%)

Type of ICT device	Percentage of households having ICT devices	Percentage of households having devices for Internet access
PCs	11.62	5.86
Laptops	1.13	0.74
Handled computers	0.14	0.08
Mobile phones	72.62	3.21
Televisions (including satellite dish, cable TV)	97.74	0.05
Games consoles	2.90	0.02
Any of the above	98.35	8.66

Source: Turkish Statistics Agency (TUIK), 2007.

to ICTs, while the second order effects are about creating value out of a connection to ICTs. As can be expected, when the majority of the population gains access to ICTs, second order issues become more important than those of the first (Dewan & Riggins, 2005: 301).

Hargittai (2006) provides an excellent example that emphasizes the difference between these levels, when she explains that having access to ICTs is not guaranteeing the users' ability to search for and access to critical information. Even when the users are capable of using the ICT that they access in a value-added way, they may not use it to its full potential due to the lack of facilitating conditions such as privacy, anonymity of use, and availability of assistance during ICT use (Rensel, Abbas & Rao, 2006). In addition, since digital divide is a phenomenon that is much more complex than just measuring technology penetration levels, its evaluation is quite difficult, and a more meaningful evaluation of digital divide requires the integration of a number of variables into composite variables (Vehovar, Sichel, Hüsing & Dolnicar, 2006).

Digital Divide in Turkey

Digital divide is considered as a serious problem in Turkey that requires urgent solution (Oruc & Aslan, 2002). Regarding the first order effects of digital divide in Turkey, levels of access to technological equipments should be taken into consideration. As Table 1 below shows, access to ICT devices is still quite low, with the exception of mobile phones, which is owned by almost three quarters of the Turkish households.

When data about the levels of access to computers and Internet are broken into different segments of the society, it can be observed that, parallel to the findings throughout the world, males have higher access levels (sometimes twice or three times higher) than females in all age groups, and younger people have higher levels of both computer and Internet use than older people, as shown below in Table 2.

The socio-economic status of women also makes a difference in access to and use of ICTs. In his study of access to ICT and women advocacy networks, Torenli (2005) documents that the ICTs and advocacy networks are used only by an elite sector of the Turkish women.

The level of education is also an important determinant of access to computers and the Internet in Turkey, similar to the findings in the digital divide literature in other countries. As the level of education increases, so does the level of computer and Internet use. Although men have more access at all levels of education, as the level of education increases, the difference in the levels of access between men and women decreases, as

Table 2. Computer and Internet Use by Gender and Age Group (%)

Age Group	Computer Use		Internet Use	
	Female	Male	Female	Male
16-24	25.02	43.79	18.82	37.41
25-34	13.91	27.62	10.63	22.50
35-44	7.06	19.25	5.01	14.35
45-54	3.25	14.19	2.36	10.09
55-64	1.25	5.04	0.94	3.80
65-74	0.23	2.24	0.14	1.80

Source: TUIK, 2007.

can be seen below in Table 3.

Location of the user also determines the level of computer and Internet access. Data in Figure 1, which is shown below, show that urban and rural users have different levels of access to both computers and the Internet. Users in urban areas are two to three times more likely to have access than those living in rural areas. High cost of access in rural communities is an important reason for this situation. It also must be noted that there is lack of data and specific research on the digital divide between urban and rural areas, and further research is needed (Akca, Sayili & Esengun, 2007: 411).

An interesting current development in access to and use of ICTs in rural areas is the establishment of village[1] Web sites. Yildiz & Guler-Parlak (2008) studied the whole population of 158 village Web sites in 2007. They found that other than being centers of social interactions between villagers living in distant parts of the country and the world due to internal and external migration, village Web sites function as local portals to e-government services.

These Web sites become tools for overcoming the identity crises and alienation problems of new generations in their new locations (in the big cities of Turkey, such as Ankara and Istanbul, and in some European countries, such as Germany, France and Belgium) of villagers by providing these people a sense of identity. They also function as depositories of contact information (postal addresses, e-mail addresses, mobile phone numbers), which are used for building virtual networks of townsmen. With their detailed and relevant local content, they give people from rural areas a solid reason to access to and use ICTs in ways to connect to their dispersed communities and enrich their lives.

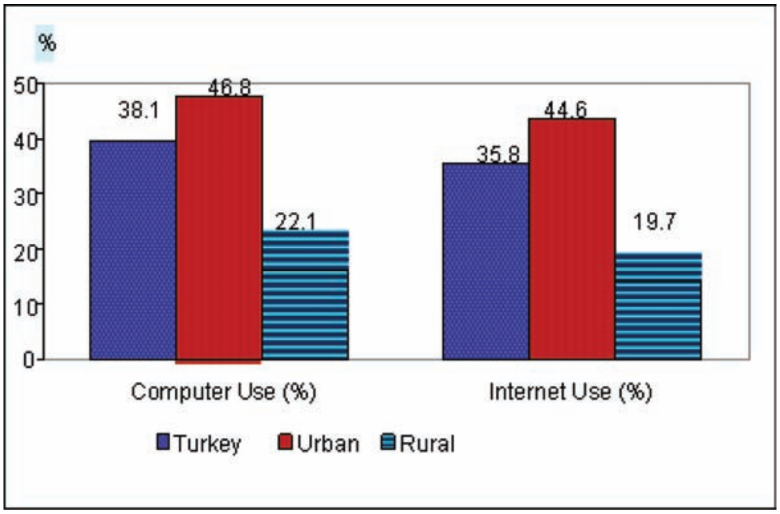
The lack of access of disadvantaged groups such as the elderly and the people with disabilities

Table 3. Computer and Internet Use by Gender and Education Level (%)

Education Level	Computer Use		Internet Use	
	Female	Male	Female	Male
Literate without a diploma	0.39	1.35	0.18	1.05
Primary school	1.22	4.78	0.34	3.11
Secondary school and vocational school at secondary school level	16.95	24.03	9.76	18.33
High school	35.79	45.65	27.14	36.52
University/Master/Doctorate	64.85	73.04	57.88	65.67

Source: TUIK, 2007.

Figure 1. Computer and Internet Use in Urban and Rural Areas (%)



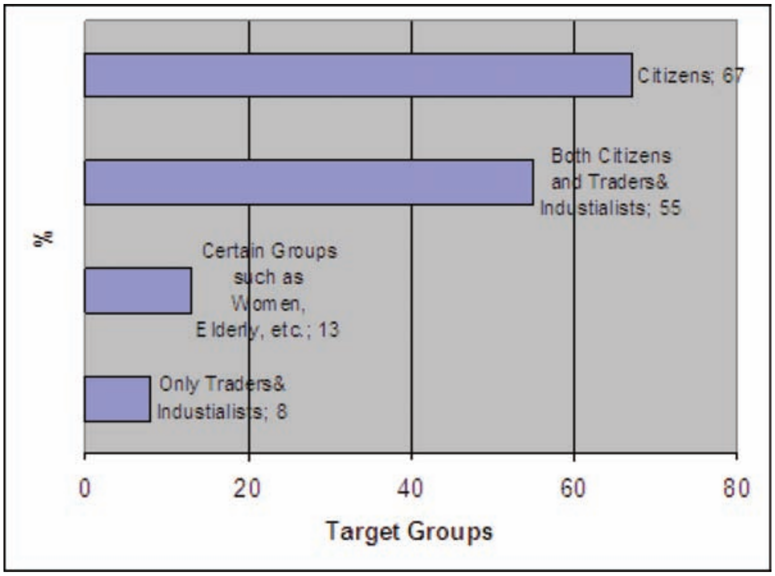
is also an important part of the problem. A recent study by the Deloitte Consulting Company (2007) shows that only 13% of the Turkish municipalities define certain disadvantaged groups, such as the elderly and women, as their target groups when they design their Web sites (see Figure 2 below). Unfortunately, there is no current detailed data on digital divide among these disadvantaged groups. Still, there are several initiatives by municipalities, NGOs and universities so as to increase their access to ICTs, as will be presented in the next section.

While one dimension of digital divide is the various types of difficulties in accessing to ICTs, other important dimensions of the concept are high cost of access and the lack of skills or motivation on the part of the users (RTD Info, 2006: 15).

Turkish people have to spend a bigger share of its income in order to get access to broadband access to the Internet, when compared to the citizens of many other countries. Developments like the privatization of the Turkish Telecom Company and the liberalization of the telecommunications market increase hopes for a substantial decrease in the costs of Internet connection. However, these hopes have not been fully realized yet. The cost of Internet access is still high, and this affects ICT availability in rural areas (Akca, Sayili and Esengun, 2007: 411). The real problem is the monopoly of Turk Telecom in providing the broadband infrastructure. An additional problem for the rural areas is the lack of alternative DSL providers outside major metropolitan areas.

Mobile phones, which are relatively cheap and easier to use than PCs or laptops, are owned by almost three quarters of the Turkish households. Also, as of June 2008, there are 63.6 million mobile phone subscribers, 90% of the country's population. It is argued that the coming of the 3G mobile technology to the Turkish telecommunications market[2], together with the competition between the three mobile service providers in the country (see Yildiz, 2007, for more detail), will increase the access to the Internet and eventually decrease the cost of Internet connection, depending on the policies of the mobile service providers that would stimulate the demand for their 3G applications. The performance of the 3G mobile technology in Turkey is also related to the provision of mobile telephone service throughout Turkey, number portability provided by the mobile operators, and use of universal service funds demanded by the mobile phone companies in order to provide mobile phone service access all over the country.

Figure 2. Target Groups for Municipal Web Sites. Source: Deloitte, 2007: 8.



Finally, several efforts for overcoming the lack of skills or motivation to access to and use ICTS are undertaken by government agencies, NGOs and private firms. These efforts are presented in detail below, in the next section.

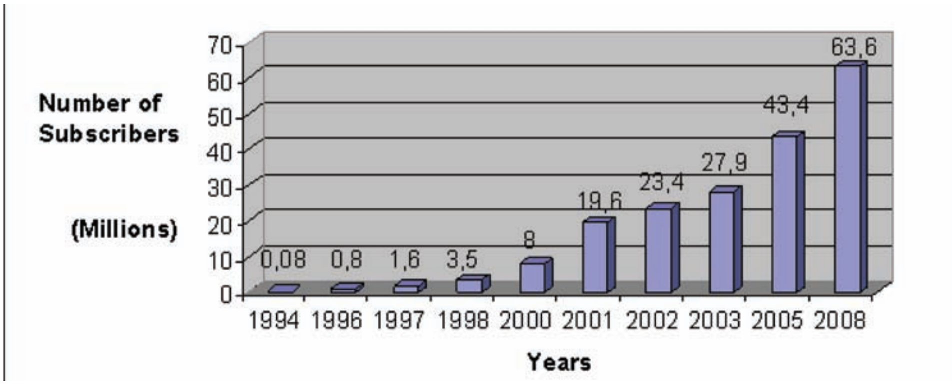
Solutions and Recommendations: Combating Digital Divide in Turkey

This section examines in detail the solutions proposed and implemented by various Turkish government agencies, private firms, NGOs and international organizations by themselves and in cooperation with each other, in order to overcome digital divide in Turkey. To this end, first, the legal developments such as the Turkish Information Society Strategy and Action Plan documents and laws are reviewed. Then, several initiatives for setting up public Internet/technology access points, by the Ministries of National Education and Transportation are presented. Next, similar efforts of NGOs and private firms such as the Turkish Informatics Association, Turk Telecom and the Microsoft Corporation, as well as international organizations such as the UNDP are listed. Calls for using the thousands of Internet cafes located throughout the country as public access points by providing them incentives, such as tax breaks are reviewed. Finally, recommendations regarding the use of current resources, such as the Universal Service Fund, in different combinations are also offered.

Specific legislation targeting at overcoming digital divide provide the legal backbone of all the efforts aiming to solve this problem. The two main legal documents that need to be reviewed here in detail are, the Turkish Information Society Strategy and Action Plan documents that the government envisioned and has been implementing, and the Universal Service Law of 2005.

The Information Society Strategy and Action Plan documents prepared in 2006 recognize digital divide as a serious problem. The Strategy document mentions digital divide as a serious threat to the establishment of an information society in Turkey (State Planning Organization, 2006a: 10, 12, 27, 30). The Action Plan document also includes quite a few actions to be realized so as to overcome digital divide. One of the most important examples is the plan for the establishment

Figure 3. The Penetration Levels of Mobile Phones in Turkey. Source: Taken from Yildiz, 2007: 256, and updated with recent data



of Public Internet Access Points (PIAPs) by the help of municipal or national government agencies (see Action Items Number 2 and 3 below in Table 5). To this end, PIAPs have been set up by the Turk Telecom, Ministry of Transportation, Turkish Armed Forces (PIAPs being established in some Army Barracks) and the Ministry of National Education. A list of actions proposed in the Action Plan document in order to overcome digital divide directly or indirectly is presented below in Table 4.

Another important legal development regarding digital divide is the Universal Service Law (Numbered 5369), which was enacted in the Turkish Parliament in 2005. The Law mandates the provision of universal service including electronic communication, regardless of differences in income and geographical location. People with disabilities are also listed as the receivers of universal service in the Law.

Together with the enactment of the Universal Service Law, a Universal Service Fund was created. Telecommunications companies, the biggest of which is Turk Telecom, contribute to the Fund. Administrative fines and some money from the Turkish Treasury are also added to the Fund's revenues. As of February 2008, 450 million New Turkish Liras (about US$ 375m) had been collected in the Fund (Turkay, 2008).

There are serious criticisms against the vagueness in the definition of the universal service concept in the Law, and the lack of planning and transparency in the use of Universal Service Funds (Aydin, Okcu and Aydin, 2008). For example, up to this date, the resources of the Fund have mostly been used for purchasing hardware. Now the mobile phone service providers demand money from the Fund in order to provide access to the few rural parts of the country, with low population density and rough terrain, where the demand is low and the investment costs are high. The use of Fund for this purpose may narrow digital divide in Turkey, especially between urban and rural areas.

The provision of PIAPs has been done by several different agencies: For example, the Turk Telecom has been launching "Internet houses" in all 720 sub-province4 centers in Turkey. Each Internet house contains 10-20 computers, with experts helping citizens use computers and the Internet.

The Ministry of Transportation has also been actively establishing PIAPs in 186 public libraries, 820 community education centers, and 270 vocational training centers. This Ministry also provided computer and Internet education to soldiers in 227 army barracks in all 81 provinces (Turkay, 2008).

Another important venue of access via PIAPs

Table 4. Items about Digital Divide in the Information Society Action Plan

Item No	Action	Responsible Organization
1	Use of computers in public school computer labs by the general public	Ministry of National Education
2	Public Internet Access Points (PIAPs)	Ministry of National Education
3	Providing computers and Internet access to people with reasonable prices and payment conditions	Ministry of National Education
4	Providing basic ICT education in public schools	Ministry of National Education
5	Providing basic ICT education to adults	Ministry of National Education
7	Development of human resources for PIAPs	Ministry of National Education
8	Providing basic ICT education to soldiers[3] of the Turkish Army	General Staff of the Turkish Army
9	Providing basic ICT education to government employees	Ministry of National Education
21	Providing vocational training via e-learning	Ministry of National Education
23	Subsidizing infrastructure costs for increasing access to and use of ICTs by businesses	Ministry of Industry and Trade
25	Encouraging access to and use of ICTs in rural areas, especially in commerce	Ministry of Agriculture and Village Works
34-35	Providing online health and telemedicine services	Ministry of Health
38	Integrated e-library system	Ministry of Culture and Tourism
39	Education portal and information system	Ministry of National Education
105	Termination of the Special Communication Tax as to decrease costs of information and Internet services	Ministry of Finance

Source: State Planning Organization, 2006b.

is the Turkish school system. In 2003, the Ministry of National Education and the Turk Telecom signed an agreement to connect every school in the country to the Internet via ADSL by the end of 2005. However, the implementation went slowly, mainly due to the lack of ADSL connection in rural areas. Meanwhile, this Ministry, together with the Intel Corporation, worked on a pilot project in the Yozgat Province by connecting schools to the Internet via wireless (Wi-Max) technology. However, other regions did not follow this example.

More recently, the Ministry of National Education and the Ministry of Transportation, assisted by the Turk Telecom, are in the process of providing 12 million students with ADSL Internet connection in their schools through 400,000 PCs. The current connection rates of schools are 59% at K12 level, and 99% at high-school level. The remaining 5,274 schools or educational units without Internet connection due to geographical reasons will be provided satellite-based connection. Both of these projects are expected to be finished by the end of 2008 (Ministry of National Education, 2008).

Non-governmental organizations that work on ICT issues also contribute to the efforts to combat digital divide. For example, the Turkish Informatics Association (TBD) has been providing ICT education to many diverse sections of the Turkish society ranging from housewives to government employees. The Association is also active in the provision of the European Computer Driver's License (ECDL) as an internationally accepted certification of ICT skills and knowledge. Another activity of the Association is the establishment of a study group for the visually-impaired people within the Association. The members of this study group work for the education of the visually-impaired people in subjects such as mathematics

Table 5. Activities of Individuals over the Internet

TYPE OF ACTIVITY	PERCENTAGE (%)
Communication	**78.23**
Sending / receiving e-mails	66.84
Telephoning over the Internet / Videoconferencing	11.36
Other (use of chat sites etc.)	40.39
Information Search & Online Services	**90.16**
Finding information about goods and services	43.31
Using services related to travel and accommodation	14.25
Listening to Web radios/watching web television	28.18
Playing or downloading games. images or music	43.58
Downloading software	22.81
Reading/downloading online newspapers/news magazines	55.77
Looking for a job or sending a job application	10.57
Ordering & Selling of Goods & Services, Banking	**15.95**
Online Banking Services	12.90
Other financial services (e.g. Share purchasing)	2.95
Purchasing/ordering goods and services (excl. Shares/financial services)	5.59
Selling goods and services (i.e. via auctions)	1.07
Interaction with Public Authorities	**39.97**
Obtaining information from public authorities web sites	37.64
Downloading official forms	10.65
Sending filled forms	6.02
Training & Education	**30.71**
Formalized educational activities (school. university etc.)	26.83
Post educational courses	7.22
Other educational activities related specifically to employment	4.37
Health	**22.97**
Seeking health-related information	22.38
Making an appointment online with practitioner	0.50
Requesting a prescription online from a practitioner	0.02
Seeking medical advice online from a practitioner	1.86

Source: TUIK, 2007.

and geography by the help of specially-produced video games. The group also encourages and helps the visually-impaired people to be trained as computer programmers.

Municipalities and universities also assist people with disabilities by establishing special computer and Internet centers for them. Two such computer centers were set up by Ankara Metropolitan Municipality and Hacettepe University's Department of Instructional Technologies. The Municipality's center was officially named as the "Education and Technology Center for the Visually-Impaired." This center provides 30 computers, programs that guide visually-impaired citizens orally, five Braille displays, and one Braille printers (Ankara Metropolitan Municipality, 2007).

The private firms in the ICT sector also contribute to the fight against digital divide: For example, Microsoft Turkey has been conducting two major initiatives to combat digital divide: The first initiative is a global one named “Partners in Learning”. The idea is to pair a knowledgeable person on ICT issues with a person who is newly experiencing the ICTs, so as to provide assistance. The second initiative is called “Bilenler Bilmeyenlere Anlatacak” (Those Who Know Teach the Ones Who Do Not Know). In association with UNDP and some NGOs, such as Habitat and Agenda 21 Youth Association, 40 young computer users from different parts of Turkey were trained as ICT educators in this program, who in turn provide training to other computer instructors (Ozdemir, 2006).

Finally, another way of combating digital divide by providing ICT access points is to use Internet cafes for this purpose by providing incentives, such as tax breaks (Yildiz, 2002). The most important advantage of using Internet cafes is that they are already in existence in every part of the country, even in small towns and villages. Although these cafes are facing various legal, managerial and technical problems, and they are currently being seen as centers for relaxation and entertainment rather than as places of learning and self-development, they can be useful public policy tools. To this end, enacting necessary legislation, initiating tax breaks, providing necessary physical infrastructure, technical support services and educational programs are necessary (Yildiz, Kaya Bensghir & Cankaya, 2005).

FUTURE TRENDS

This section provides information about some trends that would affect the future of the digital divide issue in Turkey. Wireless technologies such as Wi-Max and Wi-Fi, as well as 3rd generation mobile phone infrastructure, are the future trends of Internet connection in Turkey. The convergence of technologies, together with the high levels of mobile phone penetration in Turkey, holds the promise of mobile phone or hand-held computer use instead of PCs, laptops or, other technological equipments regarding access to computers and the Internet.

The real challenge in terms of overcoming digital divide in Turkey is finding ways to tackle the second order effects. In other words, when access to ICTs are increased to reasonable levels, people should have the skills, motivation and necessary legal protections (i.e. regarding information privacy and security, and having electronic or mobile signatures for authentication) to fruitfully utilize ICT access in ways to enrich their lives. As a country with a young population, areas such as education and health are two important areas where access to ICTs and its value-added use can make people’s lives easier, more convenient and rewarding for them. Some examples of these uses are online registration to all levels of schools, online communication between parents and teachers, and online appointments in the healthcare system.

The types of activities that individuals in Turkey engaged in on the Internet in 2007 are listed in Table 5 below. The categories and sub-categories presented in the table indicate that individuals use the Internet for a variety of purposes in order to enrich their lives. These uses include those that can be classified as second-order uses, uses that add value to individuals’ lives. Some examples of these value-adding uses are utilizing services related to travel and accommodation, looking for a job or sending a job application, engaging in online banking activities, purchasing/ordering goods and services, and seeking education and/or health-related information.

CONCLUSION

Digital divide is an important global problem, and its solution requires a coordinated global approach that uses the experiences of different regions and countries in a creative and integrative manner. Therefore, case studies of digital divide -such as this article- are important sources of cross-country comparison and learning.

Although there are above-mentioned positive developments regarding overcoming digital divide in Turkey, there are many shortcomings as well. This conclusion section first presents a general evaluation of the efforts towards overcoming digital divide in Turkey. Then it presents the important issues to be emphasized and discussed in order to conclude examining the current state and future prospects of the digital divide issue in Turkey. The issues discussed in this last section are the determination of the responsible sector (public sector, private sector, civil society and/or various partnerships among them) from overcoming digital divide, the proper placement of the digital divide issue in the public agenda, the risk of losing the "human touch" by focusing too much on ICTs, which are actually only means to an end (or multiple ends), and finally, the issue of examining the efficacy and impact of access to and use of ICTs.

There are two major problems in the implementation of digital divide policies: First, the universal service concept is not well-defined in the Universal Service Law, and other related documents such as the Information Society Strategy and Action Plan. In addition, as explained in detail above, different government agencies are setting up public internet access points (PIAPs) more or less on their own in an uncoordinated and unplanned fashion. There is evidently a problem of planning and coordination at macro level.

A second problem is the use of supply-side policies against digital divide. In other words, government agencies and firms alike provide content and applications in order to "pull" people to use ICTs/Internet. The "demand" of citizens and customers for e-government (e-health, e-education, etc.) and e-business applications, however, is largely lacking and does not provide a "push effect". Therefore, the need for universal service is not strongly felt in the Turkish case. This situation is even more aggravated by the misuse of Universal Service Funds, mentioned below in detail.

Regarding the general/global issues to be discussed, the first and most important one is finding the societal actor, who is responsible from overcoming the digital divide problem. In other words, is it merely the government's responsibility to make sure that access to and use of ICTs are equitably distributed among its citizenry, organizations and regions? Alternatively, should we let the market forces take care of the digital divide problems using the dynamics of demand and supply? Or can and should we use a "governance approach", enabling partnerships between public, private and civil society actors to solve these problems? On the one hand, the current era's global "commitment to marketplace solutions" (Strover, 2003: 275) makes this issue an especially challenging one. One the other hand, some argue that leaving the issue only to markets and time may exacerbate the problem (Torenli, 2008).

Two major players of the global telecommunications market, the European Union and the US, have different, but converging stances on the issue. It is argued that although there is a global trend towards the homogenization of telecommunications policy-making regarding the responsible actor(s), perspectives other than the marketplace is necessary. There are certain differences between the EU and the US in their definition of and proposed solutions to the digital divide problem. While the US documents define the issue as one of access to equipment and infrastructure, the EU documents identify it as access to information and services. While the market solutions are preferred more in the US[4], the EU is giving a relatively bigger (although currently decreasing) role to government in solving this problem (Stewart, Gil-Egui, Tian & Pileggi, 2006). This difference in approaches is an important one for Turkey, as it strives to be a member of the EU.

The digital divide issue is presented as one of even development throughout the globe. It is argued that overcoming the digital divide may enable many people from the developing countries like Turkey, who are called the "next billion" ICT users (Miller, 2002; Upbin, 2007), people who have not been using ICTs (especially the Internet) as widely and deeply as the "first one billion" people, (who live in the developed parts of the world, such as North America, Western Europe and South/ Southeast Asia) to enrich their lives via ICT use. Today, as the number of Internet users has almost reached 1.5 billion, the "next billion" argument may seem to become obsolete. However, the idea behind the concept is still relevant, as the uneven global access to and use of ICTs continues.

The idea of leaving the solution of the digital divide problem to the market forces of demand and supply is supported by some innovative solutions, although they can also be seen as challenges to market forces. The *One Laptop Per Child* (OLPC) Project, which is a brainchild of Nicholas Negroponte, an intellectual well-known for his 100-dollar-laptop idea (Anderson, 2006; Kaufman, 2005: 293; Rapoza, 2007) is another supply-side approach to combat the digital divide issue at global level. These cheap laptops run with free and open source software (FOSS), as such they connect the digital divide issue to another very important public policy decision, the use of FOSS as a public ICT projects.

A second major issue is the proper placement of the digital divide issue in the public agenda. It must be emphasized that ICTs complement social welfare programs, but they do not replace it. In other words, increasing access to and use of ICTs are not "magic bullets" that would solve social and political problems. They are only a tool among many for increasing social inclusion and participation.

A third issue is the risk of losing the compassion, the "human touch" by emphasizing technology too much. E-inclusion in education and health services, for example, may yield excellent results in terms of access to these services by disadvantaged segments of the society. However, there are certain points in these processes that the "human touch" does make a difference, such as a hug or pat on the back from a teacher that inspires us, or a warm, assuring smile from a doctor that makes us sure that the treatment process will go just fine. In addition to this issue, there may be specific cultural and psychological needs for "face-to-face" interaction, instead of a technology-based one.

A fourth and final issue is that of examining the efficacy and impact of access to and use of ICTs (Dewan & Riggins, 2005: 312). This issue is all about effectiveness (doing the right thing, i.e. finding the right information) and efficiency (doing the thing right, i.e. finding the information by using the minimum amount of scarce resources of time, money and expertise). In other words, the process of conducting information gathering and online transactions must be critically analyzed so as to understand whether ICTs really contribute to people's lives and enrich lives with their use. To do so, people should have the opportunity to access to relevant content (e.g. in education, health, public security, etc.), in languages that they can understand (Aydin, 2008).

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KEY TERMS AND DEFINITIONS

Digital Divide: Inequality between nation-states, regions, organizations and individuals in access to and productive use of ICTs based on variables such as income, gender, age, location, etc.

First Order Effects of Digital Divide: Effects caused by unequal access to ICTs due to digital divide.

Information Society Action Plan: A list of specific actions (and the organizations responsible from these actions) that needs to be done by a government unit (or a country), in order to achieve specific goals set in the Information Society Strategy.

Information Society Strategy: A strategic plan that explains in detail what a government unit (or a country) should do in order to achieve some pre-determined information-society-related performance criteria.

Internet Cafes: Places that are set up by individual entrepreneurs or private firms in order to provide access to computers and the Internet in exchange for an hourly fee.

Public Internet Access Points: Places that are set up by government units in order to promote access to technology, such as computer labs in schools, libraries and community centers.

Second Order Effects of Digital Divide: Effects caused by unequal value-creation via ICT access and use due to digital divide.

ENDNOTES

1 In the Turkish administrative system, a village is defined by the Village Law as a rural settlement/community, the population of which does not exceed 2,000 people.

2 3G licenses are bought by all three mobile service providers (Turkcell, Vodafone andAvea) through a bidding process in December 2008.

3 The Turkish army uses a draft system.

4 Turkey is administratively divided to 81 provinces and 720 sub-provinces as of 2008.

5 An important exception to the preference of market-based solutions in the US is the creation of the Universal Service Fund and the related universal service implementation by the Federal Communications Commission.

Chapter 6

Bridging the Digital Divide in Australia:

The Potential Implications for the Mental Health of Young People Experiencing Marginalisation

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ABSTRACT

The rapid uptake of technology offers potentially innovative approaches to promoting mental health amongst young people, addressing a significant public health challenge. The advent of Web 2.0 has seen a shift from text heavy content to the development of communities that foster connectivity. This area of research, its potential to engage young people at risk of isolation, and the mental health benefits it may have, has received little attention. This chapter considers evidence regarding technology's role in mental health promotion, particularly for marginalised young people. Results are presented from an Australian study, "Bridging the Digital Divide," which investigated technology access and utilisation by young people experiencing marginalisation. Finally, Australian policy regarding the digital divide and Internet safety is reviewed. The authors conclude that policy responses should move beyond just access and safety and explore innovative ways of ensuring safe and supportive online communities accessible for all young people.

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INTRODUCTION

In Australia, 90% of 18 to 24 year olds and 92% of 15 to 17 year olds have used the Internet (Australian Bureau of Statistics, 2007), while 88% of 15-25 year olds own a mobile phone (Department of Communications Information Technology and the Arts, 2005). The impact of information communication technologies (ICT) and the role they play in young people's everyday lives has been fiercely debated in international academia, the general community and the popular press. Take for example the Internet: on one hand it has been described as *"Cyberia"* a virtual wasteland that young people navigate without rules or regulations; a catalyst for bullying, suicide, and anti-social behaviours, including Internet addiction (Ha et al., 2007; Mitchell et al., 2007; Tam et al., 2007). On the other, it has been touted as a new community with potential to connect those experiencing isolation and marginalisation and as a tool that has the capacity to redefine the practice of relationships and diversify social interactions (Rideout, 2002; Valentine & Holloway, 2002).

Despite the debate regarding the influence of technology on society and its potential harmful effects on the wellbeing of young people there is no denying that the Internet is a dynamic evolving platform. Research exploring its capacity to engage with young people, particularly those who may be vulnerable or at risk of exclusion suggests:

- Young people feel empowered online and are provided a degree of anonymity which means they are more confident talking about sensitive or embarrassing issues, including mental and sexual health (Burns et al., 2007; Nicholas et al., 2004; Suzuki & Calzo, 2004; Valentine & Holloway, 2001);
- The Internet is accessible, anonymous, engaging, and informative and its interactivity allows the delivery of information, health interventions and services in a variety of formats, including traditional text based content, testimonials and fact sheets, both audio and visual podcasts, digital photography and storytelling, gaming, online forums and diagnostic screening with direct links to service providers, see for example (Burns et al., 2007; Baranowski et al., 2008; Christensen & Griffiths, 2000);
- The advent of 'Web 2.0' has blurred the boundaries of consumer and producer, enabling individuals to create and publish content themselves through applications such as wikis, blogs, social tagging and networking, aggregative content management and pod/vod-casting (Boulos and Wheelert, 2007); and,
- Open programming interfaces facilitate greater levels of flexibility, agency and democracy, thereby enabling new forms of social organisation while participatory content generation fosters increased collaboration, ownership, and empowerment (Christensen et al., 2002, Crespo, 2007, Wyn et al., 2005, Boulos and Wheelert, 2007, Lefebvre, 2007).

ICT provides multiple components and the possibility of multiple entry points enable individuals to tailor their online experience to suit their needs and learning preferences. This flexibility provides scope for reaching very diverse populations at low cost. It also raises the potential then, assuming access is available, for technology to assist young people experiencing, or at risk of experiencing, marginalisation to transgress the stigma and discrimination faced in their physical environments (Blanchard et al., 2007).

The 1986 Ottawa Charter, long considered a seminal document in the field of health promotion, argues that 'settings' are the cornerstone of successful health promotion initiatives (WHO, 1986). 'Settings' are defined as an environment in which interventions (including the development of healthy public policy, introduction of regulations or legislation and the launch of new decision-making mechanisms for change) can be applied. The settings approach moves interventions upstream from defining goals and targets in terms of populations and people, towards ones that look at changes in organisations, systems and the environment. Traditional settings for health promotion include schools, workplaces, local government and community groups including religious, sporting and other clubs where people congregate.

This chapter conceptualises the Internet as a 'setting' and presents research from an Australian project *Bridging the Digital Divide* which challenges some of the misconceptions associated with the Internet, and the way in which young people experiencing marginalisation or at risk of marginalisation, may access and utilise it. Conceptualising the Internet as a 'setting' acknowledges that for young people ICT is not just a tool they use to communicate or seek information, but rather a space in which they negotiate relationships, make sense of who they are and learn about the world around them.

The specific objectives of this chapter are to explore:

- the literature examining the mental health needs and the role of technology in the lives of young people experiencing, or at risk of experiencing, social, cultural and/or economic marginalisation. Young people at risk of marginalisation include those who are Indigenous, newly arrived or from refugee or migrant backgrounds, living with a disability, same-sex attracted, gender diverse, carers or from low socio-economic backgrounds;
- the implications of research, conducted with 96 young people and 22 service providers, in Victoria Australia; and,
- Australian government policy which has focused on Internet safety and the 'digital divide' with an exploration of the impact that it may have on young people experiencing marginalisation.

BACKGROUND

The life experiences of young people have changed significantly over the last two decades, in part due to key structural changes brought about by late modernity (Furlong & Cartmel, 1997). Significant transformations in the social context of Australian young people affect both the decisions they must make and the opportunities available to them. The Australian economy has entered its 17th year of strong economic growth with historically low levels of unemployment. Behind this story of prosperity is the experience of Australians who remain disadvantaged. Many of these are young people at risk of disengagement due to unemployment, low incomes, poor housing, crime, poor health and disability and family breakdown (Burns et al., 2008). In combination, these problems can result in cycles of poverty, spanning generations and geographical regions. In addition, the following changes are shaping the experiences of young people in new and sometimes unpredictable ways:

- Changes in the social fabric of society have led to a decline in affordable housing, increased levels of family breakdown, divorce, sole parent families and family conflict/violence (Australian Bureau of Statistics, 2002; Australian Institute of Health and Welfare, 2007b; Boese & Scutella, 2006).
- An increasingly deregulated and unstable labour market has resulted in increased casual, part-time and short term employment opportunities. It means young people have more flexibility – and greater job insecurity (Dwyer & Wyn, 2001).
- Increasing emphasis on 'the individual' means that young people have a perceived greater level of 'life choices' - but also higher levels of 'insecurity' (Furlong & Cartmel, 1997).

In the next decade the disparity between the privileged and the marginalised will grow. Young people who are well resourced will have access to education and employment opportunities, while young people who are marginalised due to language, economic, cultural and societal barriers will be disenfranchised and at greater risk of poor health, mental health and social outcomes (Sercombe et al., 2002)

Bridging the Digital Divide

The Victorian Health Promotion Foundation (VicHealth) has a holistic approach to health and aims to promote health by fostering change in social, economic, cultural, and physical environments. It partners with a range of organisations including sport, health, planning, transport, local government, education, community and the arts to promote engagement (VicHealth, 2005; VicHealth, 2006). VicHealth's mental health promotion framework focuses on impacting four key social determinants of mental health: social participation, freedom from violence, freedom from discrimination and promoting acceptance of diversity and access to economic resources (Walker et al., 2005).

In 2005, VicHealth commissioned a scoping paper entitled *Young People Technology and Social Relationships* identifying 'cyberspace' as a new sector for action (Wyn et al., 2005). Of major interest to VicHealth were the multiple influences and effects that ICT could have on young people's experiences of social inclusion and exclusion and their sense of mental health and wellbeing. The review identified four gaps in the international literature relating to the role of ICT and its impact on young people:

- **Wellbeing:** comprehensive and systematic research on the nature and meaning of relationships and social connections and the role they play in enhancing (or harming) young people's health and wellbeing.
- **Meaning and social context:** embracing a holistic approach to the complex use of the Internet.
- **Diversity:** gaps exist in research on the experiences of young people from a variety of backgrounds.
- **Participant research:** the opportunity exists to involve young people in the design and implementation of research.

Subsequently VicHealth called for expressions of interest from multi-disciplinary teams to apply for funding from a grant scheme titled 'The Young People, Technology and Social Relationships Grants'. The Inspire Foundation (www.inspire.org.au) was the successful recipient of one of the grants for a project, *Bridging the Digital Divide*. The Inspire Foundation is an Australian non-profit organisation, established in 1996 that has worked directly with young people from a range of backgrounds to develop and implement technology-based programs designed to promote mental health and wellbeing for young people aged 16-25 (Burns et al., 2007; Burns & Morey, 2008; Collin & Burns, 2008; Nicholas et al., 2008; Oliver et al., 2006; Sullivan & Burns, 2006; Swanton et al., 2007; Webb et al., 2008).

Bridging the Digital Divide is a three year project which aims to positively impact marginalised young people's mental health and wellbeing by increasing their levels of social connectedness and civic engagement (Blanchard et al., 2007; Blanchard et al., 2008a; Metcalf et al., 2008). The first part of the project funded research which aims to explore:

- The role of ICT in young people's identity formation, social relationships, skill development as well as information provision and communications;
- The use of ICT by young people to exercise citizenship and civic engagement;
- The digital divide created by lack of access to ICT; and,

- Organisational capacity of youth and related services to utilise ICT to promote social inclusion and civic engagement.

Community consultation was conducted in late 2006, and both a Project Advisory Group and Youth Reference Group were established to guide the project's development, implementation and evaluation. These groups facilitate ongoing dialogue between a range of stakeholders, researchers and young people. Both groups have actively contributed to the design of the research tools and methodology; guiding workshop development and implementation; and participated in the community consultation.

YOUNG PEOPLE'S USE OF INFORMATION COMMUNICATION TECHNOLOGY AND ITS INFLUENCE ON MENTAL HEALTH

The Mental Health and Emotional Wellbeing of Young People

The World Health Organisation (WHO) defines 'mental health' as 'a state of well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community' (World Health Organization, 2001). Inherent in this, is the important recognition that mental health is much more than merely the absence of mental illness. Mental health policy in Australia and internationally increasingly adopts this conceptualisation of mental health and advocates for both the promotion of mental health, and the prevention, early intervention and treatment of mental disorders (Parham, 2007). There is also an emerging emphasis in policy and practice on addressing the determinants of mental health (including social, ecological, risk and protective factors) (Herrman et al., 2005).

In Australia, while rates of youth suicide have declined by 56% since 1995 (Australian Bureau of Statistics, 2008), levels of psychological distress among young people have increased with 13% of males and 19% of females experiencing very high levels of psychological distress compared to 7 and 13% in 1997 (AIHW, 2007).

Overall young people in Australia, when asked about their health and wellbeing, paint an optimistic picture with surveys consistently showing that over 80% are healthy, happy and satisfied with their lives. Eckersley (2007) however argues that underlying this optimistic picture a growing number of young people are facing significant emotional turmoil and that the quality of life for young people in Australia is declining (Eckersley, 2007). Statistics from general population surveys suggest that:

- Between one fifth and one third of young people are experiencing significant psychological stress and distress at any given time, with some estimates of the prevalence of a more general malaise (frequent headaches, indigestion and sleeplessness) reaching 50%;
- Young people are experiencing mental health problems at higher rates than older age groups, and retaining their increased risk beyond adolescence;
- Almost a third of young males and a quarter of young females are overweight or obese and these proportions are rising;
- Hospitalisation rates for intentional self harm and emotional and behavioural problems increased during the period that youth suicide rates fell;
- Suicide rates have declined because young people are seeking and getting help, not that fewer young people are in need of support; and,
- Heroin use has dropped but methamphetamine use and risky alcohol use, including binge drinking, has increased.

Young People at Risk of or Experiencing Marginalisation

Young people who experience social, economic or cultural marginalisation are at an increased risk of experiencing mental health problems (Herrman et al., 2005). In a recently commissioned Australian Research Alliance for Children and Youth paper *"Preventing Youth Disengagement and Promoting Engagement"* the authors (Burns et al., 2008) highlight that young people who experience marginalisation have fewer opportunities to participate in community activities, are more likely to experience disparities in access to health care, education and employment and, as a consequence, experience higher rates of social and mental health problems (Herrman et al., 2005). Young people identified as being at greatest risk include:

- **Careers:** 11.6% of young Australians care for someone due to disability and/or age. Furthermore, 23% of young Australians living at home have a parent with a mental illness (AIHW, 2007). Young people living with a parent with a mental illness may experience greater social isolation as a result of the stigma associated with mental illness as well as the challenges of managing their parent's illness (Groom et al., 2003). These young people are at increased risk of developing mental health difficulties themselves including depression, bipolar disorder and anxiety disorders (Chang and Steiner, 2000, Beardslee et al., 1998, Lieb et al., 2002, Clarke et al., 2001) International research has found that a high number of young carers already report stress, anxiety, low self-esteem and depression (Banks et al., 2001; Shah & Hatton, 1999).
- **Indigenous young people:** In 2004–05, the hospital separation rate for mental and behavioural disorders amongst Indigenous 12 to 24 year olds was 1.6 times that of their non-Indigenous peers (AIHW, 2007). They also completed suicide at 3.8 (Female) and 6.6 (Male) times the rate of their non-Indigenous counterparts (AIHW, 2004). While geography has been postulated as a major risk factor for indigenous young people it may be a proxy for social isolation which results in limited opportunities for meaningful participation and a lack of services, which may all contribute to the higher rates of youth suicide in rural and remote communities.
- **Same-sex attracted young people** are six times more likely to attempt suicide than heterosexual young people. Between 20 and 42% of same-sex attracted young people have attempted suicide compared to 7-13% of heterosexual youth (Dyson et al., 2003)
- **Gender diverse young people:** Between 30 and 40% of transgender young people have attempted suicide (Di Ceglie, 2000, Holman and Goldberg, 2006, Ministerial Advisory Committee on Gay and Lesbian Health (MACGLH), 2002, Morrow, 2004, Ontario Public Health Association, 2003)
- **Young people from low socio-economic backgrounds:** Negative mental health outcomes are up to 2.5 times higher amongst individuals experiencing the greatest social disadvantage (Astbury, 2001) and depression is between 1.5 and two times more prevalent amongst low income groups within a given population (WHO, 2003). As well as limiting access to material and psychosocial resources, being from a low socio-economic background affects people's ability to exercise autonomy and decision-making placing them at greater risk of experiencing depression (WHO, 2000).
- **Individuals living with an intellectual disability:** Intellectual disability affects 1% to 3% of the population. Young people with an intellectual disability are more likely to experience physical and mental health

problems (Einfeld et al., 2006; Tonge & Einfeld, 2000). Co-occurring intellectual disability and psychopathology results in community residential placement failure, reduced occupational opportunity, and major restrictions in participation in recreational and educational programs (Einfeld et al., 2006; Tonge & Einfeld, 2000)-101). The prevalence rate for dual diagnosis, or co-occurring intellectual disability and psychiatric disorders ranges between 20% and 35% (Nezu et al. 1992).

- **Individuals living with a learning disability:** Learning difficulties and disabilities affect up to 10% of the population (Corbett et al., 2003). Young people with learning disabilities are at greater risk of emotional distress, suicide attempt and involvement in violence. Educational achievement is below that of peers (Corbett et al., 2003; Svetaz et al., 2000).
- **Culturally and linguistically diverse (CaLD) young people:** Young people from a CaLD background experience barriers to accessing support services, discrimination and racism, poverty, family stress, and social exclusion (Gorman et al., 2003, Gorst-Unsworth and Goldenberg, 1998, Dyregrov et al., 2002). Australia's population will diversify culturally in the next decade (Sercombe et al., 2002), heightening the need to address many of the challenges faced by CaLD young people.

Reducing disengagement and promoting engagement is important for young people now and in the future. When young people are provided with opportunities to participate, and as a result feel engaged in activities or with other adults or young people, they experience a better quality of life and contribute to creating and building better communities. In both the short and long term, young people who are valued and feel connected to those around them have better health and mental health across the lifespan (Burns et al., 2008).

The 'Digital Divide' in Australia

In Australia, household computer and Internet access has steadily increased since 1996 (Australian Bureau of Statistics, 2007). Key statistics indicate that in 2006-2007:

- 64% of Australian households had Internet access, while 73% owned a computer;
- the number of households with broadband access had more than doubled from 2004–05;
- 68% of all households access the Internet through a broadband connection;
- 92% of 15 to 17 year olds and 90% of 18 to 24 year olds use the Internet.

Lloyd & Bill 2004 were the first to use the term 'digital divide' in Australia, and defined it as 'the degree of exclusion from the information society'. In the report published by the Australian Bureau of Statistics (ABS) they argued the need to address this exclusion:

"Use of the Internet is rapidly becoming an increasingly common and critical part of commerce, education and social participation. Groups that do not have the opportunity to participate in the services provided by new telecommunications technology will be increasingly disadvantaged socially and economically." (Lloyd & Bill, 2004)

Notley and Foth identify a series of glaring disparities in Internet access across Australia (Notley and Foth, 2008). They report that income is the single largest determinant of Internet access and Internet broadband access. Those with higher incomes were much more likely to have any Internet connection. Other factors impacting on Internet access included: Aboriginal and Torres Strait Islander status, geography, educational attainment, disability and sole parent status. Indigenous Australians are 69% less likely than their non-Indigenous counterparts to have any Internet connection and are about half as likely to have access through a broadband connection, while 66% of dwellings in major cities have access to the Internet, compared to 42%% in remote areas. Educational attainment is another important influence on Internet access and connectivity. When controlling for other factors, individuals with postgraduate qualifications were 3.9 times more likely to have broadband compared with those who did not have similar levels of educational attainment. Only 28% of those with a disability requiring assistance with core activities had broadband access, in comparison with 48% for people not needing assistance. Finally, single parent households with dependent children under 15 years had 77% Internet and 52% broadband access compared with 92% and 68% respectively for comparable dual parent households (Australian Bureau of Statistics, 2007).

Similar trends are reflected in terms of mobile phone use. Socio-economic background appears to be a key indicator of mobile phone access with a quarter of people living in households with income of less than $50 000 having never used a mobile phone. Similarly, on any typical day, high income earners are more than 60% more likely to use a mobile phone than lower income earners (DCITA, 2005)

Given the increasing role ICT plays in determining mental health and wellbeing, there is concern that disparities in Internet access and related technologies may reproduce and generate further health, social and economic disadvantage (BECTA Evidence Team, 2001, Bernhardt, 2000, Wyn et al., 2005). While there is debate about whether this digital divide is narrowing or widening many researchers highlight its complexity, citing that there are now multiple divides encompassing access, ownership, type and quality of technologies (Becta Evidence Team, 2001; Blanchard et al., 2007; Blanchard et al., 2008a; Wyn et al., 2005). For instance online content that fails to comply with web accessibility standards, and websites that require high speed Internet connections or updated software and hardware also inhibit the extent to which such technologies can be meaningfully accessed and utilised. These issues are particularly prohibitive for people living with disabilities and individuals using older computers and operating systems, and dial up Internet connections. Furthermore there is concern about the technical skills and literacy levels required to effectively understand, find and use online resources (Benigeri & Pluye, 2003).

The Potential Role of Technology in Mental Health Promotion

Those concerned about the negative impact of technology on young people's mental health, have argued that it diminishes social involvement because it reduces the time young people spend with their family and friends. While early research supported this, more recent discourse suggests that the Internet specifically increases community participation, by cultivating new social networks and strengthening existing social connections both on and offline (Boase et al., 2006; Kraut et al., 1998; Kraut et al., 2002; Maibach et al., 2007; Mesch, 2001; Nie, 2001; Wastlund et al., 2001). Health and social researchers are beginning to conceptualise the Internet as more than 'an information repository' but also as a virtual 'community' (Bernhardt, 2000, Peattie, 2007, Hegland and Nelson, 2002). Wyn and colleagues (2005) suggests that the Internet is continuously increasing the possibilities of who we connect with, and how we 'belong' both online and offline (Wyn et al., 2005). There is also a growing body of evidence that suggests these possibilities may also extend to political engagement that translates into offline, individual and collective actions which enhance social capital (Lombardo et al., 2002).

Two important international studies, UK Children Go Online (Livingstone, 2006), and the Pew Internet and American Life Project (Boase et al., 2006; Lenhart et al., 2005; Lenhart & Madden, 2007a; Lenhart & Madden, 2007b; Madden, 2005), consider young people's use of the Internet and related technologies. The Pew study posits that the Internet can be viewed as a form of social capital with young people reporting many direct links between their activities online, including the information they access, and their daily lives (Boase et al., 2006; Valentine & Holloway, 2002). Both studies point to the complexity of the Internet and frame it as more than simply an information portal but rather as a community in which relationships, both positive and negative are formed.

At present there is no universally accepted framework for effective ICT based health promotion that integrates the fundamentals of health promotion theory with principles for leveraging the unique capabilities offered by technology. Peattie (2007) suggests adapting insights from the '3 C's' of commercial web initiatives (content, commerce and connectivity while expanding these principles to include a fourth 'C factor': 'Community' which refers to the use of message boards, clubs, and chat rooms in order to encourage information exchange and support between the target groups (Peattie, 2007). The STAR (Spiral Technology Action Research) model (Skinner et al., 2006) offers arguably the most comprehensive approach to developing and evaluating online health promotion strategies to date. The model explicitly aims to bring together key health promotion models and ICT development theory. It is underpinned by an action research methodology and acknowledges that community participation is central to the development process, particularly in terms of prototyping and usability testing of the technology and community mobilisation. The model is described as a 'rapid-cyclical change approach' comprising 5 core cycles Listen; Plan; Do; Study; Act.

Results from Bridging the Digital Divide

Bridging the Digital Divide was a demonstration project (as explained previously) and the following results are gleaned from the first report (Blanchard et al., 2007) and provide insights into young people's access to and use of ICT. The second report (Blanchard et al, 2008b) considers young people's attitudes towards political and social action, while subsequent publications will explore the role that ICT can play in promoting mental health through fostering social participation and civic engagement.

While the study presents some interesting results it is important to note that the capacity to recruit a representative participant pool and conduct in-depth analysis was limited by the constraints of funding and time, as well as the complexity of engaging young people at risk of or experiencing marginalisation in research. Ideally the study could be extended to more in depth analysis of specific groups, include non-metropolitan participants and be replicated in other states and territories to examine regional differences.

Project Participants

Sixteen focus groups were conducted with 96 young people in rural, regional and metropolitan Victoria. These were conducted at youth and related services who engage young people in the target group, including local government youth services, Indigenous and culturally specific services. In-depth interviews were conducted with 22 service providers to explore their perceptions of young people's ICT use and their capacity to utilise ICT in their practice.

Focus group participants ranged from 13 to 25 in age, with a majority (58%) between 16 and 19. 56% were male, 62% identified as CaLD and 25% as Indigenous. A large proportion (43%) spoke a language other than English at home. Participants' employment status, educational background and living circumstances were varied. A majority (54%) lived with parents or close family, while 12% lived in temporary or supported accommodation. A significant number (15%) identified as having a disability or learning difficulty and 29% as same-sex attracted. The service providers who participated represented a range of professions including youth work (45.5%), social work (22.7%), psychology (9.1%), community development and family therapy (4.5%), nursing and health promotion (4.5%).

Young People and the Use of ICT

Surprisingly almost one hundred percent (96.9%) of focus group participants had Internet access. While over forty percent of all participants (43.7%) gained access to the Internet at home, 30.2% used Internet services at the library and 17.7% used the Internet at school. Although the figures were still substantially lower than national and state access figures fro Internet use, given that the participants in this study were young people at risk of or experiencing marginalisation, these figures are higher than expected. The results clearly indicate that young people are using community settings to access technology. Almost fifty percent (49%) of those young people who had Internet access reported broadband access, compared to the Victorian average of 40%. Frequency of Internet use was high with over a third (38%) accessing it daily and 30% a few times a week.

When participants were asked about their online activates they reported a broad range including email, instant messaging and maintaining a social networking profile. Maintaining a profile on a social networking site was an important activity for participants, although there were culturally based differences between which social networking sites young people used. MySpace (www.myspace.com) is one of the most frequented sites by young people in Australia, yet amongst some participants, it was less popular than Bebo (www.bebo.com) and Hi5 (www.hi5.com). There was a high prevalence of Bebo users amongst Indigenous participants, whilst those from newly arrived and migrant backgrounds preferred the network Hi5. Young people viewed these websites as a mechanism for expression and creativity, projecting their identity to the outside world. For example, one young woman who was 'couch surfing' talked about MySpace as a space in which she could create her own identity, while for young people who were newly arrived refugees they talked about the importance of using Hi5 to maintain their existing contacts with family and friends at home.

When asked if ICT impacted directly on their identity format, a majority of participants did not feel that it made a difference however its role in mediating important social relationships was apparent. Young people who participated in the focus groups used social networking websites, instant messaging and email to meet new people, make friends and maintain relationships. Online interaction tended to supplement face-to-face interaction. Some participants expressed concern that only interacting online could have an adverse effect on "offline" social interactions. Overall, they displayed a sophisticated understanding of online safety. Many had their own strategies for reducing risks such as not meeting online acquaintances in person, without being accompanied by a friend.

Both, the Internet and mobile phones were considered important tools for young people when communicating with significant adults, including youth service providers, parents and teachers. They frequently used their mobile phones to contact service providers, saving money by texting their workers' mobiles and asking them to make contact. The cost associated with access to technology influenced what type of technology could be used and how often young people could contact friends and family. Many preferred SMS or email due to its cost effectiveness. For some of the participants who experienced social isolation, the Internet allowed them to seek help in a less threatening environment.

Service Providers' Perspectives on Young People's ICT Use

While some service providers believed that utilising ICT including the Internet and mobile phones was an important part of most young people's lives, others commented that they believed their clients were less likely to access and utilise ICT because of the cost, low literacy and technical skills. They reported that for the few that did have home access, it was often quite old and of poor quality. There was concern that peer pressure to use technology could lead to anxiety amongst those who didn't have access. Not having mobile phone or Internet access hindered some young people's employment prospects as potential employers found it difficult to contact them quickly. Service providers felt their clients, needed to develop computer and Internet skills to reduce isolation but suggested this would be an enormous challenge.

Some service providers expressed concern over their perception that young people relied too much on technology. Others feared for the safety of those who used the Internet to meet people, particularly prospective partners.

"I get nervous about technology in many senses. The kids are often looking for partners in the same-sex attracted field and they are actually getting into dangerous habits, which could happen without the Internet I know that, but they are a very vulnerable bunch of kids and they get themselves into quite dangerous situations."

It was felt that the role of social networking sites, to encourage users to expand and further develop their social networks to include individuals they may not have met face to face, placed young people at risk, raising duty of care concerns.

Most professionals used email and SMS to communicate with young people, finding it more efficient than traditional strategies such as outreach. It was also considered a non-invasive way of making contact. For example, young people attending same-sex-attracted support groups may be reluctant to disclose their attendance to others, but SMS allows them to communicate with service providers without fear of their conversations being overheard. SMS is also advantageous in communicating with young people for whom English is a second language and find using a telephone or face-to-face contact challenging.

For many service providers, the skills needed to utilise ICT in their practice with young people with maximum impact represented a significant challenge and most believed they needed further training in this area. Having adequate policies and procedures regarding young people's Internet use was considered crucial. The perception that the Internet is a dangerous place or that other activities are more productive for young people was also identified as a concern. One service provider who worked with young people in residential care units explained:

"A barrier is us wanting to restrict young people's access to the Internet. The only time I have spoken to young people … about the Internet is about meeting people. I think the perception of the people running our units is that it's not a positive thing for these young people to be using the Internet."

THE POLICY CONTEXT: UNINTENDED CONSEQUENCES FOR YOUNG PEOPLE AND THEIR MENTAL HEALTH AND WELLBEING

In the past decade, the safety of young people in the online environment has become an issue of heightened public concern. Online behaviours such as disclosure of personal information, aggressive behaviour, talking with unknown people, sexual behaviour, and downloading media using file sharing programs are commonly the focus of online safety literature and interventions targeting young people (Ybarra et al., 2007). Concerns have also been raised by health professionals about the role of the Internet in contributing to specific risk behaviours by vulnerable groups, such as the emergence of 'pro-anorexia' websites (Norris et al., 2006), and content or online networks that provide instructional information about suicide or facilitate 'suicide pacts' (Becker et al., 2004). Consequently, many health professionals advocate for the development and implementation of regulatory guidelines similar to those adopted by other forms of media around documenting and reporting on issues such as suicide to reduce the risk of contagion (Becker et al., 2004).

Notwithstanding these and other potential dangers that lie within the online landscape, there is little online safety commentary or policy in Australia that acknowledges the complexity of such risks, nor the well documented social and health benefits that the Internet and related communication technologies offer. Instead, a relatively narrow paradigm has been adopted by policy makers and commentators that focuses predominantly on reducing risk exposure through heavy regulation and monitoring of young people's Internet use, and advocating schools and parents to act as gatekeepers. Safety, and the wellbeing of young people, is paramount but this narrow focus fails to acknowledge the complexity of young people's lives, the potential benefits of the Internet and the value it might have in promoting engagement and building community connectedness amongst young people at risk of disengagement.

In July 2007 a research report, A Snapshot of the Online Behaviour and Attitudes of Children was prepared by the Wallis Consulting Group and its results were subsequently used in the Australian Governments NetAlert campaign (http://www.netalert.gov.au/) to warn of the risks to children and teenagers online. The research claimed that over half of 11–15 year olds who chat on line are contacted by strangers and that almost half of 11–14 year old children had viewed websites their parents would find alarming. Similar statistics were quoted in the NetAlert information booklet that was sent to every household in Australia.

An Australian journalist Peter Mares, Australian Broadcasting Corporation (ABC) accessed the results via a freedom of information request. On 16 September 2007 on Australia's National radio station, the ABC, he challenged the Communications Minister Senator Helen Coonan about the results and questioned whether the government investment of 22 million dollars was justified (http://www.abc.net.au/rn/nationalinterest/stories/2007/2033123.htm).

While the Australian government chose a campaign based around fear, parental insecurity and ignorance about young people's activities online an alternative interpretation of the study raises some interesting questions from both researchers and policy makers:

1. **What is the difference between unsupervised chat rooms and more popular forms of online communication like instant messaging and social networking?** Chat rooms are unsupervised open access forums and cover a broad range of topics ranging from sexual health, mental health and more general social interests. This differs to chatting online, which is more likely to involve instant messaging or communication on sites like MySpace, Bebo and Facebook.
2. **Who are young people chatting to online?** When young people were asked who they chat to or message with online, respondents said their communication was mostly with friends (96%), friends of friends (31%) or people met online who their parents had said "it is alright to talk to" (20%). Only 14% of survey respondents chat or message with "just a mixture of people including strangers." A stranger may include a health professional, or an online counsellor but the results failed to explore this.
3. **What 'sort of things' are young people doing online?** When young people were asked what sort of things they do on the Internet, they cited looking "for information for homework or study" ahead of all other activities, including playing games, chatting and messaging.

4. **Do young people have strategies to stay safe online**? The survey revealed that well before the NetAlert campaign almost three quarters of parents had already talked to their children about "keeping safe online".

Following the NetAlert campaign parents, local and state governments and schools have expressed public concern regarding young people's online behaviour and a number of safety interventions (i.e. filters, limited access) have been implemented at a local level to ease concern, with the hope of 'protecting' young people. However, these interventions can be circumvented with relative ease (Olsen 2006), as demonstrated by the high profile case of a young person who cracked NetAlert's AU$84 million filter within 30 minutes (Best, 2007). Furthermore, policies that only focus on restricted access fall short of addressing the complexity of online safety issues facing young people, whose level of risk varies considerably from person to person, and is ultimately the product of a complex set of interrelated factors (including Internet literacy and skills, age, Internet access, and overall coping skills) (Livingstone & Bober, 2005). There is also emerging evidence that online safety promotion messages that contradict or fail to recognise widely accepted online behaviours may lack credibility with young people, whereas strategies which provide young people with skills and knowledge to identify and reduce risks are considered more effective (Ybarra et al., 2007). Comprehensive research which provides an accurate picture of young people's online behaviours and experiences of risks such as meeting strangers, cyber bullying and online victimisation is required in order to further the efficacy of online safety initiatives.

Initiatives that restrict access may also inadvertently reduce young people's opportunities to build supportive relationships, participate in group activities or take action in their virtual communities. The introduction of filters has been problematic in community and government organisations as it has reduced the number of sites, including those with information about sexual and mental health that young people can access in public places. For young people whose only point of access to the Internet is via community services this further adds to the disparities and marginalisation they experience.

In addition to policy issues relating to online safety, the digital divide has received significant policy attention. Notley and Foth, 2008 have written a comprehensive historical perspective of Australian digital divide policy from 1995-2007. A summary is presented in Table 1 (Notley & Foth, 2008). Each policy predominantly focuses on supply and service access, particularly supply in rural and remote communities in Australia. As a result the government have been criticised for taking a narrow focus on supply rather than equitable access. As Notley and Foth, 2008 point out however, the policies when initially developed fell under the rubric of a much larger information society and were designed to build on economic growth. Having almost achieved saturation relating to Internet access in Australia the needs of marginalised young people and the capabilities and skills of the youth serving sector need to be better understood to ensure policy makers capitalise on the potential opportunities the Internet affords to impact on the social fabric of the Australian community.

CONCLUSION AND FUTURE DIRECTIONS

While acknowledging that results from the *Bridging the Digital Divide* project do not present a representative picture of all young people experiencing, or at risk of, marginalisation, the findings do provide some important insights into ICT use by young people. Specifically the results point to potential opportunities that could be incorporated into the development of future policy's for any

Table 1. Australian digital divide policy 1995-2007 (Notley & Foth, 2008)

Policy Name	Year Released	Key Issue Addressed	Funding Allocated
Networking the Nation (NTN)	1996 (1997–2004)	enhance telecommunications infrastructure & services; increase access to, & promote use of, services available through telecommunications networks; and reduce disparities in access to such services and facilities	$351 million from the sale of the national telecommunications carrier, Telstra 762 projects in regional, rural and remote Australia
Telecommunications action plan	2002 (over three years)	infrastructure needs of remote Indigenous communities	$8.3 million
Co-ordinated communications infrastructure fund	2004	to encourage health, education and other sectors of public interest to maximise opportunities for improved broadband access and services in rural, regional and remote Australia. 'to future-proof telecommunications services in rural, regional and remote Australia' and Connect Australia rollout broadband to people living in regional, rural and remote areas, extend mobile phone coverage, build new regional communications networks and set up telecommunications services for remote Indigenous communities	$23.7 million $2 billion from the sale of Telstra $1.1 billion over three years
Backing Indigenous ability	2006	sought to redress low levels of telecommunications access and access quality in Indigenous communities	$36.6 million
A broadband future for Australia	March 2007	to build an optical fibre network reach 98 out of 100 households in Australia offer speeds over 40 times greater than the current average	pledged an additional $2.7 billion*

*this policy was pledged by the Labour Government

government serious about 'bridging the digital divide' but more importantly supporting an equitable and socially inclusive society.

Results suggest that young people are quite resourceful in securing access to the Internet and that ICT plays a much greater role in marginalised young people's lives than commonly thought. Technology is an important part of young people's communication with significant others and for many, mobile phones, email and social networking websites mediate their contact with the world. Taken collectively this has the potential to impact on young people's identity formation, relationships and sense of belonging and connectedness potentially impacting on their mental health and wellbeing. Government policy that promotes equitable access and provides youth friendly access points to the Internet free of charge via community centres, youth centres, schools and libraries will ensure that all young people can access technology when and if they choose to. This is particularly relevant for young people; who are homeless, from families with limited economic resources, who are truant or have left school, or for young people in families where violence is problematic and young people are not offered safe and secure home environments. Additionally, draconian policy that limits access via filters further marginalises young people already at increased risk.

Findings suggest that young people experiencing social isolation or mental health difficulties also engaged with others online, with some using the Internet as an outlet for self expression. Young people used the Internet to engage in new relationships with many reporting that it helped them build confidence and self-esteem. Young people's use of ICT to facilitate their social relationships, maintain contact with significant adults and locate information and support suggests that

ICT may be a useful tool and setting for those already marginalised by stigmatising community attitudes and beliefs. A major challenge for policy makers is to ensure that online services provided for young people experiencing mental health difficulties, or young people who are gender diverse or same-sex attracted are safe and free from adults who prey on the vulnerabilities of young people. Many young people chat online and guidelines must be implemented for social networking sites and chat room services that ensure young people are safe from postings that could be potentially harmful (for example, discussions relating to suicide and self harming or depression that becomes rumination).

The study found cultural differences in the social networking sites used by young people. Many youth serving organisations and governments currently use social networking websites and tools (such as podcasts and blogs) to promote their services to young people. This finding suggests that policy makers and service providers should tailor information to suit the needs and requirements of all young people and that a ‘one size fits all’ education campaign will miss important segments of the population – usually those most at need. For example, in designing a program for Indigenous young people or young people who are newly arrived refugees Bebo and Hi5, respectively, would be more useful than other social networking sites such as MySpace or Facebook.

While young people report feeling confident in their ICT skills this is at odds to the findings from service providers who express a need for education and training that provides them with the skills to engage young people from marginalised communities in the use of ICT. At the same time service providers are concerned about the perceived risks associated with ICT, specifically chat rooms and the economic vulnerability young people might experience due to the costs associated with mobile phones and broadband access. Closing this gap between service providers’ understanding of young people’s ICT use and the reality of young people’s experience will remain a challenge. Considerable investment needs to be made by government and youth serving organisations to provide opportunities for service providers to participate in professional development courses that provide ICT related skills. Service providers must feel confident in their own ICT use, in order for them to engage young people around their technology use. Service providers are often time poor, proving a challenge for the implementation of professional development in this area. Due to young people’s confidence with this medium, it could be argued that a youth led strategy could be one such way of providing this crucial support for the sector.

A focus on the digital divide, regulation and monitoring, without a clear understanding or recognition of the importance of the Internet as a setting for young people fails to acknowledge, or explore the potential role of the Internet in promoting social inclusion. Building safe and supportive online environments, free from discrimination and violence is paramount if we look to the Internet as a setting that values diversity and creates a space that is free from stigmatising attitudes. This is particularly relevant for young people at risk of marginalisation due to mental and chronic illness, disability, gender diversity, cultural, religious or socio-economic background. As Warschauer (2003) cited in Notley and Foth (2008) argue,

the concept of digital inclusion can be used to extend the notion of the digital divide away from a singular focus on technology access and towards a focus on the way technology access and use can impact on different forms of deprivation and disadvantage.

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KEY TERMS AND DEFINITIONS

Blogs (e.g. LiveJournal.com): Blogs are websites that are much like diaries or journals in which the blog owner regularly posts entries. The word "blog" can also be used as a verb, meaning ''to maintain or add content to." Some blogs provide commentary or news on a particular subject others function as personal online diaries. They often combine text, images, and links to other blogs, web pages, or online media. Many also have the ability for readers to leave comments. While most blogs are primarily text based, there are emerging trends toward photo-blogging, video-blogging (vlogs), and audio (podcasting). Micro-blogging is also gaining popularity. This involves blogs with very short posts (often entered from mobile phones)

Digital Storytelling: Digital storytelling is a relatively new practice in which individuals tell their own stories (often about life experiences) using 'moving' images and sound. Digital stories are usually short (2-5 minutes) and often consist of a narrated piece of personal writing, a soundtrack, photos, still images, and/or video footage. They are produced using simple software (that often comes standard with most computers) such as Windows Movie Maker or iMovie, and therefore enable individuals who may not have a technical background to produce creative works. These kinds of software are capable of animating still images and photos to add movement and depth

Information Communication Technology (ICT): ICT is an umbrella term used to describe information technology (IT) (such as computer hardware and software) and telecommunications (including the Internet and mobile and landline phones). While the exact definition is subject to debate, some practitioners in the arts sector also use this term to describe creative technologies such as digital photography, music and film making equipment

Instant messaging (IM e.g. MSN Messenger): Instant messaging (IM) is a form of real-time communication between two or more people based on typed text (although some applications support communicating through web cams and/or voice over Internet). Earlier forms of IM often involved users logging on to web based chat rooms and the use of IRC (Internet Relay Chat) software. Although some young people still use these, the use of IM software such as MSN Messenger appears to be most popular. MSN Messenger requires users to register an account (in which they give themselves an alias or 'handle') as well as the installation of free software. Most IM applications allow the user to set an online status or away message so peers are notified when the user is available, busy, or away from the computer. Instant messages are typically logged in a local message history, thus allowing conversations to be saved for later reference. Additionally, users can often adjust privacy settings and 'block' other users from being able to message them

Media sharing websites (e.g. YouTube.com and Flickr.com):YouTube is a video sharing website where users can upload: view and share video clips. Similarly, Flickr is a photo sharing website that allows users to share personal photographs. Both of these websites incorporate 'tagging' technology. Tags are essentially descriptive key words (or metadata) which users assign to media. This allows media to be categorised (and browsed) into what's called 'folksonomies'

Social bookmarking, collaborative tagging (folksonomies) and tag clouds: Social bookmarking involves categorising resources by informally assigned, user-defined keywords, known as tags'. Social bookmarking services enable users to collect and annotate (tag) their favourite web links in an online, open environment, so that they can be shared with others

Social networking sites (e.g. MySpace.com, Facebook.com, Bebo.com: As the name suggests, these focus on building online social networks for communities of people who share interests and activities. Often social networking websites contain directories of some categories (such as classmates), means to connect with friends (usually with self-description pages), and recommender systems (allowing users to search for others with similar interests). Generally, social networking websites such as MySpace, Facebook and Bebo, allow users to create a profile for themselves. Users can upload a photo and become "friends" with other users. In most cases, both users must confirm that they are friends before they are linked. Some social networking sites also have a "favourites" feature that does not need approval from the other user that displays a list of 'top friends' on the user's profile page. Social networks usually have privacy controls that allow the user to choose who can view their profile or contact them. Additionally, users can create or join groups around common interests or affiliations, upload videos, and hold discussions in forums

Virtual worlds (e.g. Second Life and Habbo Hotel): These are online simulated environments that allow users to interact via avatars. Avatars are 'web based representations' of a user that generally take the form of 2D or 3D graphical characters that users can customise. 'Virtual worlds' are often based on the 'real world' and generally combine the concept of chat rooms and 'massively multiplayer online games' (see below). Some virtual worlds require users to download and install software whereas others can be accessed from within an Internet Browser.

Web 2.0: The term 'web 2.0' is used to describe the second incarnation of the World Wide Web. Web 2.0 is also called 'social Web' since it is characterized by new applications that enable online activities and user-generated content that was not previously possible. Interestingly, Web 2.0 has been likened to the original purpose of the Internet - to share ideas and promote discussion within a scientific community. Web 2.0 has also increased online social interaction through the emergence of wikis, blogs and podcasts. It has been described as a more human approach to interactivity online as it better supports group interaction and is particularly effective in mobilising online communities

Chapter 7
The Digital Divide in the U.S. in the 21st Century

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ABSTRACT

The United States has the world's largest national population of Internet users, roughly 170 million people, or 70% of the adult population. However, the deep class and racial inequalities within the U.S. are mirrored in access to cyberspace. This chapter examines the nature of the U.S. digital divide, differentiating between Internet access and usage, using data from 1995 to 2005. Although Internet usage has grown among all sociodemographic groups, substantial differences by income and ethnicity persist. The chapter also examines discrepancies in access to broadband technologies.

INTRODUCTION

By now, digital reality and everyday life for hundreds of millions of people have become so thoroughly fused that it is difficult to disentangle them. The Internet is used for so many purposes that life without it is simply inconceivable for vast numbers of people. From email to on-line shopping and banking to airline and hotel reservations to playing multiplayer video games to chat rooms to Voice over Internet Protocol telephony to distance education to down-loadable music and television shows to blogs to YouTube to simply "Googling" information, the Internet has emerged as much more than a luxury to become a necessity for vast swaths of the population in the economically developed world. In this context, simple dichotomies such as "off-line" and "on-line" fail to do justice to the diverse ways in which the "real" and virtual worlds for hundreds of millions are interpenetrated.

Yet for many others – typically the poor, the elderly, the undereducated, ethnic minorities – the Internet remains a distant, ambiguous world. Denied regular access to cyberspace by the technical skills necessary to log on, the funds required to purchase a computer, or public policies that assume their needs will be addressed by the market, information have-nots living in the economically advanced world are

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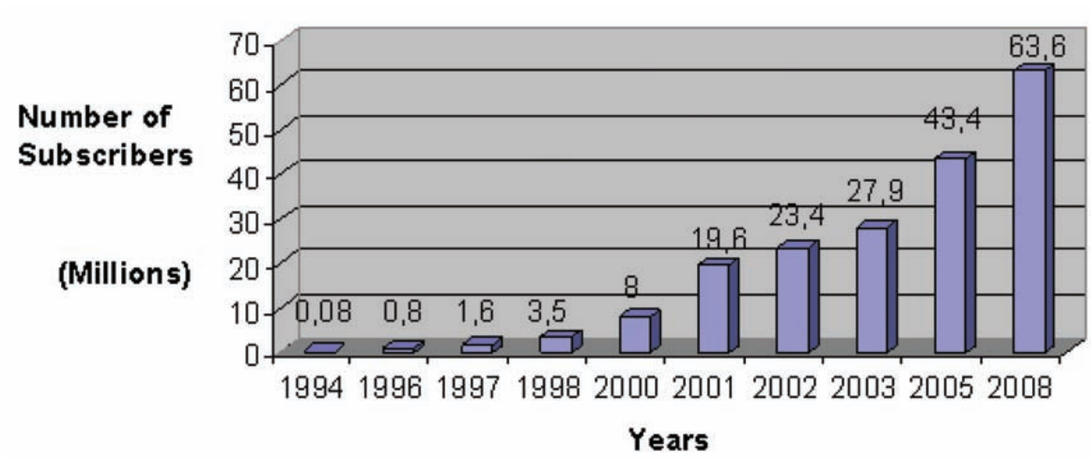
deprived of many of the benefits that cyberspace could offer them. While those with regular and reliable access to the Internet often drown in a surplus of information – much of it superfluous – those with limited access have difficulty comprehending the savings in time and money it allows, and the convenience and entertainment value it offers. As the uses and applications of the Internet have multiplied rapidly, the opportunity costs sustained by those without access rise accordingly. At precisely the historical moment that contemporary capitalism has come to rely upon digital technologies to an unprecedented extent (Schiller 1999; Zook 2005; Malecki and Moriset 2008), large pools of the economically disenfranchised are shut off from cyberspace. In a society increasingly shaped by digital technologies, lack of access to cyberspace becomes ever-more detrimental to social mobility, rendering those excluded from the Internet more vulnerable than ever before (Graham 2002).

In 2008, roughly 1.5 billion people, or 22% of the planet, used the Internet on a regular basis (http://www.internetworldstats.com). The United States continues its long standing position as one of the world's societies with abundant access to the Internet (Figure 1). Although Internet penetration rates in the U.S. (70% in 2006) are not as high as Scandinavian nations, they remain higher than many other urbanized, industrialized countries, and Americans as a whole still constitute the largest and most influential national bloc of Internet users in the planet. Despite this prominence, there exist important discrepancies in Internet access within the U.S. in terms of age, income and class, ethnicity, and location. As a slough of books has demonstrated, the digital divide is real, rapidly changing, complex, difficult to measure, and even more difficult to overcome (Compaine 2001; Cooper and Compaine 2001; Norris 2001; Servon 2002; Kuttan and Peters 2003; Warschauer 2003; Van Dijk 2005; Stevens 2006). While some decry the divide as a catastrophe, others deny its very existence. Indeed, the digital divide is so multi-dimensional that it cannot be reduced to dichotomous measurements, but should be seen as a continuum measured across a variety of variables (Barzilai-Nahon 2006).

This chapter examines the changing social differentials in access to the Internet in the U.S. in the period between 1995 and 2006. "Access," of course, is a nebulous term that exhibits different meanings (e.g., access at home, school or work); perhaps the multiplicity of meanings is optimal for conveying the complexity of the digital divide, which does not lend itself easily to simple dichotomies (DiMaggio et al. 2001). Equally important as access is what users do with the Internet, for simple access does not automatically lead one to become an Internet user. Although the ability to gain access to the Internet at work, home, school, or public libraries is widespread, employing cyberspace to gain meaningful information is another story. For many users, the Internet will remain primarily a toy. Thus, assessments of Internet usage must take into account the perspectives of the various populations that deploy it (or not) for their own means.

First, the chapter summarizes the various economic and political forces that have altered patterns of Internet access in the U.S. Central to understanding the digital divide is the rapid growth in computer and Internet usage among many social groups: the divide, such as it is, is never frozen in time or space, but a fluid, malleable entity that constantly shifts in size, composition, meaning, and implications. Second, it charts the growth in the absolute and relative numbers of different groups of American Internet users in terms of their access at home and at work from 1995 to 2005, with occasional excursions into later dates as data allow. Third, it focuses on the critical issue of broadband delivery, which has generated new patterns of inequality. The conclusion explores the changing meanings of the American digital divide in an age in which access has become widespread, Internet usage is of unparalleled importance, market imperatives

Figure 1.



dominate, and the consequences of not getting on-line are ever more profound. Throughout, it argues that the divide is not simply "digital," but profoundly social, political, and spatial.

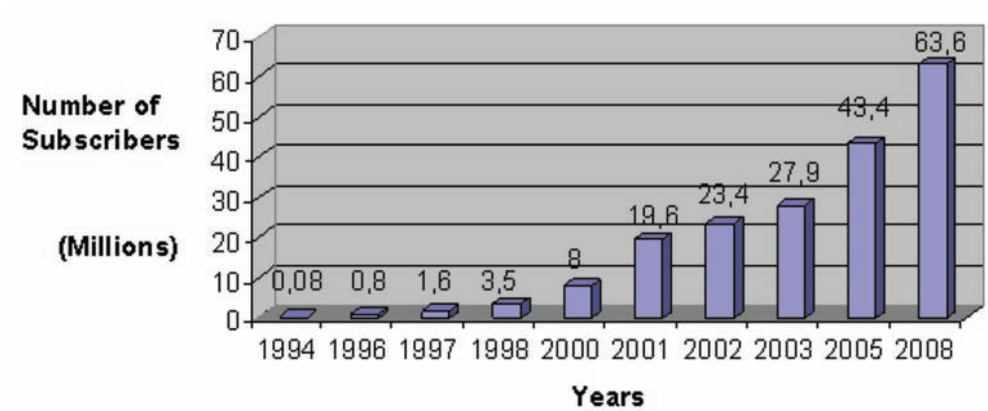
FORCES CHANGING AND PERPETUATING THE U.S. DIGITAL DIVIDE

Several factors have conspired to dramatically accelerate Internet access and usage in the U.S. among different social groups, including three major sets of forces: the declining costs of personal computers; public policies aimed at closing the digital divide; the deregulation and changing industrial structure of the telecommunications industry; and changing accessibility patterns in public schools and libraries.

Declining Personal Computer Costs

The continued decline in the price of personal computers (PCs) looms as a major factor in expanding access to the Internet. Following Moore's Law, which holds that the cost of computers falls in half roughly every 1½ years, PCs have become increasingly ubiquitous across the U.S. Indeed, relatively fast, low-end machines with Pentium microprocessors are readily available for less than $600 in numerous retail outlets. With 574 PCs per 1,000 people in 2005, the U.S. stands second only to San Marino in terms of ownership rate. Almost 80% of Americans use a PC once or more per week either at work or at home, the vast bulk of which are networked (Figure 2). Because the value of a network rises proportional to the square of the number of users (Zipf 1946), the Internet and the PC made each other increasingly powerful and attractive. Simultaneously, the rise in user-friendly graphics interfaces such as Netscape greatly facilitated Internet access for the parts of the population lacking in sophisticated computer skills. Moreover, as the number of applications of the Internet has grown, the hours of usage have steadily increased to more than nine per week. The rise in PC ownership has been a central claim of those who argue the digital divide will disappear on its own accord (e.g., Cawkell 2001; Van Dijk and Hacker 2003; Strover 2003).

Figure 2.



Changing Public Policies and Structure of Telecommunications Industry

Changes in public policy – including the deregulated environment unleashed by the 1996 Telecommunications Act – also shape the contours of the U.S. digital divide. Among other things, the Act was designed to encourage competition in high-cost rural areas and deliver the same access to cyberspace as found in cities. The Clinton Administration actively sought to reduce the digital divide by inserting the E-rate program (officially the Schools and Libraries Program of the Universal Service Fund) into the Act, which generated $2.25 billion to provide discounts to telecommunications services ranging from 20 to 90% for low-income schools (Cooper and Kimmelman 1999). E-rate was credited with raising the proportion of schools with Internet access from 14% in 1996 to 95% in 2005. However, the E-rate program did not provide funding for hardware, software, technological training, or access to broadband services, which are every bit as important as discounted telecommunications services. Additionally, the Clinton Administration created the "E-Corps," consisting of 750 AmeriCorps volunteers who facilitated Internet access in low-income communities through federally subsidized Community Technology Centers. Finally, under the Clinton Administration, the National Telecommunications and Information Administration (NTIA) (1995, 1998, 1999, 2000) released a series of reports calling attention to the digital divide and offering potential remedies.

Unlike the Clinton Administration, however, that of George W. Bush was reluctant to intervene in what it deemed market imperatives, a policy of "technology neutrality" designed to avoid "market distortions." In practice, this strategy has accentuated discrepancies in Internet access (Cooper 2002). Typically, the Bush Administration either argued that the divide has diminished to the point of irrelevance; upon taking office, FCC Chair Michael Powell declared "I think there's a Mercedes Benz divide; I'd like one, but I can't afford it" (quoted in Cooper 2004). In 2003, the Administration ended funding for two institutions central to previous efforts to minimize the divide, the Technology Opportunities Program in the Department of Commerce and the Community Technology Center initiative in the Department of Education. Instead of promoting universal access, the administration excused cable television and telephone companies from this public service obligation. These policies encouraged telecommunications providers to offer services on a "pay per" basis, allowing them to "cherry-pick" the most profitable customers and abandon those without significant purchasing power. Children will suffer the most from these policies; as the Kaiser Foundation (2004) notes,

A decade ago, the increasing importance of technology led policymakers, industry, and advocates to make reducing the digital divide a high priority policy issue in the public and private sectors. Since then, the role of the Internet – at work, at school, at home, and in the community – has continued to grow. Yet policy interest in children's access to the Internet appears to have cooled, due at least in part to a sense that most of the divide has been closed.

In the private sector, waves of corporate consolidation reshaped the landscape of telecommunications ownership and correspondingly, the abilities of different social groups to get on-line. The market structure of telecommunications services has undergone a sustained transformation, including steady oligopolization. Like many sectors of telecommunications, Internet service providers (ISPs) were heavily affected by a wave of mergers and acquisitions, particularly after the 1996 Telecommunications Act, which greatly facilitated the process of corporate consolidation. Most ISPs lease capacity on fiber optics lines from telecommunications companies, many of which are publicly regulated, in contrast to the unregulated state of the Internet itself. The privatization of the Internet, which began in 1993 with NSF's transfer of the system's management to a consortium of private firms led by MCI, increasingly brought it gradually into conformity with the dictates of the market. The resulting pattern of service provision became steadily restructured by corporate ISPs in partnership with backbone providers (e.g., AT&T, MCIWorldcom, and Sprint), generating a geography centered largely on large metropolitan areas, whose concentrations of affluent users generate economies of scale that lead to the highest rates of profit (Warf 2003).

Access Via Public Schools and Libraries

Schools remain perhaps the most important arena in which the digital divide is manifested and reproduced (Monroe 2004). Given the lack of a national school system and reliance upon local property taxes as the primary means of funding public education, the U.S. school system tends to reinforce and deepen social inequalities rather than reduce them (Kozol 2005). In an age in which the acquisition of skills to participate in advanced producer services is key to upward social mobility, this issue assumes special importance. Inequalities in school funding are mirrored in the prevalence of the Internet in public classrooms (Becker 2000): while 99% of schools offer children access to networked PCs in one way or another, these rates vary significantly in terms of quality of access: "students with Internet-connected computers in the classroom, as opposed to a central location like a lab or library, show greater improvement in basic skills" (Kaiser Foundation 2004). Not surprisingly, the digital divide in schools has strongly racialized overtones: white students are much more likely than are minorities to use the Internet in the classroom or school library (U.S. Department of Education 2006).

Simple access to PCs at school is a poor measure of the extent of the digital divide: low-income students are less likely to have them at home or to possess the requisite technical skills necessary to install, maintain, and navigate such machines. Students with access at home are more likely to be enrolled, to graduate from high school, to go to university, and to have better grades than those who do not (Fairlie 2005). While roughly 96% of all U.S. children aged eight to 18 have "ever" gone on-line (Kaiser Foundation 2004), regular, reliable, and rapid access to the Internet with social and technical support, in a comfortable, nondistracting environment, remains stratified by ethnicity and family income. Bolt and Crawford (2000, p. 19) aptly sum up the sobering implications of the academic digital divide in terms of labor market potential:

The lack of exposure to technology, at home and in the classroom, dooms millions of American youths to low-paid, insecure jobs at the margins of our economy. At the same time, wealthy children in private schools are reaping the rewards of immersion in the new technologies: their homes have DSL internet connections and their summer jobs involve designing websites or writing computer code.

After home and school, public libraries are the third-most common point of Internet access, especially for lower income minorities. Libraries have been at the forefront of efforts to reduce the digital divide, and about 99.1% of all U.S. libraries offer free Internet use. In many communities, libraries are the only free access to the Internet. However, libraries have limited space and operating hours, often lack high-speed connections, and frequently find their limited information technology budgets strained by growing numbers of people such as the unemployed seeking to use their resources for job seeking, students using them for school work, or others hoping to acquire computer skills (Walsh 2007). In 2007, the Bill and Melinda Gates Foundation announced a multi-year technology grant program for public libraries as part of its effort to combat the digital divide (Bill and Melinda Gates Foundation 2004). This step was the latest in a long series of similar moves; for example, between 1998 and 2004, the Foundation installed 47,200 Internet-ready PCs in 11,000 libraries across the U.S. and trained 62,000 library workers (Stevenson 2007).

THE CHANGING PROFILE OF THE U.S. DIGITAL DIVIDE

Throughout the 1995-2006 period, growth in Internet use among various socio-demographic groups was rapid, often spectacular (Table 1). Average Internet penetration rates – including access at home, work, or school – more than quadrupled, from 14 to 70% (Figure 3); by 2006, 176 million Americans were using the Internet regularly (Figure 4). Thus the innovation, the most rapidly diffused technology in world history, went from a tool or toy of a minority to an essential implement used by the vast majority. Every social group, as differentiated by age, gender, race/ethnicity, educational level, or household income, experienced marked gains. To the extent that the digital divide persists in the U.S. (and other economically advanced countries), it must be understood within the context of this sustained and rapid increase in the number of users and proportion of the population.

This growth, however, did not occur at identical rates among all social categories. Take, for instance, age, as measured in four broad categories. The young (i.e., under 30 years of age) steadily exhibited the highest Internet penetration rates, reaching 83% in 2006. For many children who grow up surrounded by digital technologies, the Internet is hardly mysterious. In contrast, in both benchmark years, the elderly experienced the lowest rates of Internet usage (a mere two percent in 1995 v. 33% in 2006), as well as the slowest rate of increase in users. Many elderly people find new technologies to be difficult or intimidating, do not appreciate the potential benefits, are easily frustrated by their lack of technical skills, and are comfortably ensconced in their pre-Internet lives. The digital divide, therefore, is closely wrapped up with generational differences, and the views and preferences of different groups of users are vital to understanding their willingness (or not) to participate in cyberspace.

Notably, gender differences in Internet usage, which included an eight percentage point lead among men in 1995, declined steadily throughout this period, so that by 2006 it declined to relatively minor two percentage points. Despite its popular reputation as an exclusive haven of masculinity, the Internet in fact has been harnessed by increas-

Table 1. Growth in adult U.S. Internet users, 1995-2006

	----% On-Line in----		Percentage Growth
	2006	**1995**	
AGE			
18–29	83	21	62
30–49	82	18	64
50–64	70	9	61
65+	33	2	31
Total	70	14	56
SEX			
Men	71	18	53
Women	69	10	59
RACE/ETHNICITY			
White	72	14	58
Black	58	11	47
Latino/Hispanic	69	21	48
EDUCATION			
<High school	36	2	34
High school graduate	59	8	51
Some college	84	20	64
College graduate	91	29	62
HOUSEHOLD INCOME			
<$30,000	45	8	37
$30,000-$49,000	75	15	60
$50,000-$75,000	90	23	67
>$75,000	93	32	61

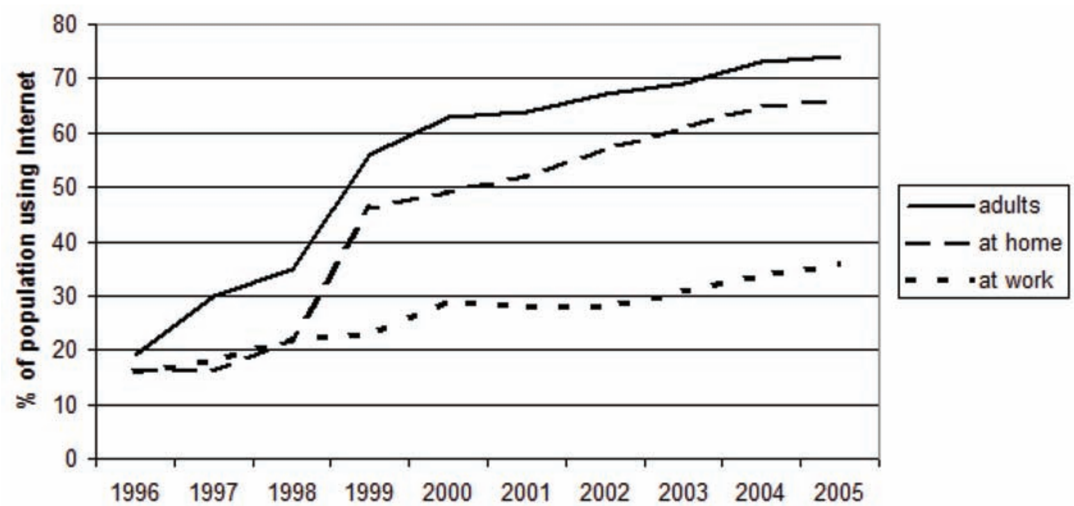
Source: http://www.census.gov/compendia/statab/tables/08s1128.xls

ing numbers of women. Gender differentials in access reflect both the lower socio-economic status of women relative to men as well as sexist cultural attitudes toward science and technology (Bimber 2000). The declining gender gap speaks to the increasing familiarity with digital technologies among many women, particularly the young and well educated, who are often employed in producer services in which computer skills are an essential prerequisite. Moreover, enrollment rates in American universities for women have consistently surpassed those for men (Mather and Adams 2007), indicating that the future gendered digital divide will become smaller yet, if not disappear altogether.

One dimension of the U.S. digital divide that has drawn the most serious scrutiny concerns racial or ethnic differences. Given the profound inequalities in U.S. society in terms of income, educational opportunities, and employment that exist between whites and ethnic minorities, it is not surprising that this gap is manifested in terms of access to cyberspace, i.e., much of the racial ravine in digital access is due to income discrepancies (Fairlie 2005). In 2006, Internet access rates for whites remained well above those for minorities or the national average. In 1995, for example, white Internet usage rates were more than double that of Latinos/Hispanics (37.7 v. 16.6%), and roughly double that of Blacks or African-Americans (19.0%). (2006 Census data on other ethnic groups such as Asian-Americans or Native-Americans were unavailable; however, studies using 2003 data (Fairlie 2005) indicate that Asian-American PC ownership and Internet use rates exceeded those for whites, while rates for Native-Americans resembled those of African-Americans). However, income alone does not explain the totality of the digital divide, as Internet use and adoption are intertwined with cultural preferences of different ethnic populations.

There are signs, however, that this dimension of the digital divide is slowly, if hesitantly, diminishing. Today, the majority of ethnic minorities uses the Internet, and the relative difference between them and the white population declined. There are important differences within minority populations, however. Among African-Americans, Internet usage tends to be concentrated among the

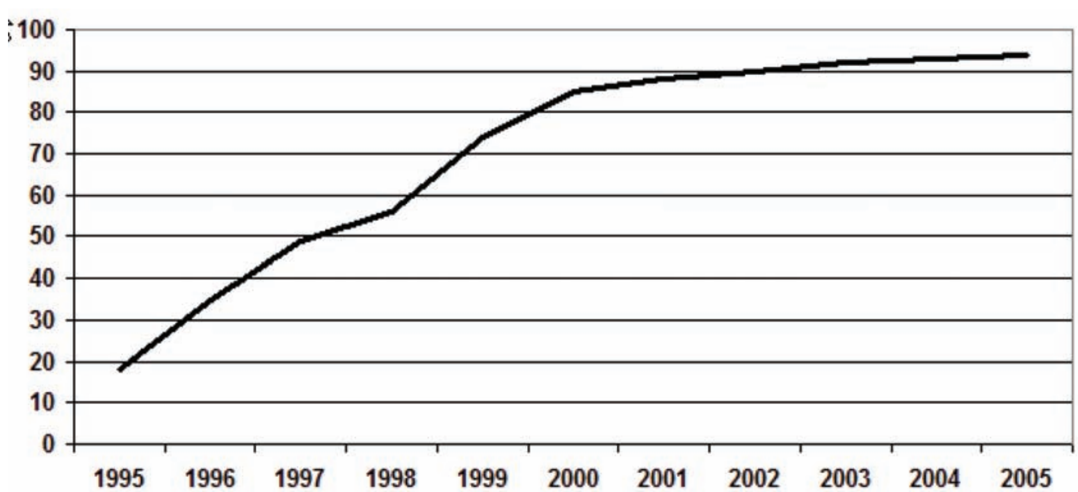
Figure 3.



young (Marriott 2006) and the college-educated, particularly women (*Journal of Blacks in Higher Education* 2001). Likewise, the Latino population is far from homogeneous, and significant discrepancies in Internet access and usage remain among various sub-groups; usage rates tend to be much higher among bilingual Latinos than those who speak only Spanish (http://www.pewinternet.org/pdfs/Latinos_Online_March_14_2007.pdf). Indeed, among English-dominant Latinos, Internet usage rates are identical to Whites. Generally, Mexican-Americans and those with origins in Central or South America had lower rates of access than did Cuban-Americans or Puerto Ricans (Fairlie 2005).

Among Native Americans, a sharp bifurcation exists between those living in urban areas, whose rates of access and usage mirror the country as a whole, and those living on reservations, the proportion of whom using the Internet falls well below the national mean; indeed, only 47% of residents of reservations have telephone access (Bissell

Figure 4.



2004, p. 137). Some Native Americans view the Internet as another tool of cultural assimilation, the latest in a long, sad history. While some universities (e.g., Northern Arizona University) offer free Internet services to reservations, in general such places are politically inconsequential and unable to confront telecommunications companies (e.g., over rights of way issues). The Bill and Melinda Gates Foundation's Native American Access to Technology Program has successfully worked with tribes in the Four Corners area of Utah, Colorado, Arizona, and New Mexico to increase access to digital information resources while preserving local heritages.

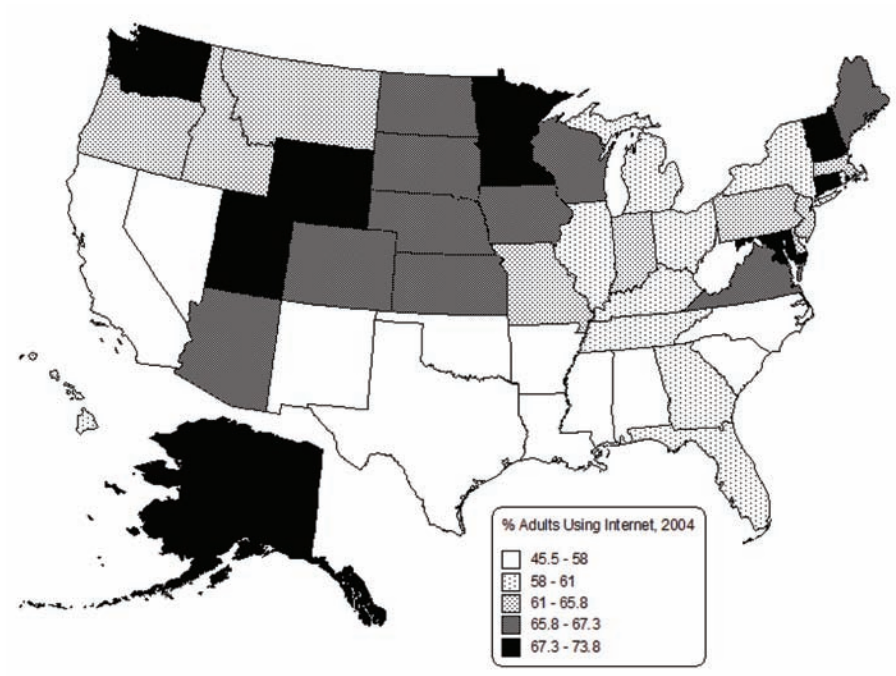
Persistently underlying the digital divide in the United States are vast socio-economic differences, particularly education and household income, which effectively serve as markers of class. Although populations at all of four broad educational levels (less than high school, high school graduate, some college, college graduate) exhibited gains in Internet access, profound differences remain (Lenhart et al. 2003). Among college-educated Americans, Internet usage is almost universal (91%); users with a high school education or less witnessed a growth in usership from a tiny two percent in 1995 to 35% in 2006. Educational level, therefore, is a prime predictor of who is on-line and who is not.

Similarly, income remains a useful measure of who has access and who does not, particularly at home. In 1995, roughly one-third of upper-income households (over $75,000 annually) used the Internet; by 2006, this share had risen to 93%. Rapid growth rates also occurred among those of more modest means, although less than a majority (45%) of poor households (earning less than $30,000 annually) were users in 2006. Thus, as with race/ethnicity and educational level, absolute discrepancies persist but relative differences declined as Internet usage rates advanced most rapidly among those with hitherto the least access.

It should be emphasized that American non-users of the Internet are a surprisingly diverse bunch. They consist disproportionately of poorly educated women, minorities, and those who live in rural areas. One-quarter of non-users have not completed high school, compared to five percent of Internet users. Non-users are much more likely than users to be retired or unemployed. Roughly 20% of this population lives with someone who does have Internet access; as Lenhart et al. (2003) note, "Internet use is so normalized in America that even most non-users say they are in close proximity to the Internet." Another 17% consist of "Internet drop-outs," who typically became frustrated by their hardware, software, or service provider. Yet others consist of the disabled, particularly those who suffered severe strokes, and the blind, who lack or cannot afford Braile interfaces. Finally, a small but stubborn core of avowed non-users remain excluded from cyberspace not by income or education, but simply out of personal choice, saying they simply did not need the Internet. While some cite the cost of computers and on-line service access, or say that it is simply too complicated, others cite fears of Internet pornography, credit card fraud, or identity theft. Roughly ¼ of this group struggles with literacy in their everyday lives, and this group is less likely than other non-users to know of public Internet access points.

Social differentials in U.S. adult Internet usage were reflected in significant geographic variations among states (Figure 5); the digital divide is an inherently and deeply spatial phenomenon (Warf 2001). Data for 2004 (the last year in which such data are available) indicate the highest rates of usage (65% or higher) in the upper Midwest (e.g., Minnesota) as well as states with important high-technology clusters (e.g., Colorado, Washington) and the suburban environs of Washington, DC. In contrast, Internet usage rates were much lower (58% or less) throughout most of the South as well as California, Nevada, and New Mexico, all regions with substantial populations of impoverished minorities and underfunded school systems. It is worth emphasizing, however, that such state-level patterns mask broad internal

Figure 5.



variations, particularly between large urban areas and lightly populated rural ones. Even when they are connected, rural residents are far more likely than urban ones to be frustrated by slow Internet connections.

THE DIGITAL DIVIDE IN THE BROADBAND ARENA

The latest frontier in the digital divide is unquestionably the arena of broadband delivery services. As Web-based material has become increasingly graphics-based, involving the transmission of large, data-intensive files (e.g., photographs), broadband access has become correspondingly more important. Broadband applications include digital television, business-to-business linkages, Internet gaming, telemedicine, videoconferencing, and Internet telephony. With large, graphics-intensive files at the heart of most Internet uses today (e.g., downloading forms, reading on-line newspapers, and films), broadband has become increasingly imperative for efficient Web browsing. Broadband is also reflective and a driving force behind the phenomenon of digital convergence, the blurring of boundaries that traditionally separated industries such as telephone, cable television, and computers, allowing the generation of significant economies of scope and scale (Baldwin, McVoy and Steinfield 1996).

Broadband technology has existed since the 1950s, but its deployment was not economically feasible until the deployment of large quantities of fiber optics cable in the 1990s allowed vast amounts of data to be transferred at high speeds, (up to 2.4 gigabytes per second). While trunk fiber lines stretch across the country and the world, many local loops into homes and businesses still use relatively slow twisted pair copper wires, giving rise to the famous “last mile” problem.

In passing the Telecommunications Act of 1996, Congress directed the Federal Communications Commission (FCC) to encourage the growth of advanced telecommunications technologies (but not any specific one), a directive that stimulated providers to offer fiber optic services directly into homes and businesses. Several technologies meet FCC standards for advanced services, which specify a very low minimum baud rate of 200 kbps, thus disqualifying ISDN connections, which operate at 144 kbps. Of the various options, digital subscriber lines (DSL) provided by cable television companies are the most popular; two-thirds of American households have cable television, and many couple Internet and television service into one integrated package. In addition, Asymmetric Digital Subscriber Lines (ADSL) include a suite of broadband technologies provided by local telephone companies that operate on twisted copper pairs and provide an "always on" Internet connection, unlike traditional modems. Broadband adoption has also been encouraged by steadily declining prices in this market. As a result, the number of broadband lines jumped from 6.8 million lines in December, 2000 to 82.5 million in December, 2006 (NTIA 2008).

In 2008, roughly 55% of the U.S. population used broadband technologies at home, the growth of which reduced dial-up services to marginal status (Figure 6). Non-users of broadband typically cite the expense or lack of availability in their local area as their reasons. Broadband accessibility tends to be most prevalent among the young, males, whites, the well educated, and rises monotonically with household income (Table 2), reflecting in many respects the same differentials that have accompanied dial-up Internet since its inception. The most rapid growth has occurred among middle class households and the young, while broadband usage among low income households actually declined by three percentage points between 2007 and 2008 (Horrigan 2008a). The elderly remain infrequent users of this mode of access, which was delivered only to 19% of those over age 65. Notably, however, some of the worst discrepancies have been mitigated: differences in broadband access between whites and Latinos, for example, have almost evaporated, although usage among African-Americans still lags behind. Nonetheless, income and educational level remain the prime determinants of who has access to broadband and who does not.

Figure 6.

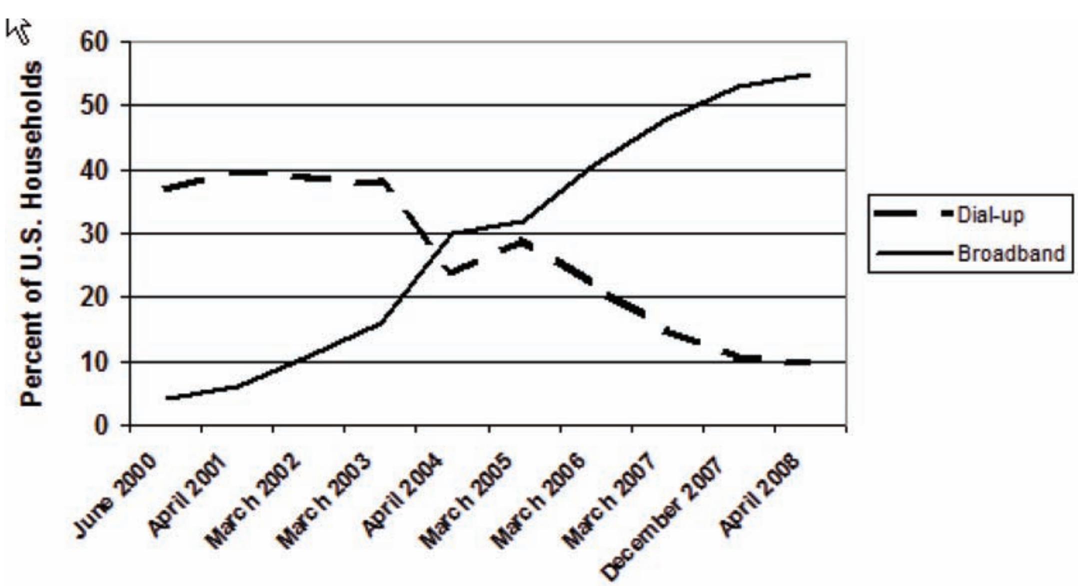


Table 2. Percent of adults with broadband accessibility at home, 2005-2008

	2005	2006	2007	2008
AGE				
18-29	38	55	63	70
30-49	36	50	59	69
50-64	27	38	40	50
65+	8	13	15	19
Total	44			
SEX				
Male	31	45	50	58
Female	27	38	44	53
RACE/ETHNICITY				
White	31	42	48	57
Black	14	31	40	43
Latino/Hispanic	28	41	47	56
EDUCATION				
<High school	10	17	21	28
High school graduate	20	31	34	40
Some college	35	47	58	66
College graduate	47	62	70	79
INCOME				
<$20,000	13	18	28	25
$20,000-$29,999	19	27	34	42
$30,000-$39,999	26	40	40	49
$40,000-$49,000	28	47	52	60
$50,000-$74,999	35	48	58	67
$75,000-$99,999	51	67	70	82
≥$100,000	62	68	82	85
LOCATION				
Urban	31	44	52	57
Suburban	33	46	49	60
Rural	18	25	35	38

Source: Horrigan 2008.

Such social differentials are accompanied by spatial ones. While 57% of urban residents use broadband, as do 60% of suburbanites, only 38% of rural denizens do so; however, growth rates were higher in rural than urban areas, indicating this discrepancy may decline in the future. Grubesic and Murray (2002) examined inequalities in access to broadband services in Ohio, noting the overconcentration in metropolitan regions and underserved rural areas. Broadband technologies have been slow to reach rural America: whereas 86% or residents in cities with more than 100,000 residents have access to DSL, very few in towns with less than 10,000 people do so (Greenman 2000). Thus, there are strong reasons to believe that far from eliminating the digital divide – a common refrain of the Bush Administration (Cooper 2004) – broadband reproduces it, gives it new form, and in some cases, accentuates it.

Despite its rapid growth, the proportion of broadband users in the U.S. is relatively low compared to most of the economically developed world; indeed, under the Bush Administration, the U.S. slipped internationally from fourth in 2001 to 15th in 2007 in terms of access to broadband services (Horrigan 2007), and Americans pay 10 to 20 times as much per megabit over broadband as do their counterparts in South Korea and Japan (Cooper 2004). As former FCC member Michael Copps (2006) argued, "America's record in expanding broadband communication is so poor that it should be viewed as an outrage by every consumer and businessperson in the country. Too few of us have broadband connections, and those who do pay too much for service that is too slow." Critics allege that the Federal Communications Commission (FCC) has exaggerated the extent of broadband usage in the U.S. (by including delivery speeds as low as 200 kbps, four times the speed of modem) and not taking the problems of inadequate access and low competition sufficiently seriously (e.g., Turner 2005); for example, the FCC holds a ZIP code as having broadband service if it contains only one subscriber, without consideration of price or speed.

However, the rapid growth in wireless and mobile broadband services injects complexity into this view (Wareham et al. 2004). In 2008, approximately 40 million Americans (15.6% of the adult population) subscribed to mobile Internet services and used it at least once per month (Nielson Mobile 2008), primarily through cell phones. Another 55 million subscribed to mobile Internet services but did not use it. Roughly 82% of iPhone owners utilized wireless broadband, about five times the rate of cell phone users as a whole. The gender of users was tilted toward men (56%). Surprisingly mobile Internet users had roughly the same household income distribution as the country as a whole. The young tended to be the heaviest users of this technology, and derived the greatest utility from it (Horrigan 2008b): roughly ½ of users are under 35, although as with the Internet in general the elderly (over 65) comprised a minuscule proportion (Table 3). In addition to wireless services at home, roughly one-third of U.S. Internet users employ wireless services outside of the home in roughly 66,000 Wi-Fi (wireless fidelity) "hot spots," such as airports, coffee shops, and restaurants (Horrigan 2008). Cities with the largest numbers of hot spots included New York, Seattle, Chicago, and San Francisco (Table 4). While the primary uses included access to information portholes such as Yahoo! or Google, as well as email, the average mobile Internet user accessed only 6.4 different webpages per month.

CONCLUDING THOUGHTS

Contrary to common utopian interpretations, cyberspace is shot through with relations of class, gender, ethnicity, and other social categories. When viewed in social terms, the interpenetration of the virtual and real worlds is mutually constitutive: discrepancies in access to the Internet simultaneously mirror and augment inequalities in the world outside of cyberspace.

The digital divide in the U.S. must be viewed in terms of the rapid absolute and relative growth in the number of users that occurred in the late 1990s and early part of the 2000-2010 decade. Today, 176 million people, almost ¾ of the adult U.S. population, have access to the Internet either at home or at work. Among those with occupations demanding a university education, Internet usage is almost universal. As the size of the U.S. Internet population has grown, it has steadily come to resemble demographically the country as a whole. Many of the most egregious dimensions of the digital divide have been mitigated. Gender differences, for example, which once loomed large, have largely evaporated as girls became as proficient at using the Web as boys. While whites continue to enjoy higher rates of

Table 3. Age distribution of U.S. mobile Internet users, 2008

Age Bracket	% of Mobile Users
13-17	12.7
18-24	11.8
25-34	27.4
35-54	37.0
55-64	9.1
65+	1.7

Source: Nielsen Mobile 2008.

Table 4. Ten U.S. cities with largest number of wireless hot spots, 2008

New York	1,069
Seattle	870
Chicago	841
San Francisco	840
Houston	600
Los Angeles	490
Atlanta	485
San Diego	446
Austin	423
San Antonio	417

Source: http://www.jiwire.com/search-hotspot-locations.htm access than do minorities, this gap has declined as well; the racial ravine has given way to a more modest ethnic gulch. Education level remains a prime marker of who has access and uses the Internet and who does not. That such differentials have declined in the face of the indifference of the George W. Bush administration testifies to the falling prices of computer hardware, the diffusion of software skills among ever large segments of the population, and the role played by schools and public libraries.

However, class differences – as expressed through different access rates for varying levels of education and household income – remain an important dimension of the American digital divide. Vast swaths of the population – largely minority, poorly educated, low in income, and often employed in the lowest rungs of the service sector – have little experience with the Internet. For many, cyberspace appears as some dimly perceived horizon with few concrete advantages to offer. Ironically, it is precisely such pools of people who might benefit the most, by having, for example, ready access to information about employment opportunities, bus schedules, or through the comparative shopping that the Internet affords. Lack of reliable access deprives the poor and uneducated of the possibility of participating as equals (Stevens 2006). Because low income ethnic minorities comprise a disproportionate share of new entrants into the labor force, the lack of Internet skills among such workers is also a matter of national competitiveness. It is only when the bottommost tiers of the social order have reliable access that the digital divide will disappear, if it ever does. Until then, the Internet may amplify social inequalities as much as it reduces them.

Moreover, important geographic variations remain: it is no accident that the highest rates of Internet access are to be found in states with relatively good public education systems (e.g., the northern Midwest) and relatively high per capita incomes. Conversely, the lowest rates are evident in poorer, frequently Southern states that typically underinvest in public education systems. Thus, the spatial dimensions of the digital divide mirror the socioeconomic ones; where users are located has as much to do with access as who they are, for the social and the spatial are hopelessly intertwined.

Even with enormous price declines in the cost of personal computers, considerable portions of the low-income population do not have them at home. Use of a networked PC, of course, presupposes minimal technical skills, which the country's least educated segments almost universally lack. As Korupp and Szydlik (2005) emphasize, social and family context and human capital matter as much or more than does the simple presence of a PC. Thus, attempts to overcome the digital divide by extending the Internet to the poorest, least educated portions of the country will encounter steeply diminishing returns: it is one thing to offer simple access, and quite another to teach the computer illiterate the basic skills necessary to navigate cyberspace and participate in the information economy. However, as a new generation of younger users increasingly familiar with the Internet gradually replaces their less computer-oriented elders, much of the roughest contours of the digital divide may be ameliorated over time.

The contemporary frontier that speaks most accurately to the digital divide's evolving nature is the uneven social and spatial distribution of broadband services. Given that the bulk of Internet applications are graphics-intensive, including Web-based functionality, broadband has become increasingly essential to meaningful Internet usage. Typically, given the deregulated climate of the telecommunications industry, providers seek to avoid low income or rural areas (where low densities inhibit economies of scale) and "cherry pick" relatively affluent, densely populated urban ones. Thus, rural-urban differences in Internet access – a topic woefully understudied in the academic literature – remain critical to understanding who has access and who does not (Parker 2000; Gabe and Abel 2002).

The digital divide in the U.S. reflects the unique constellation of cultural, political and economic forces that have long defined American society: its high degree of individualism; its faith in mythical free markets and distrust of state intervention; its tolerance of inequality; and the profoundly racialized nature that permeates differential access to social opportunities, including the Internet. Unequal access to the Internet reflects broader, growing inequalities generated by labor market polarization (including the loss of manufacturing jobs and the explosion of low-wage services), the growth of unearned income (particularly stock dividends), and a largely indifferent federal government.

What might be done to reduce the digital divide in the future? Three lines of action present themselves. First, universal service provisions, largely abandoned after the 1996 Telecommunications Act, should be re-instated as part of any federal government regulatory programs. Because the market for Internet services is unlikely to provide access for low income populations by itself, this type of policy stipulation lies at the core of any effective public program to reduce disparities in access. Second, subsidized partnerships between telecommunications companies and Internet service providers should address public schools and libraries in low-income neighborhoods, including a revival and expansion of the e-rate program, and focus not simply on the provision of computer hardware, but equally importantly on the generation of human capital, i.e., the skills necessary to log on, navigate the Internet, and employ it in substantively meaningful ways. Finally, aggressive efforts should be made to encourage broadband and mobile Internet access, including subsidies to overcome the last mile problem in impoverished regions and the proliferation of wireless "hot spots." Given how entrenched inequality is in the United States, such measures will require substantial investments and lengths of time to be effective; what is clear is that without them, the digital divide will persist.

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KEY TERMS AND DEFINITIONS

Broadband: high-speed modes of Internet access typically using fiber optics cables or satellite

Digital Divide: social and spatial discrepancies in Internet access

E-Rate: a program of the U.S. federal government in the 1990s to subsidize Internet access at public schools

Internet Drop-outs: those who once used the Internet but stopped doing so for various reasons

Moore's Law: named after Intel founder Gordon Moore, it asserts that the costs of computers and equipment decline by 50% roughly every 1½ years

Wi-Fi: wireless Internet, typically Local Area Networks at home or in some public places such as airports and coffee shops.y

Section 2
Digital Divides and Inequalities

Division 1
Digital Divides and Disabilities

Chapter 8
Beyond the Digital Divide:
Closing the Generation and Disability Gaps?

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ABSTRACT

An essential, and rapidly-developing, aspect of electronic government is the growing use of online resources for government activities such as e-rulemaking, citizen participation, and the provision of information, referral, and assistance for users with needs for service delivery. Major developments in the use of electronic government resources for services needed by the elder and disability populations are the primary focus of this chapter. We focus here on the results of a large-scale statewide survey of residents of the state of Iowa, and on the findings from evaluations of aging and disability resource Websites in the United States and in other countries. Current and future trends in service delivery that may help to bridge digital divides for the elder and disability populations are discussed.

INTRODUCTION

E-government is a key concept in scholarly and policymaker dialogues about democratic government. Generational differences play an important role in linking information and communications technologies (ICT) literacy and usage with political outcomes such as partisanship, elections, or public policy decisions (Fox, 2004). Complex contemporary issues regarding full participation by older members of the political community revolve around the rapidly expanding reliance on electronic information and communication technologies. All too

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often older adults are unfamiliar with opportunities commenting on pending government rules and regulations and the corresponding use of online "e-rulemaking" by public agencies (e.g., Garson, 2005; Shulman, Thrane, & Shelley, 2005).

Other socio-demographic differences, together with generational effects, define what has become known as the "digital divide" (Castells, 1999; Compaine, 2001; Mossberger, Tolbert, & Stansbury, 2003; Servon, 2002; Warschauer, 2003). Age, race, language, and disabilities are significant predictors of ICT literacy, even when controlling for socioeconomic status (Cooper, 2000; Dennis, 2001; Goslee, 1998; Lenhart et al.; Loges & Jung, 2001; Novak & Hoffman, 1998). Previous research has shown that age and disability are closely related to the digital divide in political participation, access to electronic media, and the use of services available through electronic sources.

E-government—delivering government services through a Website or other ICT application—can provide quicker and better services (Daukantas, 2003; Holmes & Miller, 2003), improved interactions with business and industry (Krueger, 2002), citizen empowerment through access to information and participation (Takao, 2004; Watkins, 2004), and more efficient government management (Cohen & Eimicke, 2001). However, e-government provides accurate and reliable information to only those with Internet access.

The "gray gap" in service delivery is an important dimension of the digital divide. The elderly are largely unaware of existing services, experience difficulties in expressing their needs and in negotiating the human services system, and may go without needed help. In particular, determining how best to provide and fund care for vulnerable elderly with functional deficits in daily activities who need assistance in home management such as household chores is a major national-level policy need. As a result, a significant portion of the elderly are counted among society's information disadvantaged groups.

The Aging and Disability Resource Center (ADRC) initiative of the U.S. Centers for Medicare and Medicaid Services (CMS) and the Administration on Aging (AoA), in the U.S. Department of Health and Human Services (HHS), is one current national effort to meet these challenges by establishing information and referral capability for the elderly and disabled in nearly every state. By integrating online, telephone, and in-person contacts, the ADRC cuts across generational barriers and serves as a virtual source of information for and about service providers that is intended to address the needs of the elderly and disabled population. Our study, in part, assesses the effectiveness of e-government, specifically the ADRC, in meeting the needs of the elderly and disabled (particularly in Iowa). We compare state-level and pilot-level ADRC Websites, and separately compare the information and services provided in other countries' equivalent online sources to assist in plans for long-term care, retirement, and family-based caregiving between countries with higher and more modest levels of e-readiness as measured by multiple international criteria. In sum, we address how e-government is being used in the United States to deliver information and services for the needs of the elderly and disabled, and explore how these needs are being addressed in other countries. Within the U.S., the comparison between state-level and pilot-level sites is meaningful to evaluate whether there is a differential effect on Website quality—and thus implicitly on the delivery of information and services—from programs with a statewide emphasis versus those with a more narrow pilot site orientation. Comparing international Websites between countries with relatively more and relatively less readiness for electronic government has a somewhat different purpose: to ascertain whether the often vast differences in national infrastructure precondition the performance capability of e-government efforts to provide information and deliver services. Direct comparisons between the U.S. ADRC Websites and the international Websites are not undertaken here, because of major differences in national priorities and differences in the intent behind the respective national and sub-national systems for aging and disability services.

BACKGROUND: THE AGING AND DISABILITY LINK

In the United States, the elderly represent the fastest growing demographic group in the population. In July 2003, 35.9 million people were aged 65 and older in the U.S., or 12% of the total population, of whom 18.3 million were aged 65-74, 12.9 million 75-84, and 4.7 million 85 and older. The U.S. Census Bureau projects the older population in 2030 to double in size over its 2000 estimate, to 72 million (nearly 20% of the total U.S. population) (He, Sengupta, Velkoff, & DeBarros, 2005). Elderly citizens need instrumental services related to aging, as physical and cognitive abilities decrease and social interactions and financial status diminish (Bull, 1994; Chatman, 1991; Levinson, 1996).

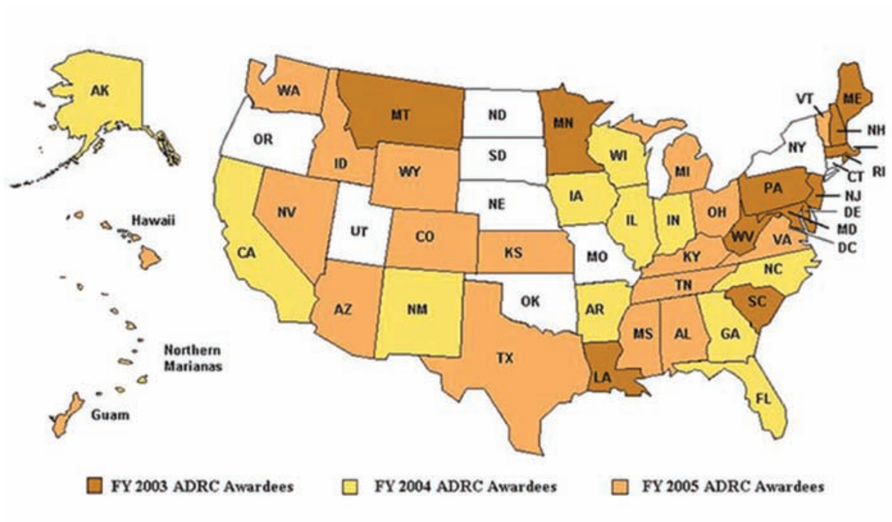
One dimension of digital divide research looks at the need to provide and evaluate functional online information and referral systems for services supporting the elderly—and especially the disabled elderly—that cut across generationally different modes of seeking and following up on sources of assistance for service delivery (e.g., Auh & Shelley, 2006; Shelley & Auh, 2006).

The need for service delivery to aging and disabled populations poses major challenges to government ICT developers. While recent efforts have been undertaken through the ADRC program, rapidly aging populations remain a world-wide phenomenon with significant policy implications. A related development is the greater survival rate and extended life expectancy of those who suffer disabilities and who might not have survived into adulthood or old age in previous generations.

An emergent ICT research front is the global need to adapt technologies that often have been developed by and for the young to the needs of the elderly (e.g., Jaeger, 2005; Thrane, Shelley, Shulman, Beisser, & Larson, 2005). Making "young technologies" available and functional to older users requires careful attention to cognitive, social, and education differences as well as to the vastly divergent life histories, that separate younger, "with it" technology users from their elders.

Shelley, Thrane, and Shulman (2008) summarized structural equation model (SEM; Jöreskog & Sörbom, 1996a, 1996b) analysis of data from a 2003 national random sample survey (n=478) reveals that younger respondents were significantly more supportive of ICT and saw significantly fewer disadvantages, compared to older respondents (Shelley, Thrane, Shulman, Lang, Beisser, Larson, & Mutiti, 2004). Younger respondents showed significantly more desire for public ICT availability and e-political participation, whereas older respondents preferred traditional electoral involvement. More educated respondents held significantly more favorable views of ICT generally and public access more specifically, compared to less educated respondents; they also were more active in both traditional and electronic forms of civic participation. More supportive views of ICT were associated with significantly greater levels of e-political participation and significantly stronger interest in e-elections. Respondents with less concern and fear about ICT were significantly more likely to act as digital citizens and involved in e-politics and e-elections. Stronger support of public ICT access was related to significantly greater support of e-elections. Whether e-citizenry will compound existing social divisions as non-electronic voices are marginalized and electronic voices are amplified or expand opportunities for more egalitarian access to public resources remains an open question. In this chapter, we explore the implications of e-government access to information and services for the elder and disability populations in the United States and in other countries.

Figure 1. States participating in the Aging and Disability Resource Center



In addition to the traditional service-delivery media such as walk-in visits, telephone, or "snail mail," visiting Websites or emailing requests have become popular service delivery media for information and referral service agencies and services for aging and disability. In the U.S., state governments provide electronic case management services to their citizens, who are able to access information and enroll through the e-application process to federal benefit programs such as Medicaid or the Women, Infants, and Children (WIC) program (Auh, 2008; Cook, Lavigne, Pagano, Dawes, & Pardo, 2002; Holmes & Miller, 2003). Increasingly, government agencies use the Internet to provide information and technologies that have the ability to transform relations with citizens, business, and other arms of government (Auh, 2008; World Bank, 2006).

As part of that initiative, the ADRC Grant Program was initiated as a joint effort of the HHS, AoA, and CMS to overcome barriers to community-based caregiving for people with disabilities of all ages (HHS, 2004). One out of three adults required information related to long-term care for themselves, a spouse, parent(s), child(ren), or friend(s) (Keitzman, Scharlach, & Santo, 2004). For families lacking information about available resources or services, institutionalized care could be the only option available. To citizens without e-literacy, only limited information and services may be available. The "knowledge gap hypothesis" (Tichenor, Donohue, & Olien, 1987) leads to the conclusion that limited access to information and services may produce greater inequality of opportunity and outcomes. Community-based caregiving for the elderly has emerged as a major public policy issue. The ADRC is meant to fulfill the needs for information and referral services for the elderly, caregivers, and disability populations. Currently, 43 U.S. geopolitical units are participating in the national ADRC (Figure 1).

The international dimensions of the work conducted by the ADRC were highlighted by the presentation of related results at the Third International Conference on Healthy Ageing and Longevity, in Melbourne, Australia, October 13-16, 2006. With more than 20 countries represented, the focus was on how to maximize lifespan and health. The aims of the ADRC are directly relevant to many of the aging and disability-related needs confronting societies around the globe such as the provision of supportive services and preventive measures for the aged and disabled that promote quality of life (e.g., psychological adjustment, alleviation of social isolation), "aging in place," financial planning, and reducing the uneven development of services within and between countries while controlling health care costs.

We contend that there is a great deal of variety in Website provisions, functionality, service availability, and usability for aging and disability resources. This has implications for aging and disability resource policy specifically, and for many other applications of e-government. Our study investigates perceptions of elder and disability services among survey respondents in Iowa and their participation in e-government services. In addition, we examine the effectiveness of ADRC U.S. Websites and their international counterparts on the traits of ease of use, content and information, interaction, and accountability, as well as e-readiness, target population, and life domains. This comparison shows clear gaps among the international Websites and differences between these and their U.S. equivalents. Many weaknesses of the Websites are evident in the subsequent discussion.

SURVEYING PUBLIC NEEDS FOR ADRC AND E-GOVERNMENT

As a joint effort of the Iowa Department of Elder Affairs (the state's ADRC grantee), with Iowa State University's Family Policy Center (FPC) and Research Institute for Studies in Education, representative statewide data were collected from 4,002 households. A 63% response rate was achieved with the Dillman (2007) method. The sample overrepresents older Iowans and gives a richer description of their e-government needs for service delivery (Auh & Shelley, 2006). The mean age of the participants was 56.03 years (SD=16.64 years). Two-fifths were at least 60 years old, 39% were between 42-59 years, and the remaining 21% were younger than 42.

Overall, 73% reported Internet access either at home, work, school, a library, or somewhere else. A logistic regression model (Nagelkerke pseudo R^2=.44, percentage of cases correctly classified=80%; χ^2=4.90, df=8, p=.77) revealed that Iowans who were 41 years and younger were nearly 3 times as likely to have Internet access compared to their middle-aged (42-59 years) contemporaries, and 7.2 times as likely as their older counterparts (60+ years) (Auh, 2008). The odds of Internet access were 2.7 times as high for seniors with another adult present in the household compared to elders who lived alone. Living in a non-metropolitan area decreased the likelihood of Internet access by 31%, in contrast to urban dwellers. The odds of Internet access declined by 10% among seniors who lived alone, rather than with another adult, in less populated areas of the state (Auh, 2008).

The most universal Internet activities were gathering information (67%) and email (67%), followed by shopping (45%), banking (33%), and other purposes (24%). The average respondent participated in roughly two Internet activities (M=2.22, SD=1.69). These items were summed to yield an "e-literacy" scale, with Cronbach alpha value of .85 (Auh & Shelley, 2006; Shelley & Auh 2007). Common benchmarks for acceptable reliability of a scale, as measured by Cronbach's coefficient alpha, are values of at least .70 for exploratory research, and .80 for well-established scales (Nunnally, 1978); Cronbach alpha values are reported extensively throughout this chapter, to establish the substantive usefulness of the various scales employed. The attained value of .85 demonstrates that the "e-literacy" scale provides a useful and meaningful measure of the extent of engagement in electronic activities. In a multiple regression analysis (R^2=0.52), older Iowans reported significantly lower levels of e-literacy and seniors living alone were significantly less likely to use the Internet (Shelley & Auh, 2007).

Internet access and e-literacy are key issues in bridging the digital divide, particularly among underserved rural seniors who may be left behind in an e-government age and may face greater risk of e-exclusion. Survey respondents emphasized the need for user-friendly functional options and customized Website information. They sought specifically a Website instruction section, clear descriptions of the three major search vehicles, service definitions in lay terms, note space, and customized information (Shelley & Auh, 2007). Major gaps were found in the type of information that was sought. Of survey participants aged 60+, 48% responded that disability and/or elder service information was "Very or Somewhat needed," as did 41% of participants aged 42-59 and 28% of participants aged less than 42. Extrapolating to the entire population of the state, this implies that ADRC information may be needed by nearly 270,000 older Iowans, over 300,000 baby-boomers, and over 250,000 young Iowans. (Auh & Shelley, 2006, 2007). If these results are indicative of national, or even global, trends, the need for information about aging and disability services is exceedingly high and may be addressed by enhancing e-government capacity to provide information and assistance for service delivery. The information and access needs related to elderly and disabled persons expressed in these survey results inform the subsequent findings on how well Websites in the United States and other countries have addressed these needs.

Profiles of ADRC Websites

The 25 U.S. statewide and pilot site ADRC Websites that were sufficiently well-developed at the time of this study and reported on the ADRC technical assistance Website maintained by the Lewin Group (the national evaluators for the ADRC program) were tested for their ability to provide aging and disability resource information and assistance making appropriate use of ICT (Auh & Shelley, 2007). Of the 25 tested Websites, 11 were developed to cover statewide services, whereas 14 were developed as pilot sites covering multiple counties within those states. Of the 25 tested U.S. ADRC Websites, 6 were implemented in 2003, 15 in 2004, and 4 in 2005. Support for this research was received from the IBM Center for the Business of Government (Auh & Shelley, 2007).

These Websites were evaluated by research staff and graduate research assistants at the Research Institute for Studies in Education at Iowa State University. An Observation Check List was developed (Auh & Shelley, 2007). This allowed raters to use a series of investigative procedures to study systematically the effectiveness of a Web-based information and referral service delivery system. It allowed systematic investigation of the following core areas of the e-government efforts as manifested through the various ADRC Websites in the U.S. and relevant Websites from other countries: ease of use, content and information, interaction, and accountability. To ensure the reliability and validity of these assessments, multiple evaluators were assigned for each individual Website.

The scope of the tested Websites included services directed to aging and disability populations and to their caregivers or families. Most of the Websites served elderly populations (n=24), elderly with a disability (n=23), and caregivers (n=20); whereas only 9 offered services for children with disabilities and 6 offered services for their caregivers. Compared to the pilot-level ADRC Websites, the state-level Websites were more likely to serve the needs of wider populations. Only 3 of the 14 pilot-level Websites (21%) offered services for children with a disability; compared to 6 of the 11 state-level Websites (55%). There is no statistically significant difference (as measured by chi-square statistics and associated p-values) between state-level and pilot-level ADRC Websites in the provision of services to children with disability, elderly with disability, elderly in general, caregivers for children with disability, caregivers for the elderly, and the general public. In these and other hypothesis testing results reported the number of observations available is not large, so there is limited statistical power to test for differences between types of Websites; accordingly, we focus on reporting relative frequencies together with hypothesis testing outcomes.

Ease of Use

Ease of use is defined as the overall rating of the ability to find desired information, helpfulness of the information provided, speed of loading, navigability, Website design, font size, trustworthiness of the information provided, finding needed services, convenience for finding services, whether the observer would recommend the Website to a friend or relative, and comfort using the Internet to get information (see Table 1; Auh & Shelly, 2007, p. 18). To measure the overall performance of the Websites on ease of use, a scale was created based on the mean of 15 items (Cronbach's alpha=.94). The mean Ease of Use score across all Websites was 6 out of a maximum of 9. There were no statistically

Table 1. Scale formation for U.S. and international Websites

Scale (Number of items)	U.S. or International	Standardized Cronbach's Alpha
Ease of Use (15 question items x 2 testers=*30 items*) I was able to find the information that I am looking for. The information provided by the Website is helpful. The speed of loading the Website is not appropriate. It is easy to navigate through the Website. I like the design of the Website. I like the font size of the Website. I trust the information provided by the Website. The information I found from the Website helped me find the services I needed. I think that the Website is convenient for finding services. I would recommend the Website to a friend or relative. I feel comfortable about using the Internet to get information. The scope of the Website is clearly stated. The contents and links match the needs of the expected audience. The contents have a rich and unique quality that inspires users to visit regularly for information. The content is written in a clear and consistent language style that is easy to understand.	U.S.	**.94**
	International	**.90**
Ease of Use: Readability (2 question items x 2 testers =*4 items*) Icons are understandable and make sense. The content is written in a clear and consistent language style that is easy to understand.	U.S.	**.60**
	International	**.76**
Ease of Use: Design (3 question items x 2 testers=*6 items*) The format is consistent throughout the Website. I like the design of the Website. I like the font size of the Website.	U.S.	**.81**
	International	**.70**
Accountability: Responsiveness (6 question items x 2 testers=*12 items*) The contents and links match the needs of the expected audience. The contents have a rich and unique quality that inspires users to visit regularly for information. I was able to find the information that I am looking for. The information provided by the Website is helpful. The information I found from the Website helped me find the services I needed. I think that the Website is convenient for finding services.	U.S.	**.95**
	International	**.89**
Accountability: Satisfaction (*4 question items x 2 testers =4 items*) The content is written in a clear and consistent language style that is easy to understand. I would recommend the Website to a friend or relative. Two more questions?	U.S.	**.74**
	International	**.76**

(Source: Auh & Shelley, 2007, p. 18.)

significant differences between pilot-level and state-level ADRC Websites.

The first sub-domain of Ease of Use, Readability, was measured with two items about writing style and layout/design (Table 1). The composite score had a Cronbach's alpha value of .60. The total mean score of Readability of the U.S. ADRC Websites was 6.69, which falls into the "satisfactory" level of the 9-point scale. As assessed by a one-way analysis of variance (ANOVA), there was a statistically significant difference (p=.04) in the mean Readability score between state-level and pilot-level ADRC Websites (7.2, vs. 6.3, respectively).

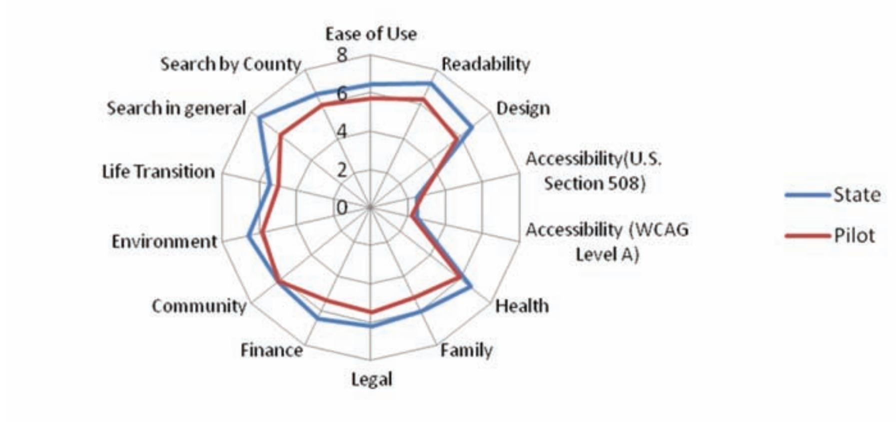
The second sub-component of Ease of Use, Design, was a composite score assessing whether the format was consistent throughout the Website, the users liked the design, and the user liked the font size (Table 1). Cronbach's alpha was .81. The total mean score of the Design composite was 6.14, which falls into the "satisfactory" level of the 9-point range. There were no statistically significant differences between the pilot-level and state-level ADRC Websites.

The third subcomponent of Ease of Use, Accessibility, addressed whether ADRC Websites were functional for people with disabilities such as visual impairment or colorblindness. Accessibility was tested using criteria based on U.S. Section 508 of the amended Rehabilitation Act of 1973 (Appendix A), and the Web Content Accessibility Guideline (WCAG) by the World Wide Web Consortium (W3C), which established standards for federal and nonfederal Websites to make information technology accessible to people with disabilities. For example, the criteria for accessibility include that the Website use the clearest and simplest language appropriate for a site's content, and that all information conveyed with color is also available without color. WCAG Level A is the basic level, where the WCAG's Priority 1 criteria are met; WCAG Level AA is the medium level, where the WCAG's Priority 1 and 2 criteria are met. Of the 25 U.S. ADRC Websites, only 5 (20%) passed the U.S. Section 508 criteria.

There were no appreciable differences between pilot-level and state-level ADRC Websites that passed the Section 508 criteria (n=3, vs. n=2, respectively). The accessibility evaluation based on the international WCAG guidelines showed similar results. Only 4 of the U.S. ADRC Websites passed WCAG Level A and none of them passed WCAG Level AA. A chi-square test shows that there is no statistically significant difference between the state-level and pilot-level Websites (18% vs. 14% passing, respectively).

A "spider chart" (or "radar char") is useful way to visualize differences across a complex range of multiple variables. Figure 2, for example, compares the performance of state-level and

Figure 2. Ease of use and content and information of the U.S. ADRC Websites



pilot-level U.S. ADRC Websites on an array of criteria addressing the ease of use and the content and information provided. Higher performance is demonstrated by a point on the graph farther away from the center. As seen in Figure 2, the results of this study showed very poor performance in terms of accessibility (Auh & Shelley, 2007, p. 58).

Content and Information

Content and information is the core element of e-government services. Seven major life domains were based on the taxonomies employed in the ADRC program: health, family, legal, finances, community support, environment (Housing/Assistive Technology), and life's transition and changes. Testers rated the sample Websites using a 9-point scale, where 1 represents a minimum-level of information and 9 corresponds with comprehensive information and content.

All 25 U.S. ADRC Websites covered the 7 major life domains. Overall mean levels of information ranged from 5.2 to 6.3, which indicated medium levels of comprehensiveness of information about the major life domains. Long-term care for the elderly and health and environment (Housing/Assistive Technology) domains received the highest ratings, followed by the community, finance, legal, and family domains.

As is evident in Figure 2, overall ratings of comprehensiveness of the information and services provided by the U.S. ADRC Websites were not high. There were no meaningful differences between state-level and pilot-level Websites. The goal of the U.S. ADRC program is to provide comprehensive services, but after five years to date the needs of the targeted population in some respects are not met adequately.

Of the 25 U.S. ADRC Websites, 18 were characterized by an optimized search engine. Nine (82%) state-level ADRC Websites had an optimized search engine as did 9 (64%) pilot-level ADRC Websites. Of the ADRC Websites with an optimized search engine, most (8 statewide and 8 pilot-level) provided information and referral services by county. About 70% of state-level ADRC Websites had a search engine by county, as did 64% of pilot-level ADRC Websites (Figure 2). To meet the targeted population's needs and support their community and home-based care, this search option is an essential function.

Interaction

Interaction includes the availability and levels of customized option and feedback components. The customized option was very important to users, with a discussion board (or Bulletin Board Service) the basic mechanism for user-Website interactions. Higher-level interactions could include individualized functions such as a log-on capacity, the ability to save visit information, and a search history. The most advanced level of this facet of human-computer interaction could be the integration of customized functions with the government's administrative process, such as by providing easy access to e-application forms for any state or local agency.

Half (n=13) of the U.S. Websites included at least one customized option. Of these, 5 provided a wide array of customized services, whereas 8 provided more limited customized options. There were no significant differences between pilot-level and state-level ADRC Websites in the number that provided customized options, search history services, log-on functions, or e-application forms and services (Figure 3, from Auh & Shelley, 2007, p. 58).

The U.S. ADRC Websites included feedback components, such as an online customer feedback capacity, user satisfaction survey, comment box, and Frequently Asked Question (FAQ) board. Customer feedback was the most common feedback component; 15 Websites included this type of service. Eight Websites included a user satisfaction survey or comment box, and 5 Websites included a FAQ board among their feedback components. There was no statistically significant difference

Figure 3. Interaction and accountability of the U.S. ADRC Websites

in feedback options available on the state-level and pilot-level ADRC Websites.

Accountability (Responsiveness/ Satisfaction/Trust)

Because the aim of the ADRC Websites is to target the delivery of long-term care and make the best quality resources and services available, the Websites should be responsive to needs of the aging and disability populations, provide satisfactory services, and build trust among users. The Responsiveness composite score, the first subcomponent of Accountability, assessed the convenience of locating services and usefulness of the content to connect users with available resources in their communities (Table 1). Cronbach's alpha was .95. The mean Responsiveness score of 6.0 indicated a medium level of responsiveness. There were no statistically significant differences between state-level and pilot-level ADRC Websites.

The Satisfaction composite score, the second subcomponent of Accountability, assessed such aspects as ease of understanding Website content and Website referrals. Cronbach's alpha was .74. Raters reported a medium level of satisfaction with ADRC Websites (M=6.32). There were no statistically significant differences between state-level and pilot-level ADRC Websites. Level of trust was measured with one question, "I trust the information provided by the Website," by using a 9-point Likert measure. The mean was 7.3, implying a high level of trust in the ADRC Websites. Compared to the pilot-level ADRC Websites (M=7), the Website testers rated the trustworthiness of the state-level ADRC Websites (M=7.7) to be significantly higher (p=.04).

Profiles of ADRC-equivalent International Websites

A total of 28 ADRC-equivalent Websites from 9 countries were evaluated (Auh & Shelley, 2007). These countries were selected based upon the availability of reviewers fluent in major languages and the distribution of countries across multiple continents. For each country, 2-5 Websites were identified as ADRC-equivalent Websites at the national or regional level, except for Brazil, for which only one Website was identified. Five Websites were evaluated from Australia, 1 from Brazil, 2 from Canada (1 French, 1 English), 2 from Chile, 3 from France, 3 from Israel, 5 from South Korea, 3 from Mexico, and 4 (1 national and 3 regional (for Scotland, Ireland, and Wales) from the United Kingdom (UK).

The ADRC-equivalent international Websites were funded by various sources, including a national agency, local government, and other nonprofit organizations. Nineteen Websites (68%)

were funded by a national agency only; 5 (18%) were cosponsored with a combination of state and federal funding; 2 (7%) were cosponsored by local government only, and 2 others (7%) were cosponsored by other nonprofit organizations. The funding resources for these Websites were not significantly different by e-readiness groups (Table 2).

All Websites within each country were selected that shared the mission and goals of the U.S. ADRC Websites and provided equivalent services. Websites that supported the independence and home-based care of the elderly and disabled in their own communities in Australia, Brazil, Canada, Chile, France, Israel, (South) Korea, Mexico, and the United Kingdom were examined.

Raters with expertise in a major world language (Korean, Spanish, French, Arabic, Portuguese, Hebrew) and with those nationalities were recruited from students in various Ph.D. programs at Iowa State University. The raters identified ADRC-equivalent Websites in each country by scanning relevant Websites in each language to assess the content and format of sites addressing needs for the elderly and disabled.

E-readiness indicators of the 9 countries were studied to determine the status of the country's ICT infrastructure and the degree of access to the Internet and computers (Table 2, in Auh & Shelley, 2007, p. 37). Based on the set of indicators summarized in Table 2, the countries were categorized into two groups. MER countries—Brazil, Chile, Israel, France, and Mexico—had medium levels

Table 2. E-readiness indicators

Country	Internet Users (000s) 2006[1]	Personal Computers (per 1,000 people)[2]	Government Prioritization of ICT (1-7)[3]	ICT expenditure (% of GDP)[4]	Schools connected to the Internet (%)[5]	E-Gov Readiness Index (0-1) UN (2005)[6]	E-Readiness Index (1-10) *The Economist*[7]
Australia	15,300.0	683	4.3	6.2	97	.8679	8.50
Brazil	42,600.0	105	4.0	7.8	50	.5981	5.29
Canada	22,000.0	700	4.5	5.9	98	.8425	8.37
Chile	4,155.6	141	4.9	6.1	62	.6963	6.19
France	30,100.0	575	5.1	6.3	89	.6925	7.86
Israel	1,899.1	740	4.9	8.3	95	.6903	7.59
Jordan	796.9	56	5.5	8.4	18	.4639	4.22
Korea	34,120.0	545	5.7	6.9	100	.8727	7.90
Mexico	18,091.8	136	4.0	3.3	60	.6061	5.30
United States	208,000.0	762	5.3	8.8	100	.9062	8.88
UK	33,534.0	600	5.0	7.3	99	.8777	8.64

[1]International Telecommunication Union. 2006. http://www.itu.int/ITUD/icteye/Indicators/Indicators.aspx#

[2]World Bank. ICT at Glance. 2005. http://Web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20459133~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[3]World Bank. ICT at Glance. 2005. http://Web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20459133~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[4]World Bank. ICT at Glance. 2005. http://Web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20459133~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[5]World Bank. ICT at Glance. 2005. http://Web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20459133~menuPK:1192714~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[6]UN Global E-Government Readiness Report. 2005. http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021888.pdf

[7]Economist Intelligence Unit E-Readiness rankings, 2006. http://a330.g.akamai.net/7/330/2540/20060424215053/graphics.eiu.com/files/ad_pdfs/2006Ereadiness_Ranking_WP.pdf

(Source: Auh & Shelley, 2007, p. 37.)

of e-readiness and HER countries—Australia, Canada, South Korea, and UK—reported higher levels of e-readiness.

The scope of services of the tested Websites included aging and disability populations and their caregivers or families. Of the 28 international Websites, 13 served only the elderly population and 15 served both the elderly and disability populations. Regarding the targeted populations of the e-government services provided by the sample Websites (Table 3, Auh & Shelley, 2007, p. 39), there was no statistically significant difference between countries with higher-level and medium-level e-readiness. The selected Websites served different specific targeted populations, including the elderly, elderly with disability, caregivers for the elderly, children with disability, and caregivers for children with disability. Table 3 reports the percentage of each country's ADRC-like international Websites that provide online services directed to each targeted group; higher percentages demonstrate a more widespread commitment to serving each targeted group. These targeted populations were matched with those of the U.S. ADRC Websites. As the countries were not selected randomly, our reported estimates combining all the sites in the MER or HER countries may not be representative of all ADRC-like sites in countries that we were unable to examine.

Ease of Use

Unless otherwise indicated, the U.S. ADRC Websites' measures and scoring system were employed in the evaluation of the international Websites. The overall mean Ease of Use score for the Websites was 7.4. The scores ranged from 6.3 (Brazil) to 8.5 (Canada). Cronbach's alpha was .90. The first sub-domain of Ease of Use, Readability, ranged from 7.4 (U.K.) to 8.9 (Canada). The average score was 7.89. Cronbach's alpha was .76. Design, the second sub-domain of Ease of Use, ranged from 4 (Brazil) to 8.6 (Canada) with mean of 7.23. Cronbach's alpha was .70.

The Accessibility measure, the third sub-domain of Ease of Use, indicated that only 8 (30%) of international ADRC-equivalent Websites passed the U.S. Section 508 criteria. All of the Canadian Websites passed the U.S. Section 508 criteria and about half of the Websites from Australia, Israel, and the U.K. passed the criterion. The Websites from Brazil, Chile, France, (South) Korea, and Mexico did not pass the U.S. Section 508 criteria. Nine Websites (34%) passed the WCAG Level A criteria. All of the Canadian Websites passed the WCAG Level A and about half of the Websites from Australia, Israel, and the U.K. passed that guideline. Brazil, Chile, France, (South) Korea, and Mexico did not pass the WCAG Level A. Only one Website from the U.K. passed the WCAG Level AA guideline. HER Websites were more likely to be accessible for people with disabilities such as vision or hearing impairments; differences between the MER and HER countries in percentage of Websites that passed the U.S. Section 508 or WCAG Level A were statistically significant (p=.002 and p<.001, respectively). As seen in Figure 4, the imbalance of effectiveness among the Websites from the MER and HER countries was noticeable (Auh & Shelley, 2007, p. 57). Despite the fact that the scope of services in the ADRC-equivalent Websites should be related to the needs of the aging and disability populations in those countries, the ADRC-equivalent Websites from the MER countries had limited accessibility, which was the most critical element in e-government services targeting the disability population.

Content and Information

Content and information is the core element of e-government services. All 28 international Websites provided information and resources about the 7 major life domains (Table 4). Average ratings varied greatly by type of domain and country. The overall mean levels of comprehensiveness in information and referral services for life domains ranged from 4.63 (Life Transition)

Table 3. Targeted population of international Websites

Country	Targeted Population					
(number of sites)	Level	Elderly	Caregivers for elderly	Disabled elderly	Disabled children	**Caregivers for disabled children**
Australia (*n* = 5)	National	4	5	4	2	2
		80.0%	100%	80%	40%	40%
Brazil (*n* = 1)	National	0	1	1	1	1
		.0%	100%	100%	100%	100%
Canada (*n* = 2)	National	2	1	2	1	0
		100%	50%	100%	50%	.0%
Chile (*n* = 2)	National	2	2	1	0	0
		100%	100%	50%	.0%	.0%
France (*n* = 3)	National	3	3	3	1	1
		100%	100%	100%	33%	33%
Israel (*n* = 3)	National	2	2	2	1	1
		67%	67%	67%	33%	33%
South Korea (*n* = 5)	National	4	1	1	1	1
		80%	20%	20%	20%	20%
Mexico (*n* = 3)	National	3	3	2	2	2
		100%	100%	67%	67%	67%
UK (*n* = 1 national, *n* = 3 pilot)	National	1	1	1	1	1
		100%	100%	100%	100%	100%
	Pilot*	3	3	2	3	3
		100%	**100%**	**67%**	**100%**	100%

*The UK was the only country with pilot-level Websites.
(Source: Auh & Shelley, 2007, p. 39)

Figure 4. Ease of use, and content and information of the international Websites

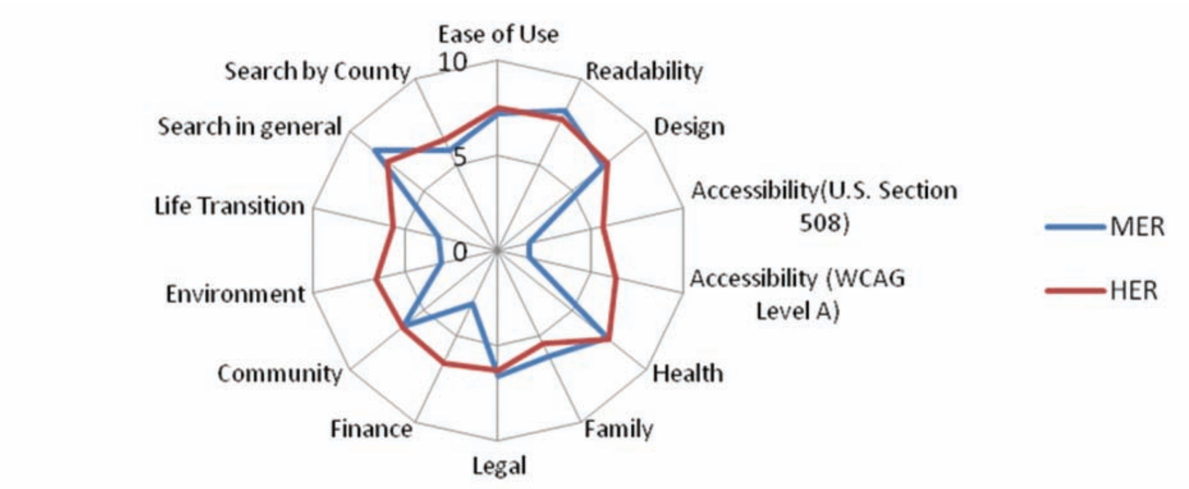


Table 4. Scope of life domains covered by the ADRC-equivalent Websites, by country

Country	N	Health Mean (SD)	Family Mean (SD)	Legal Mean (SD)	Finance Mean (SD)	Community Mean (SD)	Environment Mean (SD)	Life Transition Mean (SD)
Australia	5	8.5000 (.707)	6.9000 (2.04)	7.8000 (1.036)	7.3000 (1.717)	7.6000 (1.387)	7.6000 (1.140)	7.5000 (1.369)
Brazil	1	9.0000 (0.00)	6.0000 (0.00)	9.0000 (0.00)	1.0000 (0.000)	9.0000 (0.00)	1.0000 (0.00)	1.0000 (0.000)
Canada	2	8.5000 (.707)	6.2500 (2.474)	7.7500 (1.060)	8.7500 (0.353)	6.5000 (2.121)	8.7500 (0.353)	6.2500 (3.181)
Chile	2	9.0000 (0.00)	6.0000 (4.242)	8.2500 (1.060)	3.0000 (2.828)	5.0000 (5.656)	1.0000 (0.00)	1.0000 (0.000)
France	3	5.3333 (3.055)	6.6667 (2.309)	5.6667 (2.516)	3.3333 (1.527)	5.0000 (2.598)	3.0000 (1.732)	2.0000 (1.323)
Israel	3	6.1667 (4.072)	6.0000 (4.358)	3.6667 (4.618)	2.8333 (2.753)	6.3333 (4.618)	6.6667 (2.516)	5.5000 (4.092)
Korea	5	5.3000 (3.154)	2.0000 (0.707)	3.7000 (2.049)	4.3000 (2.489)	3.6000 (2.162)	3.2000 (2.109)	3.0000 (2.574)
Mexico	3	9.0000 (0.00)	6.0000 (2.646)	8.6667 (0.577)	4.0000 (2.645)	8.0000 (1.732)	1.6667 (1.154)	4.3333 (4.163)
UK	4	8.2500 (1.190)	7.2500 (1.554)	6.8750 (2.839)	7.2500 (1.500)	8.5000 (0.707)	8.6250 (0.478)	6.5000 (2.380)
Total	28	7.4107 (2.469)	5.7143 (2.736)	6.4286 (2.771)	5.0714 (2.801)	6.4286 (2.821)	5.1071 (3.204)	4.6250 (3.158)
F (p-value)	28	1.597 (0.191)	1.885 (0.123)	2.381 (0.58)	3.523 (0.12)	1.657 (.174)	12.207 (< 0.001)	2.442 (0.53)

(Source: Auh & Shelley, 2007, p. 46.)

to 7.41 (Health). The level of comprehensiveness on Environment (Housing/Assistive Technology) issues of the Websites differed significantly across countries ($p<.001$). HER Websites provided significantly more comprehensive information about Finance ($p=.001$), Environment ($p=.002$), and Life Transition ($p=.037$) issues to users than did MER Websites. Compared to HER countries, the information and referral services related to life transition and environment (such as housing options and technical assistance) were not provided at sufficiently comprehensive levels to meet the targeted population's needs in MER countries (Figure 4).

Search engine optimization, especially for community-based aging and disability resources, is the key element of ADRC-equivalent international Websites, as was true for the U.S. ADRC Websites. Of the 28 international Websites, 24 were characterized by an optimized search engine. Thirteen (81%) of the HER Websites had an optimized search engine, as did 11 (92%) of the MER Websites. Of the Websites from countries with optimized search engines, 17 (11 from HER countries and 6 from MER countries) offered an advanced level of service by providing information and referral services by county. There were no meaningful differences between HER and MER Websites.

Interaction

The human-computer interaction dimension explored such factors as whether ADRC-equivalent Websites had customized options, discussion boards (or BBS), log-on functions, or an integration of customized functions with the government's administrative process, such as by providing easy access to e-application forms for any national or local government or agency in the other countries.

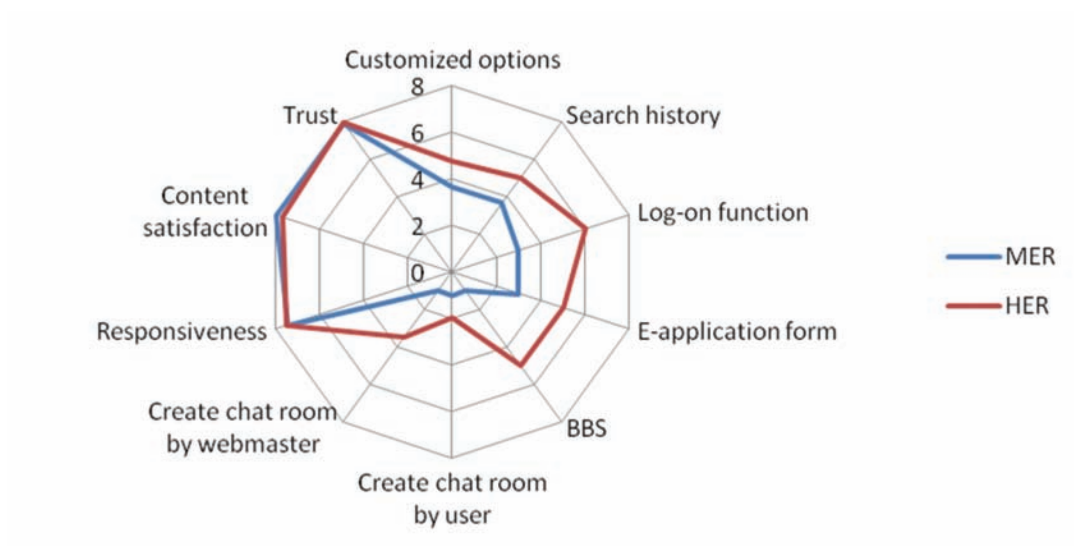
Of the International Websites, less than half (n=13) included at least one customized option. Of the Websites with customized option(s), 9 provided a wide array of customized services, whereas 4 provided more limited customized option(s). For more advanced levels of customized services, a higher percentage of the HER Websites (10, or 62%) provided those services than did the MER Websites (3, or 25%), and the difference was statistically significant (p=.032). In terms of customization, the differences between ADRC-equivalent MER and HER Websites were quite dramatic. As shown in Figure 5, HER Websites were more likely to optimize customization functions such as (saving personal) search history, log-on function, and e-application forms, compared to MER Websites.

On-line bulletin (or discussion) board system was the most common feedback component; but only 8 Websites included this type of service and all of them came from HER countries. Of the 8 Websites that included BBS, only 2 allowed users the autonomy to create a chat room for user interaction (25%) while 5 allowed the Webmaster to create a chat room (62%). The differences in availability of BBS or Webmaster-created chat rooms between the Websites from MER and HER countries both were statistically significant (p<.001 and p=.008, respectively). Thus, compared to MER Websites, HER Websites were more likely to provide feedback components promoting interactions with and the active involvement of users.

Accountability (Responsiveness/Satisfaction/Trust)

The total mean Responsiveness score was 7.44, ranging from a low in Korea of 6.56 to a high in Canada of 8.5. Cronbach's alpha was .89. The total mean Satisfaction score was 7.77, ranging from 7.3 (Korea) to 8.6 (Canada). Cronbach's alpha was .76. The total mean perceived Trustworthiness score was 7.92. Results from the comparisons between MER and HER countries did not show any dramatic difference in the effectiveness of the ADRC-equivalent Websites.

Figure 5. Interaction and Accountability of the International Websites



FUTURE TRENDS

Information and referral services are a crucial part of e-government. If Websites in areas of need, such as aging and disability, are not fully functional and do not meet a broad array of needs in user-friendly ways, the future growth of e-government and democratic citizenship likely will be stunted. International comparisons indicate major differences between the United States and other countries in the usability and comprehensiveness of information and referral Websites. Online services provided in some countries by a central government may be provided by local or provincial governments elsewhere. Still other countries may provide such services through nonprofits or other private-sector entities if they exist at all.

The findings of this research are relevant to both practitioners and the academic community. For those who practice the art of policymaking and administration, the major relevance is to realize the complexities of satisfying the needs for information and service provision within the elderly and disabled policy nexus. For the research community, our findings are linked directly to the corpus of knowledge regarding e-government and public policy, as discussed in the literature review. In addition, we believe the results of this study will contribute to future research on the digital divide and e-government.

We believe that our results lead to specific suggestions for further research. Our research agenda is not complete. Clearly, we have not covered all relevant aging and disability information and referral-type Websites in the United States, let alone in other countries. Nor have all countries been addressed here. We view these results as preliminary, and even embryonic, and anticipate growing what we know at this point exponentially by expanding the number of sites examined, as well as the number of countries (and languages), and by diving more deeply into what often have turned out to be uncharted waters that differ greatly across cultures, political traditions, and types of government. The following testable propositions are among those that beckon in future research on this aspect of e-government:

- How does the quality of online service delivery vary by type of government? For example, are unitary governments better able to provide high-quality online resources due to a greater and tighter span of control, compared to more decentralized federal-type systems of government?
- Does the nature of party control (e.g., Democratic vs. Republican in the U.S. states, or capitalist vs. social democratic vs. socialist in the broader global arena) affect the usability, depth, and informational quality of Websites?
- Are better Websites provided by more local levels of government, e.g.., by provincial/state or municipal units, rather than by regional or national entities?
- How much difference is there in the quality of services delivered by multinational organizations (the United Nations, for example), compared to those based in a single nation?
- What (inter)national standards should be applied for Website design, and who should best enforce them?

This at best scratches the surface of where we believe future research is headed. We hope that at least tentative answers are found to these and other researchable propositions through reasonable extensions of the current research agenda.

CONCLUSION

Several policy implications arise from these findings. First, public agencies need to provide the most user-friendly Websites possible, to maximize the impact and spread of the information that is meant to be available at Web users' fingertips. This will require expanded training for seniors who are not yet computer-literate, and demonstrates the need for agency budgets to accommodate both such training sessions and the expenses associated with staffing both live and broadcast/Webcast outreach efforts. Second, agencies working on ADRC-type Websites need to consider how best to provide information and referral services online to the disabled, and in particular to the disabled elderly. In addition to enhancing assistive technology, it may be productive to make use of the much greater e-literacy skills of the elders' adult children and, even more so, of the elders' grandchildren who in many cases have grown up from birth with intimate knowledge of how to take maximum advantage of online resources. Third, it is reasonable to expect (in fact, to hope) that the experience gained in seniors' and those with disability seeking out information online and making use of that information can contribute to positive spillover effects.

One likely consequence would be heightened participation by older members of society and the disability population in e-government and e-lobbying, and e-politics in general. Older voters already have a disproportionate impact on election outcomes and on many aspects of public policy (Social Security and Medicare are obvious examples), and it will be important to see how the body politic responds to seniors engaged more actively online. New and different methods are needed to provide a more fully elaborated understanding of the interplay of aging and technology in a changing society.

In addition, SEM results (Cho, Cook, Martin, & Russell, 2007) have demonstrated that willingness of community home-based long-term care is significantly higher with better perceived health and lower with increased depression. They also showed that awareness of community resources significantly decreased loneliness and depression and increased perceived health; greater loneliness was associated with greater depression; and greater depression was associated with lower perceived health.

The imbalance of effectiveness among the Websites from the MER and HER countries is noticeable. Despite the fact that the scope of services in the ADRC-equivalent Websites should be related to the needs of the aging and disability populations in those countries, the sample ADRC-equivalent Websites from the MER countries had limited accessibility, which was the most critical element in e-government services targeting the disability population. Also, the information and referral services related to life transition and environment (such as housing options and technical assistance) were not provided at sufficiently comprehensive levels to meet the needs of their targeted populations.

Imbalances among the U.S. ADRC Websites were also noticeable. Compared to state-level ADRC Websites, pilot-level Websites showed limited effectiveness. The U.S. ADRC program was implemented to target the aging and disability population; thus, Website accessibility is a high priority issue. However, the results of this study showed very poor performance in terms of accessibility. If the Website is not accessible for users with visual impairment or who are colorblind, the e-government services provided by the Website will not be available for them and may introduce or reinforce social inequality. Also, overall ratings of comprehensiveness of the information and services provided by the U.S. ADRC Websites were not high; both state-level and pilot-level Websites were rated as having at best medium or medium-high levels of comprehensiveness.

The broader impact of these findings should accentuate the need for more carefully targeted, more purposeful, and better-funded initiatives in the United States and in other countries to attain a higher level of delivery of information and services. Meeting the needs of the planet with a rapidly aging population with higher proportions of people with disabilities will strain resources now and in the future. Satisfying those needs and "ramping up" currently existing structures and processes to deal with ever-expanding volumes of unsatisfied demands for information and service delivery can be attained through wider application of e-government and through enhanced capability of online resources to provide ease of use, content and information, interaction, and accountability. To do so will require heavier commitments of resources and the political will to overcome resistance to the needed innovations. Developments such as the election of Barak Obama as president of the United States may portend the emergence of governments with the capacity and will to resolve these needs.

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KEY TERMS AND DEFINITIONS

Accountability: making the best quality resources and services available by being responsive to the needs of target populations (responsiveness), providing satisfactory services (satisfaction), and building trust among users (trustworthiness).

Aging and Disability Resource Center (ADRC): a policy initiative by the U.S. Department of Health and Human Services to provide information and referral assistance for adults over age 60 and persons with disability age 19-60, implemented in some states as a primarily online system.

Content and Information: the core element of e-government services, spanning seven major life domains: health, family, legal, finances, community support, environment (Housing/Assistive Technology), and life's transition and changes.

Cronbach's Alpha: provides a measure of the reliability of a scale formed by a linear combination of separate items, which in standardized form is a function of the average correlation of the measures underlying the scale.

Ease of Use: the ability to find desired information, helpfulness of the information provided, speed of loading, navigability, Website design, font size, trustworthiness of the information provided, finding needed services, convenience for finding services, whether the observer would recommend the Website to a friend or relative, and comfort using the Internet to get information

E-Government: delivering government services through a Website or information and communications technologies (ICT)—can provide quicker and better services (Daukantas, 2003; Holmes & Miller, 2003), improved interactions with business and industry (Krueger, 2002), citizen empowerment through access to information and participation (Takao, 2004; Watkins, 2004), or more efficient government management (Cohen & Eimicke, 2001).

Gray Gap: the tendency for older demographic groups to lag behind younger cohorts in information and communications technology literacy.

Interaction: the availability and levels of customized option and feedback components, including a discussion board (or Bulletin Board Service), log-on capacity, the ability to save visit information, search history, and integration of customized functions with the government's administrative process, such as by providing easy access to e-application forms for any agency.

APPENDIX A

U.S. Section 508. In 1998, Congress amended the Rehabilitation Act of 1973 to require Federal agencies to make their electronic and information technology accessible to people with disabilities. Section 508 was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under Section 508 (29 U.S.C. 794d), agencies must give disabled employees and members of the public access to information that is comparable to the access available to others. Section 508 also requires that individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities, unless an undue burden would be imposed on the agency.

Chapter 9
Teleworking and the "Disability Divide"

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ABSTRACT

Much of the discourse on the digital divide focuses on issues of information disparity and accessibility, frequently in socioeconomic terms. This perspective overlooks an important aspect of the digital divide, the lack of access and missed opportunities faced by persons with disabilities, referred to here as the "disability divide." Barriers to access and knowledgeable use of information and communication technology (ICT) represent more than simple exclusion from information to encompass social segregation and devaluation. At its most insidious, barriers to ICTs limit full community engagement in employment activities. This chapter examines the ramification of the impact of digital divide on the nature of employment and participation in the workplace, using ICT to conduct telework, and explores challenges to social policy with respect to 'reasonable' accommodations. In the absence of practices, structures, and policies targeting the distributive work environment, telework is much less likely to close the digital divide for persons with a disability. This suggests the need to explore and develop potential policy options to close the disability divide.

INTRODUCTION

The digital divide is a broad concept whose basic assumptions are contested (Barzilai-Nahon, 2006; Hall, 2003; James, 2005; James, 2008; Vehovar, Sicherl, Husing, & Dolnicar, 2006). The concept finds its origins in media and government reports dating back to the mid-1990s, entering scholarly discourse a few years later, and quickly building

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momentum since then, with 440 papers in the ISI Web of Science at the beginning of 2006 (Vehovar et al., 2006), and 975 publications identified (by topic) in the ISI Web of Knowledge in the latter part of 2008 (ISI, 2008). At its most basic level, the digital divide has been defined in terms of the gap in information and communication technology (ICT) use. Although ICTs are inclusive of a broad range of technologies, including computers, videoconferencing, intranets, and mobile telephones, ICTs are most commonly used synonymously with the Internet, which provides the infrastructure for most ICT devices and applications (Bayo-Moriones & Lera-Lopez, 2007; Hull, 2003; Triggs & John, 2004). One contested assumption is the strength and direction of the relationship between the digital divide, as a divide between ICT 'haves' and 'have-nots,' in addition to broader, off-line social disparities (Mehra, Merkel, & Bishop, 2004; Vehovar et al., 2006). The confounding of social inequality and access to ICTs is not disputed; however, there are unresolved questions about the context of the digital divide in poverty, rural areas, and developing countries. Also problematic is framing the digital divide simply as an aggregated distribution problem requiring scaled up infrastructure (Barzilai-Nahon, 2006; Hull, 2003; James, 2005; James, 2008; Vehovar et al., 2006). Social exclusion is a common denominator for marginalized individuals and populations, for which barriers to both access and informed use of ICT characterize their experience of the digital divide (Mehra et al., 2004; Vehovar et al., 2006). Indeed, access and use of ICT is a central concern for makers of public policy (DiMaggio & Hargittai, 2001). For example, there is well documented research demonstrating the existence of a "digital divide" in our society in terms of access to, availability of, and use of ICTs (Hoffman, Novak, & Schlosser, 2000; Light, 2001; Hargittai, 2002, 2003; Warschauer, 2003). Furthermore, the divide tends to exist along racial and socioeconomic lines, the same demographic characteristics that have stratified society in general (U.S. NTIA, 2000; U.S. NTIA 2002; Callison, 2004; DiMaggio & Hargittai, 2001; Robinson, DiMaggio, & Hargittai, 2003).

Persons with disabilities are a marginalized group for whom the digital divide presents some unique challenges (Guo, Bricout, & Hung, 2005). For example, the obstacles that must be navigated and surmounted by persons with disabilities in accessing ICT and its content have led to an additional dimension of the digital divide encompassing design, interface, and usage factors, collectively known as usability factors (Gyi, Sims, Porter, Marshall, & Case, 2004; Roberts & Fels, 2006; Ward & Townsley, 2005; Wattenberg, 2004). Usability is the key to unlocking the full potential of ICT, particularly for persons with a disability. Web accessibility standards, although considerably more disability-friendly than in the past, still leave room for improvement (Sevilla, Herrera, Martinez, & Alcantud, 2007). Defined as a product's ability to facilitate the efficient, effective, and satisfactory attainment of defined goals in a specified context (Sevilla et al., 2007), usability is ultimately predicated upon the user's digital literacy. Indeed, to address the 'informed ICT use' gap in the digital divide, users must develop digital literacy skills, namely online skill in terms of efficiency and effectiveness of browser use, Internet-related knowledge, Web experience, and computer use skill (Hargittai, 2005; Hohlfeld, Ritzhaupt, Barron, & Kemker, 2008).

Telework, or work (related) activities conducted at a distance through the medium of ICTs, as it is performed in the early 21st century, is predicated largely on the notion of Internet accessibility, either as a medium for worker communications (e.g., e-mail, voice over Internet protocol, instant messaging services, etc.), a tool for carrying out essential work functions (i.e., online research via the World Wide Web), or as a means for connecting to the physical workplace through secure websites or a virtual private network (VPN). These various uses of the Internet as part of telework suggest that accessibility of the Internet by persons with disabilities is also an important consideration for telework. Among stakeholders concerned with disability-related access to ICTs (i.e., e-accessibility), there are concerns not only about having, accessing, or using the technology, per se, but also about barriers to the content of the Internet and World Wide Web (U.S. Department of Commerce, 1999; Margolin, 1998). There are a number of websites that contain barriers to access for persons with disabilities resulting not only from design flaws, but also from a general lack of awareness and ad hoc accessibility implementation (Yu, 2002). The types and nature of barriers faced by persons with disabilities have grown over the years with the transformation of the Web into a multimedia, graphic-heavy medium that cannot easily be parsed by screen readers unless steps are taken to remediate these barriers to content access (Heim, 2000). There have been some attempts by the federal government to address issues of access by mandates and rulemaking, such as the Section 508 amendment to the Rehabilitation Act of 1973, which requires that all electronic and information technology developed by the federal government (including websites) be accessible for those with disabilities (Hackett, Parmanto, & Zeng, 2005).

With appropriate foresight and innovation, incorporating considerations of context, usability, and digital literacy, ICT can help overcome digital divide-related social exclusion for persons with disabilities. In this chapter, we consider how telework, or remote work using ICT, when properly configured and implemented, provides employment opportunities for persons with disabilities and has the potential to leverage social networks to the benefit of social capital, social learning, and social inclusion. We argue that policies, practices, and structures ensuring inclusion are needed for telework to make strides towards closing the digital divide for persons with a disability.

BACKGROUND

The Digital Divide and Persons with Disabilities: The "Disability Divide"

Policy researchers have called attention to the fact that there are aspects of the digital divide that are specific to individuals with disabilities (Jaeger, 2006; Goggin & Newell, 2004; Dobranksy & Hargittai, 2006). The term "disability divide," a variant of digital divide, has begun to appear in scholarly literature, and refers generally to the wide range of ICT barriers experienced by persons with disabilities. Use of the term "is meant to refocus awareness of how the digital divide… affects persons with disabilities specifically, and to address the gap that remains between able-bodied and disabled people despite advances in assistive technologies and more widespread awareness of implementing universal design" (Baker & Bellordre, 2003). A recent publication (RTC Rural, 2006) on the digital divide for persons with disabilities compared and analyzed several national surveys. The results suggest that economic, political, and social participation depends increasingly on the ability to use and access ICT (Hargittai, 2003; Jaeger, 2006). Data from a report by the U.S. National Telecommunications and Information Administration (U.S. NTIA, 2002) noted that, as of 2003, less than 30% of persons with disabilities aged 15 or over use the Internet, compared to 60% without a reported disability. The report also revealed that about 45% of those with disabilities own computers, compared to 72% of their counterparts without disabilities. Data also suggest that persons with disabilities face an additional barrier when living in rural areas, where telecommunications availability is less prevalent (Enders & Seekins, 1999).

Persons with a Disability

Persons with a disability are not a monolithic group. The contexts in which they live vary, for instance, rural and urban, and will have an impact on their access to ICT. So, too, will their socioeconomic status, although it is, on average, very low around the world (Garcia, 2002). The individual's type of disability will also have implications for our analysis. For example, the Web has been made more accessible for individuals with sensory disabilities (vision and hearing) than for individuals with cognitive disabilities (Sevilla et al., 2007). Disability type also introduces a rather large unknown factor into our considerations of telework arrangements because the extant research literature on telework for persons with a disability is rudimentary and characterized by small purposive samples, making it impossible to know what populations have adopted home-based telework, for instance, and what systematic differences are implied in designing and implementing disability-specific protocols, interfaces, and supports (Baker et al., 2006; Bricout, 2004). There is, however, anecdotal evidence gained through case studies of telework training and placement outcomes involving persons with a variety of sensory, physical, and cognitive disabilities. This evidence suggests that telework is a viable option for many persons with a disability (Anderson et al., 2001; West & Anderson, 2005), and in principle, telework arrangements incorporating principles of usability, Web accessibility, ICT use, and networking capabilities, ought to enable telework that decreases the digital divide.

Disability, ICTs, and the Workplace

The increasingly widespread use of ICTs has opened new possibilities for both meta-geographic and virtual interaction (Cairncross' "death of distance") in social, community, and work environments (Cairncross, 1997; Millar & Choi, 2003; Van Alstyne & Brynjolfsson, 2005). However, bridging distance is only one aspect of closing the digital divide for groups such as persons with disabilities. Much of the literature on the digital divide focuses on issues of information disparity and accessibility. While critical, this perspective overlooks an important aspect of the digital divide, the lack of socio-political access and opportunity faced by persons with disabilities, referred to here as the "disability divide." For these populations, the inability to access and use ICTs represents more than exclusion from information. For many people with a disability this exclusion is a significant barrier to full engagement in employment activities. For exclusion to be decreased, the medium must also support networking capabilities that positively benefit well-being and social status (Grimes, 2000; Hopkins, Thomas, Meredyth, & Ewing, 2004; Hull, 2003). Work-related ICT use may promote such positive networking. For example, ICTs allow not only expanded work possibilities, but more broadly, they permit expanded networked learning opportunities characteristic of telework when optimally implemented. In contrast to telecommuting, in which the work is primarily shifted in locale, teleworking is a restructuring of the tasks to be accomplished with the larger work setting which could result in "work" being done remotely, or collaboratively with coworkers (remotely or not) using ICTs (Baker, Moon, & Ward, 2006). For persons with a disability, ICTs provide both accessibility and an immediacy of supports that might not otherwise be possible, especially in the case of home-based employment (Houlihan et al., 2003; West & Anderson, 2005). Such an assessment of telework is consistent with the assumption that, within the workplace, proximate (or "traditional") workplace support for persons with a disability enhances opportunities for participation. It is sometimes presumed that the best opportunity for creating environments receptive to full participation is found in the proximate environment where persons and environments are mutually shaping, allowing customized supports, rather than in a remote system infrastructure (Williams, Bunning, & Kennedy, 2007). Indeed, there is empirical evidence (Seekins, Traci, Cummings, Oreskovich, & Ravesloot, 2008) to support the perspective that close-in environments can be adapted for enhanced supports, particularly with respect to accessibility and participation. Further, research on accessibility suggests that barriers to work are features of the work environment or events that reduce accessibility, and that once removed, enable successful job performance (MacEachen, Clark, Franche, & Irvin, 2006). The notion of work that underlies this perspective is task performance-focused. This view, however, presents a misleading picture.

In addition to purely physical barriers, persons with disabilities also experience a distance from, or lack of, social inclusion in the workplace. Persons with a disability often report having fewer ties to individuals and groups outside their immediate social networks than non-disabled persons – to their detriment in situations favoring extended work-related social networks (Carey, Potts, Bryen, & Shankar, 2004; Ruesch, Graf, Meyer, Rossler, & Hall, 2004). This suggests that the inherent capacity of telework to promote and sustain more remote social connections is important. Telework can facilitate the development of distributed (online) communities of practice (CoPs), expanding the boundaries of an in-group that shares a professional identity, experience and language to encompass a distributed network of co-workers/peers and supervisors. It has the capacity to draw upon explicit knowledge from electronic media and interpersonal exchanges (Lee, Shin, & Higa, 2007). The online CoP facilitated by telework, when situated in supportive corporate culture and high task interdependence contexts, may become the basis for increased knowledge exchanges, with the caveat that in the short-term, teleworkers adapting to new technology may actually decrease both the flow of their communication and narrow its focus, resulting in less exchange of implicit knowledge (Belanger & Allport, 2008). Online CoPs provide a learning medium conducive to informal social learning, as well as more formal didactic learning (Gochenour, 2006), further increasing the teleworker with a disability's participation as a valued an active contributor in the work process. The focus on CoPs, social capital, and knowledge should not obscure the fact that persons with a disability have often been socially excluded from the offline community, including the workplace (Bates & Davis, 2004) requiring both legal and statutory remedies of which the 1990 Americans with Disabilities Act (ADA) is the most prominent.

To characterize work as only a series of tasks performed with or without external supports seriously under-describes the nature of work. Admittedly the shift from a conceptualization of work as attached to a specific individual and locale to a focus on tasks to be accomplished represents a paradigmatic shift. However, with few exceptions, work is a form of social activity that relies on social learning and cooperation and/or and coordinated efforts of multiple workers. Both work and workplace learning are inherently social in nature, and therefore 'distributed' in a network that incorporates both proximate and distal elements, as well as other aspects, such as affective and instrumental ties (Choi & Kim, 2007). The complex nature of social ties and its profound impact on telework is illustrated in studies on home-work balance for teleworkers which suggests that the proximity of telework to family life may be detrimental to the work-life balance, a negative consequence of the boundary eliding accessibility of the virtual work medium (Montreuil & Lippel, 2003; Raghuram & Wiesenfeld, 2004). Although comparable studies (see Lapierre & Allen, 2006) have not been conducted using teleworkers with a disability, the importance of family supports for persons with disabilities suggests that home-based telework should be designed and implemented in such a fashion that proximate (familial in this case) supports are not overburdened, but rather operate in concert with distal ICT-mediated network supports.

The assumption that proximate supports typically lead to increased "participation" is thus cast into doubt in the context of workplace participation for people with a disability. Reinforcing the importance of balancing immediate (proximate) and distributed (remote) social network supports, there is a large body of research literature (Kavanaugh, Reese, Carroll, & Rosson, 2005; Spence, Schmidpeter, & Habish, 2003) underscoring the importance of weak social network ties and similar bridging social capital to favorable employment and economic outcomes (Carey et al., 2004). Individuals in the teleworker's immediate off-line social network provide the basis for "strong ties," or reciprocal affective and instrumental exchanges that bond the participants together. These bonds typically generate the trust and reciprocal aid that characterize social capital, sometimes referred to as the "social glue" that holds groups together, and as a form of implicit social contract for civil behaviors in the workplace (Liukkonen, Vitranen, Kivimaki, Pentti, & Vahtera, 2004). Social capital is not restricted to the strong ties of immediate groups. It can extend to individuals who are only tangentially (indirectly) linked to the focal individual, creating "weak ties" that create links to distal networks from which the focal individual can benefit. The social capital generated through weak ties is termed "bridging social capital", traversing the social space between disparate networks with bonds of mutual trust and reciprocity (Bates & Davis, 2004). Of course, this concept presupposes that there is a certain common understanding of the individual and his or her capacity (perceived or otherwise) to work effectively, and to engage socially in the workplace, which is not always the case.

KEY ISSUES AND PROBLEMS: DISABILITY AND WORK

According to the ADA the social isolation and marginalization of persons with a disability has deep socio-historical roots: "historically, society has tended to isolate and segregate individuals with disabilities, and, despite some improvements, such forms of discrimination against individuals with disabilities continue to be a serious and pervasive social problem" (ADA, 1990). While an awareness and analysis of the challenges faced by persons with disabilities has become more common in many social sciences, this attention is relatively new and has only begun to be supported by scholarship on the matter (Barnartt, Schriner, & Scotch, 2001). This relative paucity of academic scholarship may be due, in part, to the complex array of conditions, and characteristics that fall under the rubric of "disability", as well as to the diversity of policy arenas and stakeholders. While there are good reasons to agree about the importance of including the many voices that constitute the disabled community in the formation of policy, the creation of sound public policy, by its very nature, involves normative assumptions about those social groups protected and constrained by these policies. In the broadest terms, what is necessary is a careful review and assessment of the appropriate concepts and methodologies, as well as extant private and public policies, regarding their impact on issues of disability, accessibility, accommodation, and integration. Our focus here relates to issues of using carefully designed and implemented telework arrangements as a means of leveraging access to online social capital, social learning and social inclusion for persons with disabilities, thereby decreasing the digital divide. This is an especially important subgroup of the larger group of persons with disabilities since the presence of a disability affects both earnings and 'worklife' expectancy (Gamboa et al., 2006). Moreover, for people with one or more disabilities, the opportunity to work is often an important element for their development and maintenance of social relationships, as well as for their sense of health and well-being (Ross & Mirowsky, 1995).

Prior to the passage of the ADA, national health policy debates tended to overlook or ignore the needs and concerns of 19 million persons with disabilities (DeJong, Batavia, & Griss, 1989). While the ADA was a significant milestone for persons with disabilities by overcoming many of the barriers that prevent their full participation, it has not translated into a complete elimination of employment disparities for persons with disabilities. What evidence is there to suggest that, despite efforts such as the passage of the ADA, there remains a failure to integrate persons with disabilities into the workplace at a level commensurate with the employment rates of people without disabilities?

According to Zola (1993), the number of people with a disability varies considerably depending on the definition or measure of disability used. One common approach uses data from the Current Population Survey (CPS) to demonstrate that the employment-population ratios for persons with disabilities deteriorated over the 1990s (Hale, 2001). The problem, as pointed out by Hale, is that current CPS questions on work limitation and disability lack a specific definition of the meaning of "disability." As a result, the CPS lacks validity as an identifier "of persons with disabilities." Thus, while some studies on disability and employment have used CPS data (e.g., Yelin & Katz, 1994) most studies make use of other national data sources.

The failure of integration and subsequent exclusion of persons with disabilities from opportunities for employment often leads to an attenuation of social contacts and social support. Although conventional views of work often characterize it as difficult, arduous drudgery, this narrow view fails to capture the personal and social contexts in which work occurs (DesJardins, 2009). Majid Turmusani (2001) has observed that work, both in terms of one's employment status and the type of job a person has, is a key determinant of status and identity formation in almost all societies. The perceived inability of a person to work, even if only a function of organizational norms about the location and nature of the work, is part of the stigma associated with being disabled and dependent. The concepts of both "disability" and "adulthood" in modern societies are understood in terms of work and employment. Disability, in particular, has been consistently defined by perceived "inability to work" (Priestly, 2003). According to a broader conception, stigmatization can occur when elements of labeling, stereotyping, separation, status loss, and discrimination are present in an environment that allows them (Link & Phelan, 2001; Sayce, 2003). This stigmatization and subsequent marginalization or exclusion from employment and employment opportunities also contributes to significant health inequalities experienced by disabled people compared to non-disabled people (Melville, 2005).

Even in those cases in which businesses offer some employment opportunities for persons with disabilities, the failure to fully integrate them into the processes and decision-making activities of the organizational workforce often leads to a widening in the gap between those with access to social capital and those without (or having less) access to social capital. Putnam (2000) observes that the core idea of social capital theory is that social networks and interpersonal ties can generate trust and reciprocity as normative values. In this respect, social capital is one such recourse available to an actor in virtue of the actor's role and position within a set of social and organizational relationships (Melville, 2005). The common thread in these and other characterizations of social capital is that it is a resource (power) to which individual actors (or groups of actors) have access to in virtue of their position and role within a social network.

The failure to integrate, in a meaningful way, disabled people into the organizational workforce effectively limits the social capital available for the disabled person. Marginalizing and generally placing limits on a person because of perceived disabilities serves both to stigmatize the individual and to restrict his or her ability to make use of resources available to people more connected within the organization's network. This also affects the organization since having employees who are unable to take advantage of the social capital to which other employees performing comparable kinds of jobs and tasks have access reduces the overall efficiency and effectiveness of the organization. Accepting the assumption that "a positive impact" is created by social capital on the transfer, generation, and use of knowledge (Lesser & Prusak, 1999), then marginalizing and or failing to fully integrate persons with disabilities into the organizational workforce is a suboptimal solution for maximizing knowledge creation, sharing and use, and organizational efficiency and effectiveness.

An ancillary effect of the marginalization of persons with disabilities, although mitigated when employed, is that their social networks tend to be less extensive than for those without disabilities (Bates & Davis, 2004; Forrester-Jones, Jones, Heason, & DiTerlizzi, 2004). In the context of using social networks as a key to understanding social capital, there are fewer opportunities for disabled people not integrated into the workforce of the organization to participate in and build CoPs. Membership and participation in CoPs can be distinguished from participation in workplace teams or in formally defined work groups within the organization. Participation in CoPs can go beyond just working as part of a team, to actively participating in the processes of social communication and the construct of identities in these communities (Lueg, 2001). This sense of identity, based on shared interests and perceptions of the world, is an important element of CoPs. To the extent that the failure to integrate persons with disabilities into the organizational workforce eliminates or inhibits the formations of CoPs, there will be a loss of social and personal identification of persons with disabilities with one another and with other, non-disabled workers in the organizations. Provided that adequate and appropriate accommodations are in place, and structural barriers to performance are removed (Wilton & Schuer, 2006), persons with a disability can contribute positively to an employer's overall diversity efforts with attendant economic benefits (Ball, Monaco, Schmeling, Schartz, & Blanck, 2005). Failure to institute such workplace community supports leads to a greater likelihood of social and personal isolation by workers with disability (at least regarding their workplace activities). Moreover, the adverse outcomes are not limited to the marginalized persons with disabilities; they also accrue to the organization itself as positions are deskilled and value systems are eroded (Wilton & Schuer, 2006). The failure to integrate persons with disabilities into an organization's workforce not only affects persons with disabilities in a negative way; it also affects the organizational capacity and human capital in a negative way.

RECOMMENDATIONS: THE VIRTUAL WORK ENVIRONMENT

Therefore, as noted above, given that persons with disabilities face many barriers to full inclusion in the workplace and an attenuation of work opportunities, how can ICTs help bridge this special case of the digital divide? One approach, and the one we advocate in the chapter, is by expanding the notion of the workplace to include a virtual environment. Thus, place is no longer a principally spatio-geographic notion but is instead a "space of opportunities." Thus, the traditional conception of work is expanded to include telework. As we have previously argued, telework is conducted at a distance through the medium of ICTs. Hence, the conduct of telework is non-local in a strict geographic sense. It is physically dispersed and distributed along a network that may include non-teleworking co-workers, with psychosocial implications for the entire work community (Golden, 2007). Teleworkers, in a broader sense, are understood to include those for whom telework is their only work mode (so-called substitutors), those for whom it supplements their office work, and those who are self-employed (Schwitzer & Duxbury, 2006).

The Community of Work

Although common parlance favors the phrase "community **at** work" (author emphasis), the phrase "community **of** work" (author emphasis) seems more appropriate for telework. The distributed nature of telework potentially extends the locus of work performance beyond the physical brick-and-mortar workplace, to include issues of identity, trust and commitment, organizational and interpersonal, to persons and place unseen, but nonetheless felt, and more importantly, acted upon (Robey, Khoo, & Powers, 2000). As noted above, for persons with a disability, social integration in the workplace may prove challenging, whether due to the relatively limited experience or behavioral repertoire of the individual, functional limitations, or limited capacity or receptivity on the part of the work environment to foster mutuality and adaptations that integrate the worker with a disability (Carrier, 2007; Holmes, 2003; Ward & Baker, 2005).

While much of the research literature on the workplace social integration of persons with a disability has tended to focus on task-related exchanges or relational exchanges independent of work referents, a recent sociological perspective on the interactions between person and environment, posits a mutual adjustment that occurs between workers with a disability and their non-disabled co-workers (Carrier, 2007). In a qualitative study of ten cases (situations) involving workers with an intellectual disability receiving services from one of three public rehabilitation centers, Carrier found an asymmetric co-adaptation with more of the observed adjustment coming from non-disabled co-workers. It is reasonable to anticipate different outcomes for individuals with different functional disabilities, for which empirical research must be conducted however, the importance of co-adaptation and mutuality can scarcely be overstated as a fundamental precondition of social integration. Social integration is thus framed in terms of person-environment transactions, with implications for social capital (trust and reciprocity), social networks (network ties), human capital (personal resources), and perhaps most centrally, learning (social learning), which both draws upon the other elements (social capital, social networks, human capital) and contributes to their quality. Workplace learning is a core concept in understanding how telework may mediate the digital divide for persons.

Learning

Learning has two dimensions; *personal*, as mediated by the individual's knowledge, experience and cognition, and *social*, drawn from the experience and knowledge of others, together with documents, communications, artifacts, and embedded features of the physical environment (Becker, 2007; Eraut, 2007; Roan & Rooney, 2006). Personal, or individual, learning is strongly influenced by the social environment, and, in that sense, is social in nature. Moreover, there is evidence of collective group learning being greater or – in the case of "group think" – lesser than the sum of the individual parts (Duguid, 2005; Pelling, High, Dearing, & Smith, 2008). The social nature of learning exposes it to the same contradictions found in social capital and social networks; namely that a narrowing of perspective, an orientation that is exclusive rather than inclusive of new or challenging information, or even an outright denial of discordant information (Pelling et al., 2008; Roan & Rooney, 2006).

Properties of Workplace Learning

Mainstream employment for persons with a disability, referred to as competitive or open employment, is associated with social inclusion, social capital, and community participation (Bates & Davis, 2004). Learning, particularly in its social context, has the potential for increasing social inclusion and social capital (Bates & Davis, 2004). Workplace learning, in contradistinction to vocational skills training, includes non-formal as well as formal learning; planned and unplanned (incidental) learning and yields, among other things, complex teamwork-related skills (Clarke, 2006). Social networks are instrumental in supporting computer-mediated collaborative learning environments of distributed learners (Cho, Gay, Davidson, & Ingraffea, 2007). Distributed social learning networks are strongly influenced by the existing social ties of network members. Among members who possess more effective communication styles, a more central position in the network and a more entrepreneurial personality will benefit more from emergent collaborative social learning (Cho et al., 2007). This translates into purposefully building relationships, largely non-local ties, and attending carefully to communication and personality factors. Cho and associates (2007) note that network structures and structural positions do not account for all the variation in individual collaborative learning outcomes. For teleworkers with a disability, who may for a variety of reasons have more limited existing social ties and skills, leveraging social networks for collaborative learning may involve mentoring, formal and informal, in the context of on-the-job learning. A particularly suitable vehicle for such mentoring, as well as for transmitting work-related social learning is the online CoP as a forum for building professional and peer relationships and learning (Wattenberg, 2004).

Within the context of the workplace, CoPs structure and reflect social learning and define the competence of a group that is banded together by a sense of joint enterprise, mutuality, and a shared repertoire of communal resources. These are the social learning systems that one commonly finds in workplaces (Wenger, 2000). Non-formal learning, unlike the learning that arises from formal training, is situated in the exchanges between individuals; learning that takes place within CoPs is situated learning, shaped by the forms of social interaction and the type of collaborative work in a dynamic fashion, informed by structural aspects of the community, the relative status of its members and societal context (Amin & Roberts, 2008; Roberts, 2006; Robey et al., 2000; Williams, 2007). In the case of telework, with its dispersed workforce and limited or non-existent opportunities for proximate exchanges and locally situated learning, what Roberts terms the "spatial reach" and boundaries of CoPs are extended, but "relational proximity" is still obtainable using ICTs (Roberts, 2006). The question remains: What are the upper limits, structural and epistemological, for the situated learning that takes place in attenuated CoPs? In other words: When does situated learning in the telework distributed workplace cease to have meaning or effect?

Bridging the Digital Divide: Telework

Telework involves work conducted from a remote site at least one day a week using ICTs, which means that work performed through that medium will be distributed and non-local. However, this definition masks variation within the scope of telework which has strong implications for its character as a distributed work form. The heterogeneous nature of telework, which varies by location (home, mobile, telecenter, satellite office), the nature of the work (self-employment, full-time or part-time work, contract work), the circumstances of telework (return-to-work, new employment), and its proportion to office work (part-time, full-time, occasional) is consequential to the nature of the CoP and the environment in which workplace social learning is situated. Clearly, it also has implications for the social networks which bear part of the relational load of social learning. Home-based telework may be the most advantageous form of telework for persons with a disability due to the proximate supports of the home environment (West & Anderson, 2005). A hybridized telework-office work arrangement, in which the teleworker intersperses telework with regular office-based work and/or supervision, has sometimes been found to have advantages over a telework-only arrangement (Garrett & Danziger, 2007; Shia & Monroe 2006). But for persons with a disability, telework-only arrangements may be preferable because they eliminate the need for travel and office-based accommodations. Thus, the context for discussing telework as distributed work for persons with a disability is home-based telework with no office component.

Distributed Teleworkplaces

By virtue of its distributed nature, telework represents an increasingly important strategic choice for employers, informed by personnel, human resource, market, and cost considerations (Illegems & Verbeke, 2004; Kowalski & Swanson, 2005; Watad & Will, 2003). Thus, the decision to adopt telework, as well as the explicit forms that it takes, is the product of complex factors, resulting in unique adaptations depending upon the context (Ndubisi & Kahraman, 2005; Neufeld & Fang, 2005). Telework encompasses heterogeneous work arrangements, including full- or part-time employment, alternative work arrangements (i.e., temporary work or through employee leasing), self-employment or independent contracting, and as a convenience in general, as well as an accommodation for persons with disabilities. The spaces in which telework takes place are similarly diverse, including homes, telecenters, mobile locations, and satellite offices. Regardless of the particular form of telework, social relations with co-workers, supervisors, and others in the distributed work environment are essential to effective performance (Golden, 2007; Wiesenfeld, Raghuram, & Garud, 2001).

For home-based telework to properly support CoPs as social learning systems, employers must promote participation in work-based communities (Roberts, 2006). This could be achieved by intensive virtual team work, document-sharing tools, as well as coordinated and cooperative, but independent, task performance and high job demands. These factors have been found to promote innovative (i.e., learning-intensive) behavior in virtual teams (Leede, Kraan, Hengst, & Hoof, 2008). During the initial training phases of the job, co-locating supervisor and teleworkers to achieve face-to-face communication is important to situated learning in virtual teams. These needs may be readily supplemented by remote communication of task and socio-emotional content using interactive remote communication media (i.e., videoconferencing, telephone) developing relational, as well as problem-solving learning resources, contingent upon appropriate managerial support (Robey et al., 2000). For situational learning to take place in attenuated CoPs, proper management support in terms of mentoring, performance appraisal and rewards are critical lest the learning process shut down for wont of competence guidelines, feedback, and incentives.

For persons with a disability, telework can provide not only an accommodation that removes barriers to work, but also when properly implemented, a platform for online participation in work-related social networks and social learning, to the benefit of the teleworker's social and human capital (Anderson, Bricout, & West, 2001; Baker, Moon, & Ward, 2006; Bricout, 2004). Preliminary guidelines are beginning to be developed to inform such efforts (Kaplan, Weiss, Moon, & Baker, 2006; West & Anderson, 2005). The network capacity-building properties of properly designed and implemented telework arrangements foster greater participation in the distributed community by virtue of increased engagement in online communities. By opening up new distributive networks for learning and professional development telework can generate human capital for persons with a disability more effectively than other forms of work.

CONCEPTUAL MODEL

Telework, as a form of distributed work, has the potential to provide a platform for increased participation in both online and offline domains. In particular, telework that is embedded in an environment that encourages the development of online relationships and exchanges has the potential for closing the digital divide. Empirical studies of online or virtual communities have been conducted since the early 1990s. However, more recent technological advances have expanded access to ICT as a social technology, producing a much larger and more diverse online community. This has occasioned a shift from user- or interest-specific online communities to emergent or 'organic' learner groups and collaborations, as well as a growth in Web-facilitated social networks for work and pleasure (Cho, Gay, Davidson, & Ingraffea, 2007; Ross, 2007; Sproull, Dutton, & Kiesler, 2007). Gochnenour (2006) has termed these developments "distributed communities," or geographically distributed social networks. Such networks are chiefly defined by relationships or connectivity among members, rather than passive group membership.

Voluntary association and choice have always been hallmarks of online communities, whether distributed communities, or emergent online communities. Indeed, the preferences, concerns and interests of the individuals who people the online communities generate idiosyncratic social structures. In other words, the individual's personality, social history, and lifestyle all impact the nature of online participation (Cho et al., Gouchenour, 2006; Ross, 2007; Sproull et al., 2007). Similarly, it has been argued that distributed work environments reflect the organizations from whence they emerge (Heen, Bjornholt, & Knudsen, 2008). The online social world appears to be an imperfect mirror of the offline social world however, inasmuch as high sociability online does not predict high sociability offline. Gains in online social world do not ensure similar gains offline; indeed, a study of Chinese Internet users with a disability found that while the Internet offered opportunities for more friends online, corresponding opportunities offline could not be assumed (Guo et al., 2005).

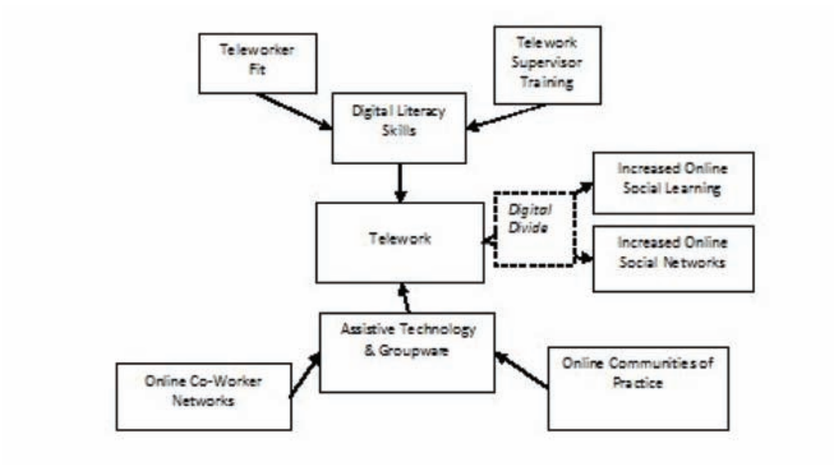
Thus, the mere fact that telework creates the potential for distributed community is not sufficient to close the digital divide. Rather, factors promoting sustainable online relationships, including teleworker, co-worker and supervisor supports for work problem-solving and professional development, foster an environment in which online social inclusion can flourish. Online social inclusion grounded in professional and/or occupational development has potential for breaking the online-offline barrier. Although beyond the scope of this paper, the potential for telework-based offline gains, extending beyond the digital divide to offline social exclusion and disparities cannot be discounted.

The conceptual model that we propose (Figure 1) describes the relationship between key elements of a telework arrangement optimally configured for increasing online social networks and social learning. The digital divide for persons with a disability is a reflection of accessibility to resources, learning, and services, both online and offline (Blackburn & Read, 2005; Guo et al., 2005; Konur, 2007), and is represented here as a dashed box.

Having properly selected and implemented assistive technologies, such as screen readers in the case of individuals with a visual impairment, or specially organized and formatted online content for individuals with a learning disability are critical to accessing the online social exchanges that will facilitate both knowledge exchange and relationship building, for the purpose of learning and building a sense of belonging. Instituting online co-worker networks, perhaps composed of office-based as well as teleworking co-workers is important in establishing workgroup practices and identity that promote online social networks and social learning, while online CoPs provide platforms for workers sharing a professional and/or occupational identity to further develop practical knowledge and skills that simultaneously build community and competence.

Groupware that supports online exchanges is equally fundamental. Digital literacy skills are

Figure 1.



indispensible for both teleworkers and supervisors, as is the 'fit' between worker and telework job, on the one hand, and proper training in supervising virtual work for front line managers on the other hand.

The net effect of this constellation of selection, training, development, and support activities is to increase the teleworker with a disability's participation in social learning and in social networks which are webs through which social capital flows, militating against the digital divide by closing gaps of usage, knowledge and resourced relationships.

FUTURE TRENDS

Opining about the future is a tricky business even when all of the current data are available, which is clearly not the case with telework and participation in distributed communities for persons with a disability. One approach to the question of future trends is to construct an empirical model that extrapolates from the present and targets those trends that are most compelling in the current environment; for example, in this time of high energy prices and an economy in deep recession, to assume a parallel rise in operational cost-cutting and energy-saving telework. Indeed, this may be at least a partial impetus behind a new telework bill for federal agencies moving through the United States Congress at this time (2008). However, history teaches us that trends propagate in unforeseen ways, so predictions of future trends must be made with care, by targeting emerging factors whose centrality to the design and implementation of telework is clear and unambiguous.

Thus, we draw upon our conceptual model to explore three emerging trends relevant to the conduct of properly supported telework by persons with a disability: (1) the diversification of the workforce (Wehman, Targett, Yasuda, McManus & Briel, 2007), (2) the diversification of telework 'feeders,' including non-profit referral and training programs, self-employment, and employee retention (human resource) programs in addition to traditional vocational rehabilitation services (Kallinikos, 2003; West & Anderson, 2005), and (3) the proliferation of alternative work arrangements (intermittent, temporary, part-time, etc.), influencing the impact of telework on social engagement (Heen, Bjornholt, & Knudsen, 2008; Malenfant, LaRue, & Vezina, 2007).

Each trend portends challenges to designing and implementing what we might call 'participatory telework.' Participatory telework involves a diverse workforce in a pluralist but highly interconnected society. It is grounded in an ethos characterized by greater interdependence in work tasks, flatter organizational hierarchies, and more inclusive environments. A more diverse, distributed workforce is supported by facilitating greater complexity in the creation of online relationships and knowledge building; similarly a more diverse workforce will require additional considerations in establishing teleworker fit and supervisor training. The diversification of pre-telework history and experience may well introduce systematic differences in the readiness of prospective teleworkers, and challenge the readiness of telework environments to reconfigure job development, training and ICT interface resources for distinctly different groups of teleworkers.. Alternative work arrangements are consequential to organizational membership, status, investments and incentives to generate full-blown participatory telework configurations, rather than partial, truncated or scaled-down telework configurations that will not have the desired effect of closing the digital divide.

A top-down, one size fits all, approach to the design and implementation of telework, or even a professional service delivery model, would be hard pressed to respond to such complexity. Self-directed strategies and approaches that vest key choices in the individual would seem to offer more promise. In particular, it will be important for individuals with a disability to have access to decision support tools that permit sound assessments of their readiness to engage in participatory telework, and readiness of the environment to support such telework. Practice guidelines derived from an evidence base of effective telework accommodations (Kaplan, Weiss, Moon, & Baker, 2006; Sanford & Milchus, 2006) become a point of departure for an assessment of the social dimensions of the distributive work environment. Participatory telework arrangements extend beyond evidence-based telework accommodations to include knowledge network skills and competencies that require a broader web of resources and supports intended for the longer term project of development, rather than immediate work performance. This focus on development, embedded in social network and social learning, is calibrated to increase employability and job tenure, as well as diminishing the digital divide by virtue of increased organizational commitment and added value to teleworker contributions. Organizations will need to undergo an evolution towards structures and policies that foster and incentivize social learning, social and human capital, and social networks, both at the organizational and individual level for their employees who telework (Clarke, 2006).

The distributive work environment must be considered an endogenous part of the organization, as tangible and real as the face-to-face environment, despite its virtual nature and incorporated into the organizational evaluation and planning processes. For teleworkers who are self-employed or independent contractors, networking becomes even more critical to fully exploit the possibilities of the distributive work environment for participation. Persons with a disability may face additional hurdles in this domain, because the prevailing notion of accommodation is tied to a short time horizon and immediate performance considerations, while underplaying the importance of social architecture of online exchanges, relationships and communication and the longer-term. This poses a fundamental challenge to social policy as the interpreter of reasonable or feasible accommodations. In the absence of practices, structures and policies targeting the development of the distributive work environment, telework is much less likely to close the digital divide for persons with a disability. The probability of logic or persuasion driving forward the necessary changes is low; rather, necessity in the form of global competition, economies of scale, high energy costs, and labor market pressures from workers' expectations of family-work balance, are likely, individually or in some combination to bring about a tipping point.

Short-term gains at the expense of longer-term viability and parallel incentive structures rewarding immediate performance goals over capacity and long-term value building will prove difficult to maintain in the context of global competition, scarcity and sustainability challenges.

CONCLUSION

The increasingly complex social and economic context of business represents both threats and opportunities to the inclusive, diverse workplace. The historical production-line, or factory, model of work becomes further and further removed from the reality of the workplace in light of the capabilities of modern ICTs. There is clearly a need to engage and fully exploit the tremendous scope of collective knowledge-worker abilities, competencies, and needs in the 21st century. We argue that the implementation of virtual workplaces, particularly, the use of participatory telework, which goes beyond the bounded notion of telecommuting, mandates reengineering the traditional idea of a fixed workplace environment. Most critically, the social and community processes that underlie the idea of work and objectives to be accomplished a developmental part of work, must be considered an essential organizational strategy, as tangible and real as the face-to-face environment despite its nontraditional "non-present" nature and actively incorporated into the organizational evaluation and planning processes. Participating in the virtual domain as a teleworker is not, by itself, a prescription for the digital divide facing persons with a disability. Participatory telework arrangements, characterized by good 'fit', access, skills, knowledge and learning networks go far beyond standard notions of accommodations, which provide a ramp without adequate consideration of user, context or destination; constituting what is in effect, a 'bridge to nowhere' unless supports facilitating greater social inclusion are deliberately incorporated.

Thus, systematic data collection involving case observations of enhanced teleworking, virtual collaborative platforms, teleprescence alternatives, and relevant digital literacy training would constitute first steps, to be followed by the distillation of these data into applied best practices and strategic implementations, is required. Organizational and institutional changes, emphasizing organizational learning that supports the growth of social networks, social capital and social learning as critical components of adaptability and workforce development are needed to fuel the adoption of telework, which has shown disappointing growth (Schweitzer & Duxbury, 2006), while at the same time ensuring that the telework arrangements will effectively address the digital divide for persons with a disability. Similarly, social policies that promote workforce development in the domains of information technologies can foster programs that upgrade the skills of workers and management to operate in virtual, distributed work environments, including online learning environments, while promoting digital literacy. In the absence of practices, structures and, policies targeting the distributive work environment, telework is much less likely to close the digital divide for persons with a disability. The probability of logic or persuasion driving forward the necessary changes is low. Rather, pressures for innovation, born of an era of necessity, are likely to force policy and practice changes favorable to participatory telework as a distributed work form that builds long term value, in part by decreasing the digital divide and its cost to a knowledge society in which every contributor is important.

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KEY TERMS & DEFINITIONS

Communities of Practice (CoP): Groups that structure and reflect social learning and define the group norms and processes, banded together by a sense of joint enterprise, mutuality and a shared repertoire of communal resources. They may be either online or face-to-face.

Disability Divide: digital divide as related to persons with disabilities, including lack connectivity, access, or exclusion from information technologies.

ICT: Information and communications technology, such as informatics, computers, web-based collaborative platforms, software applications.

Participatory Telework: Arrangements that build in customized or 'fitted' resources and supports to increase teleworker employability and effectiveness.

Social Capital: features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit (Putnam).

Social Learning: learning that takes place in a collective fashion, or in a social context.

Social Networks: structured social relations that carry informational and affective content.

Telework: Activities, tasks and participation, either separately or in the aggregate conducted at a distance through the medium of ICTs and group practices.

Workplace Participation: engagement and participation on work teams, and in the broader workplace community, either in situ, virtually or a combination of both.

Chapter 10
The Digital Divide and the Emerging Virtual Therapeutic System

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ABSTRACT

As the Internet becomes increasingly more and more ingrained in our society, the gap between those who have adequate Web access and those who do not will continue to widen. In the health, mental health, and disability sectors of society, technology helps provide access to previously unavailable information, communication, and services, allowing for greater independence, as well as 24/7 access to collaboration and support. The digital divide might prevent the people who will benefit the most from virtual services from accessing them. This chapter will explore systems of online health and mental healthcare, both formal and informal, the dependence on advanced networking technologies for these systems to be effective, and the impact of the digital divide on individuals' access to online health and mental healthcare. We will discuss the implications for both policy and practice.

INTRODUCTION

Health care is a major issue in American public policy. On one hand, Americans take considerable pride in having the most sophisticated and advanced heath care system in the world. While this system is formidable, it cannot address all of the American health issues and it cannot always deliver services in the way desired.

On balance, the cost of health care is high and access for many Americans is problematic. Large numbers of Americans lack health insurance and, for many who do have coverage, that coverage is inadequate. According to the United States Department of Health and Human Services (HHS), Americans paid 10.1 billion dollars for personal health expenses not covered by insurance in 2005. In 2006, approximately 25% of White Americans, 40% of Latino Americans, and 50% of African Americans were without private health insurance (National Center for Health Statistics, 2007).

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Coverage for many psychological problems and chronic health conditions is inadequate at best, and nonexistent at worst. Many individuals elect to forgo needed medical care when coverage is inadequate, which may result in preventable death and disability (National Center for Health Statistics, 2007). In 2005, individuals whose family income was less than twice the poverty level were more likely to report that they would forgo needed medical care.

Most of American policy discussions are about the formal health care system, or the networks of doctors, hospitals, and service providers who work for pay. In the recent American Presidential election, formal health care was a major debate topic of debate (Republican National Committee, 2008; The Democratic Party, 2008). Central to this debate was affordability and access to quality healthcare services. One of the major proposals from American President Barack Obama was to improve the quality of American health care by using technology. This cannot happen if Americans do not find some way to address the digital divide.

In addition to the formal health care system, there is an informal system of health care that fills in the gaps and provides services in a more personal way. Informal providers include family members, friends, and community members who provide support and assistance primarily through volunteer channels. This is particularly true in the area of mental health services and services for people who have disabilities (Malone, Kropf, & Hope, 2005).

Information and communication technology is a part of the formal and informal health care system and this influence is constantly growing (Slack, 1997). Fox (2007), as part of the Pew Internet and American Life Project, found that 86% of internet users with a disability searched for health information online, and that 56% reported a change in habits or thoughts as a result of their searches. Technology makes managing the finance and delivery options of the system more efficient and rationalizes many aspects of the system. Not only does technology make possible the development of new types of interventions in the formal system, but it also makes the same kind of innovation available in the informal system.

Technology and health care can take many forms from information management systems (e.g., billing databases, scheduling, electronic medical records) to telemedicine and telecare, which broadly include the provision of actual healthcare services such as blood pressure monitoring and intervention online. Discussion groups and chat can help bring together individuals who might otherwise be divided by geography or scheduling. Websites provide always-available access to health information from virtually anywhere there is a computer and a connection to the internet. These advances promise to increase the availability of services and information in a way not seen in any previous time in history.

There are limitations, however. The digital divide promises to deny these benefits to many who need services. As a result, those without access to advances in information technology may find it difficult to participate in the barter and trade of information in government and in society as a whole. As society's institutions move to cyberspace, those left out may be very alone (McNutt, 1998).

The digital divide is a moving target. Previous conceptions of the digital divide looked at low speed networking. Now there is a serious discussion of the "broadband divide" between those with broadband and those without. "Nontechnical" concerns such as literacy, exclusion due to disability, and cultural appropriateness may increase the probability that individuals will be left behind (Neuhauser & Kreps, 2008).

This chapter will discuss the formal and informal systems of healthcare, as they exist online. We will examine these systems and compare them in terms of adequacy, acceptability and carrying capacity. We will then analyze the impact of the digital divide on these two systems of care. Finally, we will offer policy ideas to address the problems that are uncovered. Our major argument is that efforts to address the digital divide will result in important benefits for both the formal and informal systems of health care and this will result in better outcomes for individuals with chronic health conditions, individuals with disabilities, caregivers, and the community at large.

BACKGROUND AND SIGNIFICANCE

The Digital Divide

The digital divide refers to inequality in access to the technology infrastructure and the skills to use that infrastucture. The Organisation for Economic Cooperation and Development OECD (2002) defines the digital divide as:

The term "digital divide" refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities (Organisation for Economic Co-Operation and Development, 2001, p. 5)

Although the term "digital divide" is of recent vintage, the issue is not new. Older concepts such as information inequality, unequal access and information poverty go back to at least the 1950s and perhaps back to the Communication Act of 1934. It re-emerged with discussions of the Internet and Information Infrastructure policies in the late 1980s and 1990s. Early studies looked at network access or computer access but later studies extended this analysis to look at other factors (McConnaughey, Everette, Reynolds, & Lader, 1999; McConnaughey, Nila, & Sloan, 1995). McNutt (1998) and Doctor (1994) argued that the factors that drive the digital divide consists of network access, technology and skills. Others have added efficacy and orientation to the list of explanatory variables (c.f. Compaine, 2001; McConnaughey et al., 1999; McConnaughey et al., 1995). One of the principal issues is adoption of technology as an innovation (Rogers, 2003) is not the same as the digital divide as a policy issue. The dividing line is often difficult to see. This is a serious problem when policy is created because policy instruments for addressing one set of issues are different from those aimed towards addressing the other issues.

The original findings of early studies looked at access to the Internet and technology. In this early research, authors reported that White and Asian American households with high socioeconomic status had relatively good access to the Internet, while African Americans and Latinos had far less access. There was also differential access between states, in rural or inner city areas and among certain age groups. In the past several years, this gap has started to close.

However, Americans now face a new isssue that of a divide in high speed Internet or Broadband adoption (Horrigan, 2008). This is critical because many of the newer web-based services, such as transmission of high-resolution scans, require higher bandwidth to function. This means that a second digital divide is emerging based on transmission speed and the means to use and process these data. As a nation, it may be difficult for the US to catch up with the rest of the world. See Pew Internet and American Life's research on this isssue (Horrigan, 2008).

The Internet was originally created as part of an American government project and was essentially noncommercial (O'Bannon & Puckett, 2008). That changed in the 1990s as more commercial firms moved in and e-commerce became a major player (National Academy of Engineering, 2008). The changing nature of the commercial part of the Intenet is also critical. The "Net Neutrality" debate in telecommunications policy could have real ramifications for how much of the evolving Internet health care providers would be able to use.

While there is no specific accepted definition of Net Neutrality, it typically refers to the idea that pricing should not be necessarily directly related to the amount of bandwidth used nor are content or content providers regulated. Hahn and Wallstein (2006) suggested that Net Neutrality might have a negative impact on high bandwidth technology, such as telemedicine. Bandwidth congestion might slow down transmission of information where time is of the essence. There seems to be little data on whether this would actually be the case. An article serch on the impact of Net Neutrality on health care did not return any results.

The digital divide remains a critical issue in the emerging online health care system. If it is not addressed, it will preclude a number of highly promising developments. As healthcare and caregiving continue to evolve, more and more information and interaction occurs online. Hospitals and formal care providers are placing information on the internet, and advances in communication are allowing services to be provided online. Informal care providers are heading online for information, interaction, and support. Therefore, the digital divide and how it affects access to quality healthcare is an issue that needs to be addressed.

Formal and Informal Systems/ Sectors of Care

Formal Systems of Care

The health care system in most societies consists of a formal and informal component. The formal component is the familiar system of health care providers, organizations, policies and financing mechanisms that provides healthcare services. It is done by professional practitioners within a professional milieu, from scheduling to prescriptions. This system provides professional services in a highly structured way and depends on a substantial body of what Friedman (1973) referred to as processed knowledge. People who are the clientele of the formal system are treated according to professional norms and values.

The formal health care system in the United States is a huge undertaking. According to the International Trade Administration (2007), “The sector consists of about 5,800 hospitals, 17,000 nursing homes, and thousands of physician offices and medical centers. This industry … employs nearly 10 million people” (International Trade Administration, 2007 para. 1).

The formal system offers many benefits to those that it serves. The treatment that it offers can extend life and improve the quality of life. Many diseases that were once thought to be death sentences are now easily managed through treatment, lifestyle change and pharmaceutical interventions.

This is not to say that the system lacks problems. In the United States, many are uninsured or underinsured. The Kaiser Family Foundation (2007) observed that 18% of all American under age 65 lacked health insurance. This means 46.5 million Americans do not have the coverage that would give them access to health care resources. This problem is even greater for mental health services. Many individuals who have adequate health insurance still lack coverage or adequate coverage for psychiatric care. While the Mental Health Parity Act requires that limits to coverage for mental health services equal those for medical and surgical benefits, employers still have the discretion to limit the scope of mental health coverage (United States Department of Labor, 2008).

There are other issues in addition to coverage. The American health care system is incredibly costly, accounting for 16% of 2006 United States Gross Domestic Product (International Trade Administration, 2007). As costs continue to grow, they stress all sectors of the economic system. Information technology, such as web-based case coordination software, is seen as one important way to reduce the cost of care by facilitating record and payment information and coordinating resources (Al-Hakim, 2007).

Another issue is the system's preference for tertiary care, as opposed to primary care. This not only increases the costs of the system but forces resources away from prevention and immediate treatment. Finally, there is the problem of Nosocomial infections (i.e., antibiotic-resistant infections typically contracted in healthcare environments; United States Government Accountability Office, 2008), therapeutic misadventures and other negative outcomes of medical treatment. All of these factors give one pause at entrusting the entire range of health care options to the formal sector.

Another serious issue for the formal system is noncompliance and avoidance of care. Regardless of the extent to which as treatment is effective in isolation from other factors, most treatment require a large amount of cooperation from the patient and often from his or her family and caregivers. At the very basic level, medical care cannot be effective if potential patients choose not to use it. This is a common occurrence in the health care field, and has been associated with psychological, physiological, and socioeconomic factors. In some cases, comprehensive case management teams are formed to increase compliance (Andal, 2008; Cruz & Cruz, 2001).

The side effects of contact with the healthcare system can also be a related issue to address. Nosocomial illnesses are often contracted through hospitalization. It is possible that the threat of infection may keep some people away from the formal healthcare system. Therapeutic errors also provide incentive to avoid the formal health care system.

The Formal System of Care and Technology

The formal system makes use of a substantial body of information technology to process information and schedule resources. The growing area of health informatics encompasses most technology used by most business organizations; it includes a growing list of telemedicine and telepsychiatry interventions. Technology has given us the ability to create many new and potentially effective interventions.

Information techology is one of the tools that can reduce and even prevent mistakes and infection in the formal healthcare environment. Decision support systems can add to clinical judgment and better communication (e.g., issues related to bad handwriting or unclear instructions).

Most formal care is done without information technology but formal care is often facilitated by technology (billing, scheduling and so forth). The emergence of on-line environments has created new possibilities for the formal sector. Some of those possible interventions are:

- **Virtual communities of practice:** Medical practitioners regularly consult with other practitioners about treatment techniques, outcomes, new interventions and so forth. The range of these resources is limited by the local community's resources. Virtual communities of practice, conducted over the Internet, can free local practitioners from those bonds and make available a wide range of resource professionals. Technology can support comparing case-notes, imaging and other materials.
- **Telemedicine/Telepsychiatry:** Telemedicine is a burgeoning field within the medical and health care sector. It includes a wide range of interventions that range from on-line consulting to actual medical proceedures done over the Internet. Telecare, which is more supported, can be considered as part of the Telemedicine field or as a separate category.
- **On-line psychotherapy:** Counseling and psychotherapy over the Internet has moved from a possibility to a rapidly approaching accepted practice. There are a number of types of treatment than can be conducted on-line (Mallen, Vogel, Rochlen, & Day, 2005; Rochlen, Zack, & Speyer, 2004).

- **On-line information about self care:** The Internet has shown itself to be proficient in disseminating self case information to pateients and potential patients. Information on the internet, according to Ybarra & Eaton (2005), is classified into two groups: passive and active. Passive information refers to static websites. Active information harnesses the capabilities of Web 2.0 (see Bryant, 2006) to create an interactive sharing environment.

These technologies allow people with disabilities and health conditions to receive care in situations where that was previously not possible. This can mean over distance or in areas where health care professionals are not available or the right professionals are not available (such as a very narrow specialist for a rare disease). For example, much of rural America suffers from a deficit of health care workers, and this gap may be exacerbated for minority populations (Probst, Moore, Glover, & Samuels, 2004). Outside the United States, many nations need physcians and other health care professionals desparately.

While the Internet and other technologies cannot increase the supply of health care providers they can improve the distribution. The advent of easily available networked technologies has been a boon to the formal sector. It has allowed the system to cope with a dispersed population, managed care and cost containment and the discovery of new disease entities. They are run by professionals using scientifically developed knowledge and skills and are generally used in conjunction with face-to-face interventions to create a package of intervention. These technology solutions add to and supplement the system that is already in place.

Informal Systems of Care

The informal system on the other hand, consists of providers and systems that generally do not work through formal institutions. This might include natural helpers (such as ministers, bartenders and hairdressers), volunteers and other people. The system operates through community networks and other pathways to care. The informal system tends to deliver services in a more people friendly manner. It is less professional and less impersonal than the traditional health care bureaucracy.

The informal system operates on a very different basis than the formal system. The informal system is based on receiprocity, trust, networks and other aspects of health social relationships. This is what Putnam (2000) discusses as social capital. This is less formal mutual assistance that operates through existing social networks. This process has varying degrees of formality, ranging from friends helping each other through formally constituted groups like Alcoholics Anonomous.

News use, use of the internet, and media campaigns are considered sources of social capital – the actual or potential for resources acquired through interaction. Social support is considered the operationalization of social capital – the advice, mentoring, and emotional support that results in reciprocal trust and exchange of information (Beaudoin & Tao, 2007).

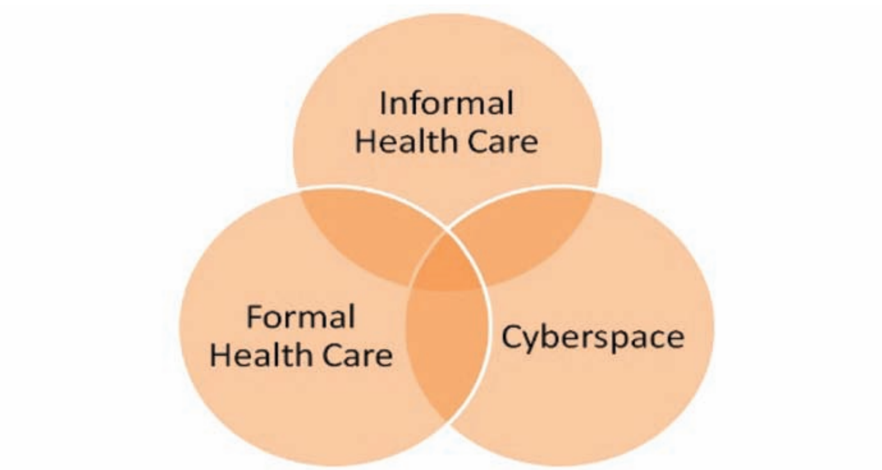
Social capital and social support are considered to be linked with more positive health outcomes, especially online (Beaudoin & Tao, 2007). According to Rice (2006) seeking health resources online is connected with increases in involvement, education, interaction, and social support. The internet provides services through a social format as opposed to an economic one – that is, most services are free of charge with no expectation of barter. The norms that informal helpers operate on vary greatlly from situation to situation. On balance, the stance of the professional system is often consistant, even over wildly varying cultures and settings.

Aside from patients and clients themselves, parents and family members are the most visible of the informal caregiving system. The impact of parents and families on the rights and care of those with disabilities and chronic conditions is well-documented in the literature. For example, the ARC, one of the older and more well-known advocacy and support groups for individuals with intellectual disabilities, was founded by parents in the 1930s to increase care, education, acceptance, and support for children with mental retardation (Hay, 1952).

Informal support is considered by most in the disability community as one of the most effective, and indeed preferred, avenues of support (Malone, Kropf, & Hope, 2005). Collaborative consultative models of caregiving and intervention are replacing the model of "professional as knowledge-giver". Individuals, families, and communities are being encouraged to be the preferred avenues of care. It has been suggested that almost 80% of advocates for individuals with disabilities are informal (Algert & Stough, 1998). Informal caregivers are more likely to speak out on behalf of individuals with disabilities, are usually more persistent, and support the individual as opposed to the disability.

- Informal caregiving systems and technology. Since technology has developed, we have begun to see more informal helping over the Internet. This includes websites and discussion groups, self-help groups on-line, networks of care and so forth.
- The informal care movement was an early adopter of the Internet. As early as 1993 Howard Rheingold (1993) was discussing the impact of power of virtual communities in providing support for those in crisis. Schuler (1996) also provided evidence that on-line support was both there and viable. Some of the ways that the informal system can use the Internet are:
- **On-line support groups:** Support groups are an important aspect of the informal system. These groups bring together people in similar circumstances (the person with a disability, the family, others) to provide emotional and often instrumental support. This can be done through webconferencing as well as discussion list systems. These on-line support groups are especially useful in situations where there are rare conditions (too rare for face to face support groups) and situation where distance or stigma makes face to face groups impractical. Bruwer and Stein (2005) found that individuals involved in two online informal support groups for trichotillomania (compulsive hair-pulling) found tips, support, information on how to talk to family members. It is interesting to note that many of the members of the support groups were not receiving formal care at the time of the study.
- **Self help groups:** Self help groups bring together people who are facing a problem or disease. Alcoholics Anonomous is a very well known example. Self-help groups typically comprised of clients/patients. The groups can and have moved on-line (Eyesenback, Powell, Englesakis, Rizo, & Stern, 2004).
- **One-to-one support on-line:** This type of support is similar to face-to-face online support except it happens on-line. This type of support usually happens in the context on-line communities.
- **Alternative information availability:** Alternative therapy information is often hard to obtain through standard medical sources. The Internet provides an excellent way to disseminate this material. It should be noted that not all of the health related material available on the Internet is reliable and some may be dangerous, although it is beyond the scope of this chapter to address information accuracy and quality online.
- **On-line advocacy:** Persons with health conditions and disabilities need both case and class advocacy. Case advocacy means intervening on behalf of an indidual or

Figure 1. The intersect between formal caregiving, informal caregiving, and cyberspace



family. An on-line advocate can be effective in this case by using a variety of skills aimed at making the system more responsive. Class advocacy means advocating on behalf of a group or class. The Internet community has had significant success in using this technology for changing public policy (Hick & McNutt, 2002; McNutt & Menon, 2008).

The informal system offers certain advantages to the formal system. While it suffers from a lower level of carrying capacity (i.e., the ability to support care) and may not be able to deal with more severe problems, it has the potential to deliver services in a more cultually appropriate ways and a way that many patients and families prefer. It can be more personal and less professional. Another advantage is that it is more likely to evolve into a systems change effort than professional services.

While there is misinformation available on the Internet, there is a good deal of off line material that is also suspect. Whether there is more suspect or unsubstantiated healthcare information online versus in print or face-to-face support has not been documented. A thorough discussion of efficacy and accuracy of health information is beyond the scope of this chapter. Given that "efficacy" and "accuracy" are subjective terms, operationalizing and measuring the quality of much healthcare information may be difficult at best and impossible at worst (Bernstam & Meric-Bernstam, 2007).

The Intersect Between Formal and Informal Caregiving

There are clearly areas where the systems converge. All of the sectors have strong interdependencies. Some interventions cross sector borders, such as self-help groups that are involved with formal processes. This results in the system delineated in figure 1:

Some examples of where formal and informal systems of care converge are within self-help groups or provider/family support groups. Many of these groups are run by professionals who bring together individuals for capacity building and social support. Families of individuals with disabilities have been long regarded as one of the strongest advocacy groups; indeed, many large, formal organizations began as grassroots family gatherings. As time progressed, professionals who provide formal care and support were added to the rolls and serve as both members and advisors (Turnbull & Turnbull, 1990).

The formal system of care often makes substantial use of the informal sector and its resources.

There is often a strong relationship between self-help groups and formal helpers. The relationship is mutually beneficial, and problems that one sector experiences can often affect the other sector.

Additional Technological Contributions

In addition to health care issue, technology can aid in the employment and educational prospects of individuals with disabilities and chronic health conditions. Assistive technology, telecommuting and other systems make it possible for those with serious physical limitations to complete their education and engage in sustained, competitive employment. Individuals who in previous times might have been dependent upon others for activities such as self-care and daily living can now function more independently with assistive and adaptive technology.

Assistive technology allows people with disabilities or other limitations to meaningfully participate in education, the workforce, and the community at large. Augmentative communication systems such as DynaVox allow individuals to communicate with others and allows for self-advocacy behavior. Technologies such as screen readers, refreshing Braille displays, and adaptive keyboards can help individuals with disabilities navigate websites (Johnston, Beard, & Carpenter, 2007). Compatibility of online sites with assistive technology allows individuals to access more information in a timely manner.

Technology has added a great deal to the future of individuals with disabilities and chronic conditions and those who work on their behalf. It offers a new world of modern miricles and possibilities. Unfortunaterly, there is a downside. The digital divide means that some will never experience the benefits of the digital revolution.

HOW THE DIGITAL DIVIDE AFFECTS FORMAL AND INFORMAL SYSTEMS OF CARE

The digital divide looms large as a barrier to these interventions. What networks and technologies are available and how much of it patients and families can use can frustrate the use of promising interventions. The digital divide represents an roadblock to almost any wide use of technology in the disabilities field. Much of the technology that the formal and informal sectors will be using will require higher bandwidth to function. This is far less of a problem for the formal system which can provide technology from its substantial funding base. It is more of a difficulty for the informal sector which has no available support. Both systems may suffer because of access and technology. The informal sector will suffer more, but, to the extent that the formal system depends upon the informal system for part of its functioning, both sectors will experience problems.

Legislative and Policy Barriers to Participation

The most salient legislative and policy barriers to participation might be those designed to protect the privacy of healthcare consumers. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) requires that health care providers protect as confidental any health information that might be “personally identifiable” (United States Department of Health and Human Services, 2003, p. 3). These restrictions are likely to increase as time goes forward. Security of online environments are now at issue, and require more sophisticated coding to ensure compliance. This might require healthcare providers to contract with third-party consultants. Therefore, more individuals might have access to protected health information, which increases the probability of breaches of confidentiality (Demeris, 2006).

Technical Barriers to Participation

Broadband penetration is not easily available everywhere (Horrigan, 2008). Even with funding it may not be possible for the formal sector to use some of their technology in the inner city, rural areas or overseas. Even if connections are available from local providers (such as libraries and local government) confidentiality restrictions make their use risky. The chance of accidental disclosure in a public access setting may be far too high to chance.

Some individuals with high-speed broadband access and the most modern equipment might also be excluded on the basis of disability. For example, a person who is blind might have difficulty accessing graphic-rich online healthcare sites without assistance. A person with a cognitive disability or processing disability may have problems navigating sites with complex designs. In order for some individuals to use technology to access available information, they must use assistive technology. Assistive technology is defined as any item designed to improve, maintain, or increase the ability of a person with a disability to function in everyday life (Johnston, Beard, & Carpenter, 2007).

When accessing online health information, however, access to assistive technology is not enough. The information provided must be in a format that is compatible with assistive technology devices. For example, if a person who is blind is using a screen reader, images must be accompanied by text that describes the images. Audio should be captioned so that those with limited hearing are able to access the same information (Waddell, 1999).

Insuring that information on the internet is accessible to individuals with disabilities has proved to be a daunting task. American federal law mandates that technology such as software and the internet should be accessible to individuals with disabilities; however, much information online is not accessible to individuals using assistive technology. Among the sites evauated by Loiacono and McCoy (2006), only 23% of American Federal homepages met minimum accessibility requirements. Only 11% of non-profit organizations and 6% of corporate websites met the minimum standard. If accessibility is not addressed, a significant portion of individuals will be left without access to information and potential services.

Additional Barriers to Participation

A major part of the digital divide is the knowledge, skills and efficacy needed to participate. Having the funds to purchase technology will not solve this. If persons with disabilities do not have this background, they will not be able to use the technology. Even if technology is provided the desired outcome might not occur.

Literacy levels are a concern for individuals creating online content, especially health-related content. Neuhauser and Kreps (2008), in a review of 800 studies on cancer communication, found that most information was written at a 10th grade reading level or higher. In contrast, 20% of Americans in 2003 read below a 5th grade level. Health and disability-related information is often full of jargon and complex language. Therefore, information online may be inaccessible to many individuals due to reading level alone.

Language and culture may also be potential avenues for exclusion. In the same article by Neuhauser and Kreps (2008), the authors found that most cancer websites were written in English, and that literal translations of information into other languages do not motivate positive changes in behavior (e.g., diet and exercise). African-Americans, Hispanics, and other individuals from minority populations reported that they preferred to receive information from pamplets and face-to-face healthcare providers. Although the results of this study apply strictly to those with a cancer diagnosis, it is possible that cultural and linguistic barriers might affect individuals searching for information about mental health and disability conditions online as well.

The digital divide is a problem for both sectors, formal and informal. We can address this problem if we have the will and resources. The next section deals with what policies to address the digital divide might look like.

FUTURE TRENDS IN VIRTUAL HEALTHCARE AND THE DIGITAL DIVIDE

Emerging Trends

It is clear that the use of the internet for informal and formal care will increase over time. The digital divide remains a critical issue in the emerging virtual health care system. If it is not addressed, it will preclude a number of highly promising developments.

Policy Options for Addressing the Digital Divide as It Relates to Healthcare

It is clear that in order to deal with the digital divide Americans must address it with a national policy. It is unlikely that market forces will deal with all aspects of the issue and the costs of inaction will be considerable. There are at least three policy issues that must be considered: 1) access to networks, particularly high-speed networks, 2) access to skills and online effectiveness, and 3) creating and disseminating models for on-line informal sector activities and intersector collaboration.

- **Providing Universal Broadband access:** This policy would not, of course, solve all the problems. It would be very expensive and difficult to implement. It could be done, much in the way that universal telephone access is a policy goal was accomplished. This, of course, was part of the vision behind the national Information Infrastructure work that was attempted during the Clinton-Gore years (Comptroller General of the United States, 1994; McNutt, 1996).
- **Creating dedicated health care broadband system with access points for natural helpers:** This might be a less expensive and more acceptable alternative. A universal broadband network for health care could be created that would connect various health care providers in the formal system. It would have secure access points for informal helpers.
- **Developing low cost, low bandwidth technology:** This would reverse much of the development trend of the past few years. This would be similar to some of the work done on the hundred dollar laptop program.

The second set of policy options looks at the skills and ability to operate in an online environments. While this would seem to be more of an issue for the informal sector, one should note that adoption by formal healthcare institutions is apparently still an issue. Clinicians, especially older clinicians, may not always have technology skills in their repertoire.

Healthcare organizations have more options in creating incentives and supports for their employees. They can create policies that encourage their staff to develop the needed skills. Healthcare financing organizations can provide them with an incentive to do so. It should lower the costs of health care by reducing transaction costs significantly over processing paper. Given much of the American formal system is funded by Federal health care programs (e.g., Medicare, Medicaid, the Veterans Administration and the Child and Maternal Health block grant), federal policy regarding electronic health care should be relatively easy to legislate. Americans should consider amending the healthcare manpower funding progams legislation to require that schools which train clinicians requrie information technology skills as part of the curriculum.

Creating an effective policy intervention for the informal system is more complex and difficult to complete. Interventions like some of the demonstration projects funded between 1994 and 2004 by the Department of Commerce's Technology Opportunities Program might be one option (National Telecommunications and Information Administration, 2006). Another options is to encourage formal health care providers to partner with informal providers around technology.

Developing low-cost, low-bandwidth technology will not only be difficult, but may require a long development process. Creating a set of new practice models will require research, model, theory building, and evaluation. However, the rewards should be worth the effort if more individuals have access to usable technology.

All of the preceding policy recommendations must be coordinated to achieve the desired outcomes. This may require overarching policy that is congruent with other aspects of information infrastructure policy and health care policy.

Research Implications

While much discussion has occurred surrounding informal and formal care online, very little rigorous study of online health care has occurred. This is especially true surrounding issues of participation and exclusion. Studies of how individuals are accessing information online, what information they are able to access, and the perceived benefits of this information is crucial to informing both policy and future online content.

Neuhauser and Kreps (2008) raised important questions regarding culture and literacy as barriers to seeking cancer-related information. Would the results of their review generalize to minority populations searching for mental health and other, more generic health information online? If so, what are possible policy implications and technological solutions?

An online search of information regarding the net neutrality debate and its effects on virtual health care did not return any results. Therefore, questions remain as to the intersect between virtual healthcare and net neutrality. In light of emerging technologies and the nature of healthcare information provided, this is an area that should receive attention.

CONCLUSION

Health care is an issue that is of consistent importance for most governments and one that is often driven by economics, by public opinion and by powerful policy actors. Policy analysis can be rational but public policy formulation is often not. Policy makers are caught between multiple interests driven by values, political considerations and agenda dynamics. Health care, however, is about survival and that makes it a different kind of issue.

As stated earlier, health care is comprised of a formal sector and an informal sector. Both sectors are primarily off-line activities and both have developed some type of virtual adjunct that can support the off line component. These activities can expand the role of health care and deliver care in new ways. In some cases, these new forms of caregiving can help overcome some of the difficulties that our healthcare system faces.

The digital divide affects formal and informal aspects of the healthcare system. In some respects, the impact is small. On balance, some aspects of the system require extensive technological supports. The emerging virtual informal sector is, we feel, the most vulnerable to digital divide issues.

Since the digital divide is important to several areas related to health care (the economy, political participation, education and so forth) addressing the digital divide will benefit health status even if it does nothing for the health care system per se. On balance, informal technology is thought to have the potential to reduce costs, prevent mistakes and improve the quality of care.

The emerging formal and informal virtual system offer opportunities for innovation that might eventually revolutionize the health care system. Solving at least part of the digital divide issue is an important part of achieving this potential.

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KEY TERMS & DEFINITIONS

Active Information: Knowledge gathered by health-information seekers who actively harness Web 2.0 technologies through email groups, chat, or other interactive virtual communication.

Assistive Technology: Any item or device that allows individuals to increase or maintain function in everyday life.

Formal Health Care: Health care providers, organizations, policies and finance mechanisms that provide health care services.

Informal Health Care: Providers and systems who generally do not work through formal institutions (e.g., family, friends)

Net Neutrality: The stance taken by many in the technology field that pricing of broadband service should be free of use restrictions and that content and content providers should not be regulated.

Nosocomial Infections: Antibiotic-resistant infections typically acquired in healthcare environments.

On-Line Psychotherapy: Psychotherapy delivered through telecommunications (i.e., email, synchronous chat, asynchronous communications).

On-Line Support Groups: Informal internet based groups that bring individuals together around a particular topic (in this case, health or disability).

On-Line Advocacy: On-line intervention on behalf of an individual, family, or group.

Passive Information: Knowledge gathered by health-information seekers that does not require interaction (e.g., static websites)

Self-Help Groups: Groups that bring individuals together who are facing a health-related issue (e.g. Alcoholics Anonymous).

Social Capital: Mutual reciprocity, trust, networking and support among a group of individuals.

Social Support: The operationalization of social capital. Often consists of advice, mentoring, and tangible social support.

Telemedicine: Any consultation or procedure done through telecommunications (e.g., the Internet)

Virtual Communities of Practice: Mental Health Practitioners and others who consult with each other on a regular basis through the internet and technology-based systems (e.g., email).

Division 2
Digital Divides, Education, Gender, and Ethnicity

Chapter 11
Generation, Education, Gender, and Ethnicity in American Digital Divides

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ABSTRACT

Through increasing access to knowledge and facilitating widespread discourse, information and communication technology (ICT) is believed to hold the potential to level many societal barriers. Using national probability samples of United States adults from 1983 to 2006, I examine how gender, ethnicity, and education interacted with generation to influence computer ownership and Internet use. Narrower digital divides in more recent generations can mean greater future digital equality through cohort replacement. However, although gender is now of far less consequence than previously in ICT access and use, significant divides, especially in PC ownership and selected Internet uses have widened by ethnicity and education over five birth cohorts. On the other hand, results from earlier research interpreted as "aging effects" are most likely generational influences instead. Implications of these findings are discussed.

INTRODUCTION

Within only a few decades of its public inception, information and communication technology (ICT) has become indispensable to most Americans. By 2006, about 80% of U.S. adults were at least minimally involved with computers, cell phones or the Internet (Horrigan, 2007). By late 2006, over 75% of Americans at least age 12 had gone online, most at home (Center for the Digital Future, 2007). Kennedy, Smith, Wells and Wellman (2008) found that 52% of U.S. households had broadband connections and 77% had a resident go online.

Online users are positive about ICT: 41% of men and 35% of women in 2002 felt it would be "very hard" to "give up the Internet" (Fallows, 2005). Seventy percent of 2006 workers said the Web increased their productivity (Center for the Digital Future, 2007). Nevertheless, a significant minority of Americans totally abstains from ICT, a minority differentially distributed across ethnicity, age, degree level and other variables; ICT access

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and use also often vary along these dimensions. "Digital divides" refer to gaps in ICT access and use across individuals and groups who occupy different societal situses.

Even in the early days, national governments, academics and commerce centers recognized the potential of ICT to create a more equitable society. Digital technology can generate greater demand for skilled workers and thus potentially create more opportunities for previously disenfranchised groups who possess digital skills (e.g., DiMaggio, Hargittai, Celeste & Shafer, 2004). Certainly the United States, with its history of gender, ethnic, and social class divisions, ideology of equality, and technological development, provides an appealing test case to track computer and Internet gaps across generations.

In this study, I focus on how generation, combined with education, gender and ethnicity affects U.S. computer ownership, and selected Internet uses, examining how generational effects contrast with those of age or life cycle stage. Age is often considered a predictor for ICT, but generation, especially over a period of several years, typically is not. This study will show that the generational construct provides valuable information about digital divides and that earlier research using only the variable "age" can mislead. Using the General Social Survey and the NSF Surveys of Public Understanding of Science and Technology I track five generations of U.S. adults over periods ranging from one to 28 years. Many scholars, executives (e.g., Gates, 2005), and government agencies emphasize the need for Americans to be "technically adept"; with their educational focus, they seem to pin their hopes on "the next generation" growing up.

Examining education, gender and ethnicity across generations may show whether the advantages of ICT are diffusing, or which, if any, groups lag behind. Cohort analyses are more informative than studying ICT use across time (which tells us where we have been) or by age (which in a single period provides a snapshot of the present). Generational changes provide data for the future as recent cohorts replace earlier ones. If aging effects are small or nonexistent, then cohort effects can suggest relative permanence in ICT skills and use across the life cycle. *Thus I juxtapose adult developmental issues versus cohort socialization experiences*.

When data from just one time point are analyzed, age and cohort are inevitably confounded because earlier generations are simultaneously older adults. Nearly all "one shot" surveys find that senior adults use ICT the least. Meanwhile young adults are said to "omnivorously devour" ICT, (e.g., Horrigan, 2007). These studies cannot disentangle whether something causal about aging processes occurs, whether youthful enthusiasm promotes ICT use, or whether more recent cohorts simply have acclimated more to ICTs.[1]

Confusing aging with generation effects can have substantial consequences. Age and generational issues are more complex than simply tracking ICT use across time as many studies do. If divides converge, or even vanish, in recent birth cohorts, this implies the benefits of digital technology are now more evenly spread throughout society, possibly generating greater overall future equality as cohort replacement occurs. If "new adults", regardless of gender, ethnicity or educational level, have similar digital skills, employers who hire or advance women or minorities will acquire valuable workers; better quality employment among these groups thus can create more social equality.

Some employers may hesitate to hire or promote older workers because they fear "seniors" lack digital skills, and may be neither interested in—nor able to—acquire them. Due to age stereotypes older workers themselves may feel unable to learn such skills. However, if birth cohort is more implicated in ICT use than age, future supervisors will no longer be able to assume that older workers by definition are digitally naïve. Future seniors could benefit from better job opportunities, thereby combating "ageism". However, if gender, ethnic or educational divides are static, or even widen by generation, then the United States can be expected to remain a country of digital have and have-nots for some time to come.

What Underlies Social Change?

My emphasis in this study on generation rather than simply on change over time or on "age" is not just semantics or statistical sleight of hand. Social changes occur several ways. One possibility is through *aging processes*; perhaps older people have more trouble learning new digital skills due to slower working memory or reaction times (Boyd & Bee, 2009). Middle-aged presbyopia can make tiny screens hard to read, particularly on gadgets such as cell phones.[2]

Second, *overall cultural transformations* can occur. More affordable ICTs, positive government policies (e.g., DiMaggio, et al., 2004; U.S. Department of Education, 2006), or even more favorable ICT images can stimulate greater adoption so that an entire society, irrespective of age or generation, engages in more frequent ICT use. For example, advertisers can emphasize to older people how email can rapidly and cheaply communicate with children or grandchildren.

In *cohort replacement on concomitant variables*, recent cohorts systematically differ from earlier ones on particular attributes; these attributes in turn directly predict ICT access and use. For example, if Baby Boomers are better educated than earlier generations, and education directly causes ICT use, then as Baby Boomers replace earlier cohorts, we would expect overall ICT use to rise simply because of enhanced education among the large Baby Boomer cohort.

Finally in direct cohort effects, members of a specific generation experience relatively unique events, predisposing them as a group to adopt certain behaviors. This study takes such an approach. Gen Y matured using computers and the Web at school and their parents provided computers at home (Kennedy, et al., 2008). Although access is not necessarily use, over 70% of [then] American teenagers in 2003 (U.S. Bureau of the Census, 2008: Table 253) indicated they had used a PC at home and 88% had used one at school; 72% of five to seven year olds had used a school computer in 2003. By secondary school, Gen Y had used computer games, and spreadsheet, presentation, and word processing programs.

Thus, recent cohorts should be *cognitively primed* to consume ICTs and adopt such innovations more easily than their predecessors, even controlling variables such as education or income in their early occupations. Further, drops in the costs of PCs or dialup access as well as burgeoning growth in broadband or DSL availability (e.g., Greenstein & Prince, 2006; Prieger & Hu, 2008) have aided the young Gen Y's access to digital equipment.

Research Questions

- How does generation interact with time to influence computer and Internet use?
- How do education, gender and ethnicity interact with generation to influence ICT use?
- Are digital divides widening, converging or remaining stable across generations?
- What are some implications of widening or converging generational digital divides?

The Digital Divide

Past research indicates that American men used ICT more than women, Whites more than Blacks or Hispanics, young adults more than the elderly, and the well educated more than those less so (Losh, 2004). "Digital divides" a term coined by the U.S. Department of Commerce in its "Falling through the Net" series (Victory & Cooper, 2002; Organisation for Economic Co-operation and Development, 2001), refer to such ethnic, gender, age, and other gaps in information technology access and use.

Digital Divides: Gender

Although U.S. computer innovators were college educated White professional and managerial men, women clerical workers often performed data entry or word processing. Early online and high-speed Internet users were also affluent White males (Buente & Robbin, 2008; DiMaggio, et al., 2004; Losh, 2004). These earlier data compare to current research in other global regions (e.g., De Haan, 2009; Demoussis & Giannakopoulos, 2006; Ono, 2005).

However, by the mid-2000s, many U.S. gender digital divides had closed (Fallows, 2005; Losh, 2004). Since education and occupation often involve computer and Internet use, this is unsurprising. Over the last part of the twentieth century, women's educational gains, greater labor force participation, and higher concentrations in the life and health science occupations (U.S. Bureau of the Census, 2008) where technology use is common (see Losh, 2004) likely played major roles in closing digital gender gaps.

In 2002 U.S. employed women and men owned a home PC at roughly equal rates; by then most computer owners regardless of gender or labor force status, went online (Losh, 2004). Science or technology professionals or managers of either sex in 2002 also had work computer access more often, although employed men more often than women had Internet access. Recent studies report that similar proportions of women and men now go online, although the amount and type of usage varies (e.g., Center for the Digital Future, 2007; Fallows, 2005).

A considerable gender gap remains in income, which is reflected in consumption patterns involving services, e.g., broadband subscriptions or length of online time for dialup users. Women spend less time online and men more often have high-speed entry (Fallows, 2005; Horrigan, 2008; Losh, 2004). Given that most U.S. married couples now have two household workers, married adults average higher incomes than single persons (U.S. Department of Commerce, 2008). Single women have the lowest income of all gender-marital status categories. During the early 2000s, single women least often went online or had home high-speed access, and women more often cited cost as a reason to stay offline than men (Fallows, 2005; Losh, 2004).

Although gender convergence on computer access has occurred, the sexes tend to use the Web differently. Men more often view news, entertainment, weather, or finance news, or do job-related research; women more often access health, maps, or religious sites and contact their children via ICT more often (Fallows, 2005, Kennedy, et al., 2008; also see review in Royal, 2008). Men are more familiar with technical terms such as spyware (Fallows, 2005). However, the Pew surveys find greater gender similarities among current teenagers than among older adults in activities such as downloading files or creating Web pages (Fallow, 2005; Horrigan, 2007). *Thus these "age differences" actually suggest fewer ICT gender gaps among recent cohorts.*

Digital Divides: Ethnicity

Although the gender data are positive, U.S. ethnic cleavages in ICT access and use continue (e.g., DiMaggio, et al., 2004). Black and Hispanic adults are disproportionately offline although some evidence suggests younger Hispanics frequently text through cell phones (Fox & Livingston, 2007; Horrigan, 2007; Lebo & Corante, 2003). Internet use is particularly low among older or female Latinos (Lebo & Corante, 2003; Fox & Livingston, 2007), and English fluency, U.S. nativity, and educational level are important determinants of Hispanic online access and use (e.g., Fairlie, 2004; Ono & Zavodny, 2007). Black and Hispanic Americans less often had home Internet access or high-speed connections (DiMaggio, et al. from Current Population Survey 2001 data, 2004). The kind of access Americans employ is important because broadband and wireless subscribers use the

Internet in more diverse ways for longer periods than dialup users. For example, Horrigan (2008) found that 47% of broadband users obtained news online on a "typical day" compared with only 18% of dialup customers.

Educational level is especially significant here partly because it intertwines with ethnicity, and with income and occupation. The latter play important roles in ICT use when comparing ethnic groups, and Blacks and Hispanics more often cite cost as a factor in Internet access (although education and income are not the entire story, see Fairlie, 2004; Ono & Zavodny, 2007; Prieger & Hu, 2008). Hispanics average less education and income than other U.S. ethnic groups and Blacks complete college at lower rates than Whites (U.S. Department of Commerce, 2008). Possibly due to lower incomes, Fox and Livingston (2007) found African Americans lacking a high school degree accessed the Internet less than their White counterparts. Blacks and Hispanics are also disproportionately concentrated in inner city areas where broadband may be less common or lower quality telephone lines make an Internet experience less satisfactory (e.g., see Greenstein & Prince, 2006; Prieger & Hu, 2008).

There are some more hopeful findings. *College graduates* in 2007 had similar online access regardless of ethnicity (Fox & Livingston, 2007). Young Hispanic and African American adults accessed the Internet in 2007 more often than earlier, although they lagged behind Whites the same age (Fox & Livingston, 2007). Some evidence (e.g., Horrigan, 2008) indicates that the recent *rate of growth* among broadband subscribers has been higher among Black Americans and Latinos than among Whites.

One recent study of Southeastern college students (Cotten & Jelenewicz, 2006) reported few ethnic differences in Web access or online time. However they analyzed an existing *Web survey* of freshman, thus only reaching students *who were online to begin with*. Most apparently received Internet access as part of their dormitory contract, thus obviating family income factors. Finally, Cotten and Jelenewicz (2006: 499-500) collapsed ethnicity into White versus "non-White", joining Asians, Blacks and Hispanics, dissimilar groups (see below) in ICT use.

Asian Americans receive scant attention in most studies of U.S. digital divides. This may be because Asian Americans are a smaller minority than Hispanics or Blacks, making sample projections unstable. Prior research is also inconsistent. Despite Greenstein and Prince's (2006) citation of NTIA data showing that Asians show more Internet use, Fairlie (2004) found Asians slightly less likely to use ICT than White Americans, as did Prieger and Hu (2008) in their Midwest data.

The reasons for such findings are unclear. Asian Americans are more educated than other ethnic groups (nearly half graduate college), more often earn science and math degrees, have higher incomes, and more often hold managerial, science, engineering, computer or mathematics jobs (U.S. Bureau of the Census, 2008: Tables 217, 218, 598 and 786). Net of income or education, for occupational reasons alone (e.g., Losh, 2004), Asian Americans should more often access or use ICTs. This is true even though equal percentages of Asian and Hispanic American students at all levels have at least one foreign born parent and speak a second language at home (U.S. Bureau of the Census, 2008: Tables 216 and 223), factors which depress ICT usage.

Although many U.S. gaps (e.g., "age") are reflected globally, I focus here on American digital divides for several reasons. First is to compare my findings with the copious prior research on U.S. adults. Consistency with earlier studies raises our confidence in the more unique results I report later, e.g., for Asians or "the elderly". Second, if not the most "connected" country, America is an international leader in digital access and use (Chinn & Fairlie, 2007). The overwhelming preponderance of English-language websites (Ono, 2005; Ono & Zavodny, 2007) makes English proficiency critical in the U.S. and abroad.

Generational results presented here may provide suggestions for other industrial and post-industrial countries, as well as for those just now entering the "information highway."

It is important to recognize that the United States is not alone in ethnic or cultural digital divides. For example, in this volume De Haan (2009) reports less ICT use among Moroccan and Turkish immigrants to the Netherlands than among the indigenous Dutch or Antilles migrants. U.S. immigrants use ICT less than natives (partly due to English fluency; Ono & Zavodny, 2007), and even after controlling income or education Northern and Southern Europeans differ (Demoussis & Giannakopoulos, 2006). Immigrants worldwide may even face discrimination using public facilities in schools, community centers or cyber cafés due to distinct appearances, speech or demeanor. And, many international studies simply omit ethnicity variables entirely although national histories (e.g., India or Japan) or new immigration patterns (e.g., Europe) would suggest the presence of ethnic prejudice or even caste lingering systems in several countries.

Digital Divides: Educational Level

As noted throughout, education is the most consistent global ICT predictor. Individuals with at least a baccalaureate are much more often innovators or early adopters of digital technology (e.g., DiMaggio, et al., 2004). The better educated more often own computers, have Internet home access, connect through broadband, and spend more time online (Buente & Robbin, 2008; DiMaggio, et al., 2004; Losh, 2004; Robinson, DiMaggio & Hargittai, 2003).

Part of educational level's effects is due to the more skilled occupations that well-educated workers hold and the digital demands and prerogatives of these jobs (Losh, 2004). Better-educated, skilled workers also earn more and thus can afford *at least* one computer (Center for the Digital Future, 2008) or high speed Internet. Horrigan (2008) reported that *85%* of U.S. households with at least $100,000 annual income subscribed to broadband, compared with only 25% of households with incomes of $20,000 or less.

But degree level means more than just being able to afford equipment and services. Well-educated adults are more cognitively primed to exploit the Internet: they have more online familiarity (thus typically more skills) and more experience in evaluating information. As a result, they can more often access the Web to improve their skills, locate useful information, or purchase bargains in goods or services, while the less educated more often access entertainment venues (Buente & Robbin, 2008; Robinson, et al., 2003).

Education may be one tool to surmount digital divides. As noted earlier, there are reports that irrespective of ethnicity the college educated access the Web equally. All U.S. ethnic groups have improved their high school and college graduation rates over time (U.S. Bureau of the Census, 2008: Table 217). Well-educated women and men have approximately equal connectivity. However, it is notable that those who earn less than college educated White men—women, Blacks and Hispanics, or older adults mistrust using credit cards online or purchasing online goods and services (Buente & Robbin, 2008; Fairlie, 2004; Fallows, 2005; Fox & Livingston, 2007).

Over 60% of American adults do not even have a two-year college degree. Although more recent cohorts have at least graduated high school, generations prior to the Baby Boom have less education (U.S, Department of Commerce, 2008). Thus we need to assess the status of digital divides for different degree levels across generations. Convergence by education could indicate that ICT is helping level classic U.S. social class divisions. On the other hand, if the digital divide widens across degree levels among more recent cohorts, the disparities will only add to the increasing "have" of the college educated, with their better jobs, higher incomes, and superior health contrasted with the "have-nots".

Digital Divides: Age Versus Generation

Do the "age differences" reported in ICT access and use reflect maturation processes or do they reflect unique experiences for specific generations that could exaggerate or minimize a digital divide? Physiological and social processes underlying cohort versus age differences differ. For example, midlife and senior citizens acquire new skills more slowly; once learned, however, young and middle-aged adults perform similarly (Boyd and Bee, 2009). Although senior citizens more often claim to be offline because they are "not interested," current midlife Baby Boomers, now ages 50 to 64 represent an ICT growth market (Horrigan, 2008).

Young adults spend more time than older adults creating social or romantic connections online, combating the tensions from school, and establishing a work life; thus they more often use the Web for romantic or entertainment purposes (Horrigan, 2007; 2008; Kennedy, et al., 2008; Pew Research Center, 2007). Midlife adults more often use the Web for business (Latinos less so, Fox & Livingston, 2007). "Everyone" except the very old uses email, although younger adults (including Latinos) more often send text messages (Fox, 2005). Both young and midlife adults use search engines more now (Fallow, 2008). These kinds of differences reported in America and globally (Center for the Digital Future, 2007; Demoussis & Giannakopoulos, 2006; Horrigan, 2008; Ono, 2005; Pew Internet and the American Life Project, 2007) are probably *age or life cycle stage*, rather than cohort related, social behaviors.

It is noteworthy that the number of older adults using computers and the Web is increasing (Horrigan, 2008). On a "typical day" Fallows (2008) found 40% of U.S. adults aged 50 to 64 used a search engine, as did 27% of those 65 or older. Seniors (32%) were second only to 18 to 29 year olds (49%) in saying the Internet improved their connections to friends and the *most likely to say* it improved their connections with family (Kennedy, et al, 2008: 26).

To examine generations, we need to know when particular cohorts begin and end (Glenn, 2005, Pew, 2007; Prokos & Padavic, 2005). Rather than using a constant time interval, cohorts are usually constructed considering both time and significant events occurring when older children or adults can consciously experience them. For example, "Gen Y" adults born in the late 1970s to late 1980s arrived too recently to remember "punch" or "IBM cards".

The generations differ considerably in their ICT exposure, new skills to be learned, and new services to purchase, e.g., broadband. Those from the late nineteenth and early twentieth centuries experienced telephones, radios, and air travel, but many either retired or died before widespread Internet availability. The "Lucky Few" (Carlson, 2008) matured in the boom economic years after World War Two; although unexposed to computers in their youth, due to free time during retirement and greater discretionary income this generation actually represents a growing ICT market (Horrigan, 2008). "Baby Boomers" matured in affluence, became well educated (often using computers in college)—only to face stiff job competition; their economic constraints to some extent limited their equipment or broadband purchases. However, Baby Boomers too are increasing home high-speed Internet use (Horrigan, 2008). PCs were common as "Generation X" matured while "Gen Y" has had the most youthful and young adult exposure to Internet access at school, work and home (see earlier review under direct cohort effects).

These cohort—and possible age—differences in ICT ease have implications for other digital inequalities. Do American women overall slightly lag behind men in particular ICT uses because they are older than men as a group or is some form of "sex difference" involved, such as "nurturing human relations," searching for different information online than men, or using the Internet somewhat less than men do "just for fun" (Buente & Robbin, 2008; Fallows, 2005)? Gender may also interact with ethnicity (Fallows, 2005, reported Black women use more online time than Black men). Since Black and Hispanic Americans are younger overall than Whites, ethnicity may intertwine with age. Is ICT use less among Hispanics because this group is younger, thus less apt to have the economic resources to buy, say, broadband services, or are other, more cultural and less transient, factors involved? These questions imply that multivariate controls are needed to disentangle just what particular digital divides really mean.

METHODS

The Data: The NSF Surveys of Public Understanding and the General Social Survey

American surveys about science and technology adult "literacy" date from at least the 1950s (e.g., Withey, 1959). The best-known series is the National Science Foundation Surveys of Public Understanding of Science and Technology (see Miller, Kimmel & ORC Macro, 2005 and Davis & Smith 2006), which also coordinate with several international surveys, such as the Eurobarometer (e.g., Allum, Sturgis, Tabourzi & Brunton-Smith, 2008). The 1979-2006 NSF Surveys archive is the most comprehensive study of U.S. adult civic science and technology literacy available[3], comprising 23,906 unweighted interviews in 12 probability sample surveys. Items monitor several knowledge, attitude and practice dimensions.

This research uses the NSF data on computer and information technology available for 1983, 1985, 1988, 1990, 1995, 1997, and 1999, all Random Digital Dial telephone surveys of U.S. adults plus the 2002 and 2006 General Social Survey data (GSS), in-person probability area sample U.S surveys.[4] Only 2002 and 2006 respondents with landlines or cell phones (95 percent of the total) are analyzed to maximize comparisons with the earlier NSF data. The total case base for this study when all nine surveys are analyzed is 18,125 adults 18 years and older.

Time Series Measures on IT Access and Use

Most analyses are more circumscribed than the total. Data on PC ownership stretch from 1983 to 2006. Home Internet access and estimated annual online hours are available from 1995 to 2006. Data on online hours through 2002 were estimated using the grand total from several questions (e.g., home, work, email); in contrast, only one item was available in the 2006 survey, thus 2006 figures are slightly lower than in earlier years. Although primary sources used by the individual to access general news (e.g., newspaper or television) are present for 1985, 1988 and 2006, and science news sources for 1990, 1995 and 2006, the Internet as a primary source is really only available for 2006 (in 1995 only three people relied on the Web for science news). Thus sample sizes range from 1962 (2006) to 18,125[5] and ns are referenced in tables and figures.

Time Series Measures on Background Variables

Data on gender, education, age and birth cohort are available from 1983 to 2006. Although its utility as a predictor is well established, income data are unavailable for the NSF series. Data on ethnicity are available for 1999, 2002 and 2006 (still highly relevant years as ICT access and use evolve). Education has four levels: at least some graduate school, a baccalaureate degree, an Associate of Arts or two year vocational degree, and at most a high school diploma. Gender is used as a dummy variable (male = 1); when it is a factor, ethnicity is coded: White ("Euro") American; Black (African) American, Asian American and Latino or Hispanic (not elsewhere classified). In regression analyses, these are coded as dummy variables with White as the reference or omitted category.

Birth Cohort or Generation and Age Categories:

One example of cohort debates is when the U.S. "Baby Boom" ended. Scholars agree that it began in 1946 (Carlson, 2008). Some end "the boom" in 1957, when birth rates peak, others in 1961 when the absolute number of births peaks. Since "Generation X" is generally agreed to begin in the early 1960s, I ended the Baby Boom in 1961, beginning "Generation X" in 1962. The five created cohorts are: Gen Y, sometimes called "Generation Next" or "Millenials", born 1979 to 1988; Generation X (1962 – 1978); Baby Boomer (1946 – 1961); The Lucky Few (1930 – 1945); and the Early Years (1891 –1929).[6]

Pragmatically some cohorts are small in these data. I omitted 86 respondents born before 1891 because they are scarce in recent data and because dementia rates rise after age 80, making their later responses possibly unreliable. Cumulatively, by 2006, 711 Gen Y respondents were age 18 or more. Future surveys, of course, will enlarge this cohort. Pre WWI respondents (n = 1836) not only have aged (or died by 2006), but many items analyzed here were not asked until 1988 or later, decimating their numbers still further.

For analysis (including cross-tabulation tables and analyses of variance), I represent respondent age in five groups approximately corresponding to U.S. federal government use: 18-24; 25-34; 35-44; 45-64; and age 65 and over. Although age group and cohort positively correlate overall (r = 0.65) because older individuals in the study years tend to be from earlier cohorts, there is still some independence between these two variables.

GENERAL ANALYTIC PLAN

First I present overall results for computer ownership, home Internet access, estimated online time, and using the Internet as a primary news or science news source. Later I show how these ICT uses vary by education, gender and ethnicity. Because I presented many of the cross time results through 2002 earlier (Losh, 2004), here I center either on exceptions to earlier trends or on how time and ethnicity combine for 1999 to 2006. *My primary focus is on how generation interacts with education, gender and ethnicity* because cohort replacement gives us a better indication of many future trends than simply observing change over time.

My early analyses employ two-way analyses of covariance, examining how generation and, in turn, education, gender and ethnicity affect ICT access and use. Depending on the focal predictor, degree level and gender become covariates. Ethnicity is controlled only for the 2006 news access questions. If ethnicity is a set of dummy covariates for PC ownership, home Web access or online time, the series shrinks to 1999 to 2006 (however, see the regression analyses, which do include ethnicity). Age group is a covariate for computer ownership, home Web access and online hours, but not for news access; with only the 2006 data, generation and age group are synonymous and the analytic system is unsolvable. Finally a set of five regression equations on ICT access and use are shown, each including degree level, age group (except for news access), cohort, gender, and ethnicity (with Whites as the omitted dummy variable category).

Means or percentages for outcome variables are shown throughout. I use the following conventions: when only main and covariate ANCOVA effects occur, Multiple Classification Analysis (MCA), a general linear model program in SPSS ANOVA (Nie, Hull, Jenkins Steinbrenner & Bent, 1975: Chapter 22), is used to create adjusted mean scores. MCA provides adjusted "Beta" predictor

Table 1. Percent of general population owning a home computer over time and by gender

Year	1983	1985	1988	1990	1995	1997	1999	2002	2006
% who own (all)	7.6	14.8*	18.5*	22.2*	36.6*	42.5	53.9	58.3	68.8*
Male	7.3	16.7*	21.4*	26.5*	40.9*	43.9	54.8	59.1	71.0*
Female	7.9	13.1*	16.0*	18.3*	32.8*	41.3	53.0	57.7	67.1*
n	1645	2019	2041	2033	2006	2000	1882	2616	1817

*Comparisons by Gender that year, $p < 0.05$

coefficients, deviations from the dependent variable grand mean. However, MCA Betas do not incorporate interaction terms, so when statistical interactions occur between year or generation, and predictors such as ethnicity, the observed, unadjusted mean scores from the analyses of variance are shown. MCA also produces an "R" statistic analogous to eta (η) in analysis of variance or R in multiple regression.

OVERALL RESULTS

Over the 28 years (maximum) covered by these data, critical for ICT adoption, Americans vastly increased their ICT access and use. Table 1 shows how the percentage of individuals owning a computer rose dramatically from 8% in 1983 to 69% by 2006 with the greatest gains in the mid- to late 1990s ($X^2_{(8)} = 3093.32$, $p < .001$, $r = 0.41$).

Similarly, overall U.S. home Internet access leaped from 1995 to 2006. In 1995 7% reported home access; for all households this rose to 16% in 1997, 28% in 1999, 52% in 2002 and 64% by 2006 ($X^2_{(4)} = 2117.77$, $p < .001$, $r = 0.44$). For PC owners the fraction of home Web users was higher still (Table 2). By 2006 virtually every U.S. computer owner had home Internet access. Indeed many households probably acquired a computer precisely to use the Web. Thus owning a PC is now "the gateway" for Internet access. Those who can only use a computer at school, work, cafés, libraries or community centers, with their limited hours of operation, typically cannot exploit the Internet as much as those who own their own computer.

The number of annual online hours rose from 5.6 in 1995 to 316 by 2006 ($F_{4,10299} = 351.08$, $p < .001$, $\eta = 0.35$). Between 1999 and 2002 (calculated identically) a jump occurred from 86 to 386 hours. The slight dip in 2006 may reflect question changes noted earlier—but it may also mirror the increasing American norm of home Web access, with less experienced users going online for fewer hours than earlier adopters who came on board between 2002 and 2006. It is also possible that amalgamating many usage items caused overestimates for 1995 to 2002.

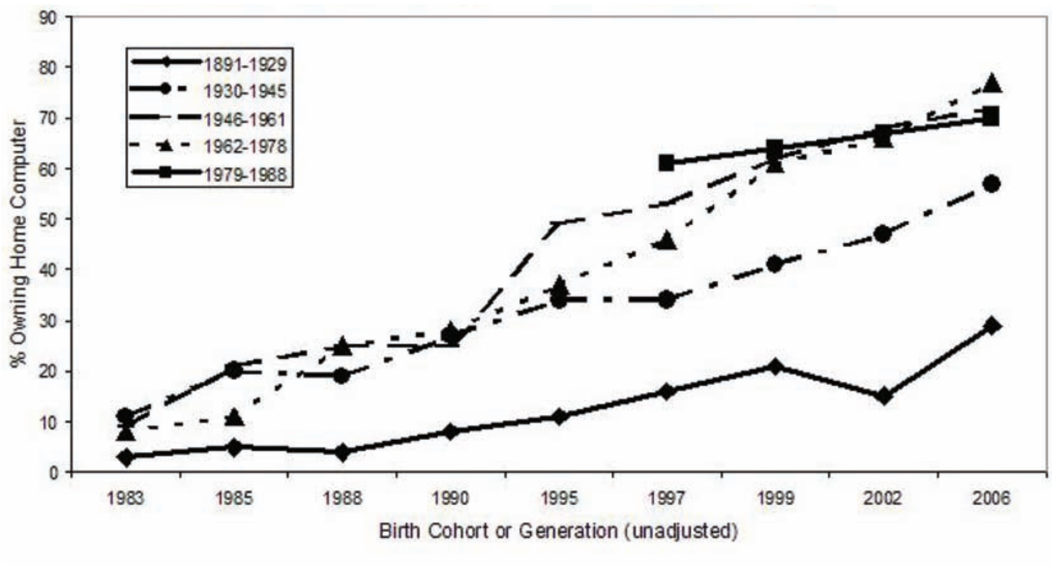
Finally, in 2006, 14% of the sample used the Internet as their major news source, compared with

Table 2. Percent of those owning a home computer who have home internet access

Year	1995	1997	1999	2002	2006
% with home Internet access (all)	32.5*	71.3*	86.1*	95.5	100.0
Male	37.4*	79.2*	90.4*	95.6	100.0
Female	26.3*	62.7*	81.8*	95.4	100.0
n	418	453	610	1361	1250

*Comparisons by Gender that year, $p < 0.05$

Figure 1. Time and generation effects on % home PC ownership 1983-2006 (n=18011)



50% relying on television, 24% on newspapers and 6% on radio. Significantly more adults, 23%, used the Internet as their primary science news source (paired *t*, 9.82 with *n* = 1818, *p* < .001); 41% watched science news on television, 11% read newspapers, 11% read magazines, and only 2% largely obtained science news via radio. Using the Internet for science information is particularly impressive when we realize how many outlets TV and magazines provide. Unlike newspapers, magazines, or even television, Internet news is constantly updated, adding to its appeal. Websites can also report in more depth than most radio or television broadcasts. However, an infinite variety of online news sites exist, some of them unabashedly partisan or even biased in what they choose to present.

GENERATIONAL EFFECTS OVERALL

Any narrowing of digital divides across recent cohorts is generally considered promising for those who hope that greater social equity will follow more digital equality. Furthermore, such convergence could mean that employers can expect more uniform ICT experiences among more recent birth cohorts regardless of gender or ethnicity. However, the generational data are mixed. Figure 1 shows how computer ownership varied by cohort over time. Because of the cohort and time interaction (F 27, 17971 = 13.33, p < .001) Figure 1 presents unadjusted mean scores (MCA adjustments only consider main and covariate effects, not statistical moderators).

Very few individuals owned a PC in 1983 and thus ownership initially varied little across the four earliest sample generations. However, by 1988, gaps began between the 1891-1929 cohort (whose youngest members were then just under 60) and those born later. In 1997, another wedge opened between the Lucky Few cohort (1930-1945) and more recent generations. By 2006, at least 70% of Baby Boomers, Generation X and Gen Y owned a home computer compared with 57% of the Lucky Few and only 29% of the by now elderly earliest cohort. Time ($F_{8,\ 17971}$ = 355.17, *p* < .001) and cohort ($F_{4,\ 17971}$ = 543.45, *p* < .001) main effects were also significant (total *R* = 0.46).

Figure 2. % home Internet access (those with home PC) by generation and time (n=4142)

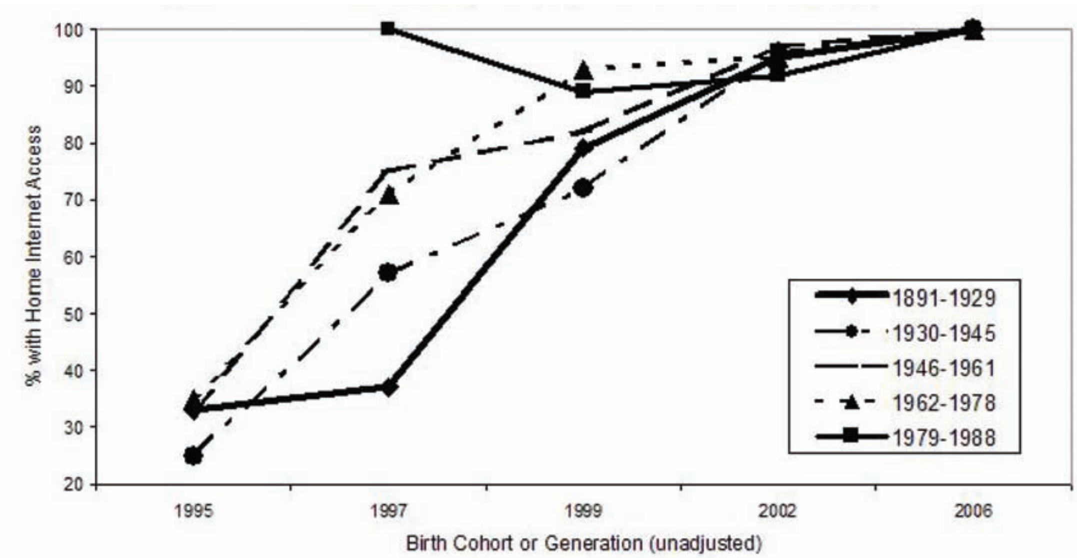


Figure 2 presents a dramatic example of how PC ownership has become the Internet gateway, irrespective of other factors. Given the study year-cohort interaction ($F_{15, 4118} = 6.10$, $p < .001$), I present unadjusted percentages. Although more recent generations obtained home Web access at younger ages than earlier cohorts, most generation gaps closed by 2002 for computer owners, totally converging by 2006. Quite simply, a home computer in the United States now is synonymous with home Internet access. Main effects for year ($F_{4, 17971} = 543.53$, $p < .001$) and generation ($F_{4, 17971} = 21.94$, $p < .001$) were also statistically significant ($R = 0.59$).

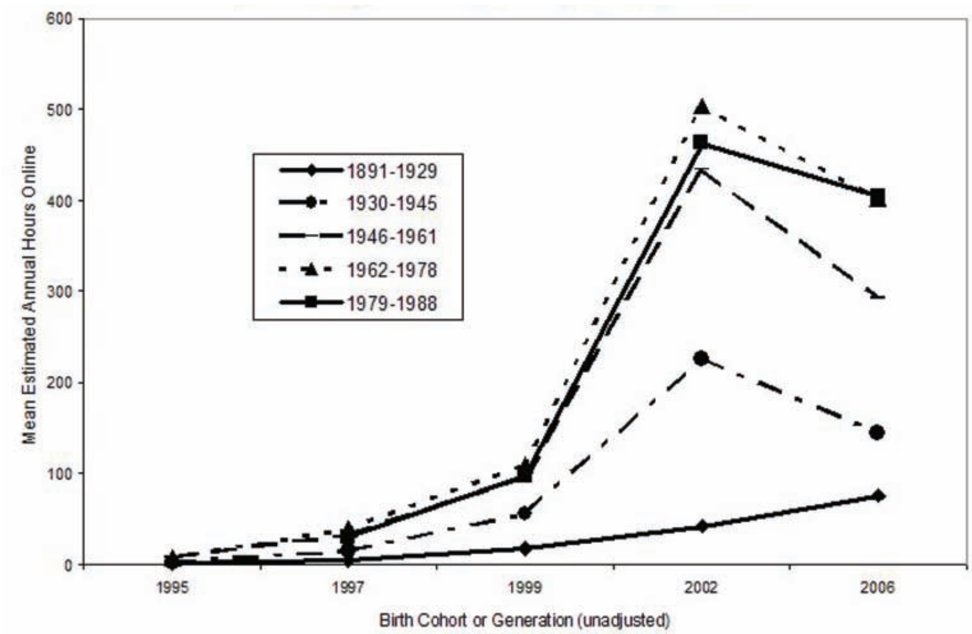
Even among PC owners, however, cohort affected online time. Figure 3 shows how generation and study year affected the hours users spent online. An interaction occurred between study year and cohort ($F_{4, 10241} = 13.44$, $p < .001$); all significance tests control gender and education. Although all generations increased their online time between 1995 and 2006 (main effect, year, $F_{4, 10241} = 272.45$, $p < .001$), Baby Boom, Generation X and Gen Y members took the most advantage of Internet access (main effect, cohort, $F_{4, 10241} = 34.48$, $p < .001$). Even with the slightly different estimates of online time in 2006, the interaction, coupled with the data presented in Figure 3, indicate that differences across generations widened over time.

Generation predicted using the Web as a primary news source ($F\,4_{, 1807} = 33.47$, $p < .001$, total R with covariates = 0.33) or for science news ($F_{4, 1807} = 34.05$, $p < .001$, total R with covariates = 0.32); 29% of Gen Y used the Internet as a primary news source, as did 18% of Generation X compared with only 8% of Baby Boomers, 5% of the Lucky Few and 1% of the Early Years. For science news, 42% of Gen Y turned first to the Web, compared with 26% of Generation X, 19% of Baby Boomers, 10% of the Lucky Few and 3% of the Early Years.[7]

Generation and Education

Obviously individuals *within* generations differ on many characteristics. In particular, I examine degree level, gender and ethnicity, which in the U.S. and globally predict digital splits. If digital divides across levels of these attributes converge by cohort, one outcome will be an interaction effect between generation and the particular

Figure 3. Generation and time effects on annual online hours (n=10268)



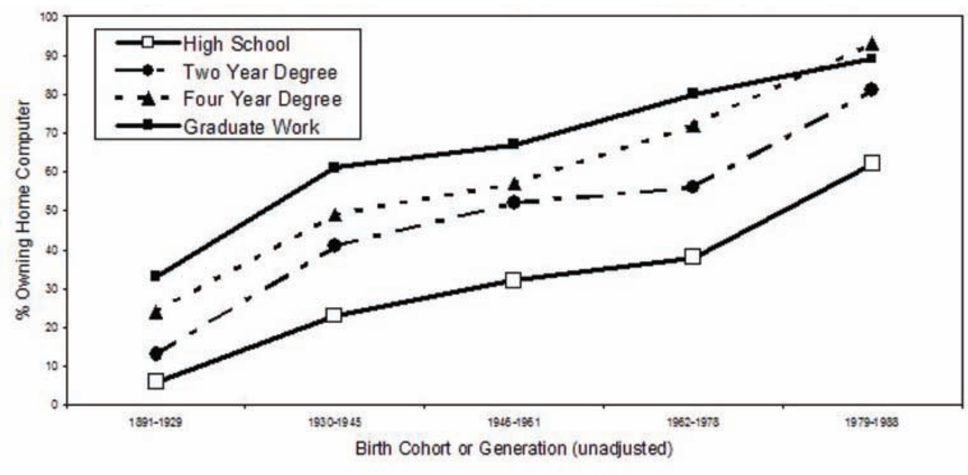
characteristic examined (e.g., degree level), as differences narrow among more recent cohorts compared with earlier ones. One such example was shown in Figure 2 for home Internet access by generation over time.

Note however, that statistical interaction can also happen *if differences across attributes widen by cohort*. It turns out that greater divides occur quite often. Finally, the lack of such an interaction implies that differences by education, gender or ethnicity on a particular ICT remained parallel or static by generation, neither widening nor converging.

Educational level has consistently been a top ICT predictor, partly because baccalaureates more often hold jobs in which digital technology use is critical, partly because well-educated individuals are wealthier, and partly because the college educated tend to be more cognitively prepared to utilize online opportunities. Among the most recent cohort, "Gen Y" young adults with two-year degrees significantly progressed on PC ownership compared with earlier cohorts (Figure 4)—thus almost certainly having home Internet access[8]. However, high school educated young adults lagged behind: only 62% owned a computer, compared with 81% of those with a two-year degree, 93% of baccalaureates and 89% of those with graduate school. Net main effects for education ($F_{3, 17982} = 409.87$, $p < .001$), cohort ($F_{4, 17982} = 801.33$, $p < .001$), and their interaction ($F_{12, 17982} = 2.10$, $p < .05$, total R including covariates gender and age = 0.46) were all statistically significant. All figures in this education section show unadjusted means because comparable degree-generation interaction effects occurred on all ICT variables analyzed.

Online time varied by education and generation (Figure 5). This analysis illustrates how an interaction ($F_{12, 10247} = 2.71$, $p < .001$) can occur because educational differences widened across generations. A gap in online time opened and enlarged between those with at least a four-year degree and those with less education. The division begins in the Early Years cohort, then increases. Both cohort ($F_{4, 10247} = 121.44$, $p < .001$) and de-

Figure 4. Generation and degree level effects on % home PC ownership 2006 (n=1812)



gree ($F_{3,10247}$ = 88.70, $p < .001$, total R including covariates = 0.27) main effects occur as well as the interaction.

Figure 6 shows how cohort and degree affected accessing news in 2006; Figure 7 shows how both affected science news access. Given differences in online time by generation and degree, the interactions for accessing regular news ($F_{12, 1793}$ = 4.50, $p < .001$) and science news ($F_{12, 1793}$ = 2.65, p = .002) are consistent. The better educated ($F_{3, 1793}$ = 28.20, $p < .001$), and Generations X and Y ($F_{4, 1793}$ = 32.39, $p < .001$, total R with gender as a covariate = 0.33)[9] most often accessed Web news, and differences widened by education among more recent cohorts. Comparable main effects for degree ($F_{3, 1793}$ = 27.44, $p < .001$) and cohort ($F_{4, 1793}$ = 33.04, $p < .001$, total R with gender as a covariate = 0.33), as well as greater educational

Figure 5. Generation and degree effects on annual online hours 1995-2005 (n=10,259)

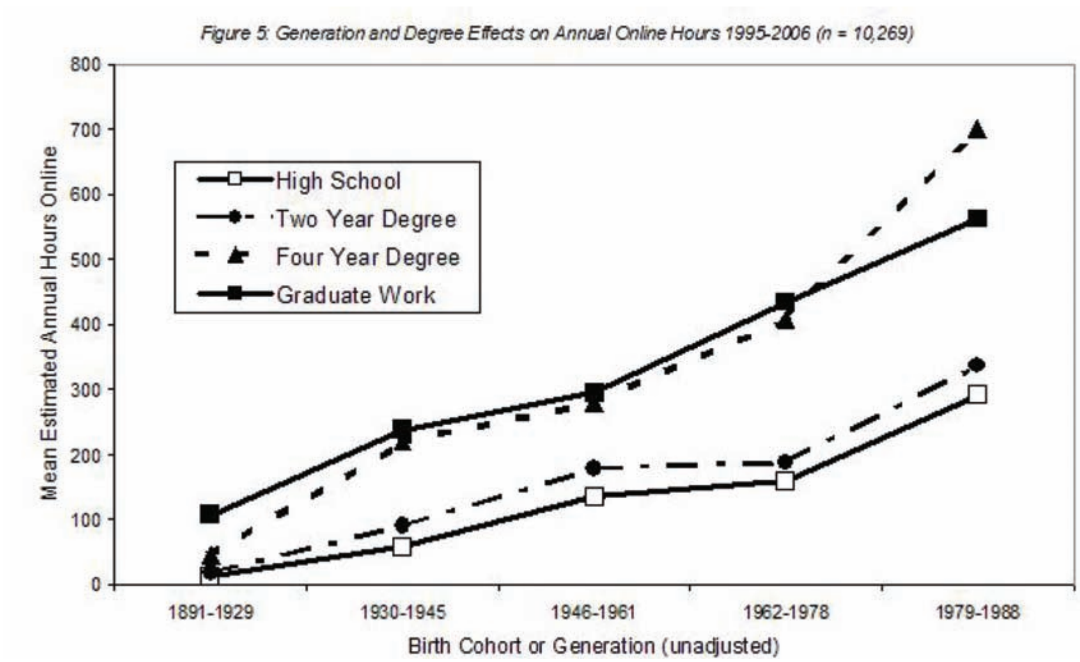
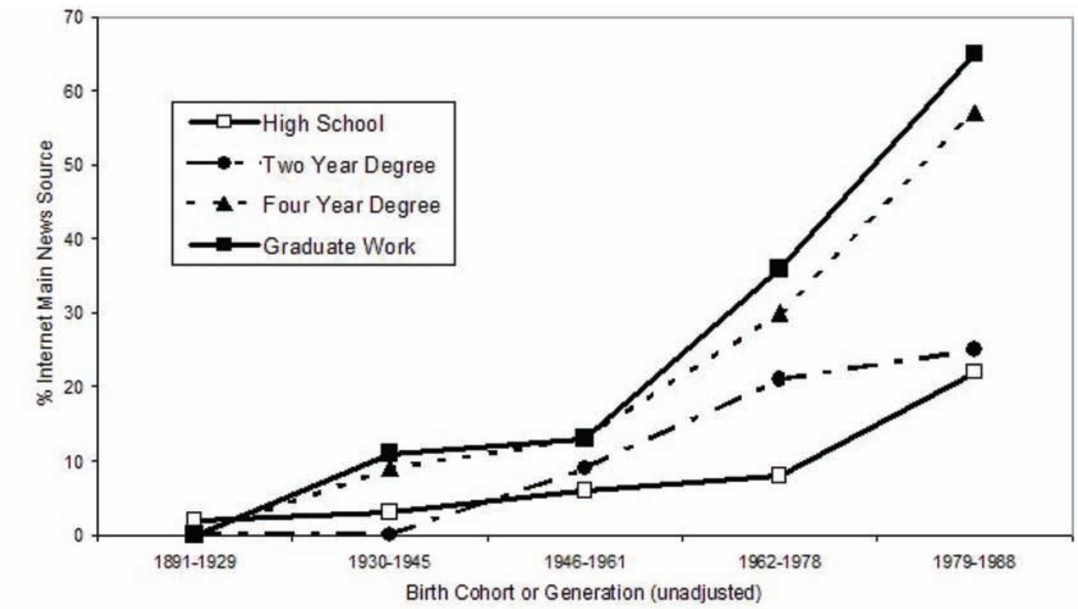


Figure 6. Generation and degree level effects on % accessing Internet news 2006 (n=1814)



gaps among more recent cohorts, also occurred for accessing Internet science news. The largest differences were between those with at least four years of college and those with less education.

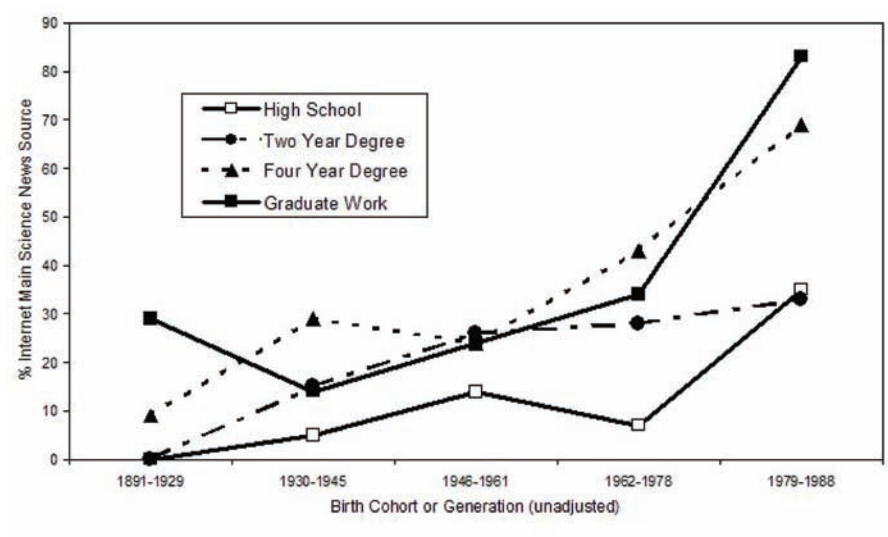
Generation and Gender

At one point, gender was a primary digital divide. American scholars still report gender differences in Internet use (Fallows, 2005; Royal, 2008). Gender still influences ICT access and use in many Asian and European nations (Demoussis & Giannakopoulos, 2006; Ono, 2005). However, much gender convergence in U.S. PC ownership (thus also in home Web access) has occurred (Figure 8), whether all aggregated study years are considered or just 2006. This time, there is a statistically significant gender by cohort interaction for the entire sample ($F_{4,\ 17992} = 3.18$, $p = .013$) because male and female "Gen Yers" are nearly equivalent in computer ownership. The 2006 data show a very minimal overall gender division (males, 71%, females 67%, $t_{1815} = 1.82$ $p = .07$).

This similarity of gender by cohort in PC ownership and home Web access also occurs for online time and accessing general or science news. For parsimony, therefore, graphs with these digital divide convergences are omitted[10] although the results are summarized below. There was no gender-cohort interaction on annual online time ($F_{4,\ 10257} = 1.03$, $p = .390$) although men used the Internet for slightly more hours than women (all, 193 versus 162 hours; for Gen Y, 359 versus 317; $F_{1,\ 10257} = 6.55$, $p = .011$). The huge gap was across cohort: 337 hours for Gen Y versus 21 for the Early Years cohort ($F_{4,\ 10257} = 107.18$, $p < .001$, total R including covariates = 0.27). The steepest difference (over 100 hours per year) occurred between Generations X and Y.

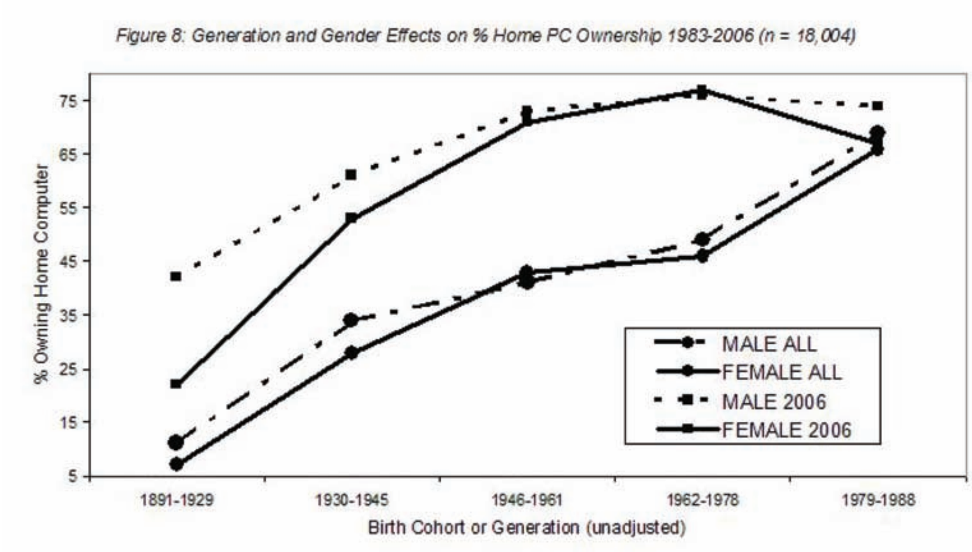
Very borderline gender-cohort interactions occurred for using the 'Net as a primary news source ($F_{4,\ 1803} = 1.95$, $p = .100$) or as a science news source ($F_{4,\ 1803} = 2.03$, $p = .087$). Gen Y women accessed general online news (30 versus 28%) and science news (45 versus 39%) slightly more than men. Overall, men ($F_{1,\ 1803} = 10.43$, $p = .001$) and more recent cohorts (29% for Gen Y

Figure 7. Generation and degree level effects on % Internet science news 2006 (n=1814)



versus 1% for the Early Years, $F_{4, 1803} = 33.54$, $p < .001$, R using education as a covariate = 0.33) accessed Internet news more often. Only a borderline sex difference occurred on science news ($F_{1, 1803} = 3.02$, $p = .082$) although again a sizable cohort difference occurred (42% for Gen Y versus 3% for the Early Years, $F_{4, 1803} = 34.12$, $p < .001$, overall $R = 0.32$).

Figure 8. Generation and gender effects on % home PC ownership 1983-2006 (n+18,004)



Contrasting with the educational findings, gender by generation results present a more positive picture of digital convergence among U.S. adults. Perhaps women's greater labor force participation, particularly in biological and health sciences, have made ICT acquisition more affordable and its use much more functional and attractive. As the literature cited earlier suggests, women also increasingly use the Internet to solidify social ties, and this desire, too, can contribute to greater ICT use and a closing of the American gender digital divide.

Generation and Ethnicity

The news is mixed for generation and ethnicity. Figure 9 shows computer ownership by ethnicity and time while Figure 10 presents it by ethnicity and cohort, controlling education, age and gender. Because Black and Hispanic Americans are younger, they may not yet have become economically established enough to afford a PC or Internet service. Sample Asian Americans had the highest degree levels (54% had at least a baccalaureate in 2006) compared with White- (31%), Black- (11%) or Hispanic Americans (5%; $X^2_{(9)} = 130.94$, $p < .001$).

With education, age and gender controlled, across time White and Asian Americans most often owned a PC. There were statistically significant effects for age (older people less often owned a computer), degree (high school graduates less often owned a PC), time ($F_{2,6151} = 55.88$, $p < .001$) and ethnicity ($F_{.3,6151} = 33.67$, $p < .001$) but no overall gender difference. Because the year by ethnicity interaction was not statistically significant ($F_{6,6151} = 0.88$, $p = .507$, total $R = 0.24$), adjusted MCA percentages are reported in Figure 9.

Similar effects occurred when generation was substituted for time; however, the cohort by ethnicity interaction was statistically significant ($F_{12, 6137} = 2.10$, $p < .05$, total $R = 0.43$) due to an Hispanic-African-American similarity to other ethnicities only for Baby Boomers, which widened again for Generations X and Y. Recent cohorts more often owned a PC ($F_{4,6137} = 71.49$, $p < .001$) and Whites and Asians owned a computer (the adjusted means by cohort were identical) more than Hispanics, followed by Blacks (ethnicity $F_{3,6137} = 34.09$, $p < .001$).

Figure 9. Time and ethnicity effects on % home PC ownership (n=6178)

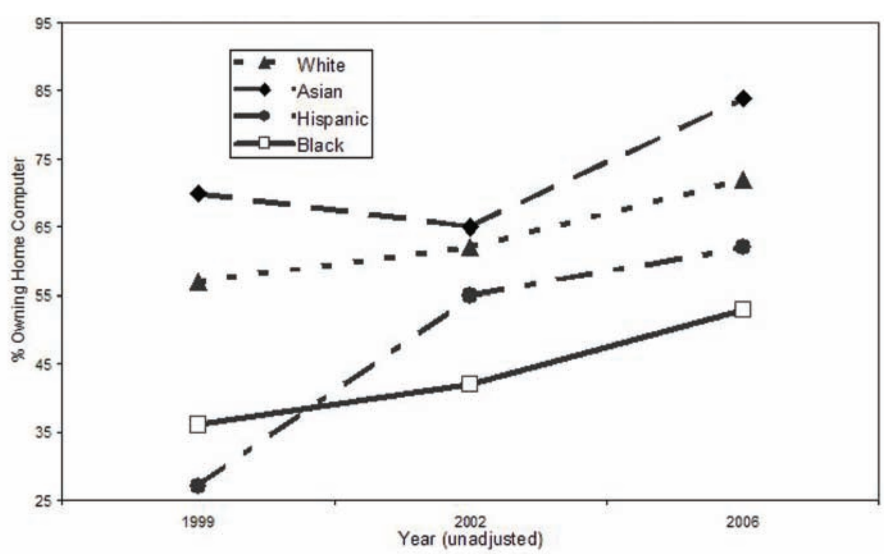
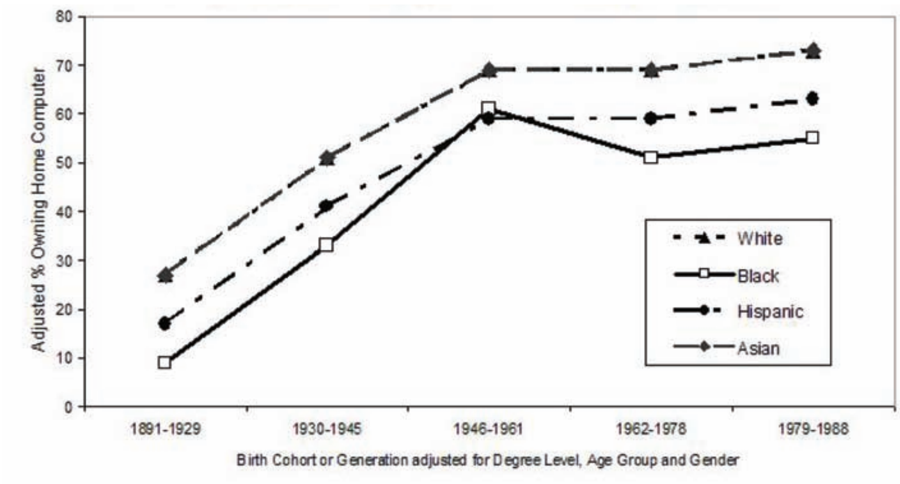


Figure 10. Generation and ethnicity effects on home PC ownership 1999-2006 (n=6160)



Although PC ownership is synonymous with Internet access, divides can still occur in online use. A divide in online hours can reflect ethnic income disparities making broadband more of a financial hardship. Thus we would expect White and Asian Americans to be online longer than Hispanic or Black Americans. Any divides in news access, on the other hand, may be more driven by education than by other factors since news access entails no additional connection costs.

Figures 11 and 12 show how online hours varied by ethnicity over time and, next, by cohort. Ethnic divides continued even in 2006 (year, $F_{2, 6138} = 189.36$, $p < .001$; ethnicity, $F_{2,6138} = 3.69$, $p = 0.01$, total $R = 0.33$). Asians spent the most time online, followed by Whites and Hispanics, then Black Americans. Because the ethnicity by year interaction was not significant ($F_{6,6138} = 1.20$, $p = 0.304$), adjusted mean hours are shown in Figure 11.

Because there was a significant interaction between ethnicity and cohort ($F_{12,6124} = 2.29$, $p = .007$, total $R = 0.26$ controlling age, education and gender), unadjusted online time is shown in

Figure 11. Ethnicity and time effects on estimated annual online hours (n=6163)

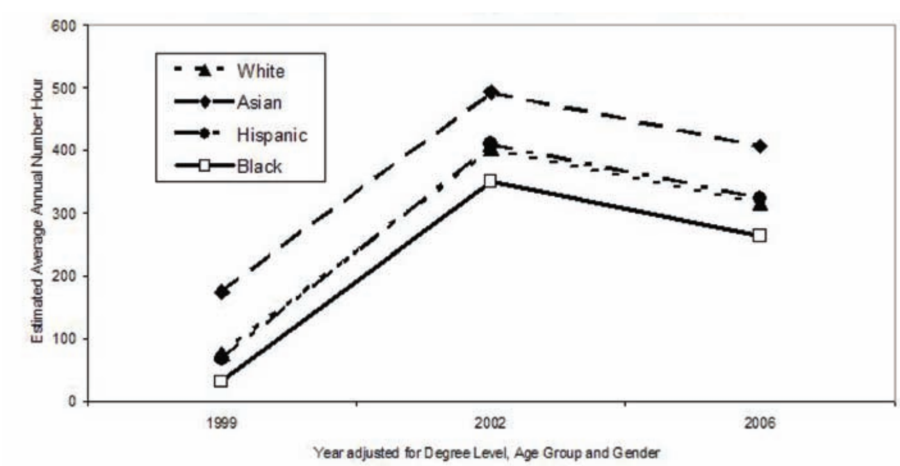


Figure 12. Generation and ethnicity effects on online hours 1999-2006 (n=6147)

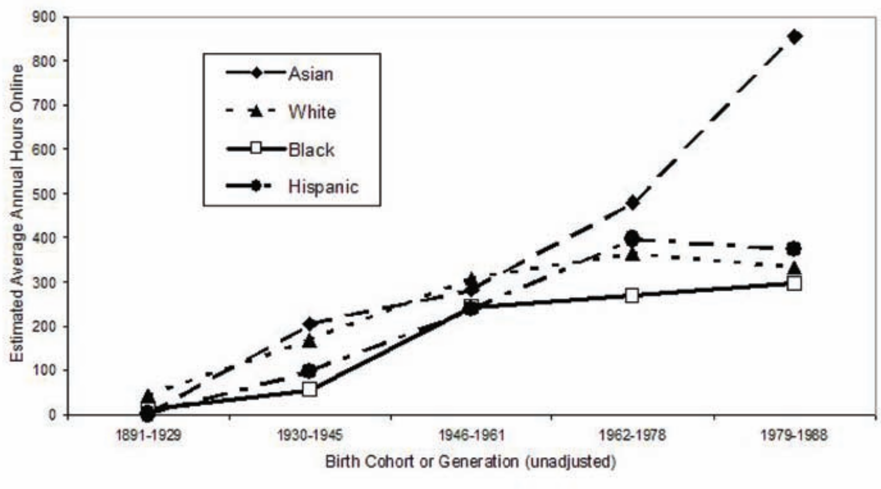


Figure 12. The interaction is due to the jump in connectivity among Asian Americans for Generations X and Y ($F_{3,6124}$ ethnicity = 3.49, p = .015; $F_{4,6124}$ cohort = 22.37, p < .001). By Gen Y, Whites, Blacks and Hispanics were relatively close in (fewer) online hours. In addition, among Whites, Hispanics and Asians, males spent more time online; however, as reported in some earlier studies Black women (mean annual hours = 232) spent slightly more time online than Black men (209 hours), a difference (nor any related interaction) that was not statistically significant.

Finally, Figures 13 and 14 show how ethnicity and generation affected primarily accessing the Internet for general news and for science news. Gender and education were covariates. Because no interaction occurred between ethnicity and cohort for general news ($F_{12,1721}$ = 1.32, p = .203, total R = 0.34), adjusted percentages are used in Figure 13. However, there was a statistically sig-

Figure 13. Generation and ethnicity effects on accessing Internet news 2006 (n=1743)

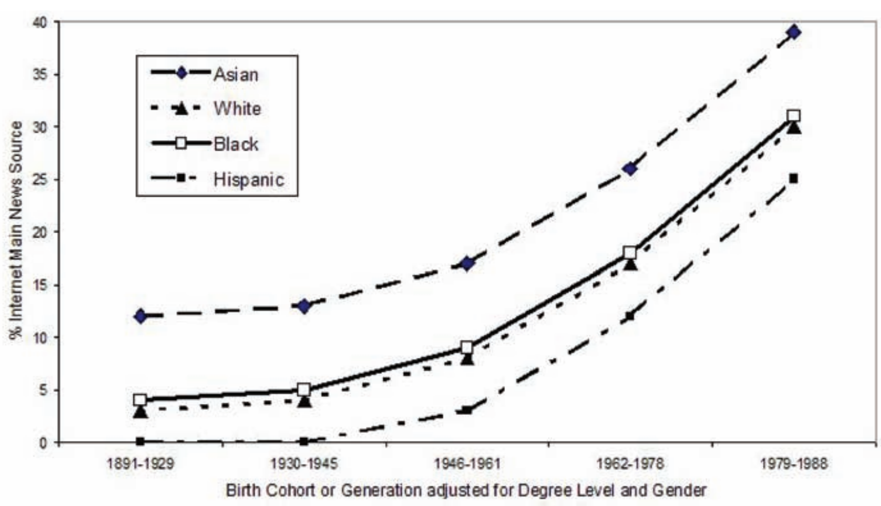
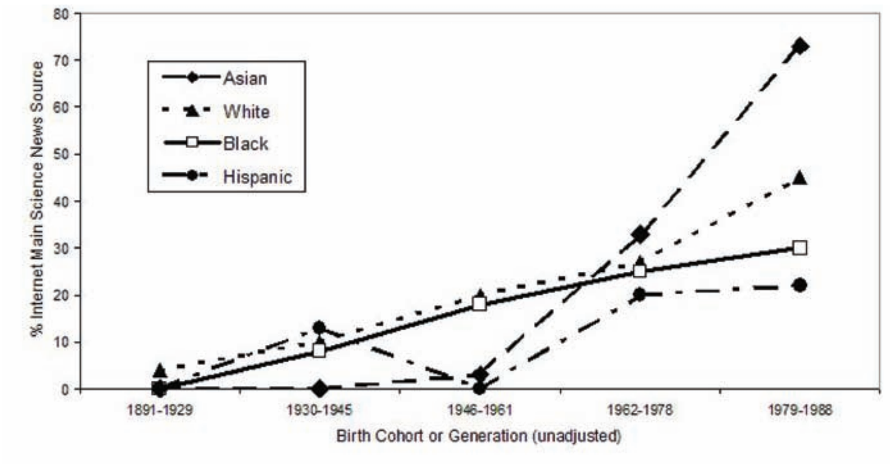


Figure 14. Generational and ethnicity effects on Internet science news 2006 (n=1743)



nificant interaction between cohort and ethnicity for science news ($F_{12,1721} = 1.96$, $p < .05$, total $R = 0.33$) so unadjusted percentages are shown in Figure 14.

Both cohort ($F_{4,1721} = 31.76$, $p < .001$) and ethnicity ($F_{3,1721} = 4.80$, $p < .01$) affected using the Web as a primary news source. Gen Yers most often did so (29%) and percents monotonically dropped to 1% in the Early Years. Asians (29%) referenced the Internet for news more than twice as much as Blacks or Whites (both 14%) or Hispanics (10%).

The picture is more complex for accessing online science news. In early cohorts, there was a low—and relatively egalitarian—usage of science news (the overall main effect for ethnicity is not significant; $F_{3,1721} = 2.07$, $p = .102$). However, in the two most recent cohorts, Gen Y Asians, distantly followed by Whites, used the Web for science news most often followed by African Americans and then Hispanics (for generation, $F_{4,1721} = 34.04$, $p < .001$).

Putting It Together: Multivariate Effects

Table 3 shows how age (except for news and science news), gender, education, cohort, and ethnicity affected computer ownership and Internet use. Because so many of these variables intertwine, especially ethnicity, age, generation, and education, it was important to institute multivariate controls to ascertain net effects. Table 3 also shows the net linear increments to explained variance from educational level, cohort, gender and ethnicity.

Consistently, in tandem with global results, the better educated more often owned a PC, accessed the Internet at home, spent more time online, and more often used the Web for news. The relative effects of education were most apparent for PC ownership. With education controlled (again consistent with earlier research), ethnicity mattered less—with the exception of computer ownership. Compared with Whites and Asians, Hispanics- (-13%) and especially Blacks (-18%) less often owned a PC. Black Americans spent less time online and Hispanics less often turned to the Internet as a primary science news source. Gender did not affect PC ownership or home Web access. Men spent slightly more annual hours online (B = 36.3) and were about 5% more likely (net effect) to use the Internet as a general news source. There were no overall sex differences in using the Internet as a primary science information source.

Table 3. Multivariate Predictors of Information and Communication Technology

Predictors	Home	PC[a]	Home Access[b]	Internet	Annual Hours	Online	Web Source	Main News	Web Main *Science*	Source News
Final Bs	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta
Degree Level	0.135***	0.28	0.012***	0.02	99.3***	0.18	0.061***	0.18	0.067***	0.17
Age Group	-0.002***	-0.06	0.005***	0.34	2.46***	0.08	--	- -	--	--
Generation	0.089***	0.20	0.080***	0.37	122.1***	0.24	0.079***	0.25	0.100***	0.26
Gender [c]	-0.007***	-0.01	0.013***	0.03	36.3***	0.03	0.050***	0.07	0.033***	0.04
Asian Ethnicity[c]	-0.012***	-0.00	0.023***	0.02	94.9***	0.03	0.093***	0.06	0.047***	0.02
African-American[c]	-0.182***	-0.13	-0.012***	-0.02	-44.0***	-0.03	0.002***	0.00	-0.017***	-0.01
Hispanic Ethnicity[c]	-0.132***	-0.07	0.000***	0.00	-23.4***	-0.01	-0.045***	-0.04	-0.085***	-0.06
Constant	0.736***		0.941***				0.262***		0.397***	
R^2 Degree Level and Age	0.147***		0.005***		0.056***		0.037***		0.031***	
ΔR^2 Cohort	0.004***		0.016***		0.005***		0.062***		0.065***	
ΔR^2 Gender	0.000		0.001		0.001**		0.004***		0.001	
ΔR^2 Ethnicity	0.019***		0.001		0.001*		0.004*		0.004*	
R	0.41***		0.151***		0.253***		0.328***		0.318***	
R^2	0.17		0.02		0.06		0.10		0.10	
Case Base		6177		3226		6163		1748		1748

[a] Home computer, home Internet and online hours for these equations only are 1999 – 2006; Internet news items were only available for 2006.
[b] Home Internet access only asked to those with computers or Web-TV
[c] Dummy variables 1 = Male; Asian=African American=Hispanic; White American = omitted category. See footnote 13 about interaction effects.
* $p < .05$ ** $p < .01$ ***$p < .001$
All data: The NSF Surveys of Public Understanding of Science and Technology and the General Social Survey

Even controlling age, education, gender and ethnicity, cohort continued to affect ICT access and use. Recent generations more often owned a computer and accessed the Internet from home more often. They garnered more online time, and more often trolled the Web for news.

Given the juxtaposition of generation and age in these data, it was interesting that age had no net effect on PC ownership or online time. Older Americans actually more often had home Internet access. Indeed, age and cohort had comparable and sizable positive standardized effects on home Internet access. These findings challenge the typical global conclusions that older people eschew ICT due to some unspecified aging process. Rather than older citizens avoiding computers or the Internet, it is more accurate to say that earlier cohorts, who neither grew up with PCs or the Web nor learned digital skills at an early age, use ICTs less.

Finally predicting ICT access and use was strongest for owning a computer (R = 0.41) and accessing Internet news (R = 0.33 for general news; R = 0.32 for science news). Predicting home Web access (R = 0.15) and time spent online (R = 0.25) was less successful. [11]

SUMMARY

The results from this study, coupled with other current research, indicate that at least some American digital gaps have diminished or even disappeared. For example, of those owning a computer, regardless of gender, degree, age, ethnicity or cohort, virtually all had home Internet access by 2006. By 2006, nearly as many women as men owned a PC; for those owning a computer, gender home Internet access converged by 2002. Women and men also increasingly spent comparable time online. On the other hand, in 2006, men more often used the Internet than women as a primary source for general news. Gender is a bright spot in narrowing American digital divides: whether considering access (i.e., owning a PC) or certain uses (e.g., online time or news access; see Buente & Robbin, 2008; DiMaggio et al., 2004; Robinson, et al., 2003) American women and men are now similar.

Further, age does not retard computer and Internet access the way other studies suggest. What has been treated as age in research that either uses one-shot surveys or a few surveys over short time periods is almost certainly generational effects. Because age and cohort are synonymous in these short-term studies, it previously has been impossible to establish which is more important. Given the 23 year time span on the NSF data for PC ownership or the 12 years for home Internet access or online time, we can now begin to disentangle age from cohort influences on ICT access or use. The positive effect then found of age on home Internet access may reflect greater income among an older group that is more occupationally established and thus more able to afford the recurrent costs of Internet connection services. It is indeed unfortunate that this database does not contain an income variable to test this hypothesis. In any event, these results indicate that there is no reason to expect adults to discontinue their email use, search engines, or online bargain hunting simply because they hit middle age.

Yet considerable educational, cohort and ethnic ICT divisions remain. By the early 2000s, owning a computer became the gateway to home Internet access but such possession was disproportionately concentrated among better educated White and Asian Americans, and the educational gaps across generation indicate these disparities will continue in the near future. U.S. Whites and Asians, and the better educated, initially logged—and continue to log—more Web time than Hispanics or Blacks. Even controlling education, Hispanic and Black Americans less often owned a computer and thus could less easily access the Internet. In 2006, Asian Americans far and away used the Internet most often, and most often as their primary news source, especially for science information.

Because of small subsample sizes, Asian

Americans typically are either excluded from analyses of the digital divide or are collapsed with Hispanic- or African-Americans into a "non-White" category. This study clearly indicates that either approach (especially collapsed categories) misleads. Because they are more educated and hold more science and technology jobs, greater involvement of Asian Americans with home computers and the Web is predictable; greater participation of American Hispanics and Blacks in college and in technical or scientific jobs ultimately should lead to more use of PCs and the Internet.

More recent American cohorts who at most had completed a two-year college degree, especially adults with a high school diploma or less, fell further behind those with at least a baccalaureate. They owned PCs less often (hence had less home Internet access), logged fewer online hours, and less often accessed Internet news. General educational differences widened by generation (despite other controls) and were most pronounced among recent cohorts. What all this implies is that as young, well-educated Americans increasingly tap into the Internet, those with even a couple of years of college exposure will continue to lag. Unless dramatic changes occur, as more recent cohorts replace earlier ones, these educational gaps will increase.

More recent cohorts, probably due to early home and school experiences with computers and the Internet, are clearly more ICT-savvy: they more often own a computer and log more Web time. In larger numbers than prior cohorts they turn to the Web for news. Indeed, many U.S. newspapers are increasingly parochial, printing local news, apparently assuming their better-educated readers will obtain national and international news online, or else they simply stop their print editions,12 thus, inadvertently robbing earlier generations—who are now older people—of their traditional window on the world.

More disturbing are the widening ethnic and educational digital gaps. The less educated, or Black or Hispanic Americans, can less often search or apply for jobs online, take online courses to upgrade their skills, locate health information, exploit bargains on travel and purchases, benefit from the constant Internet updates, from cautions about food poisoning to threatening weather, or enjoy online entertainment. In turn, employers may expect less from their less educated, Black or Hispanic colleagues or employees, which can damage future prospects for either employment or advancement among these groups. On the other hand, these data indicate that discrimination on the basis of age stereotypes about digital skills is probably uncalled-for and should be even more unwarranted in the future.

In sum, this chapter indicates that although American gender digital gaps are largely gone, in an era when electronic access and use have become increasingly important, significant differences in computer and Internet access remain. Replicating prior research, these divides fall along prior social stratification cleavages; many of these groups, Blacks, Hispanics, or the poorly educated were economic "have-nots" during the twentieth century. Thus, as we head into the twenty-first century, the promise of information technology to benefit traditionally disadvantaged demographic groups and provide a more level playing field for academic and economic marketplace achievement is only partly being fulfilled.

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KEY TERMS AND DEFINITIONS

Aging, age, seniors, older workers: A set of processes associated with chronological aging, e.g., slowing of reaction time, slower learning processes or presbyopia. Stereotyped views of aging may predispose employers to avoid older workers for digital skills jobs.

Baby Boomer, Boomers: Member of the "Baby Boom" generation, born between 1946 and 1961 (when the absolute number of U.S. births peaks; U.S. birth rates peak in 1957); very large generation with profound effects on occupational opportunities and consumer demand.

Cognitive Priming: Typically through specifics experiences, individuals possess a heightened readiness to perceive particular events or predisposition to more easily learn particular skills; applied to "Gen Y's" proclivity toward information and communication technology.

Ethnicity: A particular "racial" or cultural heritage, e.g. Hispanic or Latino background.

Gender, sex roles: The social construction of what it means to be male or female, contrasted with biological sex.

Generation, birth cohort, cohorts: Individuals born during a restricted time period who typically experience a social-time specific set of experiences.

Generation X, Gen X: The birth cohort born between 1962 and 1978.

Generation Y, Gen Y, Generation Next, Millennials: Born after 1978, these (currently) young adults grew up with information and communication technology.

ICT: Abbreviation for information and communication technology.

The Lucky Few, Depression or War Babies: Term coined by Elwood Carlson (2008) to describe members of the generation born approximately between 1930 to 1945. This relatively small birth cohort enjoyed superior occupational opportunities due to high demand for labor as it matured during the 1950s and 1960s.

ENDNOTES

1. For example, the Pew Research Center (2007) focused on birth cohort, especially the recent Gen Y or "Generation Next". However, with only one survey year in the analysis, this report confounds age and generation as noted above.
2. ICT encompasses many tools, e.g., cell phones and elaborated communication devices such as *i*phones in addition to computers. I focus on PC ownership and Internet access and use. Current literature indicates that primarily communicative devices, compared with Internet access through a computer, are more often used to communicate with known individuals or to *receive* information (e.g., weather or financial quotes), than *interactively for extensive educational or occupational purposes* (e.g., Kennedy, et al, 2008).
3. This database is an extension of the one I created through the 2002 data, and extends the data through 2006 (see Miller, Kimmel & ORC Macro, 2005 for the original database).

4 In fact, the 2006 NSF data were gathered through the 2006 GSS.

5 Data are weighted with a combination of gender, ethnicity, education, and region weights.

6 The "Early Years" generation actually collapses two cohorts born prior to 1930 due to their decreasing numbers in the 2002 and 2006 data.

7 Given the synchrony between age and cohort at one time point, either could be used to analyze 2006 news access. I use generation for consistency with the other analyses and because I believe generation provides more information about future trends. There is no reason to expect accessing Internet news or science news to drop by age or life cycle stage.

8 Because by 2006, owning a PC became synonymous with home Internet access, further analyses on home Web access are not shown here until the multiple regression equations. Detailed results are available from the author.

9 Again age group is not a covariate in 2006 analyses because of its overlap with generation in a single year.

10 These graphs are available from the author upon request.

11 Because of the earlier results, dummy variable interaction terms were separately added for gender by cohort, and for ethnicity by cohort. A multiplicative term for degree by cohort was also used. Space and ease of comprehension precludes presenting all terms in Table 3. I added interactions separately because of the multicollinearity that would result from including all interaction terms containing generation simultaneously. The following net gender interaction resulted: a small ($t = -2.06$, $p = .04$) decrease among Gen Y men in PC ownership compared with women. The following net ethnicity interactions resulted: an increase in Asian online hours among Gen Y ($t = 3.67$, $p < .001$) and the dramatic increase among Gen Y Asian-Americans accessing online science news ($t = 3.64$, $p < .001$). Net interaction effects for degree level reflected the convergence of the college and graduate school educated across generations for computer ownership but the widening gap for the high school educated ($t = 2.63$, $p < .01$), the widening gap between those with and without a college degree for online hours ($t = 3.45$, $p < .001$), and greater access among the college educated in Generations X and Y for regular 'Net news ($t = 6.53$, $p < .001$) and for science news ($t = 2.77$, $p < .001$). These findings parallel the ANCOVA results presented earlier; the reader is urged to examine those figures to see the form of each interaction.

12 In Fall 2008, the prestigious *Christian Science Monitor* announced it would only publish an online edition. The *Detroit News-Free Press* discontinued home delivery. Given rising publication costs in a poor economy it is likely that many U.S. newspapers will soon follow suit.

Chapter 12
The Digital Divides in the U.S.:
Access, Broadband, and Nature of Internet Use

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ABSTRACT

The purpose of this chapter is to describe the digital divides in the U.S. in terms of access, broadband connectivity, intensity of Internet use, and nature of Internet use. These divides hold true for both adults and youth and have far-reaching implications for both groups, as well as for society as a whole. For the most part the digital divides center around race, income, and, to a lesser extent, gender. Because the digital divides are complex and multifaceted any approach to reduce or eliminate them must also be complex and multifaceted. We suggest ways that educational, community, government, and corporate resources can be brought to bear on eliminating the digital divides.

INTRODUCTION

The objectives of this chapter are to provide evidence that: (1) There is a digital divide in Internet access in the U.S. that centers around race, income and education; (2) There is a digital divide in the U.S. in intensity and nature of Internet use that centers around race, income and education but also around gender; (3) The intensity and nature of the Internet digital use divide may have consequences as far

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reaching as the initial Internet access divide. The existence of these digital divides, broadly defined, has far-reaching implications. Vital information about health, government, jobs, education and commerce are migrating relentlessly online and thus becoming increasingly less available to those who need this information the most – underprivileged groups, and increasingly more available to those who need it least – affluent groups; (4) Efforts to reduce the digital divide in the U.S. and elsewhere through public access are unlikely to results in digital equity. Rather, direct intervention from public and private organizations will be needed to reduce and possibly eliminate the digital divide.

A second set of objectives of this chapter is to demonstrate that: (1) Digital divides are almost as pervasive among youth in the U.S. as they are among adults. The so called "Net Generation" is actually a quite exclusive group which leaves out many other groups in our society; (2) Digital divides among youth have as many if not more negative implications as digital divides among adults, potentially contributing to gaps in academic performance and professional, social and political integration; (3) Digital equality has the potential to level the playing field by providing the underprivileged "have nots" with the same opportunities for cognitive, social and psychological development as their more affluent peers.

Other objectives of this chapter are to provide evidence of the importance of being "connected" in order to obtain the educational and occupational resources needed for successful employment in the 21st century workforce. Using our own research we describe the changing nature of the digital divide in the U.S., the possible benefits of IT use to the academic performance of low-income children, and gender differences in select dimensions of academic performance among children in the U.S. and China. We conclude by discussing policy implications aimed at reducing the digital divides to achieve economic, political and social parity among racial/ethnic and gender groups.

BACKGROUND

Since the Internet first entered the public consciousness (circa, 1995) there have been countless discussions about the digital divide, including debates about its very existence and likely persistence (Driori, 2005, van Dijk, 2005; Jackson, 2008; Pew Internet and American Life Project (Pew), 2005; National Telecommunication and Information Administration (NTIA), 2000). Initially, the term "digital divide" was used to refer to the gap between those who had access to digital technologies, especially the Internet, and those who did not (NTIA, 2000). More recently, the term has been used to refer to the gap between those who have regular, "effective" access to digital technologies and those who do not. Thus, discussions have shifted away from physical access and toward the digital skills and literacy needed for success in the 21st Century global marketplace (Driori, 2005; Livingstone, 2003; Van Dijk, 2005).

Is there a digital divide? As we will demonstrate in this chapter, the answer to this question depends in part on how you define digital divide (Livingston, 2003;Van Dijk, 2005). We will demonstrate that the multidimensional nature of the digital divide necessitates multi-faceted strategies for closing the gap between the information haves and have nots.

THE FIRST DIGITAL DIVIDE: ACCESS TO INFORMATION TECHNOLOGY (IT)

For over a decade national survey research conducted by the Pew Internet and America Life Project (Pew), the National Telecommunication and Information Administration (NTIA) and independent researchers have documented the existence and persistence of a racial digital divide with respect to physical access to the Internet (e.g., Hoffman, et al., 2001; Pew, 2005; NTIA, 2000). In most of this primarily survey research "access" has been defined simply as whether or not the respondent has gone online within a designated period of time (e.g., 6 months). In 2000, 50% of Caucasian Americans had Internet access, compared to 36% of African Americans (Pew, 2000). Six years later this racial digital divide in Internet access remained. In 2006, 73% of Caucasian Americans compared to 61% of African Americans had Internet access (Pew, 2006a). The racial digital divide is most pronounced among low and high income groups. About 25% of African Americans compared to 32% of Caucasians Americans with incomes below $20,000 (USD) had access to the Internet; 65% of African Americans compared to 82% of Caucasian Americans with incomes greater than $50,000 (USD) had access. At incomes between $20,000 (USD) and $50,000 (USD), similar percentages of African Americans (55%) and Caucasian Americans (57%) had Internet access. Nevertheless, overall, African Americans have consistently lagged about 10 percentage points behind Caucasian Americans in physical access to the Internet, a difference that cannot be fully explained by race differences in income or education (Hoffman et al., 2001; Pew, 2006a).

Since the landmark reports by the National Telecommunications and Information Agency (NTIA), titled “Falling thru the net: Defining the digital divide and digital inclusion (2000), evidence of an income-based digital divide in access to the Internet has been unequivocal. Quite simply, as income increases so too does the likelihood of having Internet access. Findings indicate that 44%, 69%, 81% and 89% of Americans earning $30,000 or less, $30,000 to $50,000, $50,000 to $75,000, and greater than $75,000 (USD), respectively, had access to the Internet (Pew, 2006a).

Since the early days of the Internet (circa 1995) considerable efforts have been made in the U.S. to eliminate the digital divide based on access. In large part these efforts have been successful (e.g., Pew, 2006a; NTIA, 2000). Physical access to the Internet has become more commonplace for African Americans and low income Americans in part because the cost of technologies (e.g., computers) has decreased and in part because public access has become more available (e.g., access in schools, libraries and other public spaces). However, new digital divides are developing just as the access divide declines. Solutions to these new digital divides in the U.S. will require more than equity in physical access to technology.

THE SECOND DIGITAL DIVIDE: BROADBAND VERSUS DIAL-UP ACCESS

Recent evidence indicates that a second digital divide is developing in the U.S. based on broadband access to the Internet at home (i.e., high speed, high bandwidth access; Pew, 2006b). In 2000, less than 5% of home Internet users had broadband access. In March 2006, 42% had broadband access. The new broadband access divide is based primarily on income. As with the original Internet access divide in 2000, as income increases so too does the likelihood of having broadband access at home. In October 2005, Internet users living in the highest-income households ($75,000 and up) were not only the most likely to have Internet access (93%), but were also the most likely to have broadband access (71%).

Compared to Caucasian Americans, African Americans are less likely to have broadband access at home, again lagging about 10 percentage points behind Caucasian Americans in the same income bracket.

Researchers, educators and policy makers are concerned that the new digital divide based on broadband access will have implications as far reaching as the original physical access divide (Children’s Partnership Foundation, 2007; Drori, 2005; van Dijk, 2005). They argue that broadband access changes entirely the users’ relationship with the Internet, including how often they go online, how long they stay online, and what they do online. Whereas dial-up access is disruptive, broadband access is integrative, a distinction that some argue may result in deepening social and economic divides (Livingstone, 2003; van Dijk, 2005). Because these disparities are based primarily on income their overall effect is likely to be that "the rich get richer and the poor get poorer" as existing disparities in digital skills and literacy are exacerbated, contributing to increasing disparities in income (Norris, 2001).

Research has already documented that broadband users spend more time online, engage in more and a greater variety of activities than do dial-up users (Pew, 2006b). Broadband users are more likely to turn to the Internet first when they have a health question (versus calling a health professional). They are more confident about their Internet skills. They use the Internet to save time and money, and to get the best information available for themselves and their families. Broadband users are more likely than dial-up users to create content online (e.g., blogs or web pages) and to share self-created content online (e.g., stories, artwork, or videos; Children's Partnership Foundation, 2007; Pew, 2006b).

THE THIRD DIGITAL DIVIDE: INTENSITY AND NATURE OF INTERNET USE

As physical access to the Internet in the U.S. becomes more pervasive, whether by broadband or dial up, attention has shifted to a "third digital divide" having to do with the intensity and nature of Internet use. Some uses of the Internet contribute more to the development of technology skills and literacy than do other uses (Jackson, et al., 2006; Livingstone, 2003). Research thus far suggests that individuals are more likely to use the Internet in more intense and "engaging" ways when they have broadband access at home. But beyond this finding are deeper issues about the nature of Internet use, particularly with regard to the kinds of uses that contribute to technology skills and literacy, and who is likely to use the Internet in these ways.

Since the primary vehicle for delivering the Internet is the computer, there is concern that people lacking computer skills and confidence will use the Internet less intensely and in less engaging ways than those who have computer skills and confidence. Because the primary reason for going online is to communicate with others, there is concern that people lacking communication partners online will use the Internet less intensely and in less engaging ways than those who use it to communicate with others. Technological skills and use are strongly influenced by peer group support. And so there is concern that people lacking peer support for technology use will use the Internet less intensely and in less engaging ways than those who have peer support. Thus, having access to the Internet, even home access, and even broadband access, does not guarantee that the user has or will develop the technology skills and literacy needed to participate in the 21st century - economically, politically and socially.

A racial digital divide is evident in the intensity of Internet use even when access is not an issue. In survey by Pew (2005) a greater proportion of Caucasian Americans than African Americans who had similar access to the Internet went online on a typical day (56% versus 36%), or sent or received e-mail (49% versus 27%). Moreover, growth in the online African American population has been driven primarily by females, resulting in a gender gap in Internet use among African Americans that no longer exists among Caucasian Americans.

The nature of Internet use also differs for African Americans and Caucasian Americans who have similar access to the Internet. One national survey found that online African-Americans were proportionally more likely than online Caucasian Americans to search for information about major life issues, such as finding a job or a place to live (Pew, 2000). African Americans were more likely than Caucasian Americans to seek entertainment online through music, video and audio clips. African Americans online were also more likely to search for religious or spiritual information than were online Caucasian Americans (Hoffman et al., 2001; Pew, 2006a).

Race differences in the intensity and nature of Internet use, when access is not an issue, are as pronounced in later surveys as they were in the 2000. In 2006, compared to other racial/ethnic groups, online African Americans used the Internet less frequently (Pew, 2006a). They were less likely than online Caucasian Americans to use the Internet to connect to family and friends or to engage in other social networking activities (e.g., chat; Pew, 2006c). They were less likely than online Caucasian Americans to contribute content to the Internet (web pages, blogs; Livingstone, 2003; Pew, 2006b). Moreover, these race differences in the intensity and nature of Internet use held across all income and age levels (see also Hoffman et al., 2001).

In our own research, the HomeNetToo Project, funded by the National Science Foundation (http://www.msu.edu/user/jackso67/homenettoo/) we continuously and automatically recorded the Internet activity of 90 families, 117 adults and 143 children, who resided in a medium-size urban community in the Midwestern United States. Findings indicated that African American adults used the Internet less than did Caucasian American adults and this difference increased as the project continued. However, there was no race difference in e-mail use, which was a relatively infrequent activity throughout the 16-month project. Two explanations were offered for this finding. First, the study was conducted in 2001, a time when home Internet access was less common than it is today, particularly among low-income families. Second, and related, low-income families were less likely have family and friends online with whom to communicate. And few had jobs that required e-mail communication. Additional evidence obtained in ethnographic interviews of a sample of adult participants indicated that communicating with strangers online was viewed as inappropriate, unnecessary and potentially dangerous – a view held more strongly by African American than Caucasian American adults.

Gender differences in access to the Internet worldwide and in the nature and intensity of Internet use in the U.S. and elsewhere have been well documented since the Internet first entered the public consciousness (circa 1995). In the U.S. males and females are equally likely to access the Internet (Pew, 2006a), but a gender gap persists elsewhere, with men more likely to have Internet access than women (Norris, 2001; van Dijk, 2005). However, even within the U.S. gender gaps exist in the nature and intensity of Internet use (Pew, 2006a; Van Dijk, 2005). Men use the Internet more intensely, are more likely to use it for commercial transactions, and to know more about Internet technology than do women. Women are more likely to use the Internet to communicate with friends and family than are men (Pew, 2006a).

THE DIGITAL DIVIDES IN THE "NET GENERATION"

Are there digital divides in Internet access, intensity or nature of use among today's "Net Generation?" The answer to this question again depends on how you define digital divide (Pew, 2003a; Driori, 2005, Hoffman et al., 2001; Van Dijk, 2005). In the U.S. access to the Internet from school is nearly universal, with about 99% of schools having Internet access (Children's Partnership 2007). Thus, if the digital divide is defined in terms of having access to the Internet from anywhere, then there is no divide among the Net Generation in the U.S. However, there is a digital divide among youth worldwide, in favour of males (e.g., Norris, 2001), especially with respect to home Internet access, how homes are connected to the Internet (broadband or dial-up), and how the Internet is used once access is obtained (Jackson, 2008; Pew, 2006a).

Among the 88% of U.S. youth who reported using the Internet, access was higher for those whose parents had more education and income. It was also higher for Caucasian Americans, Hispanic Americans and Asian Americans than for African Americans (Pew, 2006a). And as expected from findings for adult, a digital divide exists between youth who have broadband access at home and those who have dial-up access, a divide based primarily on parental income and race (Pew, 2006a, 2006b).

Researchers of the Net Generation have suggested that there is also a growing digital divide between youth who use the Internet as a rich, diverse, engaging resource and those who use it as a narrow, unengaging, if occasionally useful resource (Jackson, 2008; Livingstone, 2003). Like the access and broadband divides, the Net Generation use divide is structured primarily along racial/ethnic, socio-economic, and urban-rural lines (Drori, 2005; Van Dijk, 2005).

According to one Pew survey (2006a), only a minority of teens are using the Internet in ways that may be described as engaging. For example, only 19% of online youth say they have created a webpage or blog, although a larger percentage, 32%, have created or worked on a webpage for school, a friend, or an organization. Only 33% of online youth have shared original content on the Internet, such as art work, photos, stories, or videos. Only 19% have remixed content they found online to make a new creation. Race and parental income appear to distinguish between youth who use the Internet in engaging ways from those who use it in mundane ways. As was the case for adults, differences in the nature of Internet use by youth may have implications for their participation in the 21st century – economically, politically and socially.

Findings from the HomeNetToo project indicated that African American children and younger children used the Internet less than did Caucasian American children and older children, respectively, even though all groups had equal access to the Internet at home (Jackson et al., 2006). African American children still spent less time online, participated in fewer Internet sessions, visited fewer domains and sent fewer e-mails than did Caucasian American children. However, unlike the findings for adults, race differences in Internet use decreased as the project progressed. E-mail activity was infrequent and varied considerable over the 16-month trial, as was the case for adults, probably because low-income youth had fewer family and friends with whom to communicate online.

In our ongoing NSF-funded research, the Children and Technology Project (http://www.msu.edu/user/jackso67/CT/children/) we found evidence of a "new" racial digital divide in IT use among children (Jackson, Zhao, Kolenic, Fitzgerald, Harold, & von Eye, 2008a). The sample consisted of 515 children, 172 African Americans and 343 Caucasian Americans, whose average age was 12 years old. Parents also participated in the project. All participants completed mailed surveys requesting a wide variety of information, including information about the frequency of their computer and Internet use, the frequency with which they used the Internet for communication purposes (e-mail and instant messaging), how often they played videogames and how often they used cell phones.

African American boys were the least intense users of computers and the Internet and African American girls were the most intense users. Boys, regardless of race, played videogames far more than did girls, whereas girls, but especially African American girls, used cell phones more than did boys of either race.

In an extension of the Children and Technology Project we compared the IT use of our sample of U.S. children to their same-age peers in China (Jackson et al., 2008, Jackson, Zhao, Kolenic, Fitzgerald, Harold & von Eye, 2008b). Based on samples of 600 Chinese and 600 U.S. children, average age 12 years old, we found cultural and gender differences in technology use as well as interactions between culture and gender. U.S. children used computers and the Internet more intensely than did Chinese children, with Chinese females being the least intense users. Males played videogames more than did females, with U.S. males playing more than did Chinese males. U.S. females lead all other groups in cell phone use whereas Chinese females were least likely to use cell phones.

THE TRULY DISCONNECTED

In 2005, 22% of US adults said they never used the Internet or e-mail and that they did not live in an Internet-connected household (Pew, 2005). Interestingly, the percentage of the US adult population in this category, labelled the "Truly Disconnected," has remained unchanged since 2002, despite a 10-point increase in the percentage of all adults who go online. In addition to race and income, age and education are strong predictors of being truly disconnected; members of this group are overwhelmingly above the age of 70, and have less than a high school education. In both 2002 and 2005 surveys, the truly disconnected said the primary reason they did not go online was because they do not want or need the Internet (Pew 2005). Other reasons include cost, lack of support for use, and being too busy to learn and use new technology.

In the U.S.13% of adolescents do not use the Internet at all (Pew, 2006c). About half (47%) of these nonusers were once online but dropped off for a variety of reasons, including bad experiences, parental restrictions or not feeling safe online. Adolescents who never used the Internet said that lack of interest, time, and access are the major reasons for not using it.

IMPLICATIONS OF THE DIGITAL DIVIDES: ADULTS

Most discussions of the implications of the digital divides have focused on adults. The assumption, often implicit, is that there is no digital divide among the NetGeneration or, if there is, it is small and will disappear as technology diffusion continues (Drori, 2005; Van Dijk, 2003). In contrast, our discussion acknowledges the existence of digital divides among both youth and adults and addresses the implications of these divides for both groups.

What are the implications of the digital divides in Internet access and use among adults in the US today? Five broad implications have been identified (Harris, 2003).

First, the digital divides have implications for social equality, primarily through access to information. The argument here is that those who lack access to the Internet are disadvantaged because they lack access to information needed to maintain and enhance the quality of their lives. For example, research indicates that adults use the Interent to find information about health, jobs and housing. In a March 2005 survey, 12% of online adults (17 million people) said the Internet played a crucial or important role in their ability to help another person cope with a major illness. Another 7 million said it played a crucial or important role in helping them to cope with their own major illness (Pew, 2006c). Information about social services unrelated to health, such as community and day care services, bus schedules, and law enforcement services are available on the Internet 24/7 and at little or no cost. The Internet also provides a plethora of entertainment resources, such as music, videos, games, sports and celebrity web sites, all of which may contribute to the quality of life and, more generally, to social equality (Pew, 2006a).

Relevant to the implications of the digital divides for social equality is the near limitless capacity of the Internet to support social networking. Internet users can create and maintain social networks online that are difficult to imagine offline. Those on the "have not" side of the digital divides may be disadvantaged because they are less socially connected than the "haves." A March 2005 survey indicated that being able to stay in touch with family and friends, both within and beyond one's geographic community, was a major reason for using the Internet (Pew 2005a). Moreover, much of the evidence indicates that online social connections and resources do not detract from offline connections and resources. Instead, online social activity supplements rather than replaces offline social activity (Jackson, 2008). Still other evidence indicates that Internet users report that having social support on the Internet has helped them to get through "major life moments," such as changing jobs, dealing with a serious illness, and finding a new place to live.

The adult digital divides have implications for economic equality. Educational and occupational opportunities are migrating relentlessly to the online world, leaving people without access at a considerable disadvantage. For example, almost half of young adult Internet users who chose a college during the preceding two years said the Internet played a crucial or important role in that choice. Internet users can take courses, earn degrees and even earn a living online. These opportunities are available 24/7 and in the comfort of one's home, making them particularly attractive to parents and caregivers for whom inflexible working hours and travel are major barriers to continuing education and employment. Information about housing and products is also available 24/7 on the Internet, as is the ability to purchase products and have them delivered conveniently to one's doorstep.

Related to issues of social and economic equality raised by the digital divides is the issue of <u>social mobility</u>. Without access to the Internet and the social and economic equality facilitated by it, adults on the "have not" side of the divide will have greater difficulty moving up the socio-economic ladder, especially when numerous "offline factors" are already limiting their social mobility. For example, lack of education, job experience and critical skills already hamper social mobility for low-income adults. Internet access cannot overcome all of these obstacles but it can provide a step in the direction of improving educational attainment (e.g., through online courses) and helping job seekers find an appropriate match to their job skills and interests. Similarly, Internet access cannot eliminate the socio-economic, racial and ethnic barriers which may work against social mobility. But it can provide the tools and incentives to overcome these barriers. Thus, failure to close the digital divides may exacerbate existing social class differences, resulting in the rich getting richer and the poor getting poorer (Driori, 2005).

The digital divide has still broader implications for sustaining democracy. Participation of all citizens is fundamental to a democratic society. Access to information about government, political issues and politicians, and national and local issues is essential to having an informed citizenry motivated to participant in its own governance. Participation in the political system already has a substantial online component. There exists today a plethora of websites, blogs and chat rooms devoted to government, politics and political candidates, and issues of consequence for sustaining a democratic society and involved citizenry. Although voting has yet to move to the online world, largely for reasons of security, efforts are underway to make online voting an option in the not-so-distant future.

A fifth reason to close the adult digital divides is that the economic growth and competitiveness of our society may well depend on it. The development of an information infrastructure and its active use by all citizens is inextricably linked to economic growth and competitiveness. Advances in digital technologies are associated with increased productivity in most if not all sectors of today's economy, as is the development of new "cutting edge" technologies. Thus, eliminating the digital divides makes good economic sense.

Table 1. Adult Internet activities

Activity	Percent
E-mail	90
Instant Messaging	46
Chat	26
Information: Specific question	83
Information: Product	83
Information: Health/specific	80
Information: Hobby/interest	77
News	71
Information: Health/general	66
Browse for fun	65
Purchase product	61
Government website	56
Information: School/training	53
Information: Work-related	52
Information: Sports	44
Information: Financial	42
Listen to music	38
Play games	37
Download music	32
Information: Religious/spiritual	30
Banking	30
Auction	22
Create content	19
Stocks: buy and sell	12

Note. Data are from the Pew Internet and American Life Project (2006b). Internet evolution, Internet penetration and impact. Retrieved January 6, 2008, from http://www.pewinternet.org/pdfs/PIP_Internet_Impact.pdf

Another way to view the implications of the digital divides for adults is to consider how adults on the "have" side of the divides use the Internet. Findings from the Pew Internet and American Life Project with respect to adults Internet use are summarized in Table 1. As can be seen in the Table, the primary reason adults go online is for communication and information. Most adults use e-mail and most go online to search for information. An overwhelming majority have searched for information to address a specific health issue. More than half have purchased a product or made travel reservations online. Many go online to get news. More than half have visited government websites, looked for school or training information or conducted work-related searches. Almost half have used the Internet to get financial information, and almost one-third have engaged in online banking. About one-third have downloaded music files, listened to music or played games online. Almost two-thirds say they go online to browse just for the fun of it. One-fifth have created content online, such as a website or posting to a bulletin board.

Eliminating the digital divides will require more than just increasing access to the Internet, although increasing access is a necessary first step. In a recent discussion of the digital divide in the U.K. the Digital Inclusion Panel Report (2004) elaborated "5 Cs" of digital inclusion that apply equally well to the U.S. They are connectivity, capability, content, confidence and continuity.

Connectivity refers to the way in which people access the Internet. Connectivity at home is generally considered the ultimate goal of digital inclusion because home access has numerous benefits, including 24/7 availability, privacy and the ability to tailor the technology to personal needs. However, community-based access also has advantages. Community-based access, as occurs in technology centers and libraries, can provide needed expertise while focusing on community projects, needs and concerns (e.g., safety, car-pooling, day care). Community-based access also has the potential to provide the continuity (discussed later) needed to develop technology skills and literacy.

Capability, the second "C" of digital inclusion, refers to the development of the technology skills and literacy that improve the quality of life and increase employability. Developing these skills in low-income adults is particularly challenging because many no longer have access to traditional educational channels nor do they have the time and resources needed for additional job training. The private and flexible nature of e-learning is particularly helpful for the underserved, provided that a minimal level of technology skills is already present, and provided that there is the technical and social support for successful e-learning.

The third 'C' of digital inclusion is content. There is still a shortage of relevant content on the Internet – content that will motivate members of disadvantaged groups to go online. A study by The Children's Partnership (2005a, 2005b, 2007) identified some of these content-related barriers. Among 1000 relevant websites sampled only 6% had local information that users needed and wanted. Only 1% was developed for adults with limited literacy. Only 1% was created in a culturally relevant manner. Only 2% had information available in several languages. As the Web continues to develop issues of content relevance may well disappear, but not without concerted effort and supportive public policy. Research has shown that a key to relevant content is that it be created by and for the community. Thus, to the extent that corporations, government, educators and the entertainment industry are the content creators online, the relevance of online contenet may continue to be a barrier to use by members of disadvantaged groups.

The fourth 'C' of digital inclusion is confidence. Lack of confidence is one of the most frequently cited barriers to adult Internet use (39%), after "don't want to/no need" (57%) and "no Internet access" (44%), and ahead of cost concerns (15%). Instilling confidence about technology use among the less educated and low-income groups is a challenging task that will require a multifaceted approach. But research is already available to guide the development of techniques that will enhance confidence in technology use. For example, one method known to increase learner confidence is to provide successful experiences with the technology. Another is to provide social support for learning, especially support from family and friends.

The final 'C' of digital inclusion is continuity. Too often efforts to increase technology use in low-income communities are one-shot interventions that leave participants adrift when the intervention is over. Community-based interventions, especially those that address a pressing community need, allow for greater continuity in both technical and social support. Continuity increases the likelihood that the technology skills and confidence needed for social inclusion and occupational attainment and advancement will develop and continue to grow.

IMPLICATIONS OF THE DIGITAL DIVIDES: YOUTH

What are the implications of the youth digital divides in Internet access and use in the U.S.? An optimistic perspective would argue that there will be fewer implications for youth than there are for adults. After all, youth can access the Internet from school, an alternative not typically available to adults. However, although 99% of US public schools have Internet access, it is not clear how school access translates into individual access. In many schools Internet access is available in only one location, typically the library or media center. The number of computers in these locations is limited, and sometimes extremely so, with 10 or fewer connected computers to serve hundreds of students. Hours of computer availability are also limited, as are hours of student availability for technology use. The types of activities that students are permitted to engage in online in school are also limited.

The implications of the youth digital divides become abundantly clear when one considers what youth on the "have" side of the digital divide typically do when they go online. National surveys have examined the frequency and nature of youth's Internet use (Children's Partnership Foundation, 2007; Pew, 2006a, 2006b). Other research has examined the effects of Internet use on youth, although "effects" research is nascent and findings are far from conclusive (Jackson, 2008). According to a 2006 report (Pew, 2006a), youth in the U.S. use the Internet primarily for communication, information and entertainment. Table 2 lists specific Internet uses by youth. The overwhelming majority of youth use e-mail and instant messaging, visit entertainment websites, play games and get news. More than half visit social networking websites, download music or video files and search for information about college or politics. Somewhat fewer make purchases online. About one third search for information about health, dieting and physical fitness, jobs or religious/spiritual information. About one-fifth search for information about health topics that are difficult for them to talk about in real life (e.g., drug and sex-related health issues).

Youth report that they use social networking websites to help manage their real life friendships: 91% say they use these sites to stay in touch with friends they see frequently; 82% say they use them to stay in touch with friends they rarely see in person. Almost three-fourths (72%) use social networking websites to make plans with friends. Almost one-half (49%) use these websites to make new friends, typically peers they are already acquainted with in real life. Youth view online communication and friendships as supplements to, rather substitutes for real life communication and friendships (Jackson, 2008).

Gender differences in youth's Internet use have been observed, although similarities are more common than differences. Girls lead the way in using the Internet's communication tools, such as e-mail, instant messaging, blogging and visiting social networking websites. Boys lead the way in playing games, downloading files and file sharing. Both sexes use the Internet as a social communication tool.

Where do youth go when they go online? Consistent with findings just discussed, the most popular websites for youth are social networking websites (e.g., MySpace) and websites that support social networking (PLyrics, Snapvine). Also consistent with the preceding discussion, other popular websites are those that supplement real life activities. Thus, fashion magazine websites are popular among adolescent girls (e.g., http://www.teenmag.com/). Both sexes frequent the MTV website (http://www.mtv.com/), teen news websites (e.g., http://www.teenspeaknews.com/), teen chat sites (http://www.teenchat.com/), teen culture websites (http://www.spankmag.com/) and music websites (http://www.teenmusic.com/).

The effects of Internet use on youth have been a topic of much public debate and academic discourse but little systematic research (Jackson, 2008). On the one hand is the "utopian perspective" which argues that the Internet provides youth with opportunities for self-expression, creativity and active learning while simultaneously facilitating the development of technology skills – skills that are critical to educational and occupational attainment and advancement as adults. On the other hand is the "dystopian perspective" which argues that

Table 2. Youth Internet activities

Activity	Percent
E-mail	89
Entertainment sites	84
Play games	81
News	76
Instant Messaging	75
Download music	51
Information: College/education	57
Social networking websites	55
Information: Politics	55
Purchase product	43
Download videos	31
Information: Health/diet/fitness	31
Information: Jobs	30
Information: Religious/spiritual	26
Information: Health-related (sex, drugs)	22

Note. Data are from the Pew Internet & American Family Life Project (2005d). Teens and technology: Youth are leading the transition to a fully wired and mobile nation. Retrieved January 8, 2008, from http://www.pewinternet.org/pdfs/PIP_Teens_Tech_July2005web.pdf

Internet use has negative effects, particularly for youth, because it provides inaccurate and unreliable information and exposes users to potentially harmful content and experiences. Moreover, from the dystopian perspective, time online is time taken away from family, friends and other more worthwhile activities, such as reading books, doing school work and participating in sports and recreational activities.

Research on the consequences of Internet use for youth, though nascent, is more supportive of the utopian than the dystopian perspective. As discussed earlier, youth use the Internet to manage their social lives rather than to replace them, and many consider the Internet indispensable for doing so. As is true for adults, youth's online social activities appear to have no negative consequences for their offline social lives. If anything, research supports the "rich get richer" hypothesis; youth who already have rich social networks in real life enrich them further with online activities.

Also supporting the utopian perspective, youth say that the Internet is as important to their school work as it is to their social lives. More than half (60%) of online youth regard the Internet as the most useful tool for finding information for homework – more useful than books (21%), parents (11%), CDs (3%), friends (2%) or TV (1%). For the majority of families, education is the most important reason for purchasing a home computer and connecting to the Internet (Pew, 2006a). The home computer has become one of the indispensable "symbolic goods" of contemporary parenting. Enthusiasm about the Internet is driven not only by its ability to deliver content but also by its potential to provide individualized, interactive, autonomous, and learner-centred learning opportunities, although how often this occurs is unclear (Jackson, 2008; Livingstone, 2003).

In our own research, the HomeNetToo project, discussed earlier, we found that home Internet use by low-income youth actually improved their academic performance (Jackson et al., 2006). In this longitudinal study, which occurred between January 2001 and June 2002, the Internet use of 140 youth (average age 14 years old) was continuously recorded. Most of the youth were African American (83%), male (58%), and living in single-parent households (75%) in which the median annual income was $15,000 or less (USD). Findings indicated that youth who used the Internet more subsequently had higher scores on standardized tests of reading achievement and higher grade point averages at 6 months, 1 year, and 16 months later than did youth who used it less.

In our ongoing Children and Technology Project, also discussed earlier, we again found benefits to Internet use for children (average age 12 years olds). Children who used the Internet more, either to search for information or to communicate with others (i.e., instant messaging and e-mail) performed better on a standardized test of reading skills than did children who used it less (Jackson et al, 2008). Moreover, IT use predicted children's academic performance. The longer the time the child had been using computers and the Internet the better was his or her academic performance.

Any discussion of the effects of children's IT use on their development would be incomplete without some discussion of the most popular IT activity of children, videogame playing. Research on the effects of videogame playing has produced remarkably strong and consistent results. Supporting the utopian perspective, there is strong evidence from both correlational and experimental research that videogame playing improves visual-spatial skills, skills believed to be important to successful performance in science, technology, engineering and mathematics (i.e., STEM areas; Green, & Bavelier, 2007). However, supporting the dystopian perspective, there is also strong evidence, including evidence from our own research (Jackson et al., 2008), that videogame playing undermines academic performance (GPA) and, moreover, playing violent videogames increases aggressive cognition and behavior both immediately after playing and in the distant future (i.e., adulthood; Anderson, Gentile & Buckley, 2007). Equally unequivocal is that boys are more likely to play videogames than are girls.

FUTURE TRENDS

Research reviewed here indicates that digital divides in Internet access and use exist for both youth and adults and have important implications for both. For adults the digital divides have implications for the development of the technology skills and literacy needed to participate fully in the 21st century. Social and economic equality and social mobility depend to some extent on the acquisition of IT skills and literacy. Although we recognize that Internet access alone will not eliminate all of the obstacles to social equality and mobility it can provide tools with which to work toward their elimination. Moreover, sustaining a democratic society and maintaining a competitive economic edge require a citizenry that is fully participating in today's information-based economy. Systematic, concerted efforts are needed to turn the "have nots" of today into the "haves" of tomorrow for their own sake, for the sake of their children and for the sake of the nation.

Clear from our analyses is that increasing access to digital technology is necessary but not sufficient to eliminate the digital divide. Rather, direct interventions from public and private sectors will be needed to reduce and eventually eliminate the digital divide. Interventions may take the form of free formal training in neighborhood schools or other public access locations such as libraries and community centers. The children themselves might serve as teachers to their parents, perhaps in a school-supervised intervention aimed at improving technology skills and literacy throughout the community. Corporations may contribute to after-school and evening technology training to increase the employment potential of their communities. Governments – local, state and federal, can provide incentives to corporations and grants to community organizations that strive to eliminate the digital divides.

For youth the existing digital divides have even more pressing implications. Although Internet effects research is still in its early stages, existing evidence suggests that social connectedness, academic performance and perhaps even occupational attainment and advancement may depend on technology skills and literacy. Being disconnected from new technology is fast becoming tantamount to being disconnected from resources that contribute to personal, social and professional development. The evidence for a potential link between Internet use and academic performance provides another compelling reason to eliminate the digital divides. Those on the "have not" side of the divides may be at an ever increasing disadvantage in developing the technology skills and literacy needed to participate in the 21st century global economy.

Understanding the digital divides and their implications will require additional research aimed at establishing cause-effect relationships between technology use and a variety of outcomes, including academic, social and employment outcomes. A more fine-tuned analysis of what it means to "use" IT, such as the Internet, is needed to shed light on how and when positive or negative outcomes are Likely to occur. For example, using the Internet to search to health information is likely to produce different outcomes than using it to discuss inappropriate behaviour in chat rooms. Community technology centers may play a critical role in helping children improve their technology skills in ways that contribute to their future job prospects, rather than just entertain, although the two are not incompatible. Future research on technology use and its effects must focus on specific uses, specific effects, and on establishing a casual link between the two. Schools, community centers, libraries, corporations and government all have a vested interest in raising technology skills and literacy for all members of society. Indeed it is difficult to imagine a better investment for the future.

CONCLUSION

The digital divide is a multidimensional phenomenon that is best conceptualized as a number of divides in technology access and use. Those on the "haves" side of the divide have 24/7 access to the Internet at home with a broadband connection so that Internet activities fit seamlessly into the activities of everyday life. The "haves" use the Internet intensely and for multiple purposes, such as acquiring information about products, politics, and purchases. Youth on the "haves" side of the divide use the Internet to manage their real life social activities, facilitate additional social connectedness, entertain themselves and acquire information that enhances their academic performance. In contrast, the "have nots," lacking these Internet-based social, entertainment and academic resources, are falling further behind, cut off from technologies that are fast becoming essential not only to occupational attainment and advancement but also to social connectedness, political awareness and participation, and entertainment.

Because the digital divide is a multidimensional phenomenon, eliminating it will require a multidimensional approach. From a policy perspective, universal broadband access is a necessary first step toward eliminating the divides. Internet Service Providers may require government incentives to reduce the recurring cost of broadband access for low-income subscribers. Internet content developers may need to expand their design capabilities to appeal to a more diverse set of users (Buckingham & Scanlon, 2006). And the technologies themselves should be introduced early in development, just as soon as the cognitive structures needed to support them have developed. A single effort, however large, will not be enough to eliminate the digital divides. Continuous efforts will be needed to achieve digital equality in the U.S. and worldwide. Such efforts will require coordinated participation of schools, community resources, government and private sector corporations to develop a citizenry able to participate fully in the 21st century information age.

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KEY TERMS AND DEFINITIONS

Net Generation: The generation of individuals who have grown up with computer technology and the Internet as a commonplace. The distinguishing mark of this generation is that its members spent their formative years during the rise of the World Wide Web. They usually have no memory of (or nostalgia for) pre-Internet history. Most were born after 1993.

24/7: Refers to the constant availability of technologies, especially in the home.

Digital Divide: The divide between individuals and groups who have access to information technology and can use it effectively and those who lack access and/or lack the skills needed to use information technology effectively.

Information Technology: Earlier definitions (Information Technology Association of America (ITAA)) focused on "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and securely retrieve information. Today's definitions are much broader and cell phones and videogame playing devices.

Technology Skills and Literacy: The skills and abilities needed to participate actively in the information age, including the skills and abilities neededto use computers and handheld devices (e.g., cell phones) effectively.

Visual/Spatial Skills: The ability to think and learn through visual processes; a form of nonverbal learning viewed as important in learning mathematics, science and engineering.

Chapter 13
Does the Digital Divide Extend to Minority- and Women-Owned Small Businesses?

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ABSTRACT

This chapter examines whether the digital divide in the United States extends to computer use in small businesses. The analysis is based on a 2003 telephone survey of 1,123 firms with fewer than 50 employees and at least one computer, and in-depth interviews with 45 business owners. The analysis provides no evidence of a business digital divide across racial, ethnic, and gender groups. In fact, firms owned by African-American males show more intensive computer use than white male-owned firms, even after controlling for firm and owner characteristics. We do, however, find links between the intensity of computer use and firm and owner characteristics, such as firm size, market reach, intensity of computer use in the relevant industry, and age of owner. Finally, the in-depth interviews suggest that businesses with effective computer use depend upon the technical expertise of the business owners or people in their social networks.

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INTRODUCTION

Discussions about the digital divide often focus on access to computers by most people in developing countries and by poor and minority households in developed countries. Persons in developing countries are substantially less likely to use computers and access the Internet than those in developed countries (e.g., Chinn & Fairlie, 2006; Chen & Wellman, 2004). The United States is among the countries with the highest rates of computer use, but there are disparities across demographic subgroups, including race. An extensive literature documents that African Americans are less likely than whites to own a computer and to have convenient access to the Internet (e.g., Fairlie, 2004; Hoffman & Novak, 1998; Krueger, 2004; Noll et al., 2001). This divide among individuals can exacerbate differences in business activity. For example, not having a home computer is associated with a reduced likelihood of starting a business, particularly among women (Fairlie, 2006). Another potential impact is a digital divide among small businesses by the race and sex of owners. At this point, little evidence is available to determine whether the digital divide among individuals extends to business and whether minorities and women who run small businesses are disadvantaged in their access to information technology.

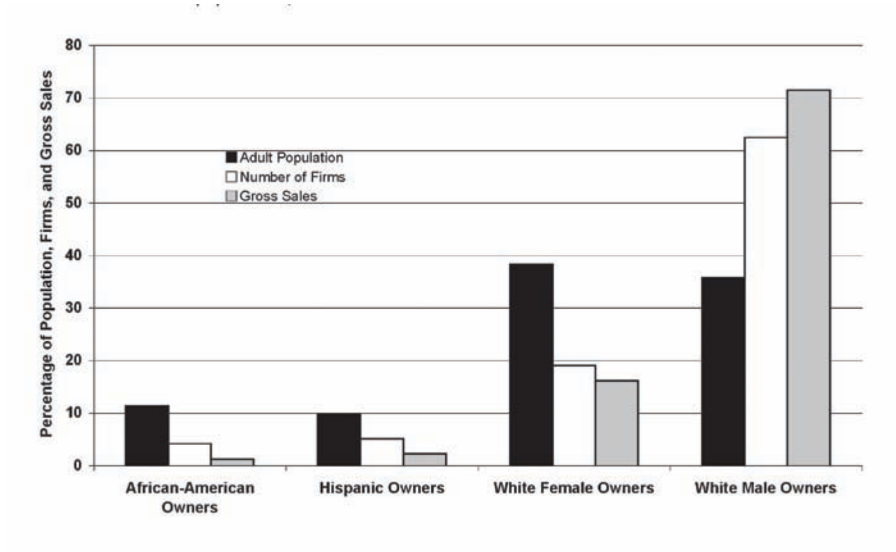
To place small businesses in context, the United States has well over 20 million small businesses, but they account for a modest share of overall sales. Firms with business receipts under $100,000 per year make up 78 percent of all firms but receive only 3 percent of all receipts. For tax purposes, U.S. businesses are grouped into C corporations (usually large, publicly traded companies), subchapter S corporations and partnerships (usually medium size and owned by a small number of owners), and sole proprietorships (usually small, self-employed individuals). As of 2003, almost 72 percent of businesses (or nearly 20 million firms) were sole proprietorships, but they accounted for 13 percent of profits and only 4 percent of business receipts. These firms are generally quite small, with annual revenues averaging about $53,000 per firm and less than $14,000 in annual profits.[1]

Overall, men own the majority of small businesses, leaving women with sole or majority ownership of 6.5 million, or 28 percent of nonfirm U.S. businesses and equal, joint ownership of another 2.7 million businesses in 2002 (Census, 2002). The number of women-owned businesses increased 20 percent (or by 1.1 million businesses) from 1997 to 2002, compared with an increase of 16 percent (or 1.8 million businesses) for male-owned firms. Yet, minorities and women are less likely to own businesses than are white males and the businesses they do own generate far lower sales (Figure 1). In 2006, approximately 1 in 7 employed white men worked in their own business, compared with about 1 in 15 employed African-American men, 1 in 13 employed Hispanic men, and 1 in 14 employed women.[2i] Moreover, even among small business owners, minority- and women-owned businesses are less likely to survive and prosper (Fairlie & Robb, 2007).

The presence of a digital divide could help explain these continuing gaps if minorities and women have less access to computers and computer use is an important element of business success. Empirical evidence generally indicates a positive impact of computer use on performance (e.g., Black & Lynch, 2004, 2001; Brynjolfsson & Hitt, 2003; Greenan & Mairesse, 2000; Lehr & Lichtenberg, 1998), although some studies find little connection between computer use and firm performance (e.g., Bitler, 2001; Cappelli & Neumark, 2001). The focus of this study is on whether the digital divide extends to computer use in small businesses. This chapter contributes to the literature by using new data specifically collected to assess the possibility of a business divide. We answer two questions.

1. Are small businesses owned by African Americans, Hispanic Americans, and women

Figure 1. Small business ownership and sales are low for minorities relative to their populations, 1998



less likely to make extensive use of computer technology as compared with white male-owned small businesses? How do they differ in their use of software for core business functions?

2. What factors beyond race and gender influence the use of computer technology?

Computers are tools that can help businesses adopt modern management practices. Although businesses are diverse, they share several tasks, such as paying workers and suppliers, accounting and tax reporting, and interacting with customers. Applying computers to these tasks is nearly universal in large businesses but not necessarily in small firms. This study examines differences among small enterprises in the application of computers to administrative and core business activities among firms with computers. The analysis focuses on differences based on the race, Hispanic origin, and gender of owners, but covers other owner and firm characteristics as well. The study relies on both new survey data and information drawn from in-depth field interviews.

The primary data source for this analysis is a 2003 telephone survey of 1,123 small firms in six metropolitan areas—Chicago, Los Angeles, Miami, New York, Seattle, and Washington D.C. The definition of "small" for the survey is firms with less than 50 employees and at least one employee. The sample was stratified to ensure that about 75 percent of the businesses were owned by minorities or women. This telephone survey provides enough cases to assess the differential use of computers by race and gender of the business owner and examine differential computer use. In order to understand motivations of business owners and the use of applications specific to selected industries, we undertook in-depth one-on-one interviews with 45 business owners—between 7 and 8 business owners in each of the six metropolitan areas. These one-on-one interviews yield a detailed and nuanced picture about how individual firms use computers, how they implement computer use, and what barriers they encounter in using computers effectively.

Our analyses reveal several notable findings about the use of computer technologies by small firms:

- Small minority- and women-owned enterprises (MWEs) show no tendency to use computers less than small firms owned by white men. In fact, African-American male-owned firms reported the highest application of computer technology.
- Most small firms use computer technologies for several business functions, especially for accounting but also for core work activities.
- Computer intensity in small firms increases with the owner's education, personal involvement with technology, the number of workers, being in an industry that exhibits extensive use of computers, and operating in national or regional markets.
- The main barrier that modestly limited computer use was "not having the skills to use computers a great deal in the business." Only about 20 percent of MWEs agreed that they could not afford computers or that they lacked the capital to purchase computers.
- Lack of technical support resources was a common problem in businesses interviewed since very small businesses do not have the funds to hire expensive outside information technology support.
- Effective computer use typically depends upon business owners having someone with technical expertise in their social networks unless they had the expertise themselves.
- Systematic business practices were also required for effective computer use in core functions but the interviews identified poor business practices as a major barrier to effective computer use.

In the next two sections, we present a brief overview of the business divide literature, followed by a discussion of the data and methods used to answer the research questions. We then describe and interpret the empirical results. After examining the characteristics of firms and business owners, we analyze the business uses of computer technology by MWEs and white male-owned enterprises. We then consider overall determinants of computer use by small firms, drawing on both statistical analyses and in-depth interviews with selected small business owners.

EVIDENCE FROM PAST STUDIES

Literature examining the business divide is limited and mixed. Two studies find that minority-owned firms are less likely to use computers than white-owned firms (Bitler, 2001; Buckley, 2002), while a third study finds greater computer use by minority-owned firms than white-owned firms (Community Development Technologies Center, 2002). The literature does, however, consistently find that women-owned firms are no less likely to use computers than male-owned firms (Bitler, 2001; Community Development Technologies Center, 2002).

Buckley (2002) uses data from the 2001 Current Population Survey to describe racial differences in the use of computers at work, for incorporated and non-incorporated self-employed persons. The incorporated self-employed are generally larger business owners, while the non-incorporated self-employed tend to be owners of smaller businesses. Buckley's analysis shows that self-employed minorities, particularly non-Hispanic blacks and Hispanics, are substantially less likely to use computers at work than non-Hispanic whites.[3] Among the incorporated self-employed, 69 percent of non-Hispanic whites use a computer at work, while only 51 percent of non-Hispanic blacks and 45 percent of Hispanics do so. For the non-incorporated self-employed, the percentages are 47 percent, 39 percent, and 26 percent, for whites, Blacks, and Hispanics respectively. Her results also suggest that incorporated self-employed Asian Americans and Pacific Islanders are less likely to use computers than non-Hispanic whites (69 percent versus 54 percent, respectively).

Using the 1998 Survey of Small Business Finances, Bitler (2001) examines the link between race and computer use among firms with fewer than 500 employees. She carries out a multivariate analysis, which allows her to test whether differences by race and gender exist after taking account of characteristics of the business (e.g., age, sales, assets, number of employees, and firm location) and characteristics of the owner (e.g., age, experience, and education). Consistent with Buckley (2002), Bitler finds that African-American-owned firms, as well as Asian-American-owned and Pacific Islander-owned firms (combined), are significantly less likely to use computers for any business purpose as compared to white male-owned firms. However, the results suggest no statistically significant difference between Hispanic-owned and white-owned firms in their use of computers for any business purpose.

Taking the analysis one step further, Bitler (2001) examines the use of computers for eight specific business functions: personal computer banking, e-mail, web buying and selling, loan applications, managing inventory, bookkeeping, administrative tasks, and any other purposes. The results suggest no statistically significant difference by race for four of the eight business functions (PC banking, loan applications, managing inventory, and any other purposes). The relationship between race and computer use varies across the other four functions. The results suggest that Asian-American-owned and Pacific Islander-owned firms (combined) are significantly less likely than white-owned firms to use computers for the remaining four functions (e-mail, web buying and selling, administrative tasks, and bookkeeping), while African-American-owned firms are significantly less likely to use computers for three of the functions (e-mail, administrative tasks, and bookkeeping). Finally, Hispanic-owned firms are significantly less likely than white-owned firms to use computers for two of the functions—e-mail and administrative tasks. Taken together, this study provides evidence that minority-owned firms use computers less than white-owned firms, although the results are somewhat mixed.

In sharp contrast to the Bitler findings, an analysis of roughly 1,100 small (less than 100 employees) businesses in California in 1999-2000 suggests that there is no business divide (Community Development Technologies Center, 2002).[4] In fact, among these small business owners, African-Americans were the most likely to report using the latest computer technology "somewhat" or "very much." Sixty-eight percent of African-American business owners reported using the latest computer technology either somewhat or very much, while only 51 percent of white business owners reported this level of use.[5] Hispanic business owners reported roughly the same level of computer use as whites—52 percent of Hispanics reported using the latest computer technology either somewhat or very much. The largest difference between these three groups was in the percent of business owners that reported using the latest computer technology "very much"—42 percent of African Americans, 27 percent of Hispanics, and 20 percent of whites.

As noted above, the literature finds no systematic gap in the extent to which male-owned and women-owned firms use computers. For example, looking at computer use for the eight specific business functions, Bitler (2001) finds no statistically significant difference in the extent to which women-owned firms and male-owned firms use computer technology. In addition, among small businesses in California, women-owned and male-owned firms were found to use the latest computer technology at roughly the same rate (Community Development Technologies Center, 2002). These findings are also consistent with research by Kominski and Newburger (1999) indicating that the gender gap is small or non-existent.

Overall, the literature provides mixed evidence of a business divide. Two studies points to shortfalls in computer use by minority-owned small businesses, although a third study finds higher level of computer use by minorities. No systematic differences in computer use by gender show up in the literature.

This study reports on the results from a more recent survey conducted specifically to analyze the business divide and differences in the use of computers for important business practices. We collected information on race-ethnic-gender differences not only on the number of computers as inputs, but also emphasize differences in how firms use computers to perform such business functions as accounting and payroll, scheduling, and core business functions. In addition, we examine broader determinants of the use of computer in small businesses.

DATA

In late 2003, the Urban Institute, in collaboration with NuStats, Inc. developed and conducted a survey to measure computer use and business outcomes in enterprises that differ with respect to the race, Hispanic origin, and sex of the majority owners. The survey collected data from a telephone poll of 1,123 firms and from 45 in-depth one-on-one field interviews with business owners at their business site. The telephone survey (or CATI, computer-assisted telephone interview) reached firms with 1 to 50 employees in six metropolitan areas—Chicago, Los Angeles, Miami, New York, Seattle, and Washington, D.C. While this focus on businesses in metropolitan areas limits our ability to extend the results to businesses in non-urban areas, the majority (84 percent) of small businesses (those with fewer than 20 employees) are located in Metropolitan Statistical Areas (Small Business Administration, 2005). The sample was stratified so that African American, Hispanic American, or women business owners would make up about 75 percent of all respondents. The sample included only firms operating for at least two years and using at least one computer (very few firms were screened out for this reason). The subjects interviewed by telephone came from a sample of 8,640 firms supplied by Dun and Bradstreet. About one in three of these firms did not qualify for the survey because the sample member did not own a computer, was out of business or had its phone disconnected, had not been in business two years earlier, and/or had too many (over 50) or no employees. About half of the businesses either refused to participate (about 20 percent) or could not be reached after several attempts (30 percent). The overall response rate was 40.1 percent. The survey reached many MWEs, including 351 African-American companies, 272 Hispanic-American businesses, 197 white female-owned establishments, and 270 white male-owned firms.

To supplement the survey findings, we conducted 45 in-depth interviews with a sub-sample of the CATI respondents to probe the motivations of business owners and to examine specific computer applications in three industries—construction, retail trade, and health services.[6] The industry-focused dimension of these interviews allow for detailed comparisons of firm owners in the same industry and the examination of special industry-based computer applications. These three industries were chosen for the in-depth interviews because they have high proportions of MWEs and high potential for making efficient use of information technology. These discussions also provided new information on the adoption and effective use of computers, the ways computers improve productivity, and the potential gains from additional computer use. The interviews also served to validate of the interpretations and conclusions drawn from the telephone survey.

METHODS USED TO ANSWER THE RESEARCH QUESTIONS

Measuring Computer Use: The survey questions capture computer use at the time of the survey (September 2003 through November 2003). Nearly all small businesses at that time used stand-alone personal computers and a wide variety of business software, ranging from word processing, accounting, check-writing, spreadsheets, and special purpose programs specific to the industry or type of firm. We chose not to focus on hardware or software, but rather measured computer use based on each firm's application of computers to seven specific business functions: interactions with customers, accounting, paying suppliers, payroll, inventory management, scheduling, and core business activity. For each of the business functions, firms' intensity of use is rated on a scale from zero to one, where a one indicates the highest level of intensity. The use of computers to attract and interact with customers is based on a series of questions that ask business owners about the availability of online product and service information and about their use of the Internet and e-mail for placing orders, communicating with customers after their purchase, and scheduling customers. Our accounting measure captures whether businesses use computers for any accounting function, as well as their use of computers for general ledger activities, accounts receivable, and accounts payable. For each of the remaining five functions (paying suppliers, payroll, inventory management, scheduling, and core business activity), respondents report the extent of their computer use on a four-point scale: almost entirely, moderately, a little, or none at all.

To capture a comprehensive measure of computer use, we also develop an overall computer intensity index. This index ranges between zero and one (one represents maximum intensity) and is calculated as the average of the seven specific business function scores.[7]

Factors Related to Computer Use: We begin with descriptive analyses that examine computer use by gender and race. Next we use a multivariate statistical model to isolate the independent role of various factors affecting computer use. This model isolates the impact of several determinants of computer use, including owner characteristics (e.g., age, educational attainment, race/ethnicity, and gender) and worker and firm characteristics (e.g., number of workers, number of firm locations, years in business, marketplace for goods or services, metropolitan area, and industry). In addition, the analyses take account of the owner's experience and comfort with computers and other digital technologies.

Conducting One-on-One Interviews: The interviewers used a semi-structured protocol in 60- to 90-minute meetings with small business owners at their company locations. The researchers began each meeting with questions about the background of the business, its growth strategies, and its use of computers (an inventory of computer equipment and applications). The next questions dealt with the firm's computer use in four functions: (1) customer acquisition and management; (2) service and product delivery; (3) internal operations; and (4) interactions with suppliers or other inputs. In addition, the interviews covered computer use for accounting and for the firm's core technology.

The respondents were asked to describe their operations in each area (e.g., "How do you get new customers?" "What are the primary ways you increase your business?"). Next, they were asked specifically about computer use in these areas. Interviewers found out how respondents made computer purchase and upgrade decisions, how they maintained their computers, and what other experiences firms had with their computers. We concluded the interviews with questions about any barriers to computer use the businesses were experiencing and the factors most important in increasing competitiveness and profitability of their businesses. Interviews were audio recorded, transcribed, and coded for analysis.

THE CHARACTERISTICS OF FIRMS AND BUSINESS OWNERS

The sample firms vary widely by industry, years in operation with the current owner, size, and market

Figure 2. Firm characteristics in 2003 by race and gender of the majority owner

Firm Characteristics	African-American Female	African-American Male	Hispanic Female	Hispanic Male	White Female	White Male
Median Firm Size						
All Workers	6.0	7.0	5.0	6.0	5.0	6.0
Number of Owners Working for Pay	1.0	1.0	1.0	1.0	1.0	1.0
Managers	1.0	2.0	1.0	1.0	1.0	1.0
Non-Managers	3.0	4.0	3.0	4.0	2.0	3.0
Median Years in Business with Current Owner	9.0	11.0	9.0	10.0	11.0	15.0
Average Number of Firm Locations	1.2	2.0	1.2	1.2	1.2	1.5
Marketplace for Goods or Services						
Local	50.8%	40.3%	50.0%	47.4%	45.7%	47.9%
Regional	23.8	27.1	23.7	30.1	20.8%	26.0
National	19.2	23.1	10.5	10.2	18.8%	15.1
International	6.2	9.5	15.8	12.2	14.7%	10.9
Industry						
Agriculture	1.5%	1.4%	1.3%	1.0%	3.0%	2.2%
Construction	3.8	15.4	1.3	14.8	4.6	12.6
Manufacturing	2.3	6.3	11.8	9.2	7.6	6.7
Transportation	8.5	6.3	6.6	5.6	5.6	3.7
Wholesale Trade	1.5	5.9	14.5	10.7	6.1	7.4
Retail Trade	10.0	4.5	10.5	10.7	15.7	12.2
Finance	6.2	5.4	6.6	4.1	4.1	8.1
Business Services	20.8	22.2	18.4	11.2	19.3	8.9
Health	4.6	2.3	7.9	5.1	3.6	5.6
Legal	3.1	0.9	1.3	3.1	3.0	9.3
Engineering, Accounting, Management Services	20.0	22.2	9.2	13.3	10.7	11.9
Other Services	17.7	7.2	10.5	11.2	16.8	11.5
Median Educational Attainment of Employees (Years)						
Managers	14.0	15.0	14.0	14.0	14.0	14.0
Non-Managers	13.0	13.0	12.0	12.0	13.0	12.0
Number of Firms	130	221	76	196	197	270

Source: Authors' tabulations from Urban Institute telephone survey.

area. As Figure 2 reveals, the average firm has about six employees, has been operating for about 10 years (15 years for white male owners), and generally operates in one location. Surprisingly, over half of the firms see themselves as reaching beyond the local market to regional, national, and even international markets. The firms typically employ college-educated managers, while the median non-manager has only a high school education. About two out of three of the firms are organized as corporations and nearly all the rest are sole proprietors. About half of the firms are in a service industry, while construction and the retail trade are the next largest industries, though the proportions vary substantially by gender.

Reports by owners or other firm representatives reveal a wide variation in sales, profits, and costs. Reported sales for 2003 reached more than $1 million per year for the top 25 percent of firms, but only $120,000 per year for the bottom 25 percent. The profit level of the top 25 percent of firms ($272,000) was nearly 14 times the level of the bottom 25 percent ($20,000).

The owners are well educated. Note in Figure 3 that, except for Hispanics, most owners are college graduates and about 20 percent have a graduate degree. Furthermore, the education gap between African Americans and whites is minimal. The high educational level among African Americans is noteworthy, given the much lower levels of education attained by the overall African-American population. The owners in the middle of the age distribution are in their mid- to late 40s. About half of the African-American and white male owners are between the ages of 39 and 56. Hispanic owners are slightly younger, but still average in their early 40s. By implication, most respondents became business owners in their early to mid-30s.

The absence of an education gap between African Americans and whites, as well as the relatively high levels of education among Hispanics, raise questions about the nature of this sample of business owners. To examine whether this pattern reflects the requirements for entering the sample—firms with 1 to 50 employees, with a computer, and in

Figure 3. Owner characteristics in 2003 by race and gender

Owner Characteristics	African-American Female Mean	African-American Male Mean	Hispanic Female Mean	Hispanic Male Mean	White Female Mean	White Male Mean
% of Sample Firms[a]	11.6%	19.7%	6.8%	17.5%	17.5%	24.0%
Age	43.5	47.2	40.3	41.7	46.7	47.4
Education						
Less then High School Diploma	0.8%	0.5%	5.3%	4.1%	0.0%	1.1%
High School Diploma	5.4	10.5	13.2	15.3	12.3	10.7
Some College	29.5	29.2	32.9	35.7	32.8	25.6
College Degree	40.3	37.0	32.9	28.6	34.9	40.0
Graduate Degree	24.0	22.4	15.8	15.8	18.5	20.0
Years of Ownership	11.7	12.0	11.2	11.8	12.5	17.0
Computer Use						
Years of Computer Use	15.0	15.2	12.4	13.1	14.6	13.9
Comfort Level with Computers						
Very Comfortable	70.3%	66.8%	60.0%	62.9%	53.1%	51.9%
Somewhat Comfortable	22.7	26.8	30.7	32.5	33.7	36.5
Somewhat Uncomfortable	6.3	5.5	6.7	3.6	9.2	7.1
Very Uncomfortable	0.8	0.9	2.7	1.0	4.1	4.5
% Cell Phone Ownership	83.8	81.0	75.0	81.1	76.1	76.7
% PDA Ownership	27.7	31.2	23.7	21.9	13.2	24.4
Number of Firms	130	221	76	196	197	270

Source: Authors' tabulations from Urban Institute telephone survey.
[a]The percentages will not add up to 100 because the 33 Asian firms in the sample are not included in this table.

business for at least two years—we tabulated and compared relative educational levels in this sample with those from the Survey of Small Business Finances. The results are interesting. First, educational levels of all small business owners are quite high, but African-American owners have somewhat lower college graduation rates than white owners (44 percent vs. 51 percent). Second, among small firms with 1-50 employees and in business for at least two years, the educational levels of African American owners were even higher (56 percent graduated college) and reached near parity with white male owners.

The levels of education among owners of small firms far exceed the educational attainment of the adult population for all demographic groups. Of all African Americans in their mid-40s (about the median age of business owners), only 19 percent had graduated from college as of 2002. The college graduate rate for the African-American owners in this sample is three times higher (61 percent). Even among white males, college graduation rates are much higher among business owners (60 percent) than among the population as a whole (32 percent).

A firm's computer use might reflect the owner's experience with computers and other new technologies. The survey results indicate a high level of comfort and experience with computers across all demographic groups. About 60 percent of owners say they are very comfortable with computers. As Figure 3 shows, African-American owners report the highest level of comfort—two out of three say they were very comfortable—while white male owners report the lowest comfort levels. Data on the years of experience with computers show a similar but not identical pattern. African-American owners average 15 years of prior experience with c omputers, a level higher than the 13.9 years averaged by white male owners. Other indicators also show owners use modern technologies at high rates. Nearly 80 percent own cell phones and nearly 25 percent own personal digital assistants (PDAs). In both cases, the rates are higher among African Americans than among white male business owners. Women and Hispanic owners, however, are somewhat less likely to own a PDA than are white male owners.

Overall, the survey results suggest that this group of small business owners is highly educated, experienced, and technology oriented. Moreover, the findings clearly indicate that African American and women owners are not disadvantaged relative to white owners in terms of observed characteristics. While Hispanic owners do exhibit a lower level of educational attainment than do white male owners, the Hispanic-white male gaps are modest.

ARE MWEs LESS LIKELY TO USE COMPUTER TECHNOLOGY THAN WHITE MALE-OWNED BUSINESSES?

One business gap of concern is shortfalls in computer use by minority- and women-owned enterprises relative to those owned by white males. Surprisingly, however, the data show no serious and consistent differences of this type. In fact, as Figure 4 illustrates, computer use as measured by the computer intensity index was highest among firms owned by African Americans, next highest among Hispanic women-owned firms, similar among white and Hispanic male-owned firms, and lowest among white and Asian female-owned firms. In two-way comparisons between white males and other groups, both the advantage of African-American owners and the disadvantage of white women were statistically significant. Thus, with the exception of slightly lower computer use among white women, the gaps in computer use by race, ethnicity, and gender did not materialize.

Turning to computer uses for specific business activities, we again find no evidence of a gap by race or sex. White male-owned enterprises typically show no greater systematic tendency for using computers for specific business activities than do firms owned by minorities and women. African-American male owners demonstrate significantly higher computer use than do white males. Hispanic and women-owned enterprises sometimes average higher computer use and sometimes average lower computer use when compared with white males, but the dominant indication is one of no significant difference. Other specific indicators of computer intensity, such as computer spending per employee and percentage of employees using computers, confirm the same basic pattern of computer use.

While few gaps emerge by race, ethnicity, and sex, limited use of computers is common among small firms in general. For most groups, less than half of firms use computers moderately or heavily to interact with customers, pay suppliers, manage inventory, and scheduling. Over 40 percent of MWEs reported minimal or no reliance on computer technologies for their core work activities. The business function for which moderate or heavy computer use is most common is accounting. Yet, about 20-30 percent of firms report they do not rely heavily on computers to perform accounting functions.

One possible reason for the absence of a consistent digital divide is that MWEs may be in industries or have other firm characteristics that are associated with higher-than-average computer use. To test for this possibility, we estimated regressions that control for a range of characteristics of the firms and yield regression-adjusted estimates of race, ethnic, and sex differences in computer intensity (Figure 5). The results again show no digital divide. In fact, the coefficients on race, ethnicity, and sex indicate smaller differences between MWEs and white male-owned enterprises than in the unadjusted results. The only statistically significant difference between the computer intensity of white male owners and other owners is the 6.1 percentage point advantage for African-American men, down from the 9 point differential based on the unadjusted differences.

The regression-adjusted outcomes for specific business functions usually but do not always follow the unadjusted patterns. The advantage in moderate or heavy use of computers for business function shows up as statistically significant for African-American males (relative to white males) in five of the seven business functions. Moderate to heavy

Figure 4. Firms' computer-related characteristics in 2003 by race and sex of the majority owner

Computer-Related Characteristics	African-American Female Mean		African-American Male Mean		Hispanic Female Mean		Hispanic Male Mean		White or Asian Female Mean		White Male Mean
Computer Intensity Index[a]	49.96		55.12	***	47.13		44.86		41.95	*	46.07
Spending on Computers per Worker ($)	984.6		2230.8	**	1277.6		1638.5		945.85		1209.1
% Firms that Use Computers for:											
Interacting with Customers	62.7	*	64.8	***	48.6		46.9		55.8		53.2
Accounting Functions	84.9		82.9		79.2		75.1	**	81.6	**	83.9
Paying Suppliers	59.2		66.7		69.4		59.4		49.3	**	60.9
Payroll	60.5		69.4	**	51.4		54.7		48.6		58.3
Managing Inventory	51.2	***	50.9	***	52.8	***	44.6	*	34.1		35.7
Scheduling	61.1	**	63.4	***	51.4		50.0		41.0		47.6
Core Work Activities	76.2	***	73.1	**	63.9		62.0		56.7		63.5
% Firms That Use Computers											
Interacting with Customers	40.5		50.9	***	33.3		33.3		37.9		35.4
Accounting Functions	78.4		79.6	*	69.4		68.4		72.9		72.6
Paying Suppliers	44.0		50.9		50.0		43.2		37.8	***	49.6
Payroll	54.0		63.0	***	45.8		45.8		42.6	*	50.8
Managing Inventory	39.2	*	40.7	***	40.3	*	35.8		27.7		29.3
Scheduling	48.4	**	55.6	***	41.7		39.1		29.5	*	37.8
Core Work Activities	63.5	*	68.1	***	51.4		54.2		50.7		54.5
Number of Firms	124		216		72		193		213		265

Source: Authors' tabulations from Urban Institute telephone survey.

[a]This Computer Intensity Index uses seven business functions and takes on a value of 0 to 100, where a higher value implies higher computer use.

Notes: *p < .10. **p < .05. ***p < .01, based on robust standard errors. The sample includes only firms with at least $600 in labor costs. Sample sizes differ slightly across outcomes due to missing data.

use of computers is higher for African-American females than among white males in two business functions—managing inventory and scheduling. This more intensive use of computers appears in spite of lower spending on computers (in dollars per worker) among African-American females than white males. On the other hand, the advantage for African-American males is consistent with their higher spending on computers.

The one-on-one interviews also revealed no evidence of digital divides, but do offer insight on the perspective of owners on their computer use. Relative to the telephone survey, the in-person interviews provided more in-depth understanding of how computers were used for business and factors related to their productive use. Most small businesses used stand-alone, standard personal computers and few had networked systems. Standard packaged software was used for basic functions (e-mail, word processing, spreadsheets), with specialty software dependant upon the type of business. Medical offices, for example, typically purchased an off-the-shelf medical software product, construction firms used packaged estimating software, and retail stores used standard retail software packages for cash registers and accounting. Very few businesses had customized software.

The use of e-mail to attract or interact with customers provides insight into the range of computer use by these businesses. Although 43 percent of firms reported this use of computers, the in-depth interviews found that, at the time of the interviews, e-mail interaction with customers was still in a quite nascent stage, used only once or twice a day with any customers. Typically, businesses used e-mail with suppliers more than customers (retail), with patients (health care), and for submitting bids more than for interacting with clients (construction), except for those contractors involved in design who regularly used e-mail to discuss design details. E-mail as a core

Figure 5. Differences in firms' computer-related characteristics in 2003 by race and gender of the majority owner, regression-adjusted difference compared with white males

Computer-Related Characteristics	African-American Female		African-American Male		Hispanic Female	Hispanic Male		White or Asian Female	
	Mean		Mean		Mean	Mean		Mean	
Computer Intensity Index[a]	3.91		6.08	***	-0.15	-1.59		-3.43	
Spending on Computers per Worker ($)	-627.0	**	711.17	*	-156.69	440.5		-593.4	***
% Firms that Use Computers for:									
Interacting with Customers	5.96		7.30		-9.27	-7.08		-0.47	
Accounting Functions	0.70		-4.44		-3.95	-9.23	**	-1.56	
Paying Suppliers	-2.66		-1.81		-0.45	-7.35		-8.77	*
Payroll	6.48		9.31	**	-2.06	-5.70		-2.36	
Managing Inventory	11.48	**	10.26	**	3.72	2.30		-4.25	
Scheduling	10.76	**	15.73	***	4.72	1.81		-5.08	
Core Work Activities	6.31		9.48	**	-4.12	2.87		-3.64	
% Firms that Use Computers Moderately or Heavily for:									
Interacting with Customers	4.34		11.16	**	-5.58	-1.40		-0.73	
Accounting Functions	7.24		3.27		-2.81	-5.30		2.48	
Paying Suppliers	-2.66		-1.81		-0.45	-7.35		-8.77	*
Payroll	6.48		9.31	**	-2.06	-5.70		-2.36	
Managing Inventory	11.48	**	10.26	**	3.72	2.30		-4.25	
Scheduling	10.76	**	15.73	***	4.72	1.81		-5.08	
Core Work Activities	6.31		9.48	**	-4.12	2.87		-3.64	
Number of Firms	123		213		71	192		211	

Source: Authors' tabulations from Urban Institute telephone survey.

[a]This Computer Intensity Index uses seven business functions and takes on a value of 0 to 100, where a higher value implies higher computer use.

Notes: *p < .10. **p < .05. ***p < .01, based on robust standard errors. The sample includes only firms with at least $600 in labor costs. Sample sizes differ slightly across outcomes due to missing data.

business function was also limited by the nature of some businesses. Additionally, there are "network effects" in which computer use for external interactions depends upon the extent of computer use by others in the specific business network. For example, in retail, which ranged from small grocery stores to eyeglasses to a specialty shoe store, customers made purchases in person and pre-purchase and post-purchase interactions were minimal. Small businesses that interacted with large businesses were either encouraged to use computers (e.g., insurance companies requiring medical services to submit reimbursements electronically) or limited (e.g., suppliers that required original signed purchase orders). One owner commented about their supplier: "They'll take orders by e-mail but we have to fax confirmations," so he didn't bother using e-mail since they could just fax the original order without confirmation. The nature and contingency of the network effects as a determinant of computer use was explained by a Chiropractor who submitted insurance claims electronically and did follow-up via e-mail but only used the telephone for appointment reminders because, "We don't know if patients check their e-mail every day, so we call."

A similar story emerges for Web sites. In response to the telephone survey, 42 percent of firms reported having a Web site. Yet, in the in-depth interviews, it became clear that few were using high-functioning Web sites. Most Web sites were informational only and did not allow for other functions, such as ordering products, scheduling services, or filling out necessary forms. Not much customer acquisition took place through Web sites and it was unclear whether lack of resources limited Web site development, and thus customers did not use Web sites because of limited functionality or whether customer use of Web sites would be limited even for fully functional Web sites. In general, Web site development and maintenance was viewed to provide limited benefit for businesses that relied on direct, in-person customer contact. For this reason, we asked about intensity of use and our measure of computer interaction gives heavy weight to users with a considerable role for their web site.

The accounting function exhibited the most extensive computer use, with 68 percent of owners reporting in the telephone survey that they used computers for various accounting functions (payroll, receivables/payables, taxes). Owners identified the benefits they perceived in using computers for these functions. In one health care business, the interviewee indicated that technology helped her manage business income and set goals for maintaining the flow:

Tracking patient billing and payments by computer allows me to run reports and see where incoming money is delayed. I can keep on target with my 'one-month run' goal (not letting patient and insurance company payments go beyond one month).

Although computer use was widespread in performing accounting-related functions, many owners were not utilizing available functions. Sometimes this occurred in businesses that otherwise demonstrated high computer usage. One reason was that owners like to "stay with what has always worked" and many want to "touch and feel" their money, which, in their perception, they can do if they have accounts written in pencil on paper rather than accounts accessible only through a computer keyboard. Alternatively, some businesses that did use accounting software said it was initiated by their outside accountants who insisted they track their finances and provide them electronic records.

The case of computer use for core business activities is complicated by fact that the relevant computer application varies across industries. In retail, a core function includes point-of-sale and business-specific systems, such as a computer-controlled drink dispenser for a bar. Core functions for health care systems involve patient record management and other processes used in providing treatment (e.g., a system for recording skeletal alignment in a chiropractor's office). Process technology for construction consists of estimation, design, and project management systems.

Throughout the interviews, we heard about the tension between an emphasis on technology to control processes and attention to service that improves the customer relationship. These issues obviously are not always in conflict, but the interviewees often identified them as a trade-off—not just in terms of how increased computer use changed the process but also in terms of where owners focused their attention and time. In some firms, there were clear productivity gains through computerization. For example, one car dealer explained,

Computer forms and submissions save time—it now takes only 5-10 minutes instead of the normal 20-25 minutes…but we only sell 30-40 cars per month. Even though the savings are significant, it does not add up to much over the course of a tracking period. But, it does translate into an easier, more pleasant experience for the customer.

In the on-site visits to firms, we found that greater efficiency in operations may not lead to overall improvements in business productivity for small businesses. Because many of these businesses employ a minimum level of staff to keep the business open, they may be little affected by small to moderate productivity gains. For example, particularly for a small store, the number of sales people required to keep the store open and assist customers will not be greatly reduced by greater efficiency in processing orders; most of employee time is still devoted to the human interaction in the sales process. This also lowers the motivation for computerization. As one store owner explained, not only did he believe there was little to gain from more computerization, but he was going to be at the store for many hours every day regardless, so saving time wouldn't necessarily reduce his work hours.

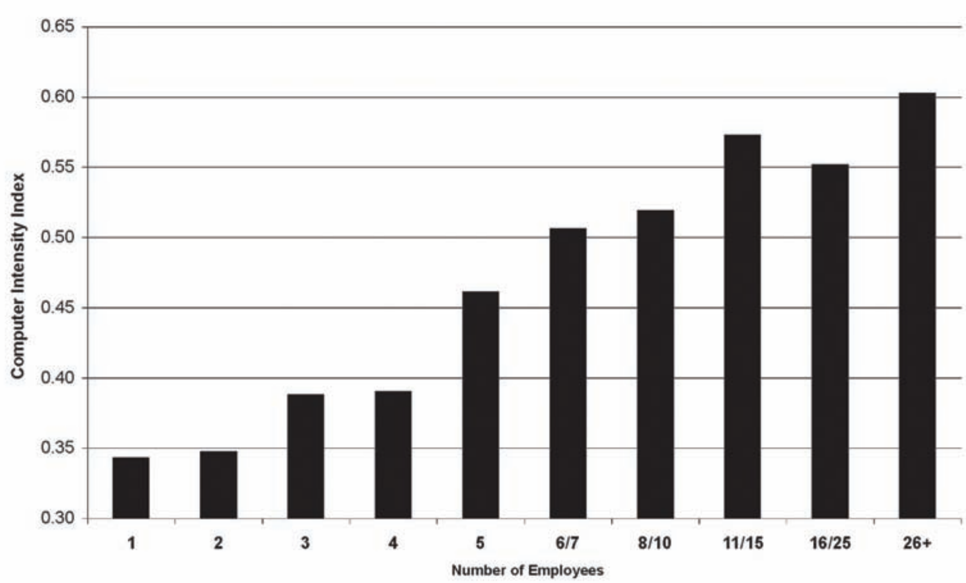
Productivity gains may not be the most important impact of computer use for small business performance (as discussed below). Field evidence indicates there is, however, a clear distinction between extensive computer use and strategic computer use. Firms may use computers for several functions without strategically applying computers to improve performance.

WHAT FACTORS DETERMINE COMPUTER USE BY SMALL FIRMS? WHAT LIMITS EXPANSION?

Computer use varies substantially among small businesses because of differences in firm and owner characteristics. One notable example is the close relationship between computer intensity and firm size. As Figure 6 shows, the computer intensity index increases sharply and steadily as the number of employees rises from 1 to the 11-15 range and then peaks for firms with more than 25 workers. To reveal how several other factors are associated with computer use, we present two ordinary least squares (OLS) regressions in Figure 6. The first regresses the computer intensity index on race, ethnic status, sex, age, education, years of current ownership, number of firm locations, number of employees, whether the firm is a sole proprietorship or corporation, the market of the firm, the location of the firm, and the natural log of the industry's computer index. The second regression adds variables linked to the owner's experience with computers.

The results shown in Figure 7 confirm the absence of a digital divide favoring firms owned by white men. The only significant difference is the higher level of computer use in firms owned by African-American men. The firm size effect remains significant, even after controlling for other factors. Each additional 10 employees is associated with a 4 percentage point higher level of computer intensity. The owner's age is negatively correlated with computer use, as is the age of the firm. Older firms, which might have well-developed business structures, actually tend to use computers less intensively than younger firms. Firms in national markets have substantially greater levels

Figure 6. Computer intensity increases with number of employees



of computer use, even controlling for firm size and number of locations. Firms with a primarily local market show the lowest level of computer use. In addition, corporations and partnerships are found to have computer use that is eight points higher than proprieterships. The average intensity of computer use in the firm's industry is another positive and significant determinant of the firm's computer use. Washington, D.C. and Seattle are the two metropolitan areas with the highest computer use, though firms in Chicago and Los Angeles also have higher computer use than firms in the New York City and Miami metropolitan areas.

The owner's own characteristics apparently exert a major effect on computer intensity. As noted, firms with young owners are more likely than other firms to use computers intensively, although the size of the impact is modest, with an additional 10 years of age associated with a reduction of three percentage points in computer intensity. This is consistent with a separate analysis (not shown), in which we find similar-sized relationships between

Figure 7. Determinants of firms' computer intensity

	Base Model	With Computer Experience Measures
Owner Characteristics		
Race and Sex[a]		
African-American Female	0.043 *	0.029
African-American Male	0.069 ***	0.052 ***
Hispanic Female	0.009	0.018
Hispanic Male	-0.008	-0.008
White/Asian Female	-0.030	-0.026
Age	-0.003 ***	-0.003 ***
Missing Age	-0.189 ***	-0.185 ***
Educational Attainment[a]		
Some College	0.050 **	0.026
College Degree	0.098 ***	0.050 **
Graduate/Professional Degree	0.112 ***	0.041
Firm Characteristics		
Years with Current Ownership	-0.002 ***	-0.002 **
Number of Firm Locations	0.002	0.002
Number of Employees	0.005 ***	0.004 ***
Firm's Legal Status[a]		
Proprietorship	-0.085 ***	-0.075 ***
Marketplace for Goods/Services[a]		
Local	-0.130 ***	-0.107 ***
Regional	-0.063 ***	-0.053 ***
Geographic Location[a]		
Chicago	0.04158 *	0.032
Los Angeles	0.040	0.034
Miami	0.005	-0.006
Seattle	0.073 ***	0.064 ***
Washington	0.066 ***	0.046 **
Experience with Computers[a]		
Log of Industry-Level Computer Index	0.140 ***	0.111 ***
Owner's Years of Computer Use		0.009 ***
Cell Phone User		0.034 **
PDA User		0.102 ***
Constant	0.467 ***	0.367 ***
Observations	1070	1066
Adjusted R-Squared	0.279	0.361

Source: Ordinary Least Squares estimates by authors based on Urban Institute telephone survey.
Notes: *p < .10. **p < .05. ***p < .01, based on robust standard errors.
The sample includes only firms with at least $600 in labor costs.
[a]Omitted variables include: White Male, High School Education or Less, Corporation/Partnership, National/International Marketplace, New York

age and moderate use of each of the separate computer functions. This effect is not reduced when we control for owner's personal involvement in technology. The owner's educational attainment appears large and significant in the first regression. But, the role of education diminishes sharply, once we control for the owner's personal involvement with technology, as noted in the second regression. For example, computer use among owners with a graduate degree as compared with those with a high school degree or less falls from 11 points to 4 points after controlling for technology use by the owner. An analysis of moderate use of separate computer functions also shows much weaker relationships associated with education after controlling for technology use.

Separate indicators of the owner's use of computers exert large effects on the firm's computer intensity. For example, firms with owners who have PDAs raise their score on the computer intensity index by about nine percentage points, or about 18 percent of the mean value. A similar increase occurs with a 10 percent increase in years of owners' computer experience.

Applying computer technology to business functions typically requires investments in hardware and software that might be expected to limit computer use in small businesses that typically have less capital than large firms. Moreover, one reason for expecting a digital divide is that access to capital is more limited among minority- and women-owned firms than among white male-owned firms. Surprisingly, firms reported few financial constraints limiting their computer use. Only about 20 percent of MWEs agreed that they could not afford computers or that they lacked the capital to purchase computers. Even among low computer users, less than one-quarter expressed these problems. One barrier, however, that does modestly limit computer use is "having the skills to use computers a great deal in the business." More than 25 percent of low users reported this problem and another 21 percent were uncertain about their skill level. Indeed, in separate regressions that control for other owner and firm characteristics, being uncertain about or lacking skills exerts a small, but statistically significant negative impact on computer use.

Social Networks and Computer Use. The survey analysis shows the substantial role of owners' computer skills, experience, and comfort in determining computer use by small firms. The in-depth interviews, however, identify an additional factor, namely the nature and extent of their social networks. The technology resources available in owners' social networks are important in determining not only the extent, but also the effectiveness of computer use. The use of information technology is typically thought of as requiring resources, capital to purchase the equipment, and then information to develop the necessary knowledge to implement and operate it, and access to qualified technical assistance. We note that although availability of capital is not seen as a constraint to the acquisition of computers, it is not as readily available for ongoing purchase of information technology services.

In-depth interviews revealed that often the owner's primary resource for computer installation, networking, and/or software development is a family member or a friend. Importantly, the types of social network resources for effective computer use are different from the types of social networks that are most useful in other contexts such as business start-ups (Davis & Aldrich, 2000), or job searches (Granovetter, 1983).[8] Social networks that are extensive rather than intensive are important for access to new resources, such as job opportunities or finding new sources of financial capital. Computer use, however, appears to depend on the intensive use of resources in dense social networks formed by family and close friends, in addition to the business owners' own expertise.

It is also important to note that age and gender of owner did not appear to be significant factors in computer use in the businesses we visited. Age and gender might have been important factors in an individual's computer use, but small businesses rely on the computer expertise in their immediate networks that typically cross age and gender. That is, personal factors were less important than social network effects, particularly since the computer resource networks most used were those of family and friends.

For example, a 74-year-old camera shop owner reported buying the region's first digital processing equipment because his daughter, who worked in the IT industry, insisted that he do so. He had a Web site because his granddaughter, who worked as a Web designer, insisted upon it and developed it for him. An occupational therapist practice had a sophisticated database that the owner's son-in-law, a programmer, had developed outside of his regular job. In a drywall company that was expanding, the wife in the husband-wife business partnership hired their daughter's friend to do the accounting. The daughter's friend had just graduated from college in accounting and was starting a job with the Internal Revenue Service in six months, and worked for the company during the interim. She developed formal accounting systems and implemented two new computers and accounting software.

In most cases, the friends and family were not paid, or paid only a nominal amount. Extensive computer networks or custom applications would have been expensive to set up and maintain and an expense they would have been hesitant to make. In fact, it often seemed that the impetus to acquire computers was the friend or family insisting, or that person's availability made it easier to consider technology use knowing the owner could call upon the family or friend for assistance. In some cases the business owner said they had a strong interest in implementing or upgrading their technology, but more often they indicated they were receptive to, or interested in, but not compelled to active pursue computerization but rather took advantage of the opportunity provided by a family member or friend.

The strong dependence on their social network for computerization is also a limiting factor in effective computer use after initial implementation. Computer maintenance can be labor intensive and social networks do not always provide the necessary availability of resources since they depend upon the availability and willingness of friends and family. One health practitioner explained, "I barter tech services for health services [patient is an information technology worker]…But, sometimes he is nowhere to be found until he is sick." In another business, the owner said, "I have to wait until my boyfriend has time—he works 12 hours a day at a software firm…that's why we'll both be here Friday night, probably until midnight, to work on the network." And a dental supplier did not have his computer set up after his move because his friend was out of the country and he was waiting until he returned.

The level of technology expertise varies by owners' socioeconomic status, and this potential digital income divide is cause for concern. Those with higher incomes (generally not in the urban inner city) reported that they had access to family and friends who worked in the IT industry. In contrast, those owners reporting very limited technology use and experiencing more problems often had little access to quality computer support. The barrier in these businesses appears to be less the owners' level of computer skills and more their limited access to quality, reliable technology support in their social network. Paid consultants were reported as expensive and the quality of support they offered varied.

Organizations with which a business interacts sometimes help drive computer use. The experiences of health and construction firms offer good examples. Health care offices reported that computer-generated reimbursement submissions to insurance companies experienced lower rejection rates than those filled out manually. Respondents reported that while the computer-generated submissions were not necessarily more accurate, their appearance indicated a more systematic process and therefore insurance companies were more likely to accept them as submitted. However, because the entire insurance reimbursement process is a large burden, many health care practices have begun to outsource the entire insurance reimbursement submission process.

In the construction industry, building loans are released on a rolling basis as a given project is at different stages of completion. To receive the loan, the company must submit a progress report for the project. Most businesses reported that they find it easier (and that lenders find it more "legitimate") to track progress on a spreadsheet that provides a breakdown of job components and shows the percentage of the job completed.9 Minority contractors working on projects that were specifically awarded to minorities stated that the additional reporting requirements and job tracking were easier on a computer.

Industry associations and minority and women business organizations are important resources for improved computer use. These organizations can provide the advantages of scale and offer professional support at a low cost. For example, a chiropractor purchased a semi-custom Web site for $400 from a chiropractic association. This site provided in-depth information and, though somewhat generic, was higher in quality than a business of that size could purchase alone. The FTD retail flower company provides to individual stores a semi-custom Web site with flower information and ordering capability. These models for Web sites offer promising examples that other associations and companies could provide to small businesses.

CONCLUSION

In recent years, concerns about a digital divide that would add to the disadvantages faced by minorities and women were common. One worry was that the divides documented among individuals would extend into the business world, thereby weakening the ability of small minority- and women-owned firms to succeed in the market. This study was undertaken to examine the possibility of a business divide and what policies might be undertaken to alleviate the problem.

Whether it is because of the declining prices of computer power, the increased familiarity of computers in the population, or that the primary owners of small MWEs are a selective group of well-educated individuals, the results of the study indicate that fears of a business divide by race, ethnicity, and gender are not supported. The disparities in computer use among all individuals in the United States do not extend to differences among this sample of small business owners with at least one computer. In fact, firms owned by African-American males consistently show more intensive computer use than observed for white male-owned firms. Even after controlling for firm and owner characteristics, there is no evidence of a shortfall in the intensity of computer use among MWEs. Analyses based on a sample that also includes businesses with no computer could come to a different conclusion; however, our findings are in line with those from the Community Development Technologies Center (2002) study, which had a sample that included small business that do and do not have at least one computer.

The study documents the rate of computer use among small businesses in a variety of business practices. Although the indicators of computer use for specific business functions do not reveal a business divide by race, ethnic, or gender of business owners, the results point to areas of subpar use and of systematic differences by type of firm. The data show that fewer than half the small firms use computers moderately or heavily to interact with customers, to pay suppliers, to manage inventory, and to conduct scheduling. Why? One major divide with respect to computer use is firm size. The survey findings show a strong link between firm size and the intensity of computer use, even among firms with 50 or fewer employees. Computer use is more critical for firms with 25-50 employees than for firms with 5-10 employees. Another divide is between firms with older owners with little personal experience with computers and younger owners who have years of personal experience with computers. Firms doing business only locally use computers than firms doing business in other parts of the nation or firms conducting business internationally. Thus, some of the firm differences in computer use results simply from differences in business necessity.

The qualitative evidence suggests that many firms see computer-based productivity increases as having minimal impact on business performance since the minimal staffing of many small businesses cannot be reduced. Finally, we find the owner's familiarity with computers and technology and the owner's social networks are important for the use of computers and the effective implementation of computer applications. In many realms, such as business start-ups, it is large, diverse networks that provide the most advantage. In use of computers, it appears that dense networks are more important since computer support relies on extensive use of friends and family. To do so requires a strong and ongoing relationship to be willing to spend the time necessary for implementation and maintenance. Small businesses typically cannot afford to purchase this level of support, so they either develop that expertise in-house or rely on their social networks.

The limitations of relying on social networks could be overcome by wider involvement by business associations in providing customizable software and/or support, which could expand the technology capabilities of small firms. Overall, both the survey and interviews identify a large variation in extent and effectiveness of computer use by all small businesses. More effective computer use, facilitated by business associations and computer companies, would improve small business performance.

Race and gender differences do arise in terms of business start-ups. The digital divides that affect the overall population might therefore influence the impetus for minorities and women to start a business in the first place. If so, expanded access to mastery of computers could lower the barriers to entry for minorities and women.

Although the evidence does not suggest a digital divide based on the sex or minority status of the business owners, various organizations have tried to help small firms improve their overall management, of which sound computer use is a part. The Kaufmann Foundation has established programs to provide training to small entrepreneurs in a number of programs, including FastTrack and Bizdom U. While not specifically aimed at solving the digital divide, these programs teach small business owners how to use technology to accomplish business tasks efficiently. This broader approach makes sense, given that computer hardware and software should be viewed as a useful tool, not an end in itself.

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KEY TERMS AND DEFINITIONS

CATI: Computer Assisted Telephone Interview.

Computer Intensity Index: An index between zero and one (one represents maximum intensity) that capture the intensity of firms' computer use for seven specific business function—interactions with customers, accounting, paying suppliers, payroll, inventory management, scheduling, and core business activity.

Digital Divide: Difference in use of computers by a characteristic such as race or gender.

Minority- and Women-Owned Enterprises (MWEs): All firms not owned by non-Hispanic white males.

Multivariate Statistical Model: Statistical model that isolates the independent role of various factors affecting the outcome of interest—computer use.

PDA: Personal Digital Assistant, such as a Palm Pilot, that allows easy computerized, hand-held access to contacts, calendars, and e-mail.

Social Network: A group of people whose relationships are established through kinship, friendship, and/or business relationships. Networks composed of many indirect relationships—friend of a friend—constitute sparse network linkages whereas a dense network is composed of a preponderance of direct relationships.

ENDNOTES

1 The data come from the Internal Revenue Service, Statistics of Income, Integrated Business data, http://www.irs.gov/pub/irs-soi/03ib01ty.xls.

2 Tabulations by the authors from the 2007 Current Population Survey.

3 Buckley's analysis does not provide information about whether the differences are statistical significant.

4 The sample for this analysis includes 1,014 minority-owned businesses and 103 white-owned businesses.

5 The study does not provide information about whether the differences are statistical significant.

6 As part of the initial survey, all telephone survey respondents in the construction, health care, or retail industries were asked if they were willing to participate in a follow-up personal interview in exchange for a payment of $100. Persons who participated in the in-depth interviews consisted of those who agreed to the personal interview and were able to schedule the interview on days the researchers were in the metropolitan area.

7 Details of the computer intensity index are available from the authors upon request.

8 A factor limiting success of women-owned and minority-owned businesses, it is suggested, is the more limited nature of their social networks. These groups are thought to have dense, homogenous networks that provide less access to resources necessary to start a business.

9 As in insurance, the appearance of legitimacy seemed to be an important factor. One construction company stated, and another implied, that using an itemized spreadsheet allowed them to indicate progress in ways that allowed release of loan amounts at a rate in advance of actual stage completion, enabling them to get more of their funds sooner.

Chapter 14
The Internet, Black Identity, and the Evolving Discourse of the Digital Divide

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ABSTRACT

In this chapter, we examine how people of African descent are using an online discussion forum as a site for interrogating the existential question of "who am I?" Contrary to the typical formulations of the digital divide as a measure of disparity in access to information and communication technologies (ICTs), we make a case for how and why ICTs are being effectively used to enable and advance the interests of people who have historically been marginalized and silenced. The contributions of this research extend the digital divide discourse to affirm the cultural realities of diverse Internet users.

INTRODUCTION

Despite the potential benefits of Internet use, research on Information and Communication Technologies (ICTs) and the African Diaspora typically starts from a digital divide thesis in which this population is viewed as lacking access and relevant skills to make use of the Internet. The digital divide was initially defined as a lack of physical access to computing devices necessary to obtain Internet access (National Telecommunications and Information Agency, 1995). The divide was subsequently formulated to include concerns related to disparities in information literacy and skills necessary to function proficiently on the Internet (Mossberger, Tolbert, & Stansbury, 2003). One consistent concern was that globally, people of African descent residing in both developing and in developed nations were on the wrong side of the divide and at risk of falling behind their online peers.

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In the decade since the digital divide gained popularity, people of African descent have increasingly adopted the Internet. In African countries, Internet penetration rates increased ten-fold over the course of four years, going from 4 countries (in 1993) to 44 countries with Internet access (in 1997). By 2000 the Internet was accessible to all 54 countries and far exceeded the penetration rate of the telephone in Africa (Sonaike, 2004). Additionally, among African Americans, the percentage of households with broadband connections in the United States (US) has increased 186% from 2005 (14%) to 2007 (40%; Horrigan, 2007). As gaps in access and use narrow, early formulations of the digital divide that framed people of African descent as deficient are challenged. This chapter is an addition to the body of literature that currently challenges this notion.

This chapter supports the objectives of this book through its exploration of the digital divide and its relationship with the Internet use of diasporic people. In this chapter, we explore this phenomenon at the individual and group level using textual analysis of discussion forum posts. We use identity theory to examine how identity is (re) constructed online in a community of indigenous and diasporic Africans. Our analysis addresses two research questions:

1. What labels are used (e.g. African American, Black, Negro) as community members negotiate their identity?
2. What social meanings are ascribed to those labels?

In the following section, we provide background information on diasporas and the digital divide. We then discuss the Internet and identity theory as a means of understanding the issues related to identity performance online. Next the research methodology and results of our textual analysis are presented. The chapter will then conclude with a brief discussion of future trends and a brief summary of the chapter's contents and purpose.

BACKGROUND

In a seminal book on identity and the Internet, Turkle (1995) suggests that identity on the Internet is more fluid and fragmented than real space because people can assume multiple identities. However, research on Chinese (Sun, 2002) and Indian (Mitra, 2001) diasporas reports that these communities use the Internet as a "cultural location" to enact identity positions online that are grounded in real life. These online diasporic people share memories of historical events of their respective nations, and reconcile their sense of displacement, multiplicity and fragmentation in real life.

Diaspora refers to categories of people such as expatriates, political refugees, alien residents, immigrants, and ethnic minorities who are dispersed from their homelands but maintain myths or memories about their country of origin (Safran, 1991). For Clifford (1994) diaspora cultures mediate, in a lived tension, the experiences of separation and entanglement, of living here and remembering or desiring another place. While scholars such as Clifford (1994) and Safran (1991) express a sense of loss and separation from home identity, diasporas have also come to represent a postmodern experience in which home and identity have become fluid concepts. The postmodern notion of 'belonging nowhere' or 'belonging everywhere' suggests freedom and new possibilities of identity formation and notions of belonging.

Regardless of whether diasporic people express identity through the prism of loss or new possibilities, immigrants are often placed in the lower ranks of the social hierarchy in the host country. Host societies also tend to subjugate the diasporas' native cultural practices such as language and religion. Psychological and personal dislocations result from this cultural denigration experience. 'Identities' is the term that Hall (1990) gives to the various ways that diasporas are positioned as subjugated others, and the way that diasporas react to this positioning:

It is one thing to position a subject or set of peoples as the 'Other' of a dominant discourse. It is quite another thing to subject them to that 'knowledge,' not only as a matter of imposed will *and domination, by the power of inner compulsion and subjective conformation to the norm. That is the lesson – the somber majesty – of Fanon's insight into the colonizing experience in Black Skin, White Masks. This inner expropriation of cultural identity cripples and deforms. If its silences are not resisted, they produce, in Fanon's vivid phrase, 'individuals without an anchor, without horizon, colourless, stateless, rootless--a race of angels' (p. 52).*

Tsagarousianou (2004) critiques Safran's conceptualization of diasporic groups and their relationship with a mythical version of its homeland because it plays down other important relationships and linkages that inform the diasporic condition. For diasporic Africans, for instance, many of the linkages to the homeland were severed as a result of being removed from Africa involuntarily. Thus, the link between diasporic African communities and their 'homeland', or the possibility of a return to the past, are much more precarious than usually thought. The collective identity of diasporic Africans and other displaced people and transnational communities is defined by their hybrid relationship to the homeland and the host society. For diasporic Africans, the nature of this relationship can vary from a denial of an African affiliation, to a mental connection, to an imagined Africa, to real travels to Africa.

ICTs enable diasporic discourses that construct "alternate public spheres" (Gilroy, 1987) or "forms of consciousness and solidarity that maintain identifications outside the national time/space" (Clifford, 1994, p. 51). People who have similar interests or backgrounds can form alliances in cyberspace that allow diasporic people to build a sense of belonging and commonality that was previously unavailable because of geographic separation between individuals (Mitra, 1997). Tsagarousianou (2004, p. 52) goes further to suggest that "diasporas should be seen not as given communities, a logical, albeit deterritorialized, extension of an ethnic or national group, but as imagined communities, continuously reconstructed and reinvented". Individuals can renegotiate their identities in relation to the online group as well as the offline societies in which they live. According to Mitra (2001) the process of renegotiating an identity is crucial for marginalized groups, such as diasporic Africans, for whom a persistent set of identity narratives has systematically constructed this group as the 'Other'. The construction of an African diasporic identity that resists these negative portrayals is a painful yet urgent necessity.

While an increasing number of diasporic Africans go online, the Internet remains an elite medium. In Africa, for instance, the overall Internet penetration was around 4%. Personal Computer (PC) penetration rates remain low due to the high cost of ownership. Each computer with an Internet connection supports three to four users on average. Most users access Internet services through cybercafes, kiosks, community telecentres, community phone-shops, schools and other types of public sites providing Internet access. Although access is increased through these public facilities, the Internet has had the greatest impact at the top end of business and in well-educated, wealthy families, primarily in the major urban areas (Paul Budde Communication Pty Ltd., 2007).

Thus, increased access is a necessary but insufficient remedy for the digital divide, if we are concerned about extending the beneficial outcomes of ICT use to all members of society. The decision to adopt and use ICTs is driven by the meanings, values, and experiences of individuals. Social and cognitive aspects such as power relations, identity, and ideology, as well as technical skills and material resources congeal to determine the consequences of Internet use. It is somewhat naïve to assume that access and market forces are the sole roadblocks to expanded Internet use. Without a contextually nuanced understanding of the social and cognitive nature of Internet use, we simply perpetuate stereotyped notions about the Internet as being "on the wrong side of the divide", and propagate damaging beliefs about this group.

According to Foucault (1980, p. 131), "Each society has its regime of truth, its 'general politics' of truth: that is, the types of discourse which it accepts and makes function as true". Oftentimes, these 'regimes of truth' subjugate people of African heritage. In this chapter, the marginalization of the Internet is essential in theorizing Internet use by this population. The Internet has historically served as the exotic 'Other' in the dominant discourses and systems of knowledge and power. While diasporic Africans have been disconnected by geography and colonial history, the Internet offers a medium to foster solidarity and understanding. People of African descent who have had little knowledge of each other are no longer disconnected. The individuals who take part in these communities in cyberspace converge to create discursive communities that forge new ways of understanding both divergent and shared history, and language and culture. The identities that are constructed by the dominant groups are no longer the primary narratives of groups such as African Americans. In producing critiques of these dominant labels and envisioning alternative identities through discourse, historically oppressed people are wrenching away the locus of identity production from the regime of the dominant (Mitra, 2001).

In addition to shifting the locus of power, the Internet serves as a cultural conveyance; one that can be "read" as a text presenting information that expresses the identity of the authors and is designed to attract like-minded others (Mitra & Watts, 2002). Researchers such as (Katz & Aspden, 1997) and (Nakamura, 2002) argue that race, racial stereotypes, and associated values structure identity formation and validation. Race is always present in conversation, noticeable by either its absence or by the furor aroused by any mention of race. When race is mentioned online, the discussion often reproduces the negative attitudes and ideologies about people of African descent found within offline content (Miller & Slater, 2000). However, the Internet provides modes of resistance.

People of African descent develop creative uses of language, style, musical, artistic and religious forms, as well as an independent press to create and disseminate a self-affirming identity that draws upon both mainstream and diasporic influences (Brock, 2005). Diasporic identities are developed through the process of trying to regain what was lost during the 'forced dispersal and reluctant scattering' that Africans experienced as a result of experiences like slavery (Woodward, 1997). Africans, and individuals of African descent, who were once unified in both time and space, are now geographically separated; "while there are many differences among indigenous and Diaspora Africans, the cultural and political dismembering of African communities on either side of the Atlantic by Europeans constitutes a bond that transgresses geographic and temporal boundaries," (Lake, 1995, p. 22). In efforts to close this gap, a place was sought that would allow them the freedom to be themselves and the ability to identify with individuals like them (Jackson et al., 2003). The Internet has become this place. Through the use of online discussion forums their identity can flourish, as the formation of identity is a spatialized process (Drzewiecka & Nakayama, 1998). Hence, conceptualizing Internet use as an alternative public sphere, in which self-affirming identity is constructed, can advance our ability to transform existing knowledge on digital divides.

PRINCIPLE INVESTIGATION

Issues, Controversies, Problems

In examining the issues, controversies and problems associated with Internet use and identity construction in the Internet, we acknowledge that perspectives on the consequences of Internet use are often paradoxical (i.e. utopian view and dystopian view). On the one hand, scholars with a dystopian viewpoint believe that Internet use leads to social isolation and negatively influences psychological well being (Kraut et al., 1998). They believe the Internet is a tool that will destroy communities; it will lead individuals to spend significant time interacting online, which will result in these individuals disregarding their offline relationships. Turkle (1995) argued that the ability to create multiple personalities in this online world would be so emotionally engaging that it would fracture identity. Others have noted problems associated with anonymous communication, which is the cornerstone of an Internet culture that promotes sharing and free speech and is overtly anti-establishment. While individuals can say how they feel with little concern for repercussions, this freedom has associated costs. According to Davenport (2002), if people remain anonymous they cannot be identified, making it impossible to hold them accountable. Anonymous communications on the Internet can open the door to many forms of criminal and anti-social behavior, while leaving victims and society helpless. One such anti-social behavior is known as flaming, which is "composed by CMC behaviors that are interpreted to be inappropriately hostile" (Riva, 2002, p. 200). As noted by an anonymous forum participant in our study, "there are some who have posted opinions on this forum indicating, and more overly, criticizing that the forum is hateful and that some commentaries made by people of African ancestry 'bash' people of African ancestry openly on the forum is less than desirable or necessary".

On the other hand, scholars of the utopian perspective believe that the Internet can be used to break down the geographic and social barriers imposed by society, thereby uniting people all across the globe (Kraut et al., 1998). The asynchronous nature of discussion forums supports this notion, as it is a social affordance of the Internet that not only supports interaction amongst people in different locations but also different time zones (Boase & Wellman, 2006). The asynchronous nature of discussion forums also makes it a useful place for identity negotiations for individuals of the Internet, since participants need not worry about real time and time zone differences. Although possible to meet face-to-face with individuals within the same geographic location, the breadth of geographic dispersal makes using the Internet better for increasing the amount of the population that is reached. Additionally, on the Internet, users tend to be less inhibited and speak more liberally (Riva, 2002). The diminished inhibition results from the anonymous nature of online communication, as well as (in some cases) the absence of visual and audio feedback (Boase & Wellman, 2006).

Both the utopian and dystopian viewpoints are limited in that they fail to take into account how the Internet is actually being used (Boase and Wellman, 2004). To overcome this limitation, we examine Internet use by individuals typically seen as being on the wrong side of the digital divide. We frame our examination by presenting three important aspects of Internet use, the Internet and identity. First, cyberspace has altered the geographic dominance of 'developed' countries that have historically served as the locus of power. In cyberspace, individuals in Ghana and other 'developing' nations have a platform from which to speak to the global community. These discussion forums are the culmination the voices of individuals, not an organized source that speaks for the 'Other' from the standpoint of the dominant ideologies. There is no single entity that can control all of the voices on the Internet (Mitra, 2001).

Second, with the improvement of Internet access across the globe, there has been an emergence of individuals using the Internet to form virtual communities. "Some online communities truly help stigmatized people accept themselves, fit into a group, and feel more comfortable in their real-life communities" (Papadakis, 2003, p. ix). Online communities provide individuals with an opportunity to communicate with others like them across the globe, in attempts to construct a collective existence. Discussion often mimics the private talk that would occur in a third place like a café or a barber shop (Kvasny & Igwe, 2008). Yet online talk is akin to a published article because the transcripts of the conversation can be read by anyone online. In this way, online forums straddle between the public and private spheres of communication.

Third, and perhaps most important, the Internet serves as a medium where marginalized individuals can exercise discursive power, and resist damaging representations. Socially marginalized groups speak to one another as they speak against authority. “On the Internet, the marginalized can call on the dominant and put the dominant in the difficult position of acknowledging the marginalized, or further distance the dispossessed by ignoring the call” (Mitra, 2001, p. 32). The Internet also affords marginalized people a place to discuss and debate amongst themselves, which facilitates the process of individual and collective identity (re)construction. “[I]dentity is never a finished product, it is dynamic and fluid and constituted in interactions… [I]dentity and ethnicity are both co-created in communication, which means that ethnic identity is constantly re-created, it is flexible and evolving rather than static and fixed” (Drzewiecka & Nakayama, 1998, p. 21).

Identity Theory

Identity is the set of behavioral or personal characteristics by which an individual is recognizable as a member of a group. Identity is often imposed by society as a result of physical and social characteristics such as nationality, race, gender, and class (Drzewiecka & Nakayama, 1998). For individuals of the Internet, the Internet provides a location where these forced identities can be contested. It is a place where diasporic people can be themselves and renegotiate their identity with individuals like them. On the Internet, these individuals can reconnect with their culture, which has been forgotten, left behind, craved since the time of their dispersal, or devalued by society. In other words, members of the Internet use the Internet as a way to not only heal, but remember and define their true identity. Like other diasporic people, individuals of African descent recognize the added value the Internet can offer to their lives; the Internet is a tool to help them sustain their identity through cultural, social, and political connections to their home countries (Parham, 2004).

While sharing an identity is strongly about binding individuals together, identity is also about signifying difference; as much as it allows for inclusion (i.e. in groups) it also results in exclusion (i.e. out groups; Woodward, 1997). Therefore, it gives diasporic people something to ‘own’. It allows them to be not only consumers of information, but also active producers of information. Through exchange of discourse on the Internet, members of the Internet are given the opportunity to create and re-create their identity, while being selective of the people they include in their community.

Identity theory posits that individuals’ behaviors are a function of the extent to which the behavioral choices are related to a personally relevant or salient role-identity. Each individual has a number of hierarchically arranged identities such as religion, class, ethnicity, gender and race. In this chapter, we focus on the labels that diasporic Africans use to describe their choice of preferred labels, and how they explain the meaning of these labels. We do so because African Americans’ experiences with oppression in the US differ significantly from members of other ethnic groups in the US. They also differ from the experiences of diasporic Africans in Ghana and other countries. For instance, African Americans lost their core personal identities when they were wrenched from their native lands. During slavery the US Constitution denied the humanity of African Americans. As slaves, they were defined legally as property. Their immigration to the US was forced, and their indigenous culture was stripped away. Social integration with Whites was illegal for nearly a century after slavery ended. As Blacks achieved emancipation they forged a new blended culture and institutions to serve their needs and interests. Due to these experiences, the concept of race has historically played an important role and has had real consequences in the lives of African Americans (Sellers et al., 1998).

Racial identity is one of the most heavily researched aspects of African Americans' psychological lives, and plays a significant role in the lives of people of African heritage (Sellers et al., 1997). Racial identity reflects understanding shared by members of the group of what it means to be Black. Stereotypes and other perceived trait differences are the symbols and shared perceptions used as the basis of racial self-identification. Jackson, Hecht, and Ribeau's (2003) argue that identities have semantic properties that are expressed in these core symbols, meanings, and labels. There is, however, great diversity in the meaning of being African American. Much of this diversity is attributed to the unique culture and history of African Americans (Sellers et al., 1997). However, there is no single set of attitudes or behaviors definitive of African Americans. Thus, to understand Racial identity, researchers must uncover how African Americans define themselves and the qualitative meanings that they ascribe to membership in that racial group.

A number of approaches to the study of Racial identity have emerged. Early scholars of the mainstream approach, such as Allport (1954), theorized that living in a racist environment has negative consequences for the African American psyche, while scholars of the underground approach, such as DuBois (1902), theorized that African Americans could develop positive self-concepts despite the stigma of being devalued by the larger society. Through the concept of "double consciousness", DuBois (1903) suggests that healthy ego development occurs through the reconciliation of the tension between being both Black and an American. Building on DuBois' claims, Cross' (1971) model of Nigrescience describes a five stage model of Racial identity development to a psychologically healthy Black identity. Sellers and colleagues (1997) developed the Multidimensional Model of Racial identity that focuses on the status of an individual's Racial identity at a particular point of time rather than the stages of Racial identity development (i.e. Nigrescience).

Self-identity can occur through the construction of labels or semantic designations that reflect shifts in consciousness and sensitivity to sociopolitical milieu. Linguistic process, such as labeling or self-identifying, is the primary means through which social reality is constructed (Hecht & Ribeau, 1991). According to Smith (1992), changes in group labels reflect strategies of redefinition by Blacks to improve their social standing in a world that historically rendered them inferior. This shift can be seen through the series of studies on racial/ethnic label preferences of African Americans conducted by Hecht and colleagues. In a study by Hecht and Ribeau (1991), 69 undergraduate survey respondents indicated their preferred ethnic/Racial identity labels as Black (46%), Black American (22%) and Afro American (15%). In a later study conducted by Larkey, Hecht and Martin 1993), 'Black' (38%) and 'African American' (39%) were the most preferred ethnic/ Racial identity labels identified by 108 survey respondents. Respondents who preferred "Black" expressed a strong Racial identity, while those who preferred "African American" expressed a blended heritage. In a subsequent study (Larkey & Hecht, 1995), the majority of the 126 survey respondents identified as Black (60%) but only 9% identified as African American.

Smith (1992) chronicles the shifts in self-identity labels used by Blacks in the US, and notes that the common goal of these shifts has been to find a group label that instills group pride and self-esteem. 'Colored' was the dominant term in the mid to late 19th century. The term fell out of favor because it included Blacks, mulattos and people of mixed ancestry, Asians, and other non-White races. Influential Black leaders, such as Booker T. Washington and W.E.B. DuBois, led the movement to change the label to Negro. Negro was replaced in the 1960s as the civil rights movement promoted Black as standing for racial pride, militancy, and power. The increase in the popularity of the African American label in the 1990s has been attributed in part to the recognition that part of their dual heritage was from Africa, and the support the label has received from leaders in the Black community (Smith, 1992).

In the next subsection, we use textual analysis to examine the process of identity (re)construction among geographically dispersed people of African heritage. We do so by examining the transcripts of a threaded conversation that took place on an online discussion forum. Online discussion groups are highly decentralized and open, which permits a many-to-many discussion to be instituted in a global environment of communication. For the dispersed Internet, "the electronic space is the only common space that they can occupy" (Mitra, 1997, p. 70), and affords a site for constructing self-affirming ethnic identities. Cyberspace fosters a sense of solidarity based on sub-Saharan Africa as a place of origin and the marginalized identities in the US.

An Empirical Example

Textual analysis is used to examine identity labels and identity claims employed in a discussion board used by people of African ancestry scattered around the globe. The discussion topics tend to focus on issues related to Racial identity such as interracial dating, the state of sub-Saharan Africa in world affairs, and fostering solidarity within the Diaspora. Textual analysis is a standard methodology in the social sciences for studying the content of human communication. Researchers reduce qualitative text, such as speeches, websites, policy documents or newspaper articles, into smaller analytical units based on the development of a consistent set of core themes that emerge from iterative reading of the texts. Data reduction is conducted by objectively and systematically determining the presence of certain words or concepts within texts. Researchers quantify and analyze specific characteristics of the message. These characteristics include the presence, meanings and relationships of such words and concepts. Researchers then make inferences about the messages based on these characteristics.

In this chapter, we provide preliminary analysis that focuses on a single threaded discussion that was sparked by an anonymous post titled "Black American not African American":

Haven't you people ever heard of the word Negro? Your race is Negro if you are a black person, whether you are from Africa or America. If you were born in Africa, then your Nationality is African. If you were born in the US, then your Nationality is American. So, blacks born in the US are American, not African-American. A person can not have 2 nationalities. Get it? Born in Asia = Asian, born in Germany = German, Born in China = Chinese, Born in France = French, etc.

A total of 71 usable responses to this initial post were included in our analysis. We excluded from our analysis posts which were off topic or blank. We also excluded portions of posts that directly quoted the content of previous posts. In counting the number of posts, however, we noted that it is possible that a single individual may post multiple responses. In addition, many posts were simply attributed to "anonymous", which limits our ability to accurately account for the number of unique individuals. Rather than attribute "anonymous" posts to a single user account, we worked from the assumption that each IP address represents a unique visitor. Using IP addresses also enabled us to determine the geographic location of users. In Table 1, we report the total number of posts for members from each represented country. We also differentiate between posts by anonymous users

Table 1. Community demographics

Country	Total Posts	Total Anonymous Individuals	Total Named Individuals
United States	57	14	30
Ghana	3	0	3
Nigeria	3	0	3
Netherlands	2	0	1
Canada	1	0	1
China	1	0	1
Ireland	1	0	1
Saudi Arabia	1	0	1
Tanzania	1	0	1
United Kingdo	1	0	1
Total	**71**	**14**	**43**

and those from individuals with user names in the belief that named users demonstrate a higher level of commitment and accountability to the group. Since individuals can make multiple posts, the total anonymous and names users do not equal the total number of posts.

We understand that individuals may falsely identify themselves as an in-group member, an out-group member, or may not identify themselves at all. This is an unavoidable limitation on our analysis, due to the text-based nature of discussion forums. Therefore, while "some commentaries made by people of African ancestry 'bash' people of African ancestry openly on the forum", we cannot prove that this is actually the case. Some forum participants make note of this limitation as well, "Your accusations are unfounded and I rather doubt that you can speak on the behalf of all Africans or all African-Americans. I contend that you are white and perpetrating to be of African ancestry on this forum".

Community members responded to the initial post by negotiating the meaning of a set of identity labels. These identity labels and associated frequency of use are included in Table 2. The most frequently discussed labels include African, American, Black and Negro. However, frequency of use provides limited insights. For instance the Black and Negro labels were primarily viewed as unfavorable labels. The African label was primarily discussed in the context of being an imprecise but acceptable label for the descendents of slaves who were stripped of their African nationality and culture. Those who could trace their tribal and ethnic heritage adopted these identities rather than the more general label of African. The American label tended to be invoked as individuals refuted the hyphenated "African-American" label and claimed their national identity as simply American.

To make sense of the meanings that were articulated as community members discussed their preferences and objections to identity labels, we use a six category scheme (ethnicity, race, blended heritage, pride, terminology and birth/origin/nationality) developed by Boatswain and Lalonde (2000) to code and categorize meanings. Through our analysis, we found these six labels to be an effective means of classifying the texts in our corpus.

In what follows, we provide three quotes that demonstrate each meaning category. It is important to note that a single response can contain several personal meanings. In these cases, we categorized the quote with the dominant meaning based on the larger context of the discussion.

Table 2. Identity labels

Identity Labels African/Afrikan	Total References: 141
American	110
African-American/African American Afro American/Afro-American	67
Black	155
Black American	26
Colored/Coloured	2
Negro	130
Negro-American	3
Nigger	7
Specific African nation (Ghanaian, Nigerian, Somalian)	7
Tribal affiliations (Ga, Ashanti, Ewe, Yoruba, Igbo)	7
Total	**655**

The first meaning, *ethnic identity*, involves references to a source of ethnicity, culture, or ancestral heritage. This was the least prevalent social meaning employed by discussants. In interpreting the use of ethnic identity, we find that most individuals refer to the American experience in which African slaves were denied their heritage, history and culture. This cultural separation led some African Americans to actively learn about African culture, while others disavowed ethnic ties to Africa. Those from African nations worked diligently to persuade their American peers to embrace their African heritage. Table 3 contains representative quotes that express ethnic identity.

Racial identity, the second category, involves references to race and/or skin color. This category was heavily used in the discussion, but mostly as a means of rejecting the "Black" label as categorization based solely on skin pigmentation. People found pride in their Racial identity, but noted how skin color made them targets for oppression. Americans, in particular, expressed extreme difficulty in avowing other aspects of their identity because this society places primary importance on race. Table 4 contains representative quotes that express Racial identity.

The third category, *blended heritage* includes references to dual ethnicity/culture or to some form

Table 3. Ethnic identity

1. We have not been allowed to give ourselves an identity that is associated with a heritage we were not allowed to claim or show our pride by practicing the customs or speaking the language until they were lost to us. We like to acknowledge the fact that we do have roots despite the fact that white America likes to deny that claim.
2. If you truly believe that ex-colonial masters meant the word Negro NOT to be negative, then you are denying a very important part of our history. The 400 years of slavery, abuse and discrimination was not based on love, but on HATE. Nothing positive, only negative. From the beginning these so called Negroes were seen as less than human, justifying the many actions that were inflicted upon the people. These are documents found where "negroes" were described as being less than animals, and equal to dirt. And what about the Jim Crow law? That "negroes" were only 3/5 human.
3. Where is Black on the world map? Look, if you don't know who you are and where your people come from, then you are most assuredly a lost babe in high weeds…You have saliently inferred that you have NO affinity with Africa or African people. Then you are just Black…a nondescript American whose origin is somewhere called Black. Go forth and be Black to your heart's content. Enough respect for the lost.

Table 4. Racial identity

1. Black Americans have the stigmatism of being labelled Black, which is a crayon color rather than a race of people. Since Black Americans have always been disrespected because of the color of their skin it makes no since [sic] to deny them the right to identify with the nationality to which they belong.
2. Black Americans were not allowed to identify with Africa when they were brought to America. Nor have they been allowed to fully be received as Americans. Always a Black, Colored, Nigger, or some other derogatory description of their skin tone.
3. As a Black person, society expects me to forget everything else that makes me me and just concentrate on the fact that I am Black. It is the same with you. Of course, the colour of my skin is celebrated as Black, but that is not the only thing that sets me apart from the next person, feel me?

Table 5. Blended heritage

1. The term African-American is respectful as well as accurately providing information regarding one's ethnic origins, though having been born in America. Hence an American who is "white" is often times regarded as Euro-American which depicts that individual's orgins [sic] as being Europe though having American nationality. Having been born in America and being Negro (as you have stated) or a Black person, certainly does not removed the fact that one's ethnic origins are Africa.
2. Are you telling me, and other Black Americans, that we are to ignore the fact that we are descendants of Europeans, as well, and claim only that African side? I think not! Having said that, yes, we are Americans who just happen to be Black. I am an American and I proudly claim European and African mixture.
3. In America, people have been identifying themselves as Irish-American, Chinese American, Italian-American, Jewish-American, etc. So Blacks there wanted also to be identified by their origin: Africa.

of cultural/racial heritage plus one's nationality or place of birth. This was the most discussed social meaning. While there was disagreement about the appropriateness of blended labels, there was a general consensus that both nationality and ethnicity are integral components of the diasporic experience. Table 5 contains representative quotes that express blended heritage.

Pride, the fourth category, was used when priority of meaning was given to notion of pride or a positive sense of kinship or nationality. This social meaning was most often used by people of African birth, and was directed primarily to individuals born in the US who disavowed an African lineage. In relation to the other categories, pride was used infrequently. Table 6 contains representative quotes that express pride.

The fifth term, *terminology*, was also used infrequently. Terminology includes simple meanings such as "who I am", "the most appropriate term", and "what I am". This social meaning was typically employed as a means of adding credibility, context and strength to an argument. Arguments based on terminology were generally used in the context of strong disagreement or agreement with a point made by another individual. Rarely

Table 6. Pride

1. Somewhere along this social continuum, people of African ancestry must demand their respect and this includes you, my friend. When you call me African-American or refer to me as African-American you are according me the respect I am due....first as one of African ancestry and secondly as an American. To call me or refer to me by any other descriptive social terminology is not according me respect.
2. You might consider mustering up a little pride in being of African ancestry instead of separating yourself from Africa with a single word that you believe describes yourself. How can you expect others to respect you when lack respect for your roots? How can you so willfully deny and disconnect yourself for others of African ancestry? How can you look yourself in the mirror?
3. If pride in Africa is there, then we must wear it like a badge as we identify ourselves anywhere and everywhere and not pay lip service whenever and wherever it is convenient. Right? Changing the labeling does not change the historical facts as to who we are and where we came from.

Table 7. Terminology

1. I am not African American. I am a Black American and my race is Negro (Negroid, to be more accurate).
2. I can be as Black as I wanna be and that is all there is to this whole saga!
3. I am a displaced African who by the nature of forced immigration resides in the U.S. and I will always be African first.

would one self-affirm an identity without such stimulus. Table 7 contains representative quotes that express terminology.

The final category, *birth/origin/nationality* was used when respondents indicated that the label indicated where they were born, where they were from, or their nationality. This social meaning was heavily used and invoked when community members discussed the identity of people of African descent residing in the US. Based on the community demographics presented in Table 1, the majority of community members reside in the US. We further infer from the discussion that some of the US-based members are African immigrants and others are American by birth based on arguments presented in the discussion. Much of this discussion is an attempt between these two groups to make sense of their disparate experiences and histories. Table 8 contains representative quotes that express national identity.

Solutions and Recommendations

Scholars such as Selwyn (2003) posit that people will use the Internet if they perceive social benefit in doing so. However, individuals may choose to opt out of Internet usage if it has no relevance to their lives, even if they possess the required computer access, skills and literacy. Hence, Internet access as well as the availability of culturally salient content and opportunities for social engagement become important factors in the shaping Internet use (Brock, 2005; Kvasny & Warren, 2006).

Prior research suggests that African American Internet users employ beliefs and concepts originating from their sense of identity when consuming Web content (Appiah, 2004). However, as Appiah reports and our study confirms, there is no single shared diasporic identity among people of African descent. While some individuals stressed a blended heritage that brought together their African ancestry and nationality, many people of African descent in the US did not express an identity that affirmed their African ancestry. Instead, they described themselves as Black or Negro. Participants from Africa took great pride in their ethnic and tribal identity, and struggled to understand why Americans would disavow African ancestry. Despite the diversity in labels and meanings associated with these labels, community members consistently called for group pride and a refusal of negative stereotypes ascribed to the

Table 8. Birth/origin/nationality

1. Secondly, the term [Negro] does NOT offer a place of origin of the so-called “negro”, or “Black”, e.g., those born in France … are not termed “blanc” or white, instead they are thought of as French first and foremost, and secondly as white which only depicts their appearance. Furthermore, their race is Caucasian. Those of African ancestry should receive the same cognitive response as well. Don’t you think?
2. I understand your reasoning and why you specify nationality. However, Blacks in America have never been allowed to acknowledge their nationality besides being labelled as Blacks. America went so far as to specify Negroid or Negro or Black (other than Hispanic) in the census. Africans identify with Africa because they belong to that continent. But they belong to whatever country they were born in-Ghana, Nigeria, Somalia, etc.
3. …preferring to be called or labeled “Black” does not tell your origins at the onset. It only gives a physical description of how your may look. The term African-American does, however, provide information about one’s origin and one’s nationality as well.

group. The global reach afforded by the Internet helped to enables diasporic people to probe their existential significance and their heritage, and to forge new and self-affirming ways of defining the group.

One way of constructing more empowering discourses about the digital divide and the Internet is to examine how these communities are actually engaging with the technology. Unfortunately, much of the research to date has focused on statistical analysis of Internet access and comparative studies of Internet usage patterns across demographic groups. There is also a tendency to focus on instrumental uses of the Internet such as banking, health information seeking, education and commerce. The results of such studies typically cast people of African descent as less savvy Internet users.

However, if scholars engage in critical and interpretive studies that start from the perspective of marginalized groups, we can uncover how these groups use the Internet in ways that are culturally meaningful. The digital divide becomes not just a technical issue; it also becomes a social issue that stems from longstanding ‘regimes of truth’ that subjugate the life chances of people of African descent (Kvasny, 2007). Technology should be used to redress seemingly intractable social problems such as inequities in healthcare, education, and workforce participation. However, in the absence of radical change in the world order that fosters social justice, welfare and equity, technology solutions will yield limited success.

FUTURE TRENDS

The chapter enhances knowledge of the digital divide by (1) providing an empirical example of the Internet as a place that fosters identity (re) construction in a population that has traditionally been viewed as deficient in Internet use, and (2) extending the digital divide discourse to affirm the cultural realities of diverse Internet users. Through our examination of an online discussion, we see an emerging public sphere where marginalized groups can define themselves in their own terms, challenge dominant viewpoints that perpetuate their subjugation, and reach a global audience. If and how this public sphere will be used to foster a shift from abstract discourse online to concrete collective action offline remains to be seen.

CONCLUSION

Through the construction of a narrative, summarizing the ways identity is constructed by forum members, this chapter demonstrates the importance of identity and culturally salient content for framing a digital divide discourse. Using ICTs allows diasporic people to negotiate their identities and develop a better understanding of who they are as individuals as well as a group.

ICTs are currently being used to enable and advance the interests of people who have historically been marginalized and silenced. More specifically, the Internet is a place that fosters identity formation and self-authorship in a population that has traditionally been viewed as deficient in Internet use. Therefore, the digital divide can result in limited negotiation of cultural identity among diasporic people, as access to ICTs provides the ability to communicate with individuals all across the globe. This communication range is useful for individuals belonging to groups that are geographically dispersed and attempting to strengthen their cultural identity. As discussions on the digital divide transform from focusing on technical access to more societal concerns, the notion of culture and identity becomes more substantial. As the digital divide continues to close, the potential for reducing the “cultural divide” continues to increase.

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KEY TERMS AND DEFINITIONS

Computer-Mediated Communication (CMC): The process by which people create, exchange, and perceive informational messages using information and communication technologies. To be mediated by computers, the communication must be done by participants fully aware of their interaction with the computer technology in the process of creating and delivering messages.

Diaspora: A dispersion of a people from their original homeland through voluntary or involuntary migration.

Digital Divide: The term "digital divide" refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access Information and Communication Technologies (ICTs) and their use of the Internet. The digital divide depends on several variables, including income, education, age, gender, racial and linguistic backgrounds, and geographic location.

Identity Labels: Self-referent terms used by individuals to identify their membership in groups.

Identity: The set of personal characteristics by which an individual is recognizable as a member of a group.

Internet: People of African descent living in the Americas, the Caribbean, Europe, and Australia. Although voluntary immigration has become the primary force in the modern diaspora, the trans-Atlantic slave trade represents the largest migration of people of African descent.

Multidimensional Inventory of Black Identity (MMRI): Sellers et al. (1997) identifies four dimensions: identity salience, the centrality of identity, the ideology associated with the identity, and the regard in which the person holds African Americans. *Centrality* measures the extent to which a person normatively defines her or himself with regard to race. *Racial salience* refers to the extent to which a person's race is a relevant part of her or his self-concept in a particular situation. MMRI theorizes that the more central a person's Racial identity, the more likely it is to become salient in racially ambiguous situations. *Regard* refers to the extent to which a person feels positively or negatively towards African Americans and their membership in that group. There are two components of regard: private (how the individual feels about his or her own race) and public (how others feel about the race). *Ideology* is the individual's philosophy about the ways in which African Americans should live and interact with other people in society. The four philosophies include nationalist (emphasizes the importance and uniqueness of being of African descent); oppressed minority (emphasizes commonalities between African Americans and other oppressed groups worldwide); assimilationist (emphasizes commonalities between African Americans and the rest of American Society); and humanist (emphasizes the commonalities of all humans). MMRI theorizes that individuals are likely to hold a number of philosophies that vary across situations.

Nigrescence: Cross (1971) describes a five-stage model to describe the experiences associated with becoming a psychologically healthy Black man or woman in the US. In the *Pre-encounter Stage* individuals do not believe that race is an important aspect of identity. In the *Encounter Stage*, the individual is faced with a profound experience(s) directly related to their race that causes her or him to reexamine their identity. During the *Immersion/Emersion Stage*, the individual becomes obsessed with identifying with Black culture, but remains uncommitted to endorsing Black culture and history. This feeling of inner security and satisfaction with being Black occurs during the *Internalization Stage*. In the final stage, *Internalization-Commitment*, the individual translates his or her internalized identity into action.

Race: a socio-biological phenomenon placing people in a social and value hierarchy. These perceptions on race depend on history, traditions, and personal experience, not genes.

Racial/Ethnic Identity: Racial identity is the significance (how important is race) and qualitative meaning (what does it mean to be a member of this racial group) that individuals attribute to their membership within the Black racial group. Ethnicity a cultural phenomenon that is shared among people who originate from the same geographic area and share language, food, ways of dress, customs and other cultural markers of group identity.

Division 3
Digital Divides and Digital Literacy

Chapter 15
Inequalities of Digital Skills and How to Overcome Them

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ABSTRACT

This chapter focuses on the differential possession of digital skills. Here, four types of Internet skills are distinguished: operational, formal, information, and strategic skills. These types are measured in a number of experimental performance tests among a cross-section of the Dutch population. The tests focus on the use of online government information. The main result of the experimental test is that the average Dutch population performs fairly well in operational and formal Internet skills but much worse in information and strategic skills. However, there are significant differences between people with different age and educational background; no gender differences have been observed. The final sections of this chapter deal with ways to overcome these differences of skill. Two main strategies are discussed: improving the information provision of government Web sites and improving the digital skills of citizens or users by all kinds of educational means.

INTRODUCTION

The First and Second Order Digital Divide

A central issue on the scholarly and political agenda of new media development is the gap between those who have and do not have access to computers and the Internet (Van Dijk 2005, 2006). Obviously, this issue is highly relevant for citizen participation and government information provision because they are assumed to be accessible for all. The split between the 'haves' and 'have-nots' of new media use has most often been framed in the term 'digital divide'. For a long time the prevailing research approach mainly focused on a binary classification of access: having physical access to computers and the Internet or not. After the year 2000 a more refined understanding of the digital divide has appeared that is sometimes called the 'second order digital

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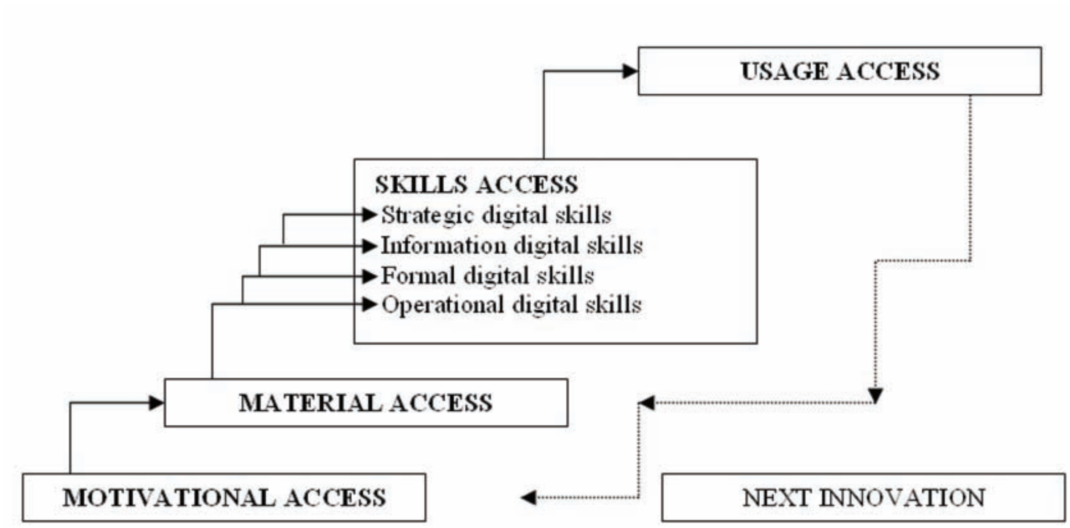
Figure 1. A cumulative and recursive model of successive kinds of access to digital technologies. (Source: Van Dijk, 2005, p. 22 with the adapted range of digital skills from Van Deursen & Van Dijk, 2008)



divide'. It goes beyond the (first order) binary classification of physical access and concentrates on the skills to use digital media and on their usage (e.g., DiMaggio & Hargittai, 2001; Mossberger et al., 2003; Van Dijk, 2006; Van Dijk and Hacker, 2003).

Van Dijk (2005) has provided a framework and model of both the first and second order digital divide making a distinction between four successive types of access that tend to recur with every new medium or innovation.

This succession of types of access was elaborated because media or technology access should be seen as a process with many social, mental and technological causes and not as a single event of obtaining a particular technology (Bucy & Newhagen, 2004; van Dijk, 2005). In this model material access was preceded by motivational access and succeeded by skills access and usage access. When the full process of technology appropriation is completed, according to this ideal scheme, a new innovation arrives and the process starts again, wholly or partly.

The concept of material access comprises physical access and other types of access that are required to reach a complete connection and every content it has to offer such as conditional access (subscriptions, accounts, pay-per-view). The concept skills access was divided in three types of skills that often assume the following order: first a computer user has to acquire operational skills, than s(he) has to develop and apply information skills and finally strategic skills (the capacity to use computer and network sources as means for particular goals in society). Van Deursen & Van Dijk (2008) proposed an adapted version of this succession of skills. They introduced a new type of skill between instrumental (or operational) and informational skills: the formal skills needed to use a medium such as the Internet: the skills needed for browsing and navigating.

Usage access is the final stage and ultimate goal of the process of technological appropriation in the shape of particular applications.

Focus of This Chapter

In this chapter we will focus on the **differential possession of digital skills**. We will start by making an extensive and detailed operational definition of this concept and the different types of skill distinguished. Then we will measure these types in a number of experimental performance tests among a cross-section of the Dutch population. The results might be instructive for solutions that help to solve gaps of digital skills. These solutions that are crucial for the theme of this book, bridging the digital divide will be discussed in the final part of this chapter.

We will first explain why this focus is important. Even when people have equal access to computers and the Internet, they may not have the skills to engage in a wide variety of uses. In the explanation of different usage of the Internet, the level of digital skills appears to be one of the most important factors. It has a strong independent weight according to contemporary digital divide research (Mossberger, Tolbert & Stansbury 2003; Van Dijk, 2005). Furthermore, this factor is most appropriate for intervention by educational policies and new media design or by the supply of websites and help functions.

Digital skills have gained more prominence in digital divide literature recently due to the recognition that access to, or ownership of a computer is not equal to the capacity to operate and use a computer (Hargittai, 2002; Van Dijk & Hacker, 2003). It is has been shown that these skills influence the take up of online government services (Van Dijk et al., 2007). Even when citizens have equal access to computers and the Internet, they may not have the skills to use the online public services offered to them. The problem of being short of skills becomes urgent when governments suppose that citizens are able to complete about every task on the Internet. Policy advisors often believe that the problem of a lack of connectivity and participation will solve itself over time when the present, mainly elderly generation of computer illiterates has become extinct (Van Deursen, 2007).

It is important that the extension of the concept of the digital divide with skills and usage access gains more footing in the public sector, where the implications are major when access data appear more positive than they actually are. After all, many policy makers at the national and local levels of government in countries with a high Internet penetration think the access problem is solved as soon as the large majority of the population is connected. They tend to believe that the Internet already is a generally accessible channel for both citizen information and communication in these countries. This results in the online distribution of as much governmental information and services as possible. Unfortunately, this policy is characterized by barely funded presuppositions of what citizens want to do and what they actually can do on the Internet (Van Deursen et al., 2006).

It is questionable whether all potential users and information seekers equally benefit from the new opportunities. The use of more traditional service channels, like the telephone and service desks, remains the most important means of interaction, despite the efforts of the government to persuade citizens in using electronic rather than traditional channels (Ebbers et al., 2008). At least in the Netherlands many of the services offered online are hardly being used and only a few services are responsible for the bulk of the eservice usage (Van Deursen et al., 2006; Van Dijk et al., 2007). The observations described force governments to go beyond obvious physical access data and focus on the more refined conceptualizations of a multitude of digital divides recent research has produced.

Previous Scientific Research of Digital Skills

Very little scientific research has been done on the actual level of digital skills possessed by populations at large. Most measurements are done in small educational settings or as a part of computer classes. Almost every measurement of the actual level of digital skills of populations has been done by survey questions asking respondents for an estimation of their own digital skills. This kind of measurement obviously has significant problems of validity (Hargittai, 2004; Talja, 2005; Merritt et al., 2005). The only way to obtain a direct measure of a skill is by means of a test which measures that skill. There are only a few serious scientific experimental tests of Internet users' skills (e.g., Hargittai, 2002; Eshet-Alkalai & Amichai-Hamburger, 2004).

A number of large-scale surveys have revealed dramatic differences of skills among populations, also among populations of countries with broad new media diffusion (Van Dijk, 2005; Warschauer, 2003). Measurements of real performances only occur in small educational settings or as a part of computer classes. The problem of these measurements is that they are fully normative: they observe whether the goal of a particular course has been reached. A problem for both types of measurements, surveys and course exams is that they mostly use a limited definition of digital skills that does not go beyond operational skills. A deeper understanding is needed to escape the simplification of early digital divide research where only binary classifications were considered. A new simplification might appear: the simple duality of can's and can-nots.

AN OPERATIONAL DEFINITION OF DIGITAL SKILLS

The few general skill studies conducted (e.g., De Haan, 2003; Hargittai, 2002) show large variations of digital skills among different social segments, but fail to explain what these skills exactly comprehend. This is caused by the fact that a lot of interpretations are given to a wide range of digital skills related terms. One should not expect agreement on what constitutes digital skills or why they are required (Martin, 2006). There is a lack of theoretical justification resulting in different operational definitions ignoring the full range of skills concerned.

There are few frameworks available that propose a succession of general types of skill categories that are applicable to both online and offline computer use (Eshet Alkalai, 2004; Steyeart, 2002; Van Dijk, 2005; Van Deursen & Van Dijk, 2008). The framework suggested by Van Deursen & Van Dijk (2008) produces an elaborate system of indications and empirical measurements of four types of digital skills. This framework is applicable in multiple digital domains, both stand-alone computers or multimedia and networks such as the Internet. It starts with a distinction of four types of digital skills:

- Operational skills: the skills to operate digital media;
- Formal skills: the skills to handle the special structures of digital media such as menus and hyperlinks;
- Information skills: the skills to search, select and evaluate information in digital media;
- Strategic skills: the skills to employ the information contained in digital media as a means to reach a particular personal or professional goal

Based on this cumulative framework operational definitions were elaborated for government online services on the Internet (Van Deursen & Van Dijk, 2008).

Operational skills mean being able to:

- Operate an Internet browser:
    - Opening websites by entering the URL in the browser's location bar;
    - Surfing forward and backward between pages using the browser buttons;
    - Saving files on the Hard Disk;
    - Opening various common file formats (e.g., PDF, SWF);
    - Bookmarking websites;
    - Changing the browser's preferences (e.g., start page);
    - Using hyperlinks.

- Operate online search engines:
    - Entering keywords in the proper field;
    - Executing the search operation;
    - Opening search results in the search result lists.
- Complete online forms:
    - Using the different types of fields and buttons (e.g., drop-down menus);
    - Submitting a form.

Formal skills mean being able to:

- Navigate on the Internet, by:
    - Recognizing and using hyperlinks (e.g., menu links, textual links, image links) in different menu and website lay-outs.
- Maintain a sense of location while navigating on the internet, meaning:
    - Not getting disoriented when surfing within a website;
    - Not getting disoriented when surfing between websites;
    - Not getting disoriented when browsing through, and opening search results.

Information skills mean being able to:

- Locate required information, by:
    - Choosing a search system or place to seek information;
    - Defining search queries that focus on the information problem;
    - Selecting information;
    - Evaluating information sources.

Strategic skills mean being able to:

- Take advantage of the internet, by:
    - An orientation towards a particular goal;
    - Taking the right action to reach this goal;
    - Making the right decision to reach this goal;
    - Gaining the benefits belonging to this goal.

MEASURING DIGITAL SKILLS

Research Design and General Results

To measure these skills a random selection (equally divided over age, gender and education) of 109 subjects was invited to a test laboratory. The sampling result is not statistically representative for the Dutch population – 109 subjects is a large number for an experimental test, not for a survey – but gives a fairly good indication of the performance level of the Dutch population as much trouble was taken to reach sample dispersion. Participants used a keyboard, a mouse and a 17-inch monitor connected to a laptop that provided the three most popular internet browsers (Internet Explorer, Mozilla Firefox and Opera).

Several assignments in the field governmental or political information retrieval strictly following the operational framework described above were prepared. See the Appendix of Van Deursen & Van Dijk (2008) for a complete overview. Subjects' performances were measured both by successful assignment completion and by the time (in seconds) spent on each assignment. According to Table 1, the participants completed an average 80% of the operational tasks, 72% of the four formal skills tasks and 62% of the three information skill tasks. The time spent on the information tasks varies substantially. Most problematic however are the two strategic tasks of which the subjects only completed 25%. Only 11% of the subjects were able to complete both the strategic skill tasks.

Table 1. Average number of tasks completed and average time spend on the tasks (N=109)

	Average number of tasks completed			Time spent on tasks (sec.)		
	M	**SD**	**%**	**M**	**SD**	**Min. / Max.**
Operational tasks (9)	7.2	2.0	80	553	254	167 / 1200*
Formal tasks (4)	2.9	1.0	72	616	255	242 / 1200*
Information tasks (3)	1.9	0.8	62	939	449	257 / 2157
Strategic tasks (2)	0.5	0.7	25	1466	575	437 / 2719

* 1200 seconds was the maximum time allowed for the nine operational tasks together.

Operational Skill Divides

According to Table 2 education, age and experience are the main predictors of the level of operational skill. They are significant both for number of tasks completed and time spent on the tasks.

People with higher age score lower than young people on number of tasks completed (F(1,107)=11.47, p<.001) and need more time (F(1,107)=30.95, p<.001). However, this effect is caused by the oldest age group that significantly differs from the other three groups for number of tasks completed and total time spent. The high educated complete more tasks than the low educated (F(1,105)=17.91, p<.001) and also need less time (F(1,105)=9.99, p<.001). This effect is mainly caused by the level of the higher educated that significantly differs from both the lower educated (p<.001) and the medium educated (p<.001). There is no significant difference between the lower and the medium educated for number of tasks completed.

Formal Skill Divides

As presented is Table 3, education and age again are the main predictors for the number of formal tasks completed and for the amount of time spent on the tasks. Additionally, receiving help from others when using the Internet has a negative

Table 2. Linear regression results of the number of operational tasks completed and time spent (N = 109)

	Number of tasks completed		Time spent on tasks	
	t	**Beta**	**t**	**Beta**
Gender (male / female)	-0.82	-.06	-1.30	-.08
Age (young – old)	-3.13	-.30***	5.11	.43***
Education (low – high)	3.86	.32***	-2.75	-.27***
Internet experience (years)	1.90	.15*	-2.56	-.18**
Weekly time online (hours)	0.55	.04	-1.44	-.10
Followed a Internet course (no / yes)	0.45	.03	-0.14	-.01
Using peers for help (no / yes)	-1.47	-.12	1.83	.13
Primary location of use (at home / elsewhere)	1.15	.08	-1.15	-.07
Working situation (inactive / active)	1.62	-.15	-1.97	-.16*
R^2	.52		.64	
F	14.02***		22.34***	

*p<.05, **p<.01, ***p<.001.

Table 3. Linear regression results of the number of formal tasks completed and time spent (N = 109)

	Number of tasks completed		**Time spent on tasks**	
	t	**Beta**	**t**	**Beta**
Gender (male / female)	1.06	.08	-2.17	-.15
Age (young – old)	-2.58	.25**	5.01	.46***
Education (low – high)	2.94	-.26*	-1.98	-.16*
Internet experience (years)	1.56	.13	-1.68	-.13
Weekly time online (hours)	-0.30	-.02	-1.66	-.13
Followed a Internet course (no / yes)	1.00	.07	-0.24	-.02
Using peers for help (no / yes)	3.08	-.26**	1.65	.13
Primary location of use (at home / elsewhere)	2.40	-.18*	-0.76	-.05
Working situation (inactive / active)	1.26	.12	-1.07	-.09
R^2	.49		.57	
F	12.39***		16.46***	

*p<.05, **p<.01, ***p<.001.

effect on the number of formal tasks completed (*F*(1,108)=14.07, *p*<.001). This is also the case for the location of Internet use; people that use the Internet primarily at home score higher on formal skills than people that most often use it elsewhere (*F*(1,108)=8,21, *p*<.01).

Seniors complete less tasks than younger people (*F*(1,108) = 9.93, *p*<.001). Again, this effect is mainly caused by the oldest age group that significantly differs from the other three groups that do not differ among each other. Also, seniors need more time (*F*(1,108)=29.20, *p*<.001). People with high education complete more tasks than people with lower education (*F*(1,108)=14.14, *p*<.001). There is a difference between the low and the medium (*p*<.01) and the medium and the high level of education attained (*p*<.05). Also, there is a time difference between the three educational levels (*F*(1,108)=6.14, *p*<.01). This effect is caused by the score of the high educated that differs from the medium (*p*<.05) and low educated (*p*<.01).

Information Skill Divides

Regression results in Table 4 indicate that education is the only significant predictor for the number of information tasks completed. Age does not seem to effect the number of information tasks completed (*F*(1,105)=2.75, *p* =.05) or the time needed. The high educated complete more tasks than the low educated (*F*(1,108)=10.59, *p*<.001) and need less time (*F*(1,108)=6.21, *p*<.01). These effects are caused by people with the highest level of education that both for number of tasks completed and time spent score better than people at the other two levels, that show no significant difference. Education is the main predictors for the number of strategic tasks completed. No significant time differences are reported.

Strategic Skill Divides

Again, age does not seem to effect the number of strategic tasks completed (*F*(1,108)=2.51, *p*=.06). See Table 5. The effect of education (*F*(1,105)=24.28, *p*<.001) mainly comes from the high educated that significantly differ from the low educated (*p*<.001) and the medium educated (*p*<.001). There is no difference between the lower and the medium educated (*p*=1.00).

Table 4. Linear regression results of the number of information tasks completed and time spent (N = 109)

	Number of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender (male / female)	-1.35	-.13	-0.15	-.01
Age (young – old)	-0.89	-.12	1.84	.23
Education (low – high)	3.12	.36***	-2.06	-.22*
Internet experience (years)	0.60	.07	0.38	-.04
Weekly time online (hours)	-1.02	-.11	0.15	.02
Followed a Internet course (no / yes)	0.27	.02	-0.85	.00
Using peers for help (no / yes)	-0.00	.00	1.82	.19
Primary location of use (at home / elsewhere)	1.12	.11	-0.75	-.07
Working situation (inactive / active)	-0.31	-.04	-1.36	-.16
R^2	.13		.23	
F	2.82***		4.67***	

*p<.05, **p<.01, ***p<.001.

Conclusions from Measurement

We are tempted to conclude that Dutch citizens have a fairly high level of operational and formal skills. On average 80% of the operational skill assignments and 72% of the formal skill assignments were successfully completed. However, the levels of information skills and strategic Internet skills attained are much lower. Information skill assignments are completed on average by 62% and strategic skill assignments on average by only 25% of those subjected to these performance tests. Unfortunately, there are no standards of comparison since comparable performance tests in other countries are non existent. Anyway, the Dutch government's expectation that every citizen with an Internet connection is able to complete the assignments following tasks the government thinks every Internet user can perform, clearly is not justified.

The level of digital skill performance is quite different among categories of the Dutch population. Educational level attained is the most important correlating factor. All performances, both in number of tasks completed and amount of time spent on tasks with all four types of digital or Internet skills, are significantly different for people with high, medium and low education. Age is the second most important correlating factor. However, this only goes for operational and formal skills. An interesting conclusion is that the so-called 'digital generation' (18-29), that in this investigation also scores relatively high in operational and formal tasks, does not perform significantly better in information and strategic skills than the older age groups, despite the fact that the elderly score lower on operational and formal skills.

A remarkable conclusion is that internet experience only correlates with the number of operational tasks completed and time spent on them. Amount of time spent online weekly only correlates with time spent on formal Internet tasks. It appears that information and strategic skills do not grow with years of Internet experience and amount of time spent online weekly. Taking an Internet course, having a support network, the location and working condition have minor influence on all skill types.

So, one of the most important general conclusions is that operational and formal Internet skills

Table 5. Linear regression results of the number of strategic tasks completed and time spent (N = 109)

	Number of tasks completed		Time spent on tasks	
	t	Beta	t	Beta
Gender (male / female)	-0.72	-.06	-1.11	-.11
Age (young – old)	-1.42	-.17	-0.19	-.03
Education (low – high)	4.24	.42***	1.06	.13
Internet experience (years)	0.21	.02	0.54	.06
Weekly time online (hours)	-1.60	-.15	-1.23	-.14
Followed a Internet course (no / yes)	0.31	.03	0.47	.05
Using peers for help (no / yes)	-1.61	-.16	1.20	.14
Primary location of use (at home / elsewhere)	-0.61	-.05	-0.26	-.03
Working situation (inactive / active)	1.29	.14	-0.62	-.08
R^2	.30		.01	
F	6.09***		.84	

*p<.05, **p<.01, ***p<.001.

are a necessary but not sufficient condition for the performance of information skills and strategic skills when using online government services.

Wider Significance of Measurement Results

These results are valid for, or at least give an indication of the situation regarding digital skills in the Netherlands, a country with one of the highest Internet access rates in the world (84% of households in 2008). Imagine what the result is for countries with much lower access rates. Though we did not find a significant relation with Internet experience, except concerning operational skills, the situation in those countries is expected to be worse. This especially goes for those countries that also have a lower general literacy level than the Netherlands. After all we discovered that educational level is the most important factor explaining the higher digital skills of information retrieval and strategy.

In the experimental tests reported here a large number of assignments that are considered performable, were in fact not completed. The actual level of completion outside the laboratory might be even lower as the subjects where stimulated by the experimental circumstances in the test. Probably they were more motivated to finish the task than they normally would be; in their own environments many of them would have grabbed the phone or run to a service desk or someone else in their social environment to reach the answer. Indeed, other research indicates that users of public websites often give up and turn to the telephone or a front desk (Pieterson & Ebbers, 2008).

An obvious objection regarding these results is that they are not surprising and probably also apply to the use of traditional media. Almost 40 years ago the thesis of the knowledge gap was defended (Tichenor et al., 1970). In this thesis it was argued that people with higher education derive more knowledge from the mass media than people with lower education. So, what actually is the difference between traditional literacy and digital literacy? Our provisional answer is that digital literacy adds to the differences observed in traditional literacy. On the one hand computers and the Internet make things easier as they enable systematic information retrieval from innumerable sources simultaneously. Finding information in a traditional library might be more difficult for inexperienced information seekers than finding the same information on the Internet. At the other hand computers and the Internet make information seeking and improving literacy more difficult as they assume a number of operational and formal skills to start with. This raises an extra barrier above the skills of reading and writing. Additionally, they require particular information and strategic skills. Otherwise one drowns in the wide ocean of information provided by the digital media. All four skills required taken together probably make the gap between people with different educational, occupational and age backgrounds bigger in the new than in the traditional media.

HOW TO OVERCOME DIGITAL SKILL DIVIDES

Two basic strategies are available for the goal of bridging digital skills divides. One is supply-side oriented and tries to improve the accessibility and usability of information provision in the shape of websites and computer programs or files. The other departs from the user and aims to assist the learning of digital skills by users. In this final section both strategies will be applied to government information and to the accessibility of e-government applications. This does not mean that the government is the only actor that is responsible for solving this problem. Producers of hardware and software, social institutions with a social and educational mission and individual citizens and consumers also have a responsibility in solving the problem of insufficient digital skills.

Improving the Information Provision of Websites

As a side-effect of the measuring of digital skills in using government websites we discovered that many of these sites are organized and structured in ways that make them more inaccessible and difficult to use than needed considering the complexity of the information offered.

First, public agencies tend to maintain their own image and profile when developing and offering sites. This makes interaction between governments and citizens different for every single website. Citizens meet different designs and layouts on every site. We have noticed that this causes problems for the low educated and seniors in particular. They have to engage in amore or less successful learning processes over and over again. One might ask whether it really is necessary that every government institution has its own website design. For citizens, they are all 'government'; within governments image competition should be out of the question. The most important goal should be to provide the Internet as a means for simple information retrieval and service supply.

Second, the organization of government websites and their division of labor regarding information provision needs to be improved. We have observed two problems. In the experimental tests it appeared that government websites that are listed in the search results, do not all contain the information citizens expect to find in these sites. Moreover, similar government information happens to be available on different sites. As long as the information is complete, this is no problem. Unfortunately, this did not happen to be the case. It might be recommended to offer less government websites with specific information following a clear task division and containing information that is continually scrutinized for its quality.

A third observation was that governments try to improve the accessibility and connectivity of their information provision by offering large, government-wide reference portals. This intention is good. However, offering portals that try to create order in the chaos of government websites does not appear to make it easier for citizens either. Usually, their scope of information and their menu design are too broad. The excessive amount of information offered only makes the relevant sources harder to find for many users as it appeared in the performance tests described here. Instead, subjects immediately grabbed to Google, by far the most important search engine in the Netherlands. When the subjects were allowed to choose the way to find the information themselves they passed all government portals and special sites and turned to Google. The government should carefully consider the added value of a portal, before it gives the orders to develop such a site. Also, portals should profoundly state for what purposes they are made, who offers them and what people might expect. Finally, governments should accept the fact that citizens also use their own search engines and accommodate their methods of information supply to this fact.

A following solution mentioned here might be to offer government websites in two versions, an advanced version for the more experienced Internet users and a relatively simple version for seniors and low educated users. This second version can offer an 'exaggerated' explanation of the operation of the website and the steps one is able to take on this site, among others when one has to go to the more complicated version. Considering design and didactic approach, this version should be equal for every agency. It is important to show a recognizable identical and simple design that leaves out options that are hardly being used. The simple sites with identical designs and menu structures can be linked in a network of government websites that covers all basic information and transaction needs of citizens in a particular country. This might seem a ridiculous revolutionary idea for many government agencies and website developers, but we think this complete restructuring of government information provision using websites would be very helpful for inexperienced users, and, by the way, for more experienced users. Currently, the fragmented and supply-side oriented nature of information provision of government departments, that insufficiently cooperate, strongly reinforces the inaccessibility of this information and the extent of digital skill divides.

A final suggestion is to develop more decision support software that is programmed with information about actual citizen's behavior in decision taking. We have observed that online government information to gain strategic benefits, for example to inform whether it makes sense to lodge an appeal against a decree or a tax assessment, seems to be only appropriate for a small minority of citizens. Taking into account low levels of strategic skills is a difficult challenge for website developers. However, decision support software such as used in intelligent or interactive search systems or in electronic voting guides appears to be very helpful for a large number of users. Such systems and guides can also be developed for other services citizens need.

Improving the Digital Skills of Citizens or Users in General

As almost goes without saying, education is the main solution to overcome digital skill divides among citizens and users in general. The government has a main responsibility here, but societal organizations or support groups with a social, political, cultural and educational mission and individual citizens themselves also have a role to play here. More than education is needed to bridge the digital divide (van Dijk, 2005). However, here we will concentrate on potential educational tasks for governments in building digital skills. First we will mention tasks to bridge operational and formal skills divides, and than we will discuss suggestions to bridge information and strategic skill divides.

Operational and formal skills divides are prominent among seniors and among people with low levels of education. When they get support with computer and internet courses adapted to their speed, cultural preferences, styles of learning and physical inabilities that are growing with age, they are able to cross the threshold of the digital information environment. This is a matter of adult education provided both by government subsidies and by the self-organization of community centers, organizations for seniors on the web and the like. However, it also is a task for regular education at all levels. Regular education very much benefits from the fact that children and young people in general learn operational and formal skills themselves in practices outside schools. However, this learning by doing could be partial and insufficient for many purposes as many important operations, applications and opportunities are bypassed.

Public libraries, community centers and government buildings such as municipal halls have a special obligation in providing facilities for learning operational, formal and information skills. This means not only providing computer and Internet terminals but also a staff equipped and experienced to help users visiting these buildings and helping them across the thresholds of using a particular electronic service or information source. They should continually walk around the terminals and assist users with questions.

Public and private institutions of adult education should receive more means and a competent staff to meet the needs of computer and internet courses. Citizens should be able to participate in these courses at low cost. The same goes for elementary computer and Internet instruction in the context of education and citizen programs for immigrants. Learning information and strategic skills is much more difficult, but no less important.

In our measurements the level of information skills appeared to be quite low. In general the search process took too many steps and too much time. This is both due to a shortage in information skills with users themselves and to insufficient anticipation on low levels of information skills by suppliers. In depth analyses indicated that defining proper search queries is hard for many citizens, especially the low educated. Too general search queries lead to irrelevant search results that make the selection of relevant sources harder to achieve. In depth analysis of the data also showed that people do not look further than the first couple of search results and do not critically evaluate the search results and their sources at all. Surprisingly, this was also true for the higher educated subjects (Van Deursen & Van Dijk, forthcoming).

Unfortunately, Internet skills in general and the acquisition of information skills in particular have a minor role in regular education at all levels, not only in the Netherlands but in many other countries. Before using computers and the Internet in educational programs, tests should indicate whether students have an adequate level of operational and formal skills. – See the insufficiency of self-learning referred to above – If not, they should be taught first. However, special attention is needed for information skills. Using search engines should be the primary objective. Teachers should achieve special training in didactic and information skills suitable for the Internet. It is important to develop new educational material, designed for Internet use, to be implemented in existing courses of the school curriculum instead of special computer classes. When learning information and strategic skills is implemented in existing courses such as language, history, biology and geography they will be more effectively picked up. Also, teachers will be more motivated to spend additional time and effort.

Citizens above 35 to 40 that did not get the chance to acquire digital skills in education depend on their work and adult education to catch up later. The results of the performance tests reported here can also be applied to the skills of employees that often only receive courses in operational skills, but would also benefit from improved information and strategic skills. Especially in the information jobs this improvement would lead to increased productivity and innovation. Courses for employees should at least train formal Internet skills and the effective use of search engines.

Functional and complete illiterates also need special attention. For them the use of computers and the Internet seems almost impossible. However, special aids such as audiovisual interfaces, multimedia programs and touch screens can be designed and offered for them. For the disabled, the government should not only make their websites more accessible with special aids. It should also provide additional services (e.g. homecare). Furthermore, voluntary organizations of/for disabled people could give computer classes adapted to the need of special disabilities.

For ethnic minorities the supply of government services should be designed to enable more multicultural choice options. One should also provide more training materials using minority languages and designs inspired by minority cultural experiences.

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KEY TERMS AND DEFINITIONS

Digital Skills Divide: The prevailing research of the Digital divide mainly focused on a binary classification of access. Now a more refined understanding of the digital divide has appeared and several conceptualizations of how to approach digital divide research exist. One of the factors that appears to be important in all of them is the differential possession of so-called digital skills.

Digital Skills: the abilities of operating digital media, handle the structures of new media, search, select, process, and evaluate information in digital media and use digital media as a means to reach a particular goal.

Information Internet Skills: the skills to locate required information.

Operational Internet Skills: the skills to operate an Internet Browser, operate online search engines and complete online forms.

Formal Internet Skills: the skills to be able to navigate on the Internet and maintain a sense of location while navigating.

Strategic Internet Skills: the skills to take advantage by using the Internet.

Chapter 16
Late on the Curve:
Causes and Consequences of Differences in Digital Skills

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ABSTRACT

Differences in digital skills lie at the heart of social inequality in advanced knowledge societies. The Internet access 'markets' in these societies are close to reaching saturation point, giving almost everyone access to the Net. By contrast, differences in digital skills appear to be widening over time. This chapter focuses on The Netherlands, where above all the elderly, people with a lower education level, people who are economically inactive and members of ethnic minorities lag behind. It addresses the mechanisms that underlie differences in digital skills between population groups. A lack of financial and cognitive resources seems to be of particular importance. Based on a diffusion of innovations framework the paper goes beyond the largely descriptive research on the digital divide and considers the consequences of differences in digital skills. These differences influence the labour market performance of those at a digital disadvantage and also has an impact on their personal lives.

INTRODUCTION: INEQUALITY IN KNOWLEDGE SOCIETIES

Information and communication technology (ICT) has become indispensable in modern knowledge societies, and more and more aspects of our lives have become interwoven with and dependent upon computers and the Internet. Handling these media require digital skills that not all people master to the same degree (Eurostat, 2006). Early adopters have more experience and capabilities in handling new media compared to late adopters (Rogers, 1995; De Haan, 2003). More and more digital skills seem to influence who participate fully in a knowledge society and who do not. Increasingly, the possession of these skills is a condition for pursuing a successful education career, finding work and progressing in one's career, and also for maintaining social contacts in our private lives.

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Concerns about increasing social inequality lie at the heart of the debate on the rise of knowledge societies, but too often these discussions are restricted to simple inequalities in access to new information and communication technologies (ICT). Countries with high diffusion of ICT's show diminishing divides in the possession to ICT's and widening divides in the digital skills and in use (Van Dijk & Hacker, 2002). This article deals with both causes and consequences of differences in digital skills. This focus on skills is based on a criticism of current research into the digital divide which is a) mainly descriptive, b) starting from a too simple criterion of access and c) lacking in consideration of the possible consequences of differences in ICT access. Digital skills are treated here as part of a multidimensional concept of access (consisting of motivation, possession, digital skills and use).

Citizens differ in the extent to which they possess digital skills. This article addressed the questions as to how far elderly, people with a lower education level, people who are economically inactive and members of ethnic minorities lag behind in terms of digital skills. It further explores the causes of that disadvantage and its consequences in the field of labour market participation, social participation, integration of ethnic groups and information seeking as a democratic prerequisite. These objectives are both theoretical and empirical. They are theoretical because they are based on a theoretical model of the digital divide. This model is based on socio-economic theory is general and applicable to a wide range of phenomenon and countries. They are empirical because multivariate analyses of quantitative data is based on this model and shows the consequences of the divide for different groups in different social fields. The four central research questions are:

- To what extent do the digital skills of the elderly, the low-educated, the economically inactive and members of ethnic minorities differ from those of the rest of the population?
- What difficulties do those with a skills disadvantage give for not using the Internet and what differences are found in this respect among the elderly, the economically inactive, the low-educated and ethnic minorities?
- Which factors contribute to the digital skills disadvantage of the elderly, the economically inactive, the low-educated and ethnic minorities?
- What social and economic consequences does non-use of ICT have for participation in society?

Answering these questions is based on data from the Netherlands, a relatively small country with more than 16 million inhabitants. The Netherlands is one of the leading countries in the world regarding internet penetration. It ranges among the countries where a wide majority of the population now has Internet access, just like countries such as Australia, Canada, Denmark, Finland, Iceland, Japan, Korea, the United States, and the United Kingdom (Eurostat, 2007; International Telecommunication Union, 2008). The Netherlands also belongs the European countries with the highest level of computers skills among the population (Eurostat, 2006; Weda et al., 2008: 11 and 70). In 2006 80% of the Dutch population could access the Internet at home and 66% had broadband connection (Eurostat 2007). The Netherlands is ahead in broadband compared to the United States where in 2008 some 55% of all adult Americans had a high-speed internet connection at home (Horrigan 2008). The high internet penetration in the Netherlands make this country well suited for the study of the impact of differences in digital skills. A relatively small part of these differences is due to the inadequate possession of equipment or infrastructural connections. In countries with lower access rates the issues of possession and connection are more prominent.

The analyses in this chapter is based on two data sources from the Netherlands Institute of Social Research (SCP): the Time Use Survey (TUS) and the Lifesituation Survey Ethnic Minorities (LSEM). Both are representative samples from the Dutch population.

Data of the Time Use Survey (TUS) were collected in 2005 with a sample size of N=1.800 of people aged 12 years and over. Respondents keep a paper-and-pencil week diary with fixed 15-minute intervals, starting on a Sunday and ending on a Saturday. In the diary, respondents identify their primary activity, their location, and (if applicable) a secondary activity, using precoded categories. In addition to the diary, a one-hour questionnaire is administered. For a detailed description of sampling and nonresponse issues in the TUS see www.tijdsbesteding.nl. Data were collected in the first weeks of October, the best period for carrying out the fieldwork since it offers the possibility of recording peoples' activities during 'an average working week'. These weeks are characterized neither by typical summer pastimes nor by specific winter conditions.

The Lifesituation Survey Ethnic Minorities (LSEM) was organized in 2004 and 2005 amongst a sample of N=4.100. This large-scale survey consists of Turks, Moroccans, Surinamese and Antilleans, the largest minority groups in the Netherlands, and a control group of indigenous citizens from the 50 largest municipalities. These people in the age between 15 and 65 were interviewed using computer assisted personal interviewing (CAPI). A weighting procedure was applied to make the data fully representative for the Netherlands. The data allow the study of the differences between the five largest ethnic groups in the way they spend their day, participation in household work and care for children, provision of informal care, involvement in civil society, cultural participation, participation in sport and going out, media consumption, social contacts in leisure time, and mobility.

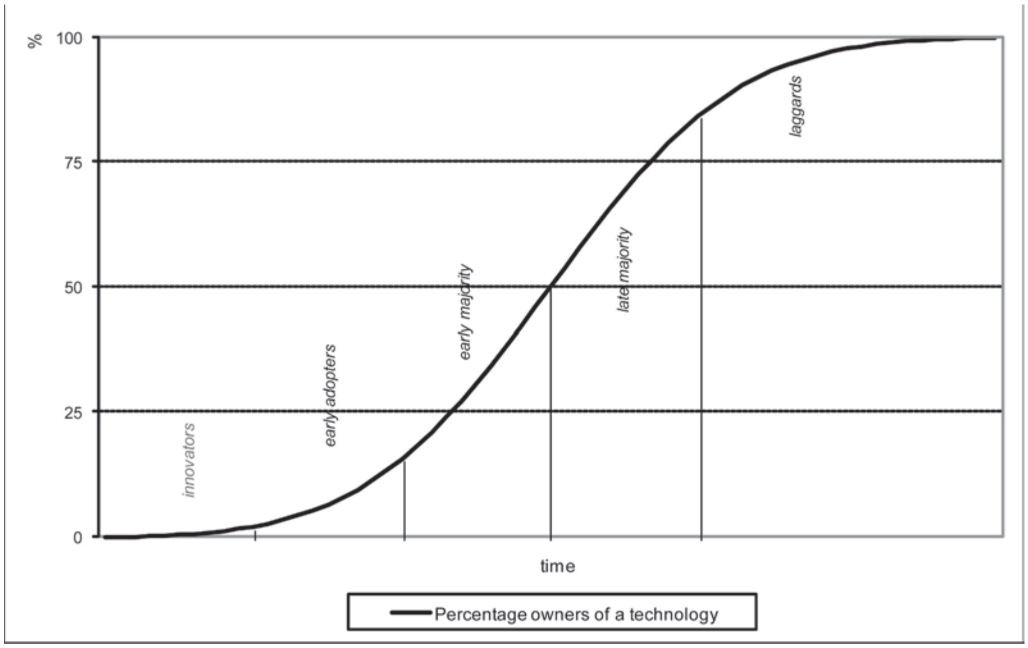
This article describes to what extent digital skills matter in an advanced knowledge society like the Netherlands. It addresses the mechanisms behind differences in digital skills between population groups and considers consequences of these differences. In this chapter first the broader concept of access is discussed which is basic for the focus on digital skills. In the following section the analyses of the causes and the consequences is presented. The results of the analyses will be discussed in the light of prevailing policy on digital skills in the Netherlands.

BACKGROUND: SEVERAL KINDS OF PEOPLE ON THE CURVE

Successful technological products go through a process of development and diffusion among the population. This process often follows a S-shaped pattern, as shown in Figure 1. During diffusion an increasing number of people come to possess that technology. The S-curve points to a relatively slow beginning, followed by an acceleration and finally a slowing down at the end, as market saturation occurs (Rogers, 1995). It should be noted that not all products are successful enough to reach this acceleration stage during which the majority of the population acquires the product. In Dutch households, as elsewhere, the penetration of the PC and Internet access started slowly. But after 1985 (PC) and 1995 (Internet) respectively, the diffusion picked up speed. Now with market saturation at hand, the diffusion is slowing down. In this way, the curve of the PC and Internet diffusion pattern is S-shaped.

The S-curve not only informs us about the degree of diffusion of a product or an idea in society, but it also provides information about the moment of adoption of the product or idea by one individual relative to another. Technology-minded people are often among the first to adopt a new

Figure 1. Ideal-typical presentation of an s-shaped diffusion curve



technology, while others prefer to wait. Dividing the curve into five stages provides a typology of adopter types. These five adopter types of Beal and Bohlen (1955) became widely known through the work of Rogers (1995). A small group of people who are the first to accept the innovation are called the innovators. The information, experiences and positive judgment of this group subsequently influences the adoption decision of the next group, the early adopters. This group is followed by the early majority. The late majority and especially the laggards are relatively late with their decision to adopt the new product/idea. These laggards are more risk-averse than the average citizen and more likely to hang on to existing alternatives. They tend to be low socio-economic status (SES) individuals who lack the means to buy the new technologies, and who do not have the economic, cultural and social resources to employ it.

Many new adopters start using their products and learn as they go along. The exploration of opportunities for using PC and Internet applications also contributes to increasing skills, which might in turn lead to more frequent and more diverse use. The forerunners in the diffusion process thus gain an advantage as regards use and skills. The laggards follow at a distance, if they follow at all. Whereas differences in possession decrease over time, differences in use and skills may be of a more persistent nature. The innovators and the early adopters are the more experienced and skillful people, the laggards are more restricted in their amount and diversity of use and in their digital skills (De Haan, 2003). Possibly this leads to a broader social disadvantage. Differences is in use of ICT's and in digital skills may increase existing inequalities that are at least partly based on unevenly distributed economic, cultural and social resources.

The accumulation of resources can lead to highly stratified outcomes in many different fields of society. Unequal access to digital resources may have behavioral consequences that may lead to increasing inequality. People who have better digital skills have a competitive advantage in their quest for scarce rewards compared to people with fewer skills. Here we will investigate to what extent a process of accumulation is at work.

Access to New Technology

Most research on the digital divide starts from a simple criterion of access. Usually it is confined to the possession of a computer or having access to internet in one's home. Also the use of Internet is often conceived as binary -- either someone is an Internet user or is not (Lenhart and Horrigan 2003). In advanced information societies almost everyone has access and almost everyone is a user. In these societies a binary concept hardly seems to discriminate in a relevant way between various groups of people. Being late on the diffusion curve requires a more elaborate concept of access. Mason and Hacker (2003) have noted that the binary nature of the arguments even hinders and disregards previous theoretical progress in understanding the influence of communication and processes of social change.

To overcome the binary concept of the digital divide a multidimensional concept of access is needed. For ICT to be used effectively three types of user access are relevant: motivation, possession and digital skills. Some would consider this multidimensional concept still insufficient and would like to distinguish other dimensions. The Real Access framework (www.bridges.org) for example distinguishes other aspects, such as affordability, appropriateness, content, relevance and also aspects like regulation and the economic and political environment. It would be too complex for further quantitative analyses on consequences to use all these different aspects.

Motivation refers to attitudes towards ICT: the interest in it, the will to use it and the lack of fear of new technology. Possession refers to the availability of equipment, such as an Internet connection at home (dial-up connection or broadband), as well as autonomy in access to it, and also access at work, school or university settings. The third component of digital skills refers to the extent to which potential users are able to handle ICT. In societies with high diffusion of computers and Internet the importance of digital skills is rising whereas the importance of possession and motivation is declining. In other publications the various aspects of access, and their interrelationships, have received a fair amount of attention, both conceptually as empirically (Van Dijk, 1999, 2005; Viherä, 2000; Marsh, 2001; Steyaert, 2002; De Haan & Huysmans, 2005; De Haan & Iedema, unpublished; Duimel, 2007). Here the issue of motivation is left aside and the possession of ICT is only briefly touched upon.

As a binary concept of ICT use is unsatisfactory the question must be raised how this concept can be refined. To get a more detailed understanding of the use of ICT in everyday life we need a more elaborate conceptualization. Distinguishing the following three different dimensions of ICT-use can be seen as a solution: complexity, diversity and intensity (Van Damme et al., 2005, see also Steijn & Tijdens, 2007). Complexity refers to the inherent difficulty to understand or operate distinct ICT application. Diversity refers to the number of different applications someone uses, and intensity refers to amount of time devoted to ICT-use. These dimensions create a three dimensional space of ICT use in which different groups of users can easily be distinguished even in situation where everyone is a user. Some people use quite simple or only a few applications while others use many different and more complex applications. Some use the Internet incidentally, while others spent a lot of time on the web.

Starting point in our analyses was the identification of groups that were lagging behind in the use of ICT. Table 1 shows differences between population groups in the possession of a pc and internet, the time spent using these technologies and the diversity of this use. Possession refers to the sum score (0-4) of possessing a pc at home and having internet access here, the use of a computer at school and the use of a computer at work. The household, the school and the work place are the most important places where the Dutch get on the Net. Access can also be found in libraries, media centers or cybercafes. However, data from the Netherlands show that Internet is used far less often at these locations that in the household, the school and the workplace (CBS 2006). Measuring access in different contexts comes close to what Lenhart and Horrigan (2003) call a ‘digital spectrum’ in which access is intermittent for many users, nearby for some users and a remote possibility for others. For use of ICT a distinction could be made in diversity (the number of different applications someone uses (0-8)) and intensity (free time hours a day spent on ICT-use). A measurement of complexity of use was not possible given the data used for analysis.

The results of the analyses in Table 1 show that especially the elderly, the low-educated, people who are economically inactive and members of ethnic minorities have less access to and use these technologies less often and less divers than young people, the high-educated, working people and indigenous Dutch respectively (cf. Van Ingen et al., 2007). The gender gap has largely been closed and also other characteristics (including income) did not differentiate more than the four mentioned in table 1.

So far digital skills have been briefly referred to as the extent to which potential users are able to handle ICT. A further distinction can be made in instrumental, structural and strategic skills (Steyaert 2002; cf. Van Dijk 2005 for a similar distinction). Instrumental skills indicates the operational manipulation of computer and software. It not only concerns simple basic actions but also more complex manipulations such as programming. The concept of structural skills refer to the (new) structure in which information is contained such as hyperlinks and search engines. Strategic skills include the basic readiness to pre-actively look for information, the attitude of taking decisions based on available information and the continuous scanning of the environment for information that is relevant to work or personal life (Steyaert 2002).

Measurements of each of these types of skills were not available in the TUS and LSEM datasets. Here digital skills are measures by the diversity of computer use (assuming that people with the highest diversity are also the most skilful). Diversity of use correlates very strongly with the amount of digital skills (De Haan en Iedema, unpublished). It does not seem to make much difference on average if people in questionnaires are asked if they can perform a computer task or if they indicate they actually perform this task. In order to make comparisons between groups of people we will rely on data about the actual use of computer applications. This measurement avoids a discussion of digital skills in terms of *haves* and *have-nots* which ignores important differences in the extent and nature of the digital skills concerned. A clear dividing line cannot be drawn; the differences are more gradual than absolute. Due to the available data the measurement of digital skills is strongly directed towards instrumental skills.

DIFFERENCES IN DIGITAL SKILLS: CAUSES AND CONSEQUENCES

Section 2 revealed that there are wide differences in digital skills between young and old, and between people with a high and a low education level in the Netherlands. The gender gap has largely been closed and also other characteristics did not differentiate more than these four. As an illustration, in the Netherlands 43% of people with a lower education level use the Internet to search for specific information, compared with 81% of those with a higher education level. The difference between people younger and older than 55 years is of roughly the same order. The difference between the economically inactive and ethnic minorities compared with those in work and the indigenous population, respectively, is

Table 1. ICT possession and use (scale 0-14), by age, educational level, ethnic origin and labour market position. Persons of twelve years and over.

	Total	Possession [a]	Time use [b]	Diversity of use [c]
Age				
12-21 years (ref.)	7,8	3,6	72,7	3,2
22-31 years	**7,2**	**3,3**	**31,5**	3,4
32-41 years	**6,5**	**3,1**	**20,6**	**3,0**
42-51 years	**6,4**	**3,2**	**26,7**	**2,8**
52-61 years	**5,1**	**2,6**	**23,7**	**2,1**
62-71 years	**3,3**	**1,6**	**20,3**	**1,3**
≥ 72 years	**1,6**	**0,8**	**11,5**	**0,5**
Educational level				
Elementary	**2,5**	**1,3**	16,4	**0,9**
Lower secondary	**4,1**	**2,1**	26,0	**1,6**
Middle secondary	**5,9**	**2,8**	**43,8**	**2,4**
Higher secondary	**6,5**	**3,1**	**41,3**	**2,8**
College	**6,8**	**3,3**	29,1	**3,1**
University (ref.)	7,4	3,5	26,6	3,4
Ethnic origin [d]				
Moroccan	**3,7**	**2,0**	**27,1**	**1,6**
Turk	**3,9**	**2,0**	**29,0**	**1,8**
Antilliaen	**5,8**	**2,7**	62,5	2,9
Surinamese	**5,4**	**2,5**	46,3	**2,6**
Indigenous Dutch	6,4	2,9	52,8	3,1
Labour market position				
Study	**8,2**	**3,8**	**70,9**	**3,6**
work (ref.)	6,6	3,3	24,1	2,9
House work	**4,4**	**2,2**	**17,4**	**1,7**
Unemployed / disabled	**4,7**	**2,0**	**43,2**	**2,1**

Bold: significant difference with reference Group (ref.) (T-test of Group average: $p < 0,05$).
a Sum score of possession of a pc, internet access at home, use of computer at school and use of computer at work (0-4).
b Time of offline and online computer use in minutes per day. Within the total score someone is or is not an offline user and is or is not an online user (0-2)
c Sum score of the use of eight computer applications (0-8).
d People aged 15 to 65 years

Source: SCP (TUS'05 and LSEM'04/'05)

relatively smaller. Housewives/househusbands and Turks/Moroccans, two large minority groups in the Netherlands, in particular lack digital skills. Surinamese and Antilleans have skill levels that almost or fully match those of the indigenous Dutch.

The degree of disadvantage in possession of digital skills is based both on more 'objective' usage characteristics (see Table 1) and on people's own, more subjective estimations of their skills. People tend to overestimate their own disadvantage to some extent, as reflected in that fact the differences based on subjective indicators are slightly greater than those based on more objective indicators.

Among those with a lower education level (at most junior secondary vocational education), the disadvantage manifests itself not only in the extent of these skills, but also in the nature of these skills. People with a lower education level tend to be mainly skilled in entertainment applications, which means that their use of ICT is not only less diverse, but also less functional. Searching for specific information, for example, is something they do much less than the more highly educated. The weak digital skills of the low-educated emerge clearly if the number of computer applications used (on a scale from 0 to 8) is compared. People who have only followed elementary education use the computer for just under one application on average (0.9); people with a university education use more than three applications (3.4) (Table 1).

The limited digital skills of older persons means that in practice those aged 55 and older use significantly fewer computer applications than younger age groups. From the perspective of social participation, however, this skills shortfall in the type of computer usage is less worrisome than that of the low-educated; although the skills of older persons are fairly one-sided, these users do focus on functional applications. The most commonly used applications are searching for specific information (47% of older users), e-mailing (44%) and online banking (30%). By contrast, older persons rarely use entertainment or leisure applications; for example, only 10% of the over-55s use the Internet for 'random surfing' (compared with 46% of people aged under 55).

Among the 'economically inactive', housewives in particular perceive their own skills as very weak. In addition, the skills they do possess are relatively strongly focused on less instrumental applications than those of working people, and to a lesser extent than those of the unemployed and disabled. These two latter groups spend a great deal of time on the computer (more than working people, although only free time use is measured), but this does not automatically translate into the possession of more digital skills, since their usage is relatively one-sided.

Causes of the Skills Disadvantage

Given the rising importance of digital skills in knowledge societies and the large inequalities in these skills between population groups, the question into the causes of the skills disadvantage is unavoidable. We need to move beyond *descriptive* analyses. Merely focusing on recording the presence or absence of digital skills is not sufficient to understand why some groups lag behind. Most digital divide research fails to take into account how differences between population groups arise. At best, multivariate analysis is applied in order to establish which of these characteristics is most important (Robinson et al., 2003), or it proposes more sophisticated methodological tools to measure the closure or widening of the digital divide (Martin, 2003).

Roughly there are two ways to answer the question of why some groups lag behind. The first is to ask respondents themselves what they consider to be the reasons for their non-use. What difficulties do they encounter on their way towards the use of new media? The second approach starts from factors associated with digital skills. These factors include the various resources to which people have access and the number of locations where they have access to a computer. The first approach is considered to more subjective whereas the second is more objective.

The more subjective approach asks what difficulties those with a skills disadvantage give for not using the Internet and what differences are found in this respect among the elderly and ethnic minorities (no results available for the economically inactive and the low-educated). Members of ethnic minorities cite financial difficulties as a problem rather than 'lack of interest' more often (roughly 25% versus 12%) than the indigenous Dutch. Older persons (55 and over) frequently cite lack of interest (42%), but they themselves also often believe they are too old (36% of the over-75s). Lack of interest or unwillingness to use the Internet can mask a variety of other reasons, such as lack of time or an erroneous image of what the Internet is, what it can do and what its potential benefits are. But reasons that people prefer not to voice can also be masked by the label 'lack of interest', such as fear of computers, fear of failure, fear of loss of face, fear of making mistakes and embarrassment about their lack of skills (Duimel, 2007). For ethnic minorities (Turks and Moroccans, and especially women), their limited command of the Dutch language can also play a role.

The more objective approach has a stronger background in social science theory. *Resource theory* was introduced to search for the deeper causes of unequal levels of digital skills (De Haan & Rijken 2002). In their decision-making process potential users are motivated by preferences and confronted with constraints. Resource theory assumes that differences in skills can be explained by differences in constraints between individuals. People are constrained in their possession of resources. Differences in this regard result not only from the quantity of these resources, but also from the type of these resources, with a distinction drawn between material, cognitive, social and time resources. This distinction draws on the work of Bourdieu (1984) and Coleman (1990). In order to stress that competencies to handle information are mental capabilities, they are referred to here under the term 'cognitive resources', a concept closer to Coleman's 'human capital' than to Bourdieu's 'cultural resources'. In addition to these types of resources are *time* resources, particularly the amount of free time available to use ICT as a leisure activity. The general assumption is that more resourceful people will acquire digital skills earlier than people with fewer resources (cf. Rogers, 1995). These types of resources were measured as follows: material resources (disposable income),

Table 2. Regression of digital skills of lower educated, people of 55 and over, people who are economically inactive (in unstandardized regression coefficients)

	model I	model II	model III	model IV	model V
Lower educated	**–2,12**	**–2,16**	**–2,12**	**–2,13**	**–1,92**
Aged 55 and over	**–2,81**	x [a]	**–2,94**	**–2,79**	**–2,88**
Occupational position					
Doing Household	**–1,34**	–0,79	**–1,39**	**–1,27**	**–1,23**
Unemployed / disabled	**–1,01**	–0,24	**–1,12**	**–0,91**	**–0,92**
Material resources (income of household)		**0,20**			
Time resources (total free time in hours per day)			0,01		
Social resources (social contacts outside household in hours per week)				**–0,04**	
Cognitive resources (diversity of media use)					**0,15**

[a] There were not sufficient older people with income records for this analysis.
Bold: significant effect ($p < 0,05$).
Source: SCP (TUS'05)

cognitive resources (diversity of use of printed media newspapers and opinion magazines), social resources (weekly hours spent on social contacts) and time resources (weekly hours of free time). Furthermore the context of use was added to this explanatory model. People can use computer facilities in several locations (in the household, in school and at work), however not everybody is able to do so. The assumption is that people with access in more places will acquire digital skills earlier than people with fewer access.

Results of OLS regression analyses in table 2 show that disposable income is a barrier to the acquisition of digital skills for the economically inactive in particular (for a more detailed discussion of analysis and results see Van Ingen et al., 2007).

A lack of cognitive resources proved to be a hindrance for both the low-educated (table 2) and for Turks and Moroccans (table 3). Cognitive resources have a significant effect on the level of digital skills. The difference between model I and V in table 2 and 3 show lower B's for these groups. Differences in digital skills between educational groups and between ethnic groups can thus in part be attributed to differences in cognitive resources.

Low literacy has been related to digital disadvantage in Groot and Maassen van den Brink (2006) and is in itself already a serious barrier to participation in the knowledge society. Two factors were found not to be relevant for the acquisition of digital skills: social setting and time constraints. In another study with better measurement of social resources we found that digital skills could partly explain the effects of age and educational level and fully for those between people who do household work and those who are in paid employment (De Haan & Rijken, 2002).

Having access to computer facilities in several locations also influences the level of digital skills. Multiple access (at home, at school, at work) is associated with more skills; this applies both for groups with a digital skills shortfall and for other groups. However, for Turks and Moroccans multiple access offers an additional advantage in the learning of digital skills (a positive interaction effect of access and ethnic group). Having access at school probably plays an important role here.

Table 3. Regression of digital skills of members of ethnic minorities, people aged 15-65 (in unstandardized regression coefficients, controlling for age, education and labour market position)

	model I	**model II**	**model III**	**model IV**	**model V**
Ethnic origin					
Moroccan	**–1,77**	**–1,75**	**–1,61**	**–1,78**	**–1,59**
Turk	**–1,69**	**–1,68**	**–1,51**	**–1,68**	**–1,54**
Antilliaen	**–0,42**	**–0,41**	–0,33	**–0,42**	**–0,43**
Surinamese	**–0,98**	**–0,97**	**–0,84**	**–0,98**	**–0,84**
Indigenous Dutch	ref.	ref.	ref.	ref.	ref.
Time resources (total free time in hours per day)		**0,00**			
Material resources (income of household)			**0,17**		
Social resources (social contacts outside household in hours per week)				**–0,00**	
Cognitive resources (diversity of media use)					**0,14**

Bold: significant effect (p < 0,05).
Source: SCP (LSEM'04/'05)

Table 4. Regression of digital skills of members of ethnic minorities, people aged 15-65 (in unstandardized regression coefficients, controlling for age, education and labour market position)

	model I (only ethnic minorities)	model II	model III
Ethnic origin			
Turk/Maroccan	n.a.	**–0,733**	**–0,798**
Antillaen/Surinam	n.a.	**–0,167**	–0,157
Indigenous Dutch	n.a.	ref.	ref.
Access to ICT at more than one place	**1,436**	**0,596**	**0,270**
Multiple access * Turk/Maroccan			**0,629**
Multiple access * Antillaen/Surinam			0,263~
Bold: significant effect (p < 0,05) (~ = p < 0,10). Source: SCP (LSEM'04/'05)			

The workplace offers virtually no opportunities for making up a digital skills disadvantage: far fewer members of ethnic minorities use a computer at work than the indigenous population (18% of Turks/Moroccans and 39% of and aliens/Surinamese compared with 50% of the native Dutch population).

Older persons (over the age of 55) have less access to computers and the Internet not just at home, but also via work and (of course) school. If they are not able to acquire skills via full-time education or work, they are forced to use other learning pathways. Despite the wide currency of stories about children and grandchildren who help their parents and grandparents to learn to use the computer, in reality older people obtain their skills to a much lesser extent from these contacts than is generally thought. For example, SeniorWeb is the largest organisation for ICT and elderly in the Netherlands and 54% of the members or users of their website had acquired their digital skills through self-study. Following courses is also a more commonly used avenue than explanations and help from children and/or grandchildren (Duimel, 2007). Eurostat (2006) comes to a somewhat different conclusion for most European countries. Besides self-study via learning-by-doing they conclude that the social network is an equally important method for obtaining basic computer or Internet skills. Informal assistance comes from colleagues, relatives and friends. The low-educated rely relatively strongly on informal assistance.

Consequences of Non-Use of ICT

The observation that some groups have a disadvantage in digital skills demands an estimation of the seriousness of that disadvantage. To gain some impression of this, we investigated a number of consequences for the different groups identified. Of course not all possible consequences of differences in digital skills for participation in society could be studied, we could only focus on a few social and economic consequences. This concern about the consequences of differential ICT access overcomes a major problem with most digital divide research which is mostly restricted to differences in access between population groups. One should be able to show to what extent differences in access are related to gaining rewards that do not directly result from previously existing differences in resources. The general hypothesis is that people who have better access to ICT have a competitive advantage in their quest for these rewards than do people with poor access. Having access to ICT can be seen as only one factor that produces differences in social and economic outcomes. These outcomes are also influenced by the forces that produce differences in ICT access in the first place. Therefore it is important in quantitative analysis to distinguish direct from indirect effects. For a more elaborate discussion of this theoretical model of the causes and consequences of lacking sufficient digital skills see De Haan (2004). Key propositions of this model are:

- Unequal distribution of resources causes unequal access to digital technologies.
- Unequal access to ICT produces increasing social inequalities through a process of accumulation of advantage.
- Growing inequality in societal participation reinforces the unequal distributions of resources and produces new differences between opportunity structures in which these resources are gained.

The consequences of ICT non-use for people with a low education level and for the unemployed are partly economic, in that they affect their opportunities for active labour market participation or for moving ahead in their profession. Only a small proportion of the unemployed and disabled (24%) report that their computer knowledge is sufficient to enable them to get a job. People with a low education level find that their deficient computer skills are a problem in progressing in their work (25% do however feel that their knowledge is sufficient). Nonetheless, people in this group are less willing (than the more highly educated) to invest in acquiring digital skills (Van Ingen et al., 2007). If people who are digitally unskilled learn to work with computers may lead to a large improvement in productivity which for a large part will return to the employers in the form of higher wages (Weda et al., 2008). However there is also a drawback to the use of ICT on the labour market. For low-skilled jobs, the use of ICT sometimes actually leads to a simplification of the work (think of the scanners used at supermarket checkouts). Such a downgrading of job content does not demand more skills, but rather the ability still to derive some job satisfaction from this reduced job content.

New technology not only plays a role in economic participation; searching for, processing and disseminating information is also the order of the day outside the labour market. There is therefore also a question to be asked about the extent to which having digital skills is today useful or even necessary for participating in social life in peoples leisure time. One way of looking at involvement in society is to consider the extent to which people are aware of what is going on around them. Consulting the Internet is one way of doing this. Older people generally make wide use of the media. However, they mainly use printed and audiovisual media and relatively infrequently seek recourse to the Internet. It may be that they are perfectly able to keep abreast of social developments without the Internet. From the standpoint of social involvement, however, older people consider Internet use important in order to have the feeling of ‘belonging’ or ‘being able to join in conversations’. Maintaining contacts in their personal network (e.g. with the frequently cited grandchildren) is then important. For those with a low education level, too, ICT use does not provide an extra stimulus to keep abreast of what is going on in society.

For ethnic minorities, we looked at the role ICT plays in the integration process. Members of ethnic minorities use e-mail, chat and surf the Internet to a relatively large extent and in doing so come into frequent contact with (indigenous) Dutch people and the Dutch language. Table 5 indicates that more digital skills and better (social) integration go hand-in-hand (after controlling for several kinds of resources). This especially holds for Maroccans and Turks. However, the data are

Table 5. Regression of social cultural integration, by ethnic group and interactions, people aged 15-65 (in unstandardized regression coefficients, from model II controlling for age, education and labour market position)

	model I (uncontrolled)	model II	model III	model IV	model V
digital skills	**0,160**	**0,167**		**0,134**	0,016
ethnic origin					
Maroccan	n.a.	n.a.	**–0,908**	**–0,832**	**–1,325**
Turk	n.a.	n.a.	**–0,824**	**–0,756**	**–1,280**
Antillaen	n.a.	n.a.	**–0,235**	**–0,260**	–0,327
Surinam	n.a.	n.a.	ref.	ref.	ref.
digital skills * Moroccan					**0,213**
digital skills * Turk					**0,225**
digital skills * Antillaen					0,020

Bold: significant effect (p < 0,05)
Source: SCP (LSEM'04/'05)

too limited to enable anything to be said about which is the cause and which is the consequence here.

AN EYE TO THE FUTURE

It is plausible that the diffusion of new technology will continue and that all population groups will get access to Internet in the near future. At least this is likely to happen in advanced knowledge societies. In the Netherlands this market saturation may be expected around 2012, based on declining costs, increasing opportunities of use, growing social pressure on non-users, greater usability of equipment. Probably these factors will convince many laggards to get on the Net. Furthermore a replacement of an older cohort with many non-users by a young cohort of savvy users will also contribute to access for (almost) everybody. However it should be noted that there are different opinions on future diffusion of Internet access. The view of approaching market saturation resembles the *normalisation model*, as formulated by Norris (2001). This model assumes that there only differences in time of adoption will occur. There are those who lead the way, Rogers' innovators and early adopters, and those who follow at a distance, Rogers' laggards (Rogers, 1995). Norris (2001) also distinguishes another model, the so-called *stratification model*. According to this model the diffusion of technology will be complete among groups with more resources and incomplete among resource-poor groups. However the existing empirical evidence does not favour this latter model. At least in the Netherlands, even among the elderly, the low-educated and the ethnic minorities the access to Internet still increases (CBS, 2006; Duimel, 2007).

In the future difference in digital skills will be pivotal in the effectiveness of ICT use. This difference might not only be a matter of who adopts first and who follows in time. Marsh (2001) assumes that the 'competence gap' will grow over time. According to him late adopters will need more time to master basic skills. They may also be less inclined to learn more advanced skills since they lack or do not perceive the need of use.

It is difficult to determine unambiguously whether someone possesses sufficient digital skills, because this involves a normative opinion about what a person should have in the way of digital skills in the present time and in a specific social situation. Such a checklist does not (yet) exist. Yet, the importance of increasing the digital skills of citizens is rarely questioned. The question is not so much whether this should happen, but rather who should be responsible for it. That responsibility lies not only with the government, but also with the business community, with technology producers and with individual citizens.

The demand for increased computer skills calls for training courses. However, developing generic policy in this regard is not necessarily the best approach. Different groups with differing goals and capabilities require measures that are geared to removing barriers that are specific to their particular group. The existence of different groups thus requires a differentiated policy. The results described above offer a stepping stone to such a policy, by providing an insight into what specific groups can and cannot do and into the relationship between those skills and their social situation. Some groups are for a large part technology excluded (e.g. those over 70 year old) but not necessarily socially excluded or economically benefiting from technology (elderly people won't gain from increased ICT-skills in terms of labour market opportunities).

The responsibility of the government is expressed – or should be expressed – in education and other provisions which enable citizens to acquire the necessary skills. Education has traditionally played a key role in the acquisition of skills such as reading and arithmetic. By contrast, basic computer skills can be gained by young people themselves through using and playing with computers. Media education which devotes attention to the safe use of Internet applications is however important. Learning to search for specific information and to interpret and apply online information is also important. It would seem logical that education should also provide a forum for learning the more complex applications.

A great deal has already been written elsewhere about the role of education in the imparting of digital skills and increasing ICT competencies on the work floor (f.e. Steijn & Tijdens, 2007; Weda et al., 2008). And it is clear that employers and employees share a responsibility, and also benefits (higher productivity and higher wages respectively), for offering and following training of digital skills. Unemployed people and those with a low education level stand to gain from having more digital skills in order to improve their chances on the labour market. A small proportion of these groups report that the price of equipment presents a barrier, but other reasons, especially lack of interest, are more important motivations for not having a computer.

Improving labour market opportunities by training digital skills is also important for ethnic minorities, but for them integration into society is also a relevant factor. Many initiatives which provided public access at neighbourhood level, have attracted fairly high numbers of ethnic minorities. Training of digital skills at neighbourhood level deserves to be supported and should be focused very specifically to those who can benefit most from technology access in terms of social inclusion trajectories (not only ethnic minorities, also unemployed and low-income households especially those with school-aged children).

A large part of the population are no longer reached by full-time education and also have no opportunity to acquire digital skills at work. Some are forced to rely on other people or other provisions in order to acquire these skills. In a discussion about the inclusive information society (in the summer of 2005, the European Union launched i2010, its five year strategy to boost the digital economy and to promote an inclusive European information society), it is precisely the groups that are found here to be at a disadvantage which require extra attention. A wealth of training initiatives is now available, from large-scale national initiatives to PC introduction courses in the back rooms of neighbourhood cafes. Initiatives carried names such as community internet centres, community technology centres or cybercafés. These access points mushroomed at public libraries, community centres in low-income neighbourhoods and civic centres such as government buildings. In the Netherlands in 2008 a special ComputerPlusBus offered computer courses to elderly with the objective of increasing digital skills.

Older people in particular can benefit from an alternative teaching provision, because they have had relatively little contact with the new technology via full-time education or at work. Before moving to the task of equipping the older persons with digital skills, however, a more motivational task needs to be carried out. Older people can only become skilled ICT users if they make a connection with the Internet. In order to overcome their digital stage fright, it is essential for them to have an accurate picture of the possibilities of ICT usage. Most Western countries have seen public and private initiatives to promote awareness about the internet. In awareness raising campaigns internet coaches were introduced, television programmes and printed media preached on the usefulness of internet and free internet accounts were massively distributed as a free feature of magazines and through bookshops. While most of these awareness raising initiatives had a national coverage, some were focused on specific user groups, e.g. the elderly.

For large numbers of older people, ethnic minorities and people with a low education level functional illiteracy presents a barrier to participating in a knowledge society (cf. Groot and Maassen van den Brink (2006). Before this group can acquire computer skills, it is first necessary to bring their reading and writing skills up to scratch. Only then will it be possible for them to search for information and use it effectively, and to communicate with others online.

CONCLUSION

Differences in digital skills appear to be widening over time. In the Netherlands, it is above all the elderly, people with a lower education level, people who are economically inactive and members of ethnic minorities who lag behind. To explain these differences in digital skills especially a lack of financial and cognitive resources seems to be of particular importance. Disposable income is a barrier to the acquisition of digital skills for the economically inactive in particular. A lack of cognitive resources (partly coinciding with literacy) proved to be a hindrance for both the low-educated and for ethnic minority groups. These differences in digital skills influence the labour market performance of those at a digital disadvantage. Especially people with a low education level and the unemployed are confronted with lesser opportunities for active labour market participation or for moving ahead in their profession. Unemployed people and those with a low education level stand to gain from having more digital skills in order to improve their chances on the labour market.

The differences in digital skills also has an impact on the private lives of people. From the standpoint of social involvement, older people consider Internet use important in order to have the feeling of ‘belonging’ or ‘being able to join in conversations’. Maintaining contacts in their personal network (e.g. with the frequently cited grandchildren) is then important. Members of ethnic minorities use e-mail, chat and surf the Internet to a relatively large extent and in doing so come into frequent contact with (indigenous) Dutch people and the Dutch language. Similar consequences were found in the USA. Americans who do not use the Internet report a variety of disadvantages about not being online, such as being excluded from communications, feeling disadvantaged during job transitions, or having difficulty obtaining information for their jobs or personal interests (USC 2008).

Recognizing the importance of digital skills in a knowledge society, several initiatives have been launched to improve access and to raise the level of digital skills. Those at a digital disadvantage benefit from these initiatives, provided they are aware of the opportunities of ICT use and motivated for appropriate use. Continuing these initiatives may in time contribute to a smaller skills gap.

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KEY TERMS AND DEFINITIONS

Digital Skills: sum score of 8 types of use (information search on the internet, buy something online, telebanking, surfing for leisure, e-mail, chat, text editing/spreadsheet, games). average 2.61, standard deviation 1.78, Cronbach's alpha .75, average inter-item correlation .33.

Diversity of Media Use: combination of the frequency (1-7) of reading magazines and the number of newspapers per week.

Education: highest attained level of education or the present level (for those who are still in the educational system)

Free Time: number of hours a week that are not spent on work, schooling, household tasks, personal care or transportation.

Income: net household income

Multiple Access: number of places where respondent uses a computer/internet (home, school, work).

Social and Cultural Integration: social contact of people from ethnic minorities with indigenous Dutch and the control over the Dutch language (based on three statements)

Social Contacts: amount of time spent on social contacts outside the household (amongst other parties, visiting friends and family, telephoning)

Chapter 17
The Digital Divide among the Incarcerated Women in the United States:
A Case Study from New Jersey

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ABSTRACT

A computer-based learning (CBL) program in the New Jersey women's prison system is helping to bridge the digital divide among the incarcerated. The hallmark of this program is a computer-based learning process that begins in the prison environment and follows an inmate through the corrections system and into the community. The program provides access to computers through computer labs, use of computers in coursework, and computer ownership upon release into the community. Access to information technology helps to develop skills that will be useful for offender's chances of employment upon reentry and may even help to reduce recidivism rates.

INTRODUCTION

Information technology (IT) is prevalent in most workplaces and homes in the United States. According to Pew Research, about eighty percent of the population uses the Internet and about seventy percent of Americans have a computer in their home (Pew Research, 2007). While the use of technology in the United States is clearly high, there are groups that remain disconnected from these technologies. Since the mid 1990s the term "digital divide" has been used to describe disparities in access among citizens to technology and more recently gaps in technological literacy. Academics and policy-makers have explored and expanded on the concept of digital inequality, and the debate has led to the understanding that access to both available hardware and skills development are essential components in the effort to close the digital divide. While the two waves of digital divide research tend to examine the access and skill levels of marginal-

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ized groups according to race, gender, income, and other variables, they have not yet flushed out the effects of this existing technological disparity on incarcerated populations. Some argue that computer education within the correctional system is as important for the incarcerated as it is for traditional students throughout America (Lintner et al., 2001). Individuals leaving prison will be competing for jobs in which knowledge of technology and computers is essential. By improving an inmate's computer skills, the system is providing that inmate with a significant boost that will help him/her re-integrate into the workforce.

This chapter will analyze the digital divide in the context of the correctional system through a case study in New Jersey designed to help incarcerated women develop computer skills and knowledge in preparation for successful community reintegration. This effort to close the digital divide among female offenders is critical to their future employment. Technological skills are necessary in today's high-tech labor market. It is estimated that by 2014, seventy-seven percent of jobs in the public and private sector will require good technological skills. A learning system in prison which better prepares women offenders for high tech jobs offers an important antidote to the digital divide they will face upon release.

INCARCERATION AND EDUCATION

In the United States today, there are approximately 2.3 million people incarcerated in state and federal prisons (Bureau of Justice Statistics, 2008). Of those incarcerated in the United States, 115,779 are female offenders and 1 in 100 African American women are incarcerated (Bureau of Justice Statistics, 2008; Pew Center on the States, 2008). During 2007, the prison population rose by more than 25,000 inmates (Pew Center on the States, 2008), and women are currently the fastest growing group of prisoners in the United States with their incarceration rates rising 1.2 percent in 2007 as compared to 0.7 percent for men (Bureau of Justice Statistics, 2008). Statistics show that 26,500 people are currently incarcerated in the state of New Jersey; about 1, 400 of whom are female (Bureau of Justice Statistics, 2008).

Although men and women share comparable experiences that lead them towards incarceration, the path to prison is influenced by gender (WRITE-NJ, 2006). Women's economic marginality, the high rates of violence towards women, and women's inferior position in informal economies as well as other factors are all distinctive their incarceration. Women's criminal offenses also differ from men's; women rarely commit violent crimes and are most often arrested for economic and drug crimes. Women also generally serve longer sentences than men for the same crimes, and are older at the time of their first incarceration. The average age of a female prisoner in the United States is 31 while men are generally imprisoned in their twenties (Bureau of Justice Statistics, 2006).

Getting Out and Staying Out: The Importance of Education for Reentry Women

While time served in prison continues to grow for women as well as men, most women leave prison eventually and return to their families and communities. Reentry into the community presents formidable challenges to these already economically and racially disadvantaged individuals (Travis & Visher, 2005; Western, 2006). As a result, policymakers, correctional officials, and academics are interested in how offenders spend their time while in correctional care. There is also great attention paid to how experiences in the correctional system impact the lives of offenders post-release (Austin, 2001; Travis & Visher, 2005; Vacca, 2004; Hrabowski & Robbi, 2002). The New Jersey State Employment and Training Commission (SETC) found that for people who are incarcerated, male or female:

…corrections education [can] provide a second chance to ameliorate their educational disadvantage and skills deficiency, better equipping ex-offenders to compete for employment, education, and training opportunities. Ex-offenders who read with understanding, can accurately complete forms, and analyze numbers are more likely to have high self-esteem, find employment, and avoid criminal behavior than those who lack basic educational and job readiness skills (SETC. 1997).

In addition to these findings research has shown that providing education and job training that is tied to high-wage, high demand jobs is the most significant factor in reducing recidivism. (O'Brien, 2001; WRITE-NJ, 2006). Despite the need for education and training for the incarcerated, educational programs in state prisons are limited in number (Hrabowski & Robbi, 2002; Vacca, 2004); in fact most state prisons allocate a meager one percent of their corrections budget to educational programming (Tolbert, 2002). The limited resources for education leave many inmates ill-equipped to enter the workforce and successfully compete in the labor market (Pager, 2003; Petersilia, 2003). Education is even more limited for incarcerated women. Research demonstrates that in general female offenders receive fewer educational and job training opportunities than men while incarcerated (Belknap, 1996; Rose, 2004). Without access to quality education and job training, many newly-returning women will reenter society with little educational capital and will not be prepared to obtain employment that will provide them with economic self-sufficiency. Women's need for economic independence is especially critical given that, unlike men, most incarcerated women are custodial parents who will assume mothering responsibilities upon reentry into society, making employment critical to family survival.

Services that would effectively position incarcerated men and women to successfully reintegrate upon release are lacking for both genders. Despite this, women have traditionally been neglected in the corrections system because they constitute a smaller proportion of those imprisoned and are older on average at the time of incarceration (WRITE-NJ, 2006). As a result female felons have fewer options for rehabilitation in correctional facilities than do men, and are allocated a smaller amount of financial resources. For women in the New Jersey prison system, entrance exam results average at a sixth grade reading level and fourth grade math level. Without "well-funded, well-staffed, and well-administered educational programming at all levels, from basic literacy programs through to postsecondary and advanced vocational training programs", most women will be released ill-equipped to participate in and contribute to New Jersey's high-tech, high-skill economy (WRITE-NJ, 2006). Programming options are limited and can serve only a small percentage of the total number of women who might be interested, and this is coupled with the fact that there are unmet funding and staff needs. Thirteen percent of the women incarcerated in New Jersey are enrolled in the system's academic offerings. Approximately twenty-four percent of the total population is enrolled in the Education Department's combination of academic and vocational programming (WRITE-NJ, 2006). In addition to inadequate funding and educators, the facility also faces a shortage of adequate classroom space, supplies, and equipment.

Inmates at the female correctional facility in New Jersey also have disproportional access to occupational training programs relative to their male counterparts (WRITE-NJ, 2006). At this time, there are no licensing programs and few apprenticeship programs available to serve the incarcerated women. In addition there is almost no access to nontraditional occupational training. Programs such as these would better prepare female offenders for the high-wage, high-demand jobs needed to help prevent recidivism (WRITE-NJ).

Computer-Based Education in Prison

Technology-based learning programs hold great promise for preparing women and men for life outside prison. Research shows an array of computer-based educational initiatives have been used to equip offenders with information technology skills and training. Its adoption has been due in part to its cost effectiveness as an alternative to understaffing in classroom-based learning, and as a means of educating large numbers of people at different skill levels (Borden & Richardson, 2008). This type of learning can also be helpful in serving hard to reach rural prison populations. This is particularly important for female offenders as women's prisons tend to be located in rural areas. While, correctional education departments have historically used technology in prisons most often for vocational training (Borden & Richardson, 2008), technology is also used in Workforce Investment Act initiatives and computer labs to provide inmates with academic and skills based appraisals and training.

There is also a program run by the Federal Bureau of Prisons, which allows inmates to experience email through a time-delayed closed system in law libraries (Borden & Richardson, 2008). Another program in Iowa uses an internal networked system to detail schedules and menus on site and allows inmates to access downloaded newspapers and other helpful information (Borden & Richardson, 2008). Finally, in Alaska the Highland Mountain Correctional Center allows inmates to get certified in Microsoft and IC3 (Borden & Richardson, 2008). These technology-based initiatives allow inmates to further their technological skills and help to bridge the digital divide. Beyond these uses, however, technology-based education programs are limited due to stipulations in many state correctional systems against any use of the Internet by the incarcerated.[1]

There is also interesting research evaluating the benefits of computer-based training with an individualized learning component in correctional institutions as compared to traditional classroom-based learning. The majority of this literature describes the key advantage of this type of education as the ability to individualize a plan of learning. Many authors also state that this type of learning holds the potential for improving student achievement (Askar et al., 1992; Fletcher-Flinn & Gravatt, 1995).[2] Research also shows that implemented computer-assisted instruction and computer-based learning techniques can make a difference in expanding access to overall computer literacy, increasing rates of program completion, enhancing individual educational goals, and improving post-incarceration employment outcomes (Batcheleder & Rachal, 2000).

Understanding How the Digital Divide in Prison

The digital divide literature makes clear that social barriers to accessing information technology [IT] directly can be related to statistics on incarceration in the United States generally, and in New Jersey. Income and education have been proven to be strong determiners to IT access and familiarity with computers and the Internet (Shelley et al., 2004). Statistics show that in the general public 75 percent of Americans with a college degree have home computers, compared to only 13 percent of those with some secondary education (Shelley et al., 2004). Research also indicates that 75 percent of state prison inmates in the United States did not complete high school (Harlow, 2003). This lack of post-secondary education makes the female prison population more likely to suffer the digital divide when compared with women on the outside.

Other factors that are important predictors of IT access and literacy are race, ethnicity, gender and age. These attributes are important even when socioeconomic status is controlled for (Shelley et al., 2004; Cooper, 2006). In the general population, although computer ownership and Internet access have increased in general, Black and Hispanic populations continue to suffer from an IT disparity. Among the general population, 56 percent of Whites have a home computer compared with only 33 percent of Blacks and Hispanics (Shelley et al., 2004). These relationships are mirrored in the women's prison population in New Jersey as well. In the New Jersey women's prison, 55 percent of the inmates are Black, 13 percent are Hispanic and 31 percent are White (New Jersey Department of Corrections, 2006). The racial divide in computer use in the nation when compared to the racial composition in the women's prison in New Jersey is startling and suggests that the racial barrier to IT use is pervasive among incarcerated women in New Jersey.

Gender is another factor that directly has a relationship to digital access and digital literacy. Women have been shown to be underrepresented in their ownership of computers and in computer skills (Cooper, 2006; Mercier et al., 2006). Age has also been demonstrated as a key factor in digital inequity. While much of the research details that the digital divide is a "gray" issue (the likelihood of Internet use is lowest among those 65 and over,) a strand of literature that proposes a digital native – digital immigrant theory looks at IT skills as being lower for people much younger than 65. Caroline Geck describes digital natives as those who were born after 1990, because, "they were born into the digital world" (Geck, 2006). Taking into account the ideas of the digital native-immigrant literature when thinking about digital literacy, it becomes clear that there is a divide in skills for many people younger than 65, especially if looking at incarceration. The median age for female inmates in the New Jersey women's prison system is 36 and thus many of those incarcerated could certainly be described as lacking IT skills and therefore qualify as digital immigrants (New Jersey Department of Corrections, 2006).

The women's prison population in New Jersey reflects these characteristics, and in many cases inmates' identities and experiences encompass a combination of these attributes. As a result the digital divide in women's prisons must be examined through an intersectional lens that explores these identities as interwoven characteristics that in many cases result in inequities in IT access and skill (Gatta, 2005). The statistics about the general population and the digital divide suggest that prior to incarceration it is likely that a large number of the inmates in the New Jersey women's prison did not have access to computers in their home and lack computer literacy skills. Additionally, data about this population indicates that an overwhelming number of inmates come from disadvantaged communities (Petersilia, 2003; Rose & Clear, 1998).

Reentry from Prison: The Challenge of Employment

Successful reentry into society following incarceration has become a very important policy issue, especially given the increasing incarceration rates –including the rates for women offenders. Employment for male and female ex-offenders has been found to be particularly important as it has been shown to reduce recidivism rates in older offenders (Uggen, 2000). In the wider literature on the digital divide, the desire to understand and begin to close gaps in access and use of information technology (IT) stems from the perceived link between IT use and economic well-being. This becomes a particularly poignant fact when looking at the IT divide among incarcerated populations. The extensive literature on labor market participation and incarceration details that simply having a criminal record is in and of itself a highly stigmatizing factor in the acquisition of entry level and union jobs. Ex-inmates are also hindered in the labor market as a result of the months and years they have spent not participating in the workforce.

Time away from the labor force results in the erosion of existing skills and the inability to develop new skills in the changing global and technological economy, IT skills are certainly among these (Western, 2006: Pager, 2003). Research has shown that ex-inmates have diminished earnings even before they were incarcerated (Western, 2006). Any earnings are further diminished if their IT skills are deficient, as digital literacy has also been shown to have an effect on earnings. Access to IT, however, raises the level of human capital in an economy and social mobility in the same ways as education. As one study put it since ‘the Internet holds the key to the vault of riches of the information age’, closing the gap would lead to an improvement in social and economic disparities (Western et al., 2001).

Certainly, the role technology plays in the workforce continues to grow. It is estimated that by 2014 seventy-seven percent of jobs in the labor market will require technological skills. While IT knowledge will not eradicate the existing problems of prior incarceration and employment, it may serve to make more employment opportunities available to former inmates. Learning via the computer increases IT skills and can be used as an educational tool in and of itself. International studies have shown that education is a very important vehicle for female offenders, as it has been proven to reduce recidivism rates, improve the prison environment, and an increase self esteem and life skills (Fine et al., 2001, Vacca, 2004). Studies have also shown that inmates who participate in these programs do so because they view education as a vehicle with which to improve their skills and increase their chances of employment upon release. Digital literacy alone has also been shown to contribute to educational attainment; IT knowledge and computer ownership have been found to lead to dramatic advantages in academic test scores.

A significant though intangible result of computer-based programs for women has been the increase of an important variable among women especially called “self-efficacy.” This was demonstrated by New Jersey’s online learning pilot for single mothers in 2002. Participants in this pilot showed increased confidence when they learned how to troubleshoot computer problems (Gatta, 2005). Davis (2001) has written about self-efficacy as one of the greatest problems incarcerated women face. Success in education has been shown to increase self-esteem among female inmates, and the attainment of IT knowledge produces similar results.

NEW JERSEY’S PILOT PROJECT

One way in which the digital divide is being bridged among female incarcerated populations is through a computer-based learning project piloted in New Jersey that follows offenders from prison to community. This project is a privately-funded, large, multi-partner collaboration, which officially began in the summer of 2007 and is scheduled to run for a total of two years. It is designed as a lifelong learning project to help incarcerated women develop the skills they need to secure a job upon release from prison. The computer-based nature of this program means that whether or not students choose to take specific computer literacy courses, they are developing computer skills and familiarity through continued computer use. The program is based on incarcerated women’s natural ‘trajectory of release’ from the New Jersey prison system.[3] It begins with the incarcerated women taking education and training courses via a special prison-dedicated learning system on a desktop computer. These courses are provided by a computer hardware and software vendor at a maximum security prison facility in New Jersey. Next it follows the women over to an assessment center, where they have a CBL lab with desktop computers to continue their training; and it is then available to women in a CBL lab with laptop computers as they move to a group halfway house. At this halfway house the women both begin employment (through different work release programs) and also make connections with a local community college and the New Jersey Department of Labor and Workforce Development’s One-Stop System.

Once students are connected with the New Jersey One-Stop system they may be eligible to continue their computer-based education and training through online courses on a personal laptop via the State's online learning program. Once eligibility is established, the learner will receive a laptop, 12 months of Internet service, and access to a library of more than 50 curriculums featuring over 600 courses. The vendor of the home-based learning program provides online mentors to help students navigate the web site. These mentors work with students on an individual basis and have weekly contact with them for the first thirty days of their in-home learning. In addition, technical support is available via the telephone for all hardware and software issues. The transition at the halfway house from desktop computers to laptop computers helps to prepare students for continuing with the program via a laptop upon release into the community.

The bulk of the learning in this pilot project takes place in computer labs where students complete computer-based coursework and tests; at each of the three correctional sites students primarily work individually in a classroom setting on desktop computers. The computer coursework at the correctional institutions is server-based. The purpose of this limitation exists due to the presumption that some inmates may use the Internet for prohibited or questionable purposes (McIntyre et al., 2001). Despite being server–based, the program uses a simulated Internet platform, allowing inmates to become familiar with "the idea of the Internet" and provides them with the ability to practice some Internet skills. [At the halfway house parolees in the STEPS program are allowed to access the actual Internet in a special lab.]

Participants take a wide variety of computer-based courses that empower them to obtain an array of academic, life, and workforce-readiness skills. Simply navigating through available coursework allows students to develop basic computer skills and to begin to troubleshoot technological problems for themselves. Available coursework includes basic and applied math, fundamentals of math, English, basic writing skills, and all major Microsoft Office applications (Access, Word, Excel, PowerPoint, and Outlook).[4] These courses help to improve general literacy skills. There are also courses on conflict resolution, effective decision-making, active listening, and communication skills. The curriculum also includes courses on many occupational areas and allows participants to prepare for the National Workforce Readiness Credential.[5]

Students are able to complete their coursework at their own pace, and in this project typically spend up to three hours a day in computer labs. While learning primarily occurs on an individual basis at the three correctional sites, computer labs use a "blended model" of education. Research demonstrates that —whatever the site inside or outside prison in any setting—intensive online learning can feel isolating for many people. Early research studies show that simply expecting students to only learn individually at the computer can become monotonous and lower morale in the classroom. As a result, teachers who implement a blended model of learning that combines "high tech" with "high touch" learning have better results (Gatta, 2005). Students work together with instructors in a "lab as classroom" setting. Instructors run class activities where they work on course-relevant and workplace-readiness skills. Examples include creating computer-generated resumes, brochures, reports, presentations, calendars, and holding mock interviews for jobs. This variance in learning helps to break up the monotony of computer classes and tests and according to the teachers has helped to create a more positive and productive learning environment.

Once offenders move into the community, the learning environment changes drastically and students are no longer studying in a structured environment among other students. This change is a significant one, because they no longer have the benefit of a teacher and other students who are experiencing similar difficulties. As a result, this transition can be isolating and frustrating for students who are not able to access help and encouragement right away. Therefore, it is very important that students get support from their online mentors and others so that their learning experience continues to be as positive in the community as it was in the correctional institutions. One of the great benefits of using laptops at the reentry stage of the program is that offenders are able to use their laptops to access learning from their homes, work, or any other place with an Internet connection. This method of learning offers flexibility for students allowing them to fit their coursework and time on the computer into their busy schedules. For individuals reentering the community, life can be very hectic involving many different tasks such as securing employment, meetings with parole officers, accessing benefits, securing rights to their children, and visiting family and friends. This type of learning also offers flexibility when the stresses of reentry begin to subside, allowing students to work their computer use around their own and their children's schedules.

Online learning also helps to alleviate some concerns for childcare— women can utilize the computer courses while their children are sleeping or are out of the house (Gatta, 2005). Using laptops instead of desktops can also be a benefit as offenders may live in the homes of family or friends or may reside in group housing (Gatta, 2005). These group living situations often come with space limitations. Using a laptop does not require a designated area, and allows participants to put the computer away when they are finished. Laptops are a very important component to offering flexibility in time and space for learners (Gatta, 2005). Making computer education work within the lives of the women is an important component of learners staying active on the computer and continuing to improve their IT skills in their less-structured post-release lives.

The New Jersey Inmate Profile: Who Are the Participants?

To date, 352 women have participated in the computer-based learning program at one or more of the three sites.[6] Of this group, 336 women responded to a computer-based survey and thus comprise our sample.[7] The bulk of the women in the program have participated at just one of the three sites; 68 women have participated at two different sites and nine women have followed the full "path" of the program with enrollment at all three sites. To date six women are active in the in-home portion of the program. The most recent analysis of the demographic data on these participants, representing all three correctional sites, reveal the following mix of socio-economic status, age, ethnicity, and education level, as well as computer knowledge and experience before entering the program. The women represent an ethnically diverse group, with 53 percent of the sample identifying as African American, 33 percent White; and eight percent Hispanic. The sample represents a slightly older population, as 39 percent of the women are over 40 years old; and 33 percent are between 30 and 39 years old.

Participants' educational levels also represent great diversity. Thirty-three percent of the women had no high school degree, 35 percent of the women have a high school diploma or GED, and 23 percent have at least some college, with 11 women holding an associate's degree, 8 holding a bachelor's degree, and 14 women holding graduate or professional degrees. The majority of women, 60 percent, report having had some type of skills or job training prior to incarceration in addition to their formal schooling. Participants were also surveyed on their employment histories. Sixty-seven percent of women reported having held a full-time job prior to incarceration. Of these women 30 percent earned between $201 and $400 weekly, 18 percent reported earning between $401 and $600 weekly, and only 12 percent of women earned more than $600 weekly.

At all three research sites efforts were made to make the recruitment process for this program largely voluntary. At the prison, inmates signed up for the program on sheets provided in their housing units. In the other two facilities program information was spread through word of mouth, bulletin boards, and other public sites, as well as through direct inquiries from inmates. The number of participants enrolled at each site depended upon the number of available seats in each computer lab. Many inmates (59 percent) reported hearing about this opportunity from a staff member, teacher or counselor at one of the facilities. In general, the participants in this pilot come to the program with some experience or background using computers. In fact, 88 percent have used a computer and/or have had prior experience with computers, while only 12 percent have never used a computer. Moreover, as a group, the women self-report a relative high-degree of confidence with computers, as 49 percent of women believe they possess an average knowledge of computers, and 24 percent indicated that they have an above average knowledge of computers. We also know that 60 percent of the women have taken a computer class prior to enrollment in this program. The picture changes somewhat when age and computer knowledge were taken into consideration. While computer use and computer knowledge is common in the sample as a whole, older participants described themselves as much less familiar and less experienced with computers. Thirty-one percent of older women [40 years of age and above] reported having below average knowledge of computers, compared to 10 percent of younger inmates, women between 20 and 29 years of age.

One of the most important components of this computer-based learning program is that it is available to inmates of all ages. At this New Jersey women's prison, inmates tend to be older. As a result, federal funding for basic skills education was cut in 1993 because the majority of federal correctional education funds are only available to institutions with a certain percentage of inmates under the age of twenty (Peet, 2004). According to Department of Correction's figures, the average education level at the prison is sixth grade, so despite the age of the population, education and the development of skills for employment such as computer skills is very important. Prior to the implementation of this program, older women were funded to participate in some occupational training programs at the prison, including cosmetology, sewing, and a veterinary assistant program. These training courses offered inmates very gender specific training and provided them with skills that are often not useful to inmates for employment upon reentry. Those convicted of drug felonies cannot work in veterinary offices, and there are few jobs in New Jersey that require sewing and cosmetology skills. For these individuals, prior to this program, access to computer-based learning and training in correctional settings was limited, and in some cases non-existent.

How Does the New Jersey Program Bridge the Digital Divide?

This computer-based learning program helps to bridge the digital divide through computer access, computer use, and finally with computer ownership. As has been shown, access to computers and new technology in prison is not always available. During the years or months when offenders are incarcerated they will lose existing technological skills, and if they are not introduced to new technologies as they become available to the general public, they will be even more digitally disadvantaged upon release. This pilot project allows inmates to access computers on a daily basis during incarceration. As a result offenders are able to spend time on the computer and develop necessary computer skills. While the program does not use the Internet until release, inmates are provided with a simulated Internet platform so that they may become familiar with the idea of the Internet and are able to practice some Internet skills, such as navigating through pages.

Inmates are able to address academic, life skills and workforce readiness needs through computer courses while improving their digital literacy. Simply navigating through available coursework and taking classes allows students to become familiar with the computer and begin to troubleshoot technological problems for themselves. Although the majority of women enrolled in the program report that they have used a computer prior to enrolling, only a few report having basic knowledge of Microsoft applications and other computer programs. Daily use of the computer allows these women to develop these skills in Microsoft applications and other important IT software. The variety of coursework also allows them to increase other skills that will be necessary for successful reintegration into the community and employment. In addition to developing skills through time on the computer and individual daily use, inmates' IT skills are furthered as a result of the blended model approach of the pilot. When asked to comment on the value of the pilot one stakeholder stated:

The exciting thing about this project is that the learning is happening on a computer. Remember two short years in prison is a light second in technology, and if you are in prison for five or more years you have missed out on even greater technological development." It was also observed: *"The women's reaction to technology is surprising; they feel smarter and more professional, because they are learning on a computer. For me this demonstrates the great respect for technology that is out there.*

The New Jersey's Program "Success to Date"

The program's success in exposing women to computer-based learning can be measured in a variety of ways, one important one being course completion. Following the completion of a module course, students are tested on their knowledge, and after passing that course they receive a certificate, which serves as tangible proof of their training and comprehension of a module. To encourage "follow-through" and build confidence during any of these modules, all tests can be re-taken until the desired grade is achieved. As we delineate below, using data provided by the CBL vendor, nearly all program participants successfully completed their courses and passed the required tests.

In total, at all three sites, the participants have begun 16,547 courses, successfully completing 15,008 of them. Collectively the participants have spent some 16,550 hours at the computer. At the prison, 175 women have participated in the program and have collectively completed 7,288 courses and logged 7,159 hours at the computer. At the assessment center, 205 women have gone through the program and have collectively completed 7,103 courses and logged 5,563 hours at the computer. At the halfway house 62 participants have participated in the program and have collectively completed 249 courses and logged 2,196 hours on the computer.[8] The majority of participants in this program are still incarcerated in one of the three sites. To date, six of the participants who have been released into the community are actively involved in the in-home portion of the program. As a result of their involvement in the program, these participants all have a computer in their homes. This group has collectively completed some 1,060 hours online and 377 courses since their release. Some participants are more active than others in this final stage program, all are posting work hours, and one is currently enrolled in her local community college.

If going to computer classes and taking and passing courses are measures of increased access and use of technology, our qualitative data suggest further positive impacts in these areas. In focus groups and interviews with forty participants, women were asked to share their thoughts about the computer-based learning program, their experiences on the computer, and what they hoped to achieve from such computer-based learning. Overall, most participants saw the opportunity to use a well-equipped computer and engage in day to day computer-based learning to be a significant benefit of the program. All seemed aware of the unique "high tech" nature of the program and its advantages over purely classroom based computer and job-skill programs. Indeed, there were inmates who had never had the opportunity to work on a computer prior to enrollment in the program. During the initial classes, these women expressed fear about using computers and were anxious about touching the computer, using the mouse and typing on the keyboard. However, many of these women, especially the older women, cited overcoming their fears of computer use as an important triumph. As two women told us:

This was my first computer class. It's a necessity because technology is bursting out and to have an awareness of computers is needed. The first time on the computer was scary and in the beginning I was so nervous. I thought I was messing up when the computer goes off or I hit the wrong key. But I know more now, so I am less nervous.

It is a great opportunity for older women like me who don't have much computer knowledge; it's beneficial to us.

Given the continual, fast paced changes in IT upgrades and innovations, it is not surprising that many inmates interviewed reported both being "behind" in IT changes that occurred during their incarceration, and eager to learn new programs and play "catch-up ball." For some women, such high-tech offering simply gave them the opportunity to update their existing skills. Others reported being content to improve their basic skills as well as math and science. As three participants put it:

I learned a lot that I did not know. This program has given me the opportunity to write a complete sentence and complete a paragraph. And I learned Math an easier way too…I especially feel that I accomplished something when I get my certificates.

This program has really brushed me up on math skills and reading and writing. It's taught me how to communicate with others in a business environment and it's helped me a lot with the basic skills I need when I go back home.

I chose this because with any career these days, you need computer skills. It's helping me to improve on everything.

Another woman shared how having the opportunity to use computers has changed her perspective on life and has enabled her to fulfill unexpected learning goals:

Computer learning is awesome. It has given my mind a chance to develop new things in life and grow. This course gives my mind a chance to renew and restore things so I have a different reality check in life because I never thought I would ever touch a computer. I have a chance to work in things I never thought I could have had the opportunity work on.

Program participants further commented on the potential long-term impact of computer-based learning for offenders. The women believed that during the incarceration period the program has been a worthwhile learning experience and they have benefitted from this style of learning. But for them, the benefits envisioned post-release were even greater. Five participants shared:

I really need this computer learning program to get connected. The odds are against me, I do have a criminal background so if I can get support that can help me that would be good. I want to complete this program so I can figure out which direction to go and have more information in how *to fulfill my goals and what area or field I want to get into.*

This computer class will help me get a better job at a desk, not a factory when I get out. It will help me get better benefits and be more professional and have a stable job.

I hope to learn more and have more skills not only to get a job but also to remain in that job and keep the job. I believe the program will help me go further in the workplace. And once I get myself together I can get my kids back.

I can see myself putting what I have learned on my job application and saying to my employers that this is what I accomplished in prison instead of being down and depressed.

I hope to learn more and have more skills —not only to get a job, but also to remain in that job and keep that job. I believe the program will help me go further in the workplace. And once I get myself together I can get my kids back.

Overall not only were the benefits of computer-based learning far-reaching for these women, it also allowed them to constructively manage their time in prison. Two women shared:

I look forward to going to class every day. I get disappointed when there is no class. It's nice to see what I am good at and what I am not good at. I enjoy learning and I enjoy the class. I want more education and I want to learn how to use the computer more.

I'm also excited about class. I love sitting in front of the computer. I feel like I am doing something with my time and not wasting it.

Clearly these views demonstrate the potentials of computer-based learning for individuals in correctional settings. Having consistent access to technology and using this technology for academic, workforce and skills development has immediate and long-term benefits for this special population. Given the fact that the digital divide is so prominent in prisons in the United States and the majority of people in prisons are the "people of the digital divide", computer-based learning can be a viable and promising way of closing the IT gaps for these individuals.

CONCLUSION

This pilot project in New Jersey seeks to bridge the digital divide among incarcerated females. Its goal is to prepare these women for "real jobs" in the "real world", for which IT skills are essential. The project works to close the gaps in digital literacy among female felons through computer access, use, and ownership. Quantitative and qualitative data demonstrate that this program is providing successful exposure to technology for female inmates in New Jersey. This case study provides insight into the effects of the digital divide on the incarcerated. Much more research is needed, however, if we are to understand the actual effects of computer–based learning in a correctional setting. We need measurable data not only on computer-based learning and recidivism rates, but also on computer-based learning and improvements in the quality of employment and wages for individuals exiting prison into the workforce. We need better research on how incarcerated men and women "lag" behind other Americans in "the digital divide", and better measures of the real cost of any such IT disadvantage. Over the next few years the longitudinal data from this pilot project will have to be examined more closely. As more women who have gone through this pilot are released into the community we will be able to better explore the effects of technology use on employment and recidivism rates for the incarcerated.

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KEY TERMS AND DEFINITIONS

Blended Model: teaching that includes both individual computer learning as well as organized group activities run by an educator or group leader

Digital Divide: disparities in access to technology and gaps in technological literacy

Digital Immigrant: a person who grew up before digital technology was prevalent

Digital Native: a person who grew up with digital technology

One-Stop System: Established in United Stated in 1998 through the Workforce Investment Act. One-Stop Career Centers were established in local areas, and are sites where individual's can access core services and are directly referred to job training and other services within the workforce system.

Recidivism: returning to prison as a result of relapsing to criminal behavior

Self-Efficacy: a person's belief in their ability to accomplish a task

ENDNOTES

1 A few states have devised innovative ways to use technology-based learning while enforcing necessary security measures (Borden & Richardson, 2008). In New Mexico, New Mexico University is offering post-secondary education via *Web CT* based on a prison server. In Wisconsin, inmates are offered post-secondary education through *The College of the Air*, which provides programming broadcast via satellite (Borden & Richardson, 2008). In Ohio, the *Transitional Education Program* uses video-conferencing technology to link offender learning communities (Borden & Richardson, 2008).Outside of the United States, penal systems are also using technology as a method of educating the incarcerated, and in prison libraries. In Northern Ireland and the Greater United Kingdom attempts are currently being made to institute e-learning and video courses in conjunction with further education colleges (Irwin, 2003). In Canada, technology is used widely in the prison library system. Research also shows that similar uses of technology in prison are present in correctional institutions in Australia and New Zealand.

3 The "natural trajectory" of the program is the ideal model, but the research thus far has demonstrated that this path is not always straight forward. There are many different routes that offenders can take in their transition from prison to community. For instance offenders may go directly to the community from either the prison or the assessment cen-

ter, they may not connect with the One-Stop and continue their learning upon entry into the community, and they may even return to one of the three correctional institutions. The system of reentering society following incarceration is often a complicated one which involves many variables, and as a result each inmate's path to the community varies.

4 While the majority of women enrolled in the program report that they have used a computer prior to enrollment, only a few reported having a basic knowledge of Microsoft applications and other computer programs.

5 The National Workforce Readiness Credential was created as a national standard in the United States confirming for employers that entry level workers have the skills to join the workforce. In order to obtain the credential, students must pass an assessment scoring on such skills as: situational judgment, oral language, reading with understanding, and using math to solve problems.

6 The focus of this pilot program is currently the female incarcerated population in the state of New Jersey. One reason that the pilot is specifically for the female population is because they are less transient than male population. In New Jersey men can, and often do move to different facilities during their sentence. For female offenders this is not the case, because there is only one prison in the state that houses women. This lack of movement made the pilot project both feasible and affordable, but the concept for computer-based learning in prison is one that could be applied to male offenders. Men would certainly benefit from this program simply because they are often moved from facility to facility. This program allows offenders to take their training with them so, unlike traditional educational programs; their work would not be interrupted by a facility transfer.

7 See Appendix A

8 At this stage it should be noted that participants at the halfway house are also engaged in intensive and demanding work release activities that take them away from the halfway house to full and part-time jobs for many hours of the day and/or night.

APPENDIX A:

In-Person Survey Questions

Background Information

1. What year were you born in?
2. How long have you been at [name of institution]?
3. How long have you been incarcerated? [years/months]
4. Is this the first time you have been incarcerated? Yes No
5. When you leave this facility, will you be on parole supervision? Yes No
   If yes, for how long? and when?

Community Reentry

6. What state and/or county do you plan to live in upon release?
7. Do you know who you will live with? Yes No
   (Record any details participant gives about living arrangements)
8. Do have any plans for employment upon your release? Yes No
   If yes, what are your plans?
9. Ideally, what career or job would you like to find upon release?
10. Do you have any future educational goals upon your release?

Current Program Review

11. When did you start this computer based program? How long ago?
12. How did you hear about this program?
13. Why did you decide to take part in this program?
14. What do you hope to accomplish through this program?
15. Since enrollment in this program, what has your experiences been?
16. Have you set up your curriculum of study on the computer yet?
17. How helpful have the instructors been? Please explain your response.
18. What is it about this program that you find most interesting?
19. What is it about this program that you find least interesting?
20. What aspect of the program has been the most difficult for you?
21. Which aspect of the program has been the easiest for you?
22. Can you envision how this program may best help you upon your release?
23. All in all – and I will give you some choice here – how satisfied are you with this computer based learning program? (Please circle one)
    Very Satisfied. Satisfied. Moderately Satisfied Dissatisfied. Very Dissatisfied.
24. If you could give advice to the program organizers about how to better start up this program, what would you suggest? (e.g. better publicized, more program time?)
25. Is there anything you would like to share with me?

Chapter 18
Information Literacy and the Digital Divide:
Challenging e-Exclusion in the Global South

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ABSTRACT

With the increasing spread of information and communications technologies (ICTs) globally, there is heightened debate about the continuing disparities of access and usage. The dialogue has proceeded in many respects oblivious of the centrality of information literacies in capacity building measures to redress the digital divide. This chapter examines both the concepts of the digital divide and information literacies and regards them as highly compatible in their application to the global south following a detailed analysis of issues such as orality and literacy, globalization from below and effective access to technology networks. The chapter concludes with a range of recommendations relating to reforms in strategic thinking and policy planning. The call for heightened emphasis on education including information literacies forms the centerpiece of an analysis grounded in both theory and empirical research.

INTRODUCTION

Discourses on the digital divide have often represented the issue as a matter mainly of access to physical resources such as computers, telephony and other networked ICT resources. While these technical appurtenances remain important to realizing greater global information equity, there is insufficient attention being paid to the urgency of information literacy and the development of the inherent information seeking capacities of humans, as a key component to any strategy to redress the digital divide.

As Horton (2007) points out, information literacy is about developing a wide range of cognitive skills: “understanding technologies is not enough” (p.5). Similarly The American Association of College and Research Libraries (ACRL), notes that information literacy “is an intellectual framework for understanding, finding, evaluating, and using information—activities which may be accomplished in part by fluency with information technology, in

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part by sound investigative methods, but most important, through critical discernment and reasoning. Information literacy initiates, sustains, and extends lifelong learning through abilities which may use technologies but are ultimately independent of them." (ACRL, 2000 p.3). While this definition is a useful one, its failure to reference people's information needs stands out.

Among the foundation competences required to seek out, interpret and make meaningful use of information, based on one's needs, are the traditional literacy skills of reading, writing and computation using a recognized system of symbols. From this point of departure, the chapter will explore the definitions and meanings ascribed to what we shall call the 'multiple literacies' required to function effectively in a knowledge-based society.

Many traditional societies already have forms of literacy and knowledge sharing that are often unrecognized and undervalued. Oral traditions of learning and knowing characterize many societies not equipped with the conventional tools of reading and writing. Knowledge is acquired, organized, stored and effectively communicated in many cultural and linguistic forms and through developed systems of non-verbal communication. Some of these competences may be gained from an early age or may be acquired later in life. One form of literacy may be used to enhance, teach and reinforce other necessary forms of literacy in the on-going cognitive process of learning, doing, growing and human development.

When applied to the concept of the digital divide, this idea of multiple literacies proves to be a potent construct in understanding how modestly endowed societies in terms of information communication technologies, may build on their own knowledge systems to increase information flow and operational effectiveness. It also helps us to understand how from their own knowledge base, these societies can more securely adopt and adapt new forms of knowledge, using new literacies and new technologies of information gathering.

We will delineate the varied forms of literacy and multiple representations of the digital divide already evident, and explore their relationship to notions of globalization. We argue in favour of a new multi-dimensional approach to human literacy that foregrounds information literacy as one way of beginning to tackle the wider, more long standing and pervasive social and economic divides that now increasingly reflect themselves in disparities of access to information. While these disparities are more clearly demonstrable within the ex-colonial countries of the South, these divides also pervade substantial marginalized segments of the industrialized north, such as reservations, trailer parks, inner city housing estates, deep rural villages and poor ethnic communities – places and spaces where concepts of economic disparity, digital divides and the need for information literacy and 'multiple literacies' will be just as applicable as in the global South.

The focus of the chapter is on deepening theoretical perspectives and sharing alternative understandings of literacy and the digital divide. It explores new approaches to redressing the global disparity, which is often as much economic and class based as it is linked to physical access to information. While encouraging a growth in technical access to ICTs, we argue that a solid foundation of technology assisted basic education is a key prerequisite to advanced and effective use of ICTs. The challenge of bridging the digital divide emerges as a far more nuanced and complex process involving greater emphasis on social context, multiple literacies and, yes, effective technology access.

While the analysis seeks to challenge conventional technology-driven approaches and to question linear notions of learning it also presents a frame of reference that offers new research-based insights into the experiences, geography, social and cultural characteristics of people from within the South.

ICTs, E-EXCLUSION AND LITERACY

The recognition that the so-called 'digital divide' extends well beyond the physical inaccessibility to ICTs is crucial to finding a solution. The National Telecommunications and Information Association (NTIA), in its influential study entitled 'Falling Through the Net: A Survey of the 'Have Nots' in Urban and Rural America' linked inequalities in information and communication technologies (ICTs) to development gaps. Although not using the term 'digital divide' the NTIA study suggested that the physical inaccessibility to ICTs ran along racial, gender, demographic, educational and socio-economic lines.

This study was by no means the first to call attention to this deficiency in techno-access and information flows. While it may be one of the first major reports to reflect these problems within the industrialized United States, other global studies have also highlighted the gaping disparity in information access and linked the divide to deeper and longer standing social and economic inequities. Unesco's 1980 McBride Report, entitled 'Many Voices: One World' highlighted information flow challenges in developing countries emanating from the editorial content and technical dominance of the then established Northern international news agencies over the circulation of news around the world. Less than five years later, in 1984, the ITU published the Maitland Report, dubbed 'The Missing Link', in which the gulf in telecommunications resources and technology flows between the developed and the developing countries was featured. Today, we are concerned about more than a missing technical link, but how a more holistic approach might be taken to mitigate the effects of long-standing global disparities.

Even against this background, the NTIA's 1995 Study was constructed mainly as a dichotomous phenomenon, that is, highlighting 'information haves' and 'information have nots'. While providing a stark and useful contrast of differing conditions and lifestyles within the United States, the report did not sufficiently acknowledge that people from all social and economic backgrounds may gather and store information differently, related to their means and the nature of their needs. This is integral to the argument being advanced here about the need to acknowledge varied forms of literacies, including local and indigenous means of information processing, traditional knowledge systems and indigenous learning methods, beyond the conventional.

The Information Technology Access For Everyone (ITAFE) programme of the World Economic Forum operates implicitly on the same dichotomous premise as the NTIA's Report. The range of their programmes appears to emphasize physical access to ICTs as a desired end, rather than as a means towards multifaceted human empowerment. Programmes like the ITAFE generally measure the degree of digital inclusion or exclusion using variables such as the ratio of inhabitants to phone lines, the number of Internet users of Internet Service Providers (ISPs), and the number of mobile subscribers.

Ongoing research over the years has deepened perspectives on the digital divide to cover some aspects that were being overlooked in earlier research, policy formulation and implementation. The Organization for Economic Cooperation and Development (OECD), OECD, for example has offered a useful definition of the divide as "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICT and to their use of the Internet for wide variety of activities."(2001, p.4). There is an important recognition here that the divide encompasses individuals, communities and businesses and that stages of development are relevant to the concept. In its historical and emerging forms, the divide reflects itself in gender disparities, in language use as well as in geographical, social and technological imbalances.

The Internet provides one representation of this global disparity across many social and demographic indicators. We may consider here just the global inequity in Internet use as a proxy for other development gaps. According to the Internet World Statistics Database (2008), Africa, with the second largest population after Asia, recorded a 5.3% Internet penetration rate compared to just over 73% in North America. While the African continent registered the second fastest growth rate in Internet usage globally between the year 2000 and 2008, the challenges of being typecast as lacking in conventional literacy and with acute household income constraints and national financial challenges, the pace of growth may yet be slowed.

The highest Internet penetration rate was indeed in North America, which clocked a 73.6% penetration rate. However, that region, consisting of mainly the United States and Canada, not surprisingly, showed the slowest rate of growth in Internet usage. The region of Oceania/Australia had the second highest penetration rate at 59.5%. Asia, with by far the largest population globally, had a 15.3% Internet penetration, but enjoyed the largest percentage of Internet Users at 39%. The fastest rate of usage growth is taking place in the Middle East, which has a relatively low 21.3% penetration rate. In Latin America/Caribbean, the penetration rate was recorded at 24.1%, but with the third fastest growth rate in usage globally. Europe had a penetration rate of 48.1%, with that region having the second slowest growth rate globally. The North-South divide is quite evident in these statistics. However, what they do not disclose are the deeper economic cleavages as well as the internal access and usage divides within regions and countries and the linguistic, cultural and gender divides that exist globally. The extent of exclusion of people with varied disabilities is also not reflected in these statistics, which while expected to shift moderately over the next few years, will likely retain the fundamental rankings for the foreseeable future.

Norris (2001) believes that the digital divide has three distinct aspects: global, social and democratic divides. By global divide she refers to differential access to Internet between nations; social divide refers to the existence of information rich and information poor; and, the democratic divide refers to differential access to ICT applications in governance, and issues in the public domain. While we appreciate Norris' extension of the concept, we believe that the notion of what constitutes access to ICTs must be further disaggregated, as a vital prerequisite for a more nuanced and holistic understanding of the reality of the digital divide.

Whereas physical access to ICT infrastructure is a vital prerequisite for individuals to participate in the networked society, one's success is contingent on a range of other forms of access. From this vantage point, Wilson (2006) makes a useful distinction between 'formal' and 'effective' access to ICTs. He argues that installing a cable in the vicinity of a school or community is formal access, while making sure that the connection results in a linked desktop for trained prospective users would go some way in making this effective access. In addition, effective access could also be measured by the extent to which the community is represented in the related policy process (Wilson, 2006, p.304).

Wilson's outline of eight types of engagement considered conducive to effective access is worth reflecting on here:

- Physical access, refers to individual's physical proximity to and access to ICT equipment
- Financial access, refers to individual's ability to pay for ICT equipment and services
- Cognitive access questions a potential consumer's mental capacity to identify information needs, find, use, evaluate and store that information.
- Design access refers to 'human-machine interface'. This questions whether ICT

hardware and software are designed to meet the needs of a given population.

- Content access underscores how meaningless physical access to ICTs could be if all content on these platforms have no significance or relationship to their culture or lived reality. It also questions the ability of individuals to develop content of their own.
- Production access speaks to the concern that "the vaunted information superhighway runs in one direction only, from North to South. There is much less content produced by the South for the South, and much less that flows from South to North". (p.302)
- Institutional access refers to "the variety of organizational forms and regulations that have emerged around world as contending groups struggle to structure access to digital content in particular ways". (p.302).
- Political access refers to the ability of marginalized people to gain access to the political decision making processes in their countries in order to contribute ideas on what policies better suit their communities. (p.303)

Many elements of Wilson's extensive narrative of 'effective access' are consistent with our own earlier call for greater global inclusiveness, local political control and social equity with regard to digital information flows. These measures were seen as being among the most meaningful ways to redress current and historical divides:

The South needs to adopt the mental attitude and practical approaches which emphasize up-loading our own content under controlled conditions, to national, regional and global networks such as the Internet. Both in the areas of audio-visual media and text-based content services, developing countries must seek to create and sustain a counter-flow of information, as an alternative to the vast volumes of information flooding in from the North. The process should also involve enhancing existing levels of information exchanges in an effort to foster more education and development, using the accumulated knowledge and appropriate technologies of the historically oppressed societies. (Dunn 2001, pp 67-68)

The idea embodied here and in Wilson's analysis is that it's not any type of access or any type or volume of content that matters, but that attention should also be given to how access is achieved and to the quality of content that is made available. The paper therefore makes the argument that societies with even modest technical ICT deployment can leverage the quality of access and content to make meaningful economic and social contributions. The perspective on why this is important is reflected in Haddad's definition of the digital divide, where he suggests that "[N]arrowing the divide - publishing a newspaper in every village, placing a radio, and wiring every building to the Internet - does not automatically solve the problem. The most serious divide is in the extent and quality of human knowledge and learning. It is not digital, it is educational." (Haddad, 2001). Wilson's views on cognitive access, production access, content access and design access could also be situated in Haddad's overall frame of analysis. It is from this vantage point that the paper advocates a process of south-south and south-north networking using our concept of 'globalization from below' (Dunn 2001, p.67). Underpinning this approach is the need for a range of literacies to redress the digital exclusion of the peripheries in the South and the North.

We agree with Wilson that getting meaningful physical access to ICTs by the marginalised is not the function of technologists or ICT practitioners, but lies to a large extent in the domain of economic, social and educational structures. For instance, the degree of foreign direct investments or government capital injection into the telecommunications sector will largely determine how many people get access to telecommunications services. Equally, tariffs levied on ICT imports will make the cost of such ICT systems higher as importers must retrieve their costs plus a profit markup. We argue that greater emphasis on public policy-making and technology education rather than simple technology transfers will yield more widespread benefits. In particular policies that seek to revise older, monolithic conceptions of literacy into more nuanced and multifarious ideas of cognition and social learning are more likely to succeed as one key building block in re-thinking remedies to the digital divide.

DE-CONSTRUCTING LITERACIES

Historically, literacy connoted the basic ability to produce and understand written texts at a basic level of proficiency. Literacy was seen as a matter of enabling individuals to acquire a set of technical skills namely, reading, writing and calculating. This view was supported by methods of promoting literacy as a single model approach, where a general set of techniques were seen to be easily applicable and transferable irrespective of content, method of distribution and cultural context.

The Universalist claim of literacy or autonomous literacy is "seen as a general, uniform set of techniques and uses of language, with identifiable stages and clear consequences for culture and cognition" (Collins, 1995, p.75). The Universalist approach was primarily promoted as the method by which individuals could acquire these skills and also influenced the conception of mass literacy campaigns. Collins further points out that this method tends "to assume a clear cumulative distinction between literacy and orality and, as formulated initially, that the literacy of the West was somehow exceptional to all other literacies" (p. 76).

Like other critics of the Universalist approach, we maintain that the single model approach is too limited and that literacy is not autonomous or a set of discrete technical and objective skills that can be applied across all contexts. Instead, literacy is determined by the cultural, political, and historical contexts of the community in which it is used, drawing on academic disciplines, as reflected in the more diverse approach of cultural anthropology and linguistic anthropology. The central assumption that literacy can be treated as a "thing in itself" is challenged by more realistic arguments that there are "diverse, historically and culturally viable practices with texts"

This concern of multiple literacies is focused on "the diversity and social embeddedness of those ways with text we call literacy, emphasizing the ways as much as the texts" (Collins, 1995 pp. 75-76). It is associated with comparative anthropological criticism of claims made for a unitary or autonomous literacy, questioning literacy's causal consequences in social development or cognitive progress with detailed ethnographic studies of inscription and discourse. This approach undermined the notion of separable domains of orality and literacy, with revisionist historical scholarship re-periodizing and reframing the debate about literacy and social development in the West. (See Collins, 1995, p. 76)

The ongoing debate has influenced internationally agreed-upon definitions of literacy. In 1958, UNESCO's definition indicated that "a literate person is one who can with understanding, both read and write a short simple statement on his or her everyday life" (UNESCO 2004). This often quoted definition was revised by 1970 as a result of attention being given "to the ways in which literacy is linked with socio-economic development" (UNESCO 2004, p. 9). The concept of "functional literacy" was conceived where literacy was valued as a technical solution to socio-economic problems.

A functionally literate person is one who can engage in all those activities in which literacy is required for the effective functioning of his or her group and community and also for enabling him or her to continue to use reading, writing and calculation for his or her own purposes and the community's development (UNESCO 2004, p. 9).

But even this revision by UNESCO was not holistic enough. It did not capture the multiple contextual life skills that we have argued are a crucial part of the competences qualifying a person as being literate. UNESCO later further developed its conceptual approach in this direction. In the 1980s and 1990s, the UN agency acknowledged literacy as being also a technical skill, seeing literacy as a "set of practices defined by social relations and cultural process - a view exploring the range of uses of literacy in the entire spectrum of daily life from the exercise of civil and political rights through matters of work, commerce and childcare to self-instruction, spiritual enlightenment and even recreation." (UNESCO 2004, p.10)

In 2003, a proposed operational definition was further formulated which appropriately aimed to include the several different dimensions of literacy.

Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society. (UNESCO 2004, p .13)

As an operational corollary to this definition it was argued that the concept now needed to be "centered on the life of the individual person" (p.13). In this regard, UNESCO acknowledged that "more reflection should be given to incorporating into it the various circumstances in which individual learners live their lives." (UNESCO, 2004, p.13).

With these re-conceptualizations, the international community no longer saw literacy as a "stand alone" skill and embraced the evolving plural concepts of literacy as a "key element of life long learning in its lived context". (UNESCO, 2004, p.10)

The plurality of literacy refers to the many ways in which literacy is employed and the many things with which it is associated in a community or society and throughout the life of an individual. People acquire and apply literacy for different purposes in different situations, all of which are shaped by culture, history, language, religion and socio-economic conditions. (UNESCO 2004, p.13)

At the same time, however, it must be acknowledged that in view of actual practices, not all functional approaches to literacy have failed, nor have all mass literacy campaigns proceeded on the uni-dimensional basis. A number of countries within the global South implemented politically motivated literacy campaigns that produced remarkable results precisely because they privileged local and national contexts for learning and in some instances included work related and technical applications in delivery strategies that preceded the information revolution. Many of these campaigns helped transform rural and national life in countries such as China, Cuba, Nicaragua, the United Republic of Tanzania and Viet Nam in the South and similarly within the former USSR in the global North. The important role of political will and social mobilization in literacy efforts also influenced traditional literacy campaigns in Ecuador, India and South Africa. These countries have "achieved remarkable results in meeting the learning needs of different groups, paving the way for more advanced literacy practices and continuous learning opportunities." (UNESCO, 2004, p.10).

The contemporary application of the plural notion of literacy will be useful for orienting the discussion on information literacy to include critical issues such as cultural and social contexts, access and empowerment.

One important issue implicit in the conduct of mass literacy campaigns globally is the profound question of why mass literacy programmes became necessary in the first place. It would seem that this was reflective of a breakdown in the established educational systems in these and many other countries. Conventional educational delivery through schools, churches or home tuition facilities were seemingly not within reach of the affected population groups either physically, culturally, psychologically or financially. Their approach to education may also have been fundamentally flawed. It is to this possible deficiency that Paulo Friere addressed his potent critique of the conventional educational establishment:

Education thus becomes an act of depositing, in which the students are the depositories and the teacher is the depositor. Instead of communicating, the teacher issues communiqués and makes deposits which the students patiently receive, memorize, and repeat. This is the "banking' concept of education, in which the scope of action allowed to the students extends only as far as receiving, filing, and storing the deposits. They do, it is true, have the opportunity to become collectors or cataloguers of the things they store. But in the last analysis, it is the people themselves who are filed away through the lack of creativity, transformation, and knowledge in this (at best) misguided system... (Friere, 1993)

These are the very complexities that the new multi-dimensional and pluralistic approaches to literacy seek to address or redress. The delivery of training in the multiple literacies required for the current age must include some emphasis on the contextual deployment of information literacy.

Information literacy is an important part of the toolkit in forging greater effective access to ICTs. But it is to be seen as one in a range of literacies often available within particular locales. Collins' useful distinction between the Universalist and situated accounts of literacy is to be valued. His suggestion that the Universalist perspective on literacy views it as a "uniform set of technologies and users of language, with identifiable stages and clear consequences for culture and cognition" reflects aspects of Friere's critique. Alternatively, the relativist's account is seen as "diverse, historically and culturally variable practices with texts." (Collins, 1995 p.75). The Universalist perspective views literacy as a "technology of the intellect" in line with Goody and Watt's main proposition that literacy helps to draw the distinction between myth and history, opinion and truth and oral culture and documented historiography. Collins further suggests that critics of this hypothesis "have questioned the central assumption that literacy can be treated as a thing-in-itself, as an autonomous technology" (1995, p.78). Instead, these critics who argue for a more situated or relativistic viewpoint of culture, have asked whether "literacy is not essentially embedded; its nature and meaning shaped by, rather than determinate of, broad cultural-historical frameworks and specific cultural practices." (Collins, 1995, p.78).

Dunn and Brown (2007), in agreeing with this situated viewpoint of information literacies, reaffirmed their view that societies with even a moderate degree of technological development can leverage their own situated literacies to maximize the benefits of technologies. Their argument is critical to the discussion on strategies for closing the digital divide:

ICT does not an information literate society make, but the technologies are enablers of multi-phase plural literacies, lifelong learning and the empowerment process. This is so because they give the user greater control over the rate at which information is consumed and understood, the time when such information is used and the power to create content. As we have seen the core principle of empowerment relies on achieving the full potential of an individual, community, and country, and in an information economy ICTs can be leveraged to achieve such an end . (Dunn and Brown, 2007, p.21).

It is the more varied concepts of literacy and learning that may be most applicable to the cultural and economic contexts of the global South. It is these approaches that may also best contribute to challenging some of the long embedded dimensions of the historical socio-economic disparities now reflected in the current notions of the global digital divide. To re-phrase Haddad, it is not simply a technology-based digital divide but more precisely an educational and social divide, created, I might add, by historical and economic disparities and contemporary gaps in vision, resources and policy.

INFORMATION AS COMMODITY

Underpinning our analysis of both conceptual and resource deficiencies is the recognition of increased importance being placed on information in all sectors of the global economy. Negroponte has argued that the ability to digitize information signals a new global order, and may be a foundation layer supporting the growing services dominated global economy. Separate and apart from trade liberalization, the growth of services rooted in information or knowledge based sectors is a distinct characteristic of globalization. For instance, an OECD study in 2007, indicated that "the main drive is for countries to move up the value chain and become more specialised in knowledge-intensive, high value-added activities. Specialisation in more traditional cost-based industries and activities is no longer a viable option for most developed countries." (OECD, 2007, p 19).

Moore as cited by Rowlands also anticipates that this new economic orientation can be used as a step towards more integrated development among global south nations:

In the less developed and newly-industrialised countries an information society is seen, not as a means of hanging on to an existing position, but as a path towards future prosperity through accelerated economic growth. This accelerated growth is, however, also seen as the key to solving long term socio-economic problems, such as rural stagnation, urban blight, disparities in income, poor education and inefficient public services. (Moore, 1992. pg.92, as cited in Rowlands (Ed), 1997)

Against this backdrop, the urgency of redressing the existing knowledge divides becomes even more critical. Free market mechanisms and the lowering of computer costs suggest that overtime even low income users will be able to gain access to the digital domain through transitional and integrated technologies such as mobile phones as a result of market competition and industry growth. An example of this is demonstrated in Jamaica. The diffusion in the Jamaican market of Motorola's high-end mobile phone, called the 'Razr', caused a dramatic 'Razr phenomenon' in about 2006. Its Internet enabled capacity, video and voice recording functionalities and attractive design made it a highly desired cellular phone among all social groupings in the society. Acquiring this cell phone would have cost a buyer close to US$384 in 2006.[1] In 2008 however, this cell phone can be acquired at around US$138 or just over a third of the original price two years earlier. The point is that the market will provide a certain narrowing of the cost gap for certain technologies thereby reducing one component of the divide. But the question is should public policy be premised entirely on the vagaries of the market.

For Robert McChesney, "the very essence of the technological revolution is the radical development in digital communication and computing". However, while these changes proceed a pace, he warns that the social implications of a purely market oriented ideological underpinning should be approached cautiously:

For capitalism's cheerleaders, like Thomas Friedman of the` New York Times, all of this suggests that the human race is entering a new Golden

Age. All people need to do is sit back, shut up, and shop, and let markets and technologies work their magical wonders. … [T]hese claims should be regarded with the utmost skepticism. (McChesney, 2001 p.1)

Alongside demonstrable market-driven price reductions, there is need then, for more strategic public policy interventions that can confer a wider range of benefits, including information literacy, content production training and capacity building to achieve more meaningful change. Understanding ones information needs, finding such information, and using and evaluating that information are now critical skills necessary for empowering marginalized people to be active participants in the information society.

SOURCES OF THE DIGITAL DIVIDE

Arising from our foregoing analysis is the need to broaden the theoretical lenses through which the digital divide is viewed, especially as it relates to information policy. Rowlands (1997) citing Weingarten defines information policy as "the set of all public laws, regulations, and policies that encourage, discourage, or regulate the creation, use, storage and communication of information." (p.29). It is not often foreseen that public policy formulation and implementation processes addressing information policy are sources which can give rise to the emergence of both digital divides and social divides. According to Rowlands:

[I]nformation supply, transfer and use take place within an environment which is in a constant flux, shaped by the often unpredictable interaction of commercial, economic, technological, social and demographic forces…public policy has an influence, directly or indirectly, on each of these sets of forces; hence, even such broadly horizontal policies as those relating to education, open government or the funding of civil science may have quite dramatic implications for information availability and use. (Rowlands 1997, p.29)

The danger in the information policy-making process that policy analysts must guard against is the uncritical importation of prescriptive policies from the developed country context, into the developing country context. This is a danger which economists such as Girvan and Beckford have advised against. In a study on technology policies in small developing economies, Girvan warned that "the importation of developed country technology, especially in unmodified form, does not necessarily lead to self sustaining development and can exacerbate the social, economic and environmental problems of poor countries rather than attenuate them." (As cited in Dunn, 1995 p. 21). Clearly, if the public policies and technologies do not take account of the domestic situation in terms of literacy levels, poverty distributions, per capita income and other socioeconomic variables, then such policies are likely to fail to achieve their stated objectives.

If public policy can be seen as the balance of power between competing interests, then resultant policy is often reflective of the superior bargaining power of particular stakeholders. Wilson adds credence to the notion that while technological diffusion may be achieved with relative ease, the negotiated process of social and institutional changes necessary to facilitate the effective is far more complex. According to Wilson (2006), "it is virtually impossible for the technical, and commercial, and institutional gears to mesh and turn efficiently unless the politics is right. If the politics is wrong, especially in developing countries, then the other three elements will not function." He argues further that "since institutions are much weaker in poorer countries, a revolution that is mainly institutional and not technical is not easily achievable." (pp.12-13).

The idea is that while it is easy to grant people of the developing south some amount of access to aid related technical resources, this may often not translate into meaningful sustained economic growth, development and empowerment. The inhibiting factors include institutional capacity, strategic vision and the lack of political will among many global south leaders. While the situation will vary from country to country, our perspective is that overall, institutional and political issues play a significant role in redressing or exacerbating e-Exclusion and the known socio-economic divides.

Within the nascent political and institutional environments in most developing countries, the issue of formal or functional literacies in information policy must be examined to determine its influence in perpetuating the widening digital divides.

To address this issue, recall Weingarten's definition of information policy, which suggests that the public policy outcome of information policies may be unequally influenced by a ruling, governing elite. These governing elites, who are themselves steeped in the culture of formal and functional literacies, are unsympathetic to the range of other literacies that people might posses. They insist on pursuing traditional public policies on literacy imported from the developed country context, which do not fit into the cultural context of the global south. This unequal power relation in the policy making process may well be an additional source of digital exclusion and demand for change. Friere reflects on the same social contradictions in educational terms:

Problem-posing education, as a humanist and liberating praxis, posits as fundamental that the people subjected to domination must fight for their emancipation. To that end, it enables teachers and students to become Subjects of the educational process by overcoming authoritarianism and an alienating intellectualism; it also enables people to overcome their false perception of reality. (Friere, 1993)

There is a perceived unwillingness on the part of certain power elites to acknowledge that oral cultures and other forms of literacies, if appropriately honed pedagogically, can be potent constructs for people to gain more functional competences including information literacy, in a manner consistent with their cultural and social environments.

We will discuss this point by looking at oral culture among lower income peoples and the paucity of public policies to harness that culture as an educational tool, economic resource and an avenue for redressing digital exclusion.

LITERACY, ORALITY AND PUBLIC POLICY

As previously mentioned power elites in the global south tend to have an unequal amount of power in information policy formulation and implementation. Their own experiences, education and socialization, as power elites inform their approach to policy making and the items they advocate on the agenda. The idea of orality and literacy has not featured highly in policy debates, because it seems that dominant power elites are mostly in favour of formal literacy paradigms. Not much work or thought have been done on whether information technology could be leveraged to bring oral literates into more mainstream formal literacies. What does the orality versus literacy debate offer in better understanding this possibility?

The position of critics against orality maybe summed up as: "spoken words are always modifications of a total situation which is more than verbal. They never occur alone, in a context simply of words. Yet words are alone in a text." (Ong, 2002). The idea is that the spoken word is ephemeral, without memory, liable to misinterpretation and without context. Whereas, literacy is perceived as synonymous with text, is presented as long lasting and a basic prerequisite for participation in mainstream society.

But, we are suggesting in line with Imbo (2002), that a false distinction is often made between individual and collective memories. For instance many of the esteemed classical texts such as the Homeric corpus, including the Iliad and Odyssey grew out of an oral culture, in which stories were recounted accurately from memory over many successive generations. But, is there a real dichotomy between texts and orality as critics of the oral culture are suggesting? We may begin to perceive an answer through Imbo's definition of text as "… any bearer of signification. It is a consciously designed system of symbols characterized by the internal inconsistency of those symbols and specific conventions for explaining and assigning meanings." (p.50)

At the core of being information literate (or having multiple literacies) is the potential to understand the form and essence of any systems of symbols transmitted through a medium, whether through oral discourses or written [read 'texts']. The understanding of a signification is not uniform throughout global societies, but each interpretation is contextual. Oral discourses, seen as 'text', should not be compared to written discourses and then adjudged a lower or inferior form of literacy. Instead we are arguing that orality and folk forms of knowledge can be a potent construct for the understanding of numerous other discourses, or information literacies where the public policy framework exists.

MULTIPLE LITERACIES AND THE DIGITAL DIVIDE

The intention here is to demonstrate the conceptual link between the varied forms of literacy and how they can be applied to redress the digital divide. The idea of multiple literacies which includes oral cultures can begin to point a lead to creative ways to redress the digital divide among marginalized people. A caveat is necessary: Our argument does not seek to establish a monocasual and unidirectional relationship between literacies and specifically the technological conception of the digital divide. Instead, we argue that the technological dimension of the divide has been unduly emphasized. The other ways, in which the digital divide is manifested, specifically cognitive, content and effective inaccessibility will be the points of emphasis in our discussion. It is on these terms that one fully understands how a plurality of literacies can help marginalized people to be efficient in the information domain within the context of a modestly endowed digital architecture.

Traditional approaches to learning and teaching, perhaps, number highly among the core factors perpetuating the digital divide, to the extent that the divide is conceptualized in cognitive, content and effective access terms. This observation is in keeping with the preponderance of rote learning approaches in the global south and what Friere called 'making deposits of information' into students

Jamaica provides a useful context for this analysis. According to Carlson and Quello (2002), "the educational system is historically stratified and remains so inspite of policy interventions in education (grade 6), students are tracked into different types of secondary schools of clearly different levels of quality. Children of poor families in the rural areas and the inner cities receive a low quality education that the high enrollment rates mask. It is here that the problem of school dropout in the later years of secondary education begins, with poor quality teaching and poor attendance. This particularly affects boys." The study paints a picture of a system in trouble. Although there is high enrollment up to Grade 9, there is a sharp fall off thereafter, reflecting a bottleneck in space availability, but also in levels of attainment of literacy and numeracy by students across the system, and particularly those in poor rural and inner city communities.

Carlson and Quello (2002) further stated that:

By far the most serious problem is students´ reading abilities. Deficient reading starts in the lower *primary grades and continues to build, year-on-year. Poor reading abilities are concentrated among boys. By the time students reach grade 6, 30 percent of students read below their grade level. By grade 9 a huge divide has occurred—large numbers of students, especially boys, cannot read or write, some are functionally illiterate. Because of their reading deficiency, they cannot learn the content of various subjects. This is the tremendous paradox of Jamaican education that standard statistics do not reveal—high enrollment rates through lower secondary but low learning, interest and participation.*

In the report, Hyacinth Evans, A Professor of Teacher Education is quoted as saying, "…boys and girls enter grade 1 in equal numbers and with roughly the same kinds of experiences and skills, though we know nothing about their attitudes to school work at this age. …By the time they reached Grade 5 and 6, major distinctions were detectable in their attitude to and interest in work, the quality of work which they produced and in the academic performance...". The situation has not changed dramatically since this assessment and has been confirmed by subsequent studies and analyses. According to the Report of the Task Force on Educational Reform submitted in 2004, about 30 per cent of primary school leavers were illiterate and "only about 20 per cent of secondary graduates had the requisite qualification for meaningful employment and/or entry to post-secondary programmes".

The implication is that with a labor force that is substantially illiterate, the country has a very slim chance of attracting technology based foreign direct investments. These industries are very reliant on the possibility of value added through the cognitive abilities employees in the host country. We are contending that the issue of content in curriculum is not the major issue – Laws of Indices in India, remain Laws of Indices in Jamaica - it is pedagogy and instructional design methods that are critical lynchpins to realizing better academic results from students and in the long term attracting value based technological investments. Certainly, this is an indirect and novel approach to redressing the digital divide.

But what about literacies? Where do they fall in the scheme of things? We are contending that these notions should be the underlying mechanisms motivating a new philosophy of educational approach in developing countries: Jamaica has started to engage this approach. The Broadcasting Commission of Jamaica has long called for instituting information literacies, including media literacy, in teacher education and the school curriculum. This is finally being undertaken through a partnership between the Broadcasting Commission and the Joint Board of Teacher Education. This approach would train and enable teachers to guide students in processing media output and in how to use technologies and programmes that are more appropriate to particular age groups.

It is common knowledge that new media platforms like SecondLife, instant messaging services such as MSN messenger and networking locations which number over 150 sites on the Internet, are mainly dominated by the adolescent to young adult demographic grouping. Among the sites under reference are MySpace, Flixter, Netlog, Elftown, Goodread, College Tonight, Friendster, Photolog, Facebook, YouTube, Hi5, MyChurch, and many others, most counting their subscribers in the tens of million users globally. See: http://en.wikipedia.org/wiki/List_of_social_networking_websites.

These user-created and youth populated sites are supported by Web 2.0, a technology which as we have noted, puts subscribers in control of content creation and global distribution. This is what motivates the high school age grouping and younger cohorts, and access persists well into adulthood. Gee (2004) has called these "affinity spaces" operating in a participatory technological culture. These spaces are really informal learning spaces, where peers relate to one another on a casual basis and new ideas are allowed to be shared freely.

Jenkins (2006) holds that affinity spaces are fertile grounds for learning as they are "sustained by common endeavors that bridge differences in age, class, race, gender, and educational level, and because people can participate in various ways according their skills and interests, because they depend on peer-to-peer teaching with each participant constantly motivated to acquire new knowledge or refine their existing skills, and because they allow each participant to feel like an expert while tapping the expertise of others."

He further maintains that affinity spaces are distinct from formal educational systems in several ways. While formal education is often static and conservative, the informal learning within popular sites and culture is frequently experimental, dynamic and innovative. The structures that sustain informal learning are seen as more provisional, while those supporting formal education are more institutional.

SPATIO-TEMPORALITY, TRANSITIONAL TECHNOLOGIES AND THE GREAT DIVIDES

Reference has already been made to the argument here that the digital divide closely approximates and follows other more known and established social and socio-economic inequalities. For example, traditionally depressed and marginalized rural communities are expected to have a similarly much lower rate of ICT diffusion than certain more well endowed more upscale or wealthy communities. In this section of the chapter, we employ a spatio-temporal analysis to demonstrate how information literacy empowers low-income citizens to use transitional technologies to help bridge not just technological divides, but also to begin to tackle broader social and economic divides.

In a national research study conducted in 2008, we found that low-income Jamaicans were using mostly inexpensive transitional technologies (mainly the mobile phone) to circumnavigate the challenges of the more entrenched social and economic divides in a spatiotemporal way (Dunn, 2008). These empirical data enable us to argue that the power of such transitional technologies, buttressed by a range of acquired information literacy skills, make for a hopeful construct to help redress exclusion among low income persons in the global south.

The concept of space and place is critical to understanding how transitional technologies can bridge the digital divide and mitigate other social and economic divides among low income citizens. Brown and Perry (2002, p.50) suggest that "… to call something a 'place', brings attention to its located, embodied, personal, local, human nature. And to call something 'space' is to bring attention to its abstract, objective, global, general, inhuman qualities." Brown and Perry also argue that there can be objective localized conceptions of space. For instance, a user of a communication technology is at once in two spaces simultaneously: the physical space where each user is located and the metaphysical air time space, which both users occupy. This point is demonstrated by Schegloff as cited in Rettie (2005); Schegloff reports on a cell phone conversation he observes: "'Do you mind!?' This is a private conversation!' Schegloff writes, "she [phone user] is almost literally in two places at the same time…The other place [space] that she is, is 'on the telephone'. And she may well understand that to be a private place [space]… (she) is not in the same 'there' as the rest of us are; there are two 'theres' there".

Schegloff's observation of the simultaneous existence of the young lady in two different places and space seems to fit into the Bauman's notion of "liquid modernity". A core idea of modernism is that modern societies consist of solid social structures- the intensification of bureaucratic power in a network of institutions. This monolithic conception of present day society runs counter to Bauman's idea of a liquid modernity: "In a world of shape-shifting capital and labour, modernity is best defined as amorphous – in short, liquid." Bauman's idea could also be seen in the context of Urry's (2000) notion of multiple mobilities. Urry suggests mobility does not only refer to the movement of people but also "of other societies of ideas, images, technologies, monies, flowing across various scapes". (p188).

Looking at the digital divide in the context of this 'amorphous' modernity we immediately realize how complicated the issue becomes. For example, in the Jamaican society, we established that social and economic inequalities are rife in the Jamaican society, which is actually an outgrowth of the history of colonial domination and later the turbulent political period of the 1970s and 80s. In that context, we suggest that the mobile phone as the most pervasive, low cost and integrated technology among low income Jamaicans in both rural and inner city communities performs a special role in society. The mobile is serving as a bridge into the world of broadband Internet access for many who would otherwise not have that kind of access. The analysis within this study regards the mobile as a bridge, because on the one hand it is a communication device, and on the other it is also a medium, a link into more advanced technological usages and more advanced economic and social intercourses.

These advanced usages are enabled without need for the physical relocation of people from their individual places as the residential and inner city communities represent two distinct physical places and spaces. The portability of the cell phone and the mobility of individuals from one physical address to another establish a dynamic process of interlinked usage of space and place. Brown and Perry's space and place framework can be applied here to demonstrate that phone-linked inner city residents, for example, can actively engage in the use of common virtual airtime space with both the social elite and their rural poor counterparts without any group changing their physically embodied place.

Essentially, we are arguing that the mobile phone simultaneously conquests space and place and bridges social and economic divides while introducing users to the thin edge of the digital domain. The learned literacy of texting and of managing the placement, retrieval and conversing in a call may precede higher stage computing literacies among the marginalized. Using their transitional technologies they can become keener on their information needs, able to locate information in the digital domain and evaluating that information when the need arises. Mobile services providers have begun to capitalise on the propensity of low income Jamaicans to use technologies once they are available. The challenge now is how best to develop and implement public policies that are capable of steering attention to more beneficial usages of the Internet, such as for learning and business. Should these avenues be effectively pursued through strategic public policies, then significant progress could be made towards redressing widespread digital exclusion in the global peripheries of the North and South.

We concede that broadband access through the mobile phone is above the budget line of many low income Jamaicans. However, even though we caution against an over-reliance on the free market to be the final arbiter of the distribution of economic goods, this is one instance where we think the competitive market could have, and has been having, a downward pressure on prices leading to improved access among the poor. Recall that it was the competitive free market which led to the phenomenon of almost all Jamaicans being able to purchase a cell phone. With recent developments in the mobile market, including the entry of a major new player, the restructuring of the incumbent and the re-energising of the present market we could see a price war not only on voice-call rates, but also on mobile telephony Internet rates. This could redound to the benefit of consumers including mobile broadband usage by lower income groups.

STRATEGIES AND RECOMMENDATIONS

Part of the global reality is that the poorer, less educated citizens, in the main, enjoy the lowest effective ICT access. That is to say financial poverty shadows digital poverty. Given, this situation perhaps a preliminary analysis would suggest that solving the deeply entrenched economic and social divides would in effect solve the digital divide. That is not likely to be the case. In what is now being hailed as the networked society, one is unsure of the direction of causality between the digital poverty and the social and economic divides that preceded it. This is a viable and recommended subject for future critical research. We know however that the forms of poverty are mutually reinforcing and co-integrated requiring intensive and interdisciplinary study and a web of social interventions.

To address the challenge of the digital divide in a meaningful and sustainable way requires creative and critical thinking and a questioning of received knowledge and perceived obvious relationships. The poor may not wish to be included in ways conceived of by national and global techno-elites of policy specialists. Will the inclusion and participation of the excluded lead to the growth of new forms of exclusions and divides? Within increasingly tight aid and national budgets, is the goal of redressing the digital divide to be prioritized over the provision of other basic necessities such as healthcare, food security and shelter, or are these somehow interlinked in using ICTs to enable people to provide these supplies and services for themselves. With declining preferential treatment in traditional agricultural commodity markets, ICTs have acquired increased importance in many countries that are now looking to export and market creative products and services using the Internet. To what extent will these efforts be thwarted by limited effective access to the Internet and to ICTs for such applications as telework and M-services?

Competence in a range of information literacies is perhaps the emerging lingua franca in the information economy. The ability to identify information needs, locate, use, and evaluate such information is a critical force in enabling low-income people to have an equitable footing in the global economy. In recognition of this fact, we propose a more decentralized and less prescriptive approach to the information policymaking process.

The information policy making process which generally involves dominant social, ethnic or political elites, has in many developing countries dispelled the culture and oral expressions of the lower classes as lacking the basis to support more advanced formal literacies. Both additional research and pro-poor government policy interventions are also needed to develop and advance programmes that link oral and folk expressions to productive sectors (e.g. tourism, information technology, and education) as an avenue for both training in formal literacy skills and for economic empowerment.

We would expect to see reductions in the practice of ‘dumping’ unserviceable equipment in developing countries, while at the same time see an increase in both multilateral and bi-lateral aid in support of not just hardware, but covering the range of capacity building measures that we have articulated as vital in a more holistic ICT development strategy. Facilities focused more on the human and social development are necessary inputs towards meaningful global co-existence and development.

Within the industrialized countries, many still experience their own internal disparities and digital divides. The inequalities cited in the NTIA’s report still haunt parts of North America and Europe, despite the favourable statistics. In a real sense the digital divide phenomena requires the mutual co-operation and collaboration of both the developing south and industrialized north to fully address the issue and to tackle their root causes.

Following two global summits and on-going deliberations such as within the Internet Governance Forum sessions, the search for credible solutions to the disparity in global ICT access and governance continues. Many countries have made major strides in redressing this historical imbalance through deliberately high levels of investment in education, research and training. As countries develop or re-define their ICT development strategies, we close by offering a short menu of the issues that we feel will need to be tackled in challenging e-Exclusion in the global south. The key, strategic elements required for more inclusive ICT development include:

- Closer private and public sector collaboration towards more widespread use of ICT applications, especially e-business, e-learning, e-health, and e-government
- Adoption of policy processes that acknowledge cultural diversity as well as oral texts, folk forms and indigenous knowledge systems
- Increased national investment in research and development of both appropriate technologies and policies
- Engendering an appropriate enabling environment through legislation and systematic deregulation of de-monopolized markets
- Efficient and effective spectrum management to expedite the diffusion process of 3G capabilities on cell phones among the marginalized
- Insistence on a multifaceted modern, basic education, including exposure to information and other forms of literacy.
- Policies to address the gender divide in education, access to ICTs and equal access to jobs, credit and business leadership opportunities.

CONCLUSION AND PROGNOSIS

Redressing the digital divide is an important process for the creation of a socially equitable society. We have argued that societies that are moderately endowed in technological terms can leverage development through an emphasis on a diverse range of educational competences, including information literacy. The proliferation of information content globally suggests that the ability to understand not only one's own information needs but that of a wider global community and the capacity to respond to such needs in an efficient and productive manner is critical to the re-incorporation and empowerment of marginalized peoples. The framework discussed in this chapter is however limited in its generalisability as different countries in the global south have been shaped a range of different social and cultural factors.

The discussion content, on space and time flexibilities and on bridging or transitional technologies all foreshadow new and emerging opportunities to use lower-cost communications technologies to address the information and knowledge gaps in our societies and to generate upward mobility among the dispossessed. The analyses offered in these areas are particularly critical in the context of the growth of user generated content emanating both from youth around the world.

The digital divide, as we have suggested, is a complex, shape shifting and deeply subjective concept. In any reconfiguration of the notion, the catalyzing mantra must be increased emphasis on education, information literacy and public policy reform to deal with what we have elsewhere described as the 'digital millennium'. It may well be worth remembering that even within this milieu of a newly emerging Internet and evolving Next Generation Networks (NGNs), one must not lose sight of the fact that technologies are not ends in themselves, but tools and means to an end. As we reminded readers as early as 1995, "the proliferation of new methods of communication doubtless represents an important transformation. But if we confuse the prevailing technologies of communication with the basic (development) process itself, we run the risk of ascribing more importance to the technologies than they objectively merit." (Dunn, 1995. pg.23).

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KEY TERMS AND DEFINITIONS

Globalization From Below: Use of mobile technologies by the poor and by community-based networks to interact with both their counterparts in the global north and south as a means of building bridges for marketing, trade and for cultural exchange. This is in contradistinction to Globalization from Above, where the ICT tools are used by powerful corporations, governments and the established techno-elites to perpetuate exclusion and promote their corporate income and class interests.

Digital Divide: The differential access to and usage of information and communication technologies (ICTs) that exist both within and between countries.

ICTs Information and Communication Technologies: These include a range of applications from the cell phone to the computer, where all are playing a role in facilitating the global networked economy.

Information Economy: This represents the structural shift in the global economy away from a purely manufacturing or agriculturally based economy to one dominated by services with a disproportionate emphasis on digitized information.

Information Literacies: The degree to which an individual can find, use and understand information from a variety of sources.

Orality and Folk Forms: Represents the cultural traditions of learning and knowledge dissemination, which can be a potent construct for the acquisition of more functional literacies

Transitional Technologies: Technologies that facilitate the mobility of individuals to higher degrees of ICT usage

ENDNOTES

1 At 2006 exchange rates: US$ 1 = $ JMD 65

Division 4

Digital Divides and Broadband Access

Chapter 19
Connection Disparities:
The Importance of Broadband Connections in Understanding Today's Digital Divide

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ABSTRACT

In assessing the integration of the Internet into society, scholars have documented that certain sectors of the population are disadvantaged by their lack of physical access to computer resources. The disadvantaged have traditionally included the less educated, nonwhites, females, the elderly, lower income people and third world citizens. Scholars are now beginning to go beyond basic issues of access to address differences in Internet experiences among Internet users. However, few digital divide researchers focus on the importance and impacts of the various types of connections people use to log onto the Internet. Among U.S. Internet users, we examine which is more important in determining Internet use, the traditional digital divide factors or type of connection. This study examines a wide range of online activities that provide vital information and services for Internet users. We find that connection disparities explain more variance in time spent online engaged in essential tasks, than most other long-established digital divide measures.

THE TRADITIONAL DIVIDE

Initial concerns surrounding the digital divide revolved around issues of access. Certain segments of the population were more likely to have access to computers and the Internet than were other segments. The initial wired population in the United States reflected the more privileged Americans in that they typically had elevated income, education and occupational prestige; they were also more likely to be white, male and young (Fox, 2005; Savage & Waldman, 2005; van Dijk 2006). With the traditional demographic gaps in material access to the Internet starting to narrow in the United States, researchers have started to focus on other dimensions that distinguish different types of Internet users and subsequently, the variability in benefits that are derived from different types of Internet

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usage (Cotten & Jelenewicz, 2006; Davison & Cotten, 2003; DiMaggio et al., 2004; Hargittai, 2002). Once connected to the web, other factors intervene in determining the value a person gains from using the Internet. Two factors that are of particular importance are technical skills and type of connection.

Although Internet navigation skills and being able to produce and manipulate content for the web are important, this project focuses on the issues surrounding type of Internet connection. Given the increasing focus in the United States and around the world on e-business, e-health, e-learning, and e-government activities, individuals are increasingly going online in their homes to perform a variety of activities that they formerly conducted offline. In addition, individuals are increasingly accessing the Internet by a variety of devices other than traditional computers. Thus, understanding the impacts of different types, speeds, and functions of access becomes more prominent. In this chapter, we examine how Internet connection speed shapes one's Internet experiences, and whether type of connection is more important for certain types of online activities than are traditional digital divide factors.

Regardless of computer skills, a faster Internet connection provides more opportunities to accomplish more tasks online than is feasible with a slower connection. We examine four broad categories of Internet activities that users are likely to perform at home: information seeking, business transactions, learning, and general activities. As some of these activities are more easily accomplished with high-speed access, we expect that individuals with broadband connections will report doing these online activities more often than those with non-broadband connections.

Most of the research on broadband technologies focuses on the diffusion or availability of the technology and a general description of broadband users (e.g., Horrigan, 2008, 2006; Reynolds & Wunsch-Vincent 2008; U.S. Dept. of Commerce, 2004). Our study focuses on the importance of having high-speed access at home to create more equitable Internet experiences. By better understanding how Internet experiences vary between high-speed and low-speed users, we hope to provide justification for more proactive government policies to ensure that all users worldwide have high-speed access.

BROADBAND ISSUES

Defining Broadband Access

Connecting to the Internet at a high-speed can be obtained through a number of different technologies, including DSL, ISDN, fiber T1/T3, satellite, WebTV, wireless and cable connections (Savage & Waldman, 2005). There is disagreement about what connectivity speeds actually constitute high-speed and values have changed over time (Han, 2003). The FCC defines broadband as the ability to receive and send data at 200 Kbps (Grubesic & Murray, 2002; Han, 2003) which is 75% faster than the traditional dial-up connections at the rate of 28.8 to 56 Kbps (Grubesic & Murray, 2002).

Worldwide, broadband connections surpassed dial-up connections in OECD (Organization for Economic Co-operation and Development) countries in 2004. In June 2007, approximately 221 million individuals had broadband connections in OECD countries (OECD 2008). Currently, DSL broadband connections are the most common followed by cable connections for U.S. citizens (Savage & Waldman, 2005). The ubiquitousness of the DSL connection in American homes is not only due to the lower cost of the Internet service, but this form of connection allows individuals to utilize their existing phone lines without having to pay for or obtain new technologies (Grubesic & Murray, 2002).

Ostensibly, the advantage of a broadband connection is quicker loading of web-pages and faster access to online programs that are data intensive (Han, 2003; Savage & Waldman, 2005). Broadband connections can be left on without interruption of traditional telephone communications and offers the convenience of not having to spend actual time connecting to the Internet (Savage & Waldman, 2005). Whereas previous digital divide studies found that non-Internet users, compared to Internet users, felt left out of communications and felt disadvantaged at their jobs (e.g., Cole et al., 2008), we expect to find similar disadvantages in terms of activities conducted when comparing high-speed to low-speed Internet users.

Broadband Subscribers

High-speed Internet users tend to reflect the same population that first logged onto the Internet. The privileged population tends to be in a better position to take advantage of emerging computer technologies. In the United States, broadband subscribers are male, white, young (25-44), educated and urban dwellers with higher than average income (FCC, 2008; Horrigan, 2008; Fox, 2005; Rains, 2008; Savage & Waldman, 2005). High-speed subscribers also have more Internet experience and tend to be in multiple family member households (FCC, 2008; Savage & Waldman, 2005). Cole et al. (2008) report that 82% of those with greater than 10 years of Internet experience use broadband to go online, compared to only 40% of those who have been online 1.5 years or less. Recently, African Americans are starting to adopt broadband technologies faster than other racial groups; however, they still lag behind whites in their overall broadband access (Horrigan, 2006).

As of 2008, estimates indicate that upwards of 70% of United States Internet users have broadband Internet access at home, although most reports of U.S. broadband adoption are around 55% (Cole et al., 2008; Fox, 2005; Horrigan, 2008; Horrigan, 2007; Kruger and Gilroy, 2008). The latest Pew Internet Study reports only 10% of U.S. citizens connect to the Internet via dial-up at home (Horrigan 2008). The percentages of broadband connection are even greater among certain populations. In the U.S., over half (62%) of college educated, nearly three-quarters (71%) of upper income, and 82% of experienced Internet users have a broadband connection at home (Fox, 2005). Finally, income remains a salient factor in determining Internet access. Poor countries and poor people are the least likely to be able to afford computers and connection technologies (van Dijk, 2006). These demographic trends are true for most countries (Reynolds & Wunsch-Vincent, 2008; Savage & Waldman, 2005).

Broadband Diffusion

Most Americans have accessed a high-speed connected computer at home or outside of their homes either at work, at friends' or relatives' homes, or in public places like libraries and cafes (Savage & Waldman, 2005). Diffusion of broadband adoption has outpaced previous technologies, such as TVs, VCRs, cell phones, CDs and personal computers (Horrigan, 2007; Han, 2003). As of December 2006, the FCC estimated 82.5 million Americans had broadband connections and that "91.5 percent of ZIP codes had three or more competing service providers and more than 50 percent of the nation's ZIP codes had six or more competitors" (National Telecommunications and Information Administration, 2007, p. 14). Broadband connections are becoming cheaper in areas that have had the technology for longer periods of time (Reynolds & Wunsch-Vincent, 2008). Despite the progress in broadband availability, the United States is ranked lower (15th) than other countries in accessibility of broadband (Horrigan 2007). Countries like Korea, Denmark and the Netherlands have greater deployment of broadband Internet access due to deliberate policy efforts of governmental organizations (Han, 2003; OECD, 2008).

Although the availability of broadband in developing countries is unknown, there is a growing sense that broadband is emerging more quickly than anticipated (Crampton, 2006). Countries like Morocco, Malaysia, Argentina and India report widespread adoption of broadband technologies. One reason for the rapid adoption increase in certain areas, is new emerging technologies such as "…WiMax, the wireless standard that allows for sending Internet wirelessly as far as 70 miles, or 110 kilometers, and third-generation cellular telephone networks that will become more affordable as equipment costs drop" (Crampton, 2006, para. 14). The next generation of wireless cellular phones is the best possibility of spreading broadband to remote and undeveloped regions of the world (Crampton, 2006; The World Bank, 2006).

Geographically, broadband availability in the United States has primarily been in urban areas, leaving many rural areas without the availability of high-speed Internet access (Grubesic & Murray, 2002; Reynolds & Wunsch-Vincent, 2008; Strover, 2003; U.S. Dept. of Commerce, 2004). Interestingly, many affluent suburbs find themselves in similar positions as rural areas, spatially challenged in trying to connect to the Internet through broadband avenues (Grubesic & Murray, 2002). As of 2008, a third of rural U.S. citizens have broadband at home (Horrigan 2008; Kruger and Gilroy 2008)

Many experts feel that greater broadband dispersion can stimulate economic growth (Han, 2003). One study found that between 1998 and 2002, broadband communities saw increases in employment and businesses, particularly in the IT sectors (Lehr et al., 2006). "High volume transmissions such as real-time video, on demand movies, and Internet telephony are of increasing importance for electronic commerce. Moreover, the on-time (and accurate) delivery of such information, and its subsequent retrieval by a consumer, will become crucial for many businesses involved in the digital economy" (Grubesic & Murray, 2002, p. 198). Many expect both businesses and governments to increasingly offer services and force the populace to conduct business online (Bouwman, 2003).

Broadband Benefits and Impact

The Pew Internet & American Life Project finds that type of connection is a stronger predictor of online activities than Internet experience (Fox, 2005). Broadband users, compared to dial-up connectors, use the computer on a daily basis (Fox, 2005; U.S. Dept. of Commerce, 2004) and consider the Internet to be a valuable source of information (Cole et al., 2008). Broadband users are able to accomplish more online, such as sharing music and photos, shopping, banking, trading stocks, and becoming informed (Fox, 2005; Rains, 2008; Savage & Waldman, 2005; U.S. Dept. of Commerce, 2004), and are more "active and creative" with their online activities than narrowband users (van Dijk 2006, p. 230). High-speed Internet users are more likely to use the net to communicate with educators, government officials, and medical professionals (Cole et al., 2008). Many broadband subscribers recognize the time saving advantages of a broadband connection to the Internet that informs and educates (Savage & Waldman, 2005).

The FCC states that broadband gives users the advantages of (1) saving money in long distance calls through Voice Over Internet Phone services; (2) connecting rural areas to urban medical specialists by allowing rapid transferring of information; (3) access to "reference and cultural resources, such as library and museum data bases and collections;" (4) providing better educational opportunities for online learning; and (5) allowing more efficient shopping and surfing (FCC, 2008, para. 7). "Computers and the Internet are a central avenue through which individuals may acquire information and participate in the public sphere. Gaps in access to computers and the Internet, then, broaden such inequalities and further disadvantage those in society who are traditionally considered have nots" (Rains, 2008, p. 284).

Although there is a lot of agreement about the apparent rewards of broadband connections, few studies have actually documented the specific contexts in which broadband impacts our society. Rains (2008) found that broadband Internet use increased a person's access to "health-related information" while Zimmer (2003) found lack of bandwidth impeded business opportunities for non-profit organizations. We need more studies like these that examine the potentially wide-ranging impacts of type of connection and the ways that differing connections may enrich or detract from individuals' lives.

Broadband technologies are increasingly an integral part of doing business. "Broadband plays a critical role in the workings of the economy and society. It connects consumers, businesses, and governments and facilitates social interaction" (Reynolds & Wunsch-Vincent, 2008, p. 7). The concern is that the web is evolving with broadband users in mind. Users expect to do more communicating, business, school work and job related tasks via the web while web developers are designing their sites for high-speed uploading and downloading (Reynolds & Wunsch-Vincent, 2008). Google is digitizing the world's largest collection of books while newspapers, such as the Christian Science Monitor, are only publishing online (New York Times, 2008). With Web 2.0, "higher data-intensive applications are on the horizon, e.g. streaming high-definition video and TV, new peer-to-peer applications, health or education applications, virtual conferencing, and virtual reality applications" (Reynolds & Wunsch-Vincent, 2008, p. 8). The increased utilization of broadband technologies will further the divide between Internet users. Dial-up connections will not keep pace with the bandwidth requirements of sites that are data intensive.

Our study furthers the understanding of how non-broadband connections disadvantage users and create another layer of divide. Our research also addresses the significance of connection speed compared to other traditional digital divide measures. Whereas being connected to the Internet and having appropriate Internet skills are important factors that should be examined when exploring the utility of the Internet, scholars also need to control for type of Internet connection. Specifically, we examine how type of connection compares to traditional digital divide factors, such as race, education, gender, age and income. Our study advances work in the digital divide literature by focusing on four significant areas in which individuals utilize the Internet: general use, information seeking, business transactions, and learning. By focusing on these areas, we can determine whether type of connection is more important than traditional digital divide factors for particular types of online activities. Paramount to this effort is to continue to document how the different Internet connection types distinguish the overall value gained from using the Internet.

METHODS

Data

For the analysis we used the 2007 Digital Future Data collected by Cole et al. (2008) at the University of Southern California Annenberg School Center for the Digital Future. Beginning in 2000, the Center has annually collected data on United States households and their Internet use. In 2007, the seventh wave of data collection, a total of 2021 surveys were completed. Of the over 2,000 respondents surveyed, 14% (n=274) connected to the Internet at their home exclusively by dial-up telephone connection while 50% (n=1008) connected primarily by broadband including cable, WebTV, DSL, ISDN, satellite, and T1/T3 connections. About two-fifths of the respondents (n=739) were left out of the analysis because they did not use the internet or their type of Internet connection was unclear.

Measures

We used four measures of Internet Activities as our dependent variables. The Digital Future survey

Table 1. Construction of dependent variables

INTERNET ACTIVITIES SUMMATION SCALE (30 items)	EDUCATION & STAYING INFORMED SCALE (4 items)	BUSINESS TRANSACTIONS SCALE (6 items)	SEARCHING FOR INFORMATION SCALE (5 items)
α = **.860**	α **=.691**	α **=.761**	α **=.635**
Check Your E-mail Instant Messaging Chat Rooms Send Attachments Phone Calls Blogging Look For News Look For Travel Info. Look For Jobs Read Web-Logs Look For Humor Look For Health Info. Play Games Listen To Music Watch Videos Visit Religious Sites Listen to Radio Gamble Surf Visit Porn Sites Find Product Info Shop Make Reservations Pay Bills Bank Invest Look Up Words Find or Check Facts Get School Info. On-Line Classes	Look Up A Definition Of A Word Find Or Check A Fact Get Information For School Related Work Participate In Distance Learning For an Academic Degree Or Job Training	Get Information About A Product Buy Things Online Make Travel Reservation or Bookings Pay Bills Use Your Bank's Online Services Invest In Stock, Funds, Bonds	Look For News-Local, National, International Look For Travel Information Look For jobs, Work Read Web-Logs (Blogs) Look For Health Information

asked "How frequently do you use the Internet for the following purposes" – for 30 *Internet Activities.* Response choices included: 1=Never, 2=Less Than Monthly, 3=Monthly, 4=Weekly, 5=Daily, 6=Several Times A Day. We created four scales including *Education & Staying Informed* (4 items), *Business Transactions (*6 items), *Searching for Information* (5 items), and a *Summation scale* of all 30 Internet Activities (see Table 1). As shown in Table 1, all four scales, including the smaller ones, have a Cronbach's Alpha level greater than .60. We did not create scales for communication and entertainment, such as checking email, watching movies or downloading music, as it is likely that any detected differences between broadband and dial-up users would not be considered a major disadvantage in terms of life opportunities. However, these measures were included in the Internet Activities Summation scale.

We created a variable called *type of connection* that categorizes respondents as broadband users or dial-up users; this measure was derived from a question that asked respondents to list how they connect to the Internet at home. We included other typical digital divide measures *education (in degrees)*, *gender*, *white* (compared to non-whites), *age* (in years), and *income* (less than $50,000 and $50,000 or higher annual household income). Additionally, respondents were also asked to report how many months they had been using the Internet as a measure of *Internet experience*.

Analytical Design

We set out to test how type of connectivity compares to other typical digital divide measures in understanding amount of time Internet users spend online completing important tasks. We conduct OLS regression analysis to explain differences in time spent on important internet activities such as business transactions, work and school tasks, and searching for information. For each Internet activity category, we ascertain whether type of connection supersedes well-known digital divide predictors of Internet use in explaining variance in Internet activities. All dependent variables were within acceptable skewness and kurtosis ranges and were not logged.

FINDINGS

The sample used in these analyses was slightly more female than male (see Table 2). Around 90% of the respondents were white, 52% made less than $50,000 annually, and most (85%) had a high school degree or above. Only around one-fifth (21%) of the Internet users connected by dial-up, with the majority (79%) reporting use of a broadband connection at home. Most of the Internet users were online for several years, with the average previous Internet experience among the respondents being around 9 years.

Table 2. Descriptive information for 2007 digital future data.

Variables	N	Mean	Standard Deviation	Range
Summation Of All Internet Activities (Lower Value = Less Often Higher Value = More Often)	1008	71.15	16.12	145
Education & Staying Informed (Lower Value = Less Often Higher Value = More Often)	1224	9.56	3.77	20
Business Transactions (Lower Value = Less Often Higher Value = More Often)	1245	13.81	4.52	30
Searching For Information (Lower Value = Less Often Higher Value = More Often)	1233	12.48	4.05	25
Type of connection (0=Phone Modem / 1 = Broadband)	1282	.79	.41	1
Months of Internet experience (Total Months)	1220	112.05	46.81	357
Age (12 years old – 89 years old)	1282	38.99	16.91	77
Education groups (1=Primary or Lower / 5=College Degree or Higher)	1279	3.80	1.06	4
White (0=Non-White/1=White)	1282	.92	.27	1
Gender (0=Male/1=Female)	1282	.51	.50	1
Income (0 = < $50,000 /1 ≥ $50,000)	1149	.48	.49	1

Regression Results: Broadband Versus Digital Divide Factors

Table 3 shows the regression results for the *Summation Scale* of the 30 various Internet activities. Around 26% of the variance in occurrence of Internet activities was explained by the digital divide variables, Internet experience, and type of connection measures. The results support the continued importance of digital divide measures in explaining online behaviors given that relatively few variables explain a quarter of the variance in online activities. Race and education did not significantly explain any of the variance. Younger users were significantly more likely to be engaged in more online activities than older users. Males were more active online than females. The higher the income and the greater the previous Internet experience, the more time spent engaged in the Internet activities. Finally, broadband users were more active online than those who use a phone modem connection. According to the standardized regression coefficients, age matters the most in determining the amount of time spent engaged in the various Internet activities. The second strongest predictor of Internet activity was type of connection to the Internet followed by Internet experience and the other digital divide measures, gender and income.

As seen in Table 4, the traditional digital divide measures, Internet experience, and Internet connection explained almost 20% of the variance in time spent on *education and staying informed* Internet activities. Youthfulness and higher levels of income and education were associated with spending more time online in educational and information related activities. Previous Internet experience does not significantly predict education Internet activity, but having a broadband connection does. Age is the most salient of all the factors, followed by education and type of Internet connection.

In Table 5, age and race do not significantly contribute to explaining the variation among users in amount of time spent online to conduct *business transactions*. *Business transactions* were more likely to be engaged in by females, those with higher levels of income and education, and those with more online experience. However, having a broadband connection had the largest impact in understanding the variance in online *business actions*, followed by prior Internet experience.

Table 3. OLS Regression Results for Summation Scale.

	b	SE B	B	P-value
(Constant)	68.696	3.241		.000
Age	-.353	.030	-.335	.000
Gender	-3.128	.910	-.097	.001
White	-.134	1.828	-.002	.942
Income	2.281	.934	.071	.015
Education	.920	.541	.049	.089
Internet Experience	.060	.010	.175	.000
Type of Connection	9.438	1.161	.238	.000
Adj-R^2 = .266				
F value = 49.61* **				
N = 940				

Table 4. OLS Regression Results for Education & Staying Informed Scale.

	b	SE B	B	P-value
(Constant)	9.482	.709		.000
Age	-.092	.007	-.386	.000
Gender	-.123	.211	-.016	.561
White	.101	.412	.007	.808
Income	.746	.216	.098	.001
Education	.546	.118	.133	.000
Internet Experience	.003	.002	.037	.201
Type of Connection	1.029	.270	.109	.000
Adj-R^2 = .196				
F value = 37.75* **				
N = 1053				

Table 5. OLS Regression Results for Business Transactions Scale.

	b	SE B	B	P-value
(Constant)	7.006	.797		.000
Age	.003	.008	.010	.717
Gender	.498	.241	.058	.039
White	-.240	.479	-.014	.617
Income	1.277	.246	.148	.000
Education	.590	.132	.129	.000
Internet Experience	.019	.003	.203	.000
Type of Connection	2.482	.305	.236	.000
Adj-R^2 = .173				
F value = 32.85*				
N = 1069				

Finally, in Table 6 we found that the traditional digital divide measures were the weakest in explaining differences in Internet behaviors. Younger ages, greater income, education and Internet experience as well as broadband connection increased time spent *looking online for information*. Internet experience had the greatest impact in determining amount of time spent searching for information online followed by age and then broadband connection.

Table 6. OLS regression results for searching for information scale

	b	SE B	B	P-value
(Constant)	8.962	.773		.000
Age	-.031	.007	-.127	.000
Gender	-.033	.231	-.004	.888
White	.899	.463	.057	.053
Income	.530	.236	.068	.025
Education	.326	.128	.077	.011
Internet Experience	.016	.003	.188	.000
Type of Connection	1.158	.293	.120	.000
Adj-R^2 = .095				
F value = 16.74*				
N = 1055				

DISCUSSION

A World Bank report on global information and communication trends suggest that a key factor for economic development is access to information and communication portals (The World Bank, 2006). To the extent that education institutions, government agencies or private businesses offer information and services in online data intensive formats, those around the world with slow connections, or no connections, will be less likely or unable to take advantage of the virtual business world.

Our research shows that overall, speed of Internet connection explains more about online Internet activities than most other traditional digital divide concerns such as race, gender, education or income differences. The exception is the importance of age; younger users engage in more online activities than do older users. Age is more salient than all of the other digital divide factors, except when examining the *business transactions* scale. Age differences are likely due to motivational factors (i.e., older Internet users are less driven to be online) rather than access opportunities (Loges & Jung, 2001). The good news is that gender, and especially race, seem to matter less. The gap between whites and blacks is not a significant factor in online activities for U.S. users. Our research finds gender an issue only for the *summation* and *business* scales. Education and income continue to be a digital divide issue, but are generally less important than Internet experience and type of connection. The connection measure is consistently a strong explanatory factor of online behaviors in all the models.

CONCLUSION

This research advances other work in this area by focusing on three broad categories of Internet activities: education, business transactions, and information related activities; we also examine a composite of 30 different online activities. Our results show that type of connection is more relevant for understanding participation in these activities than are most traditional digital divide factors (i.e., gender, race, income and education). Our analysis shows that broadband connection at home was the strongest explanation of differences in time spent on *business* activities and the second most important factor for the *summation* and *education/information* scales. These results suggest that across a range of activities, having a broadband connection at home enhances individuals' ability to engage in online activities. As many of these activities relate to enhancing social and human capital, the benefits of having broadband connections are likely to become even more magnified over time.

In a previous paper on this subject (Davison & Cotten, 2003), we quoted Fixmer's (2002) statement about the Internet's future that still seems appropriate. He writes…

motivated by cost savings, environmental concerns and increased productivity, governments from city halls to Congress and the White House are relocating records, services and operations to cyberspace. Eventually, anyone who is limited to dial-up access will become a second-class citizen, an issue that will never be fully resolved until we all have fiber to our home or wireless connectivity as ubiquitous as the air (para. 3).

The availability of broadband access should be a primary concern of digital divide scholars. Access issues go beyond the physical presence of a computer and Internet connection. Internet users' abilities to take advantage of online services are impeded by their connectivity speed. As the world goes paperless, people around the world without broadband connections will not equally participate in the virtual world and will subsequently be left behind. The FCC chairman recently remarked

that broadband technology is a key driver of economic growth. The ability to share large amounts of information at ever-greater speeds increases productivity, facilitates commerce, and drives innovation. Broadband is changing how we communicate with each other, how and where we work, how we educate our children, and how we entertain ourselves. Broadband is particularly critical in rural areas, where advanced communications can shrink the distances that isolate remote communities (FCC, 2008, para. 3).

Currently in the U.S., broadband markets are driven by competition (Kruger and Gilroy, 2008; van Gorpa et al., 2006). Internet users with lower incomes and living in geographically constrained areas are less likely to have high-speed Internet connections. Perhaps the United States government should consider making broadband a public utility, or government subsidy, rather than depending on the private sector to provide this service to all Internet users (Kruger and Gilroy, 2008; Fixmer 2002). The U.S. and other governments around the world should not only prioritize Internet access, but also broadband access (Han, 2003; Reynolds & Wunsch-Vincent, 2008).

FUTURE TRENDS

If trends continue as they have for the past 10 years, it is likely that more and more activities will take place online. We anticipate that governments, in particular in the U.S., will increasingly rely upon the Internet for dissemination of information, application for various benefits, and so forth.

Our research suggests that digital inequality is exacerbated as long as differences in type of

Internet connection exist. We anticipate that, although rates of broadband diffusion will continue to increase, a significant segment of the U.S. and an even larger portion of the world population will lag behind in broadband diffusion. Until government entities decide to make broadband a priority and support the provision of infrastructure to ensure that individuals have access and the ability to effectively utilize these resources, individuals and groups across the world will continue to be disadvantaged.

While we recognize that countries around the world and even municipalities within certain places in the U.S. are limited in their ability to address broadband access issues due to lack of resources, physical and geographical conditions, cost, and so forth, we suggest that additional lobbying efforts are needed to further encourage policymakers to think about creative ways to ameliorate this situation. In particular, it may be that encouraging use and further development of the new generation of wireless technologies is more cost-effective as well as easier to diffuse than traditional cable and/or phone mechanisms for enhancing access to broadband. However, making sure that the cost of mobile phones remains and/or become more affordable will be a key factor in decreasing digital inequality.

In sum, scholars interested in lessening the contemporary digital gap need to consider the type of connection as an important dividing layer of the digital world. As we and others have noted, there are multiple layers and types of digital divides that are still being uncovered (e.g., Davison & Cotten 2003; Hargittai, 2002). It behooves us as scientists and citizens of the world to continue efforts to better understand the multiple layers and types of divides, the social impacts of these divides, and ways to ameliorate them.

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KEY TERMS AND DEFINITIONS

Broadband Diffusion: How widespread the availability of Broadband is to certain geographical areas.

Broadband Internet: Connecting to the Internet at speeds of 200 Kbps or greater.

Broadband Subscribers: Characteristics of Internet users that connect to the Internet at higher speeds.

Digital Divide Factors: Traditional measures used to explain differences in Internet access and experiences among users. These factors typically include race, gender, age, education and income.

Digital Divide: Internet inequality issues.

High-Speed Internet: Another terminology for a broadband connection to the Internet.

Internet Activities: Measures of online behaviors including visiting sites, uploading/downloading content, searching for information and completing tasks.

Internet Connection Type: Categorizes Home Internet connection as either dial-up or broadband.

Chapter 20

Broadband in America:
A Policy of Neglect is Not Benign

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ABSTRACT

Under the Bush Administration, the U.S. failed to close the digital divide and fell behind on broadband. In 2001, 54 percent of households did not have the Internet. In late 2007, 49 percent of households did not have broadband. About 25 percent of households with incomes below $25,000 per year had broadband in 2007; whereas over 80 percent of households with incomes above $75,000 did. In 2001, the U.S. ranked third in the world in the penetration of broadband, but had fallen to 15th by 2007. A variety of measures of performance and econometric models that control for economic and social factors show a dozen nations are ahead of the U.S. The laissez faire policy pursued by the Bush administration let a duopoly of cable and telephone companies dribble out broadband at slow speed and high prices. In contrast, the nations that passed the U.S. implemented much more aggressive policies to promote broadband and instead of relying on weak intermodal competition, they required the dominant networks to be open to competition in Internet services. This kept the price down and stimulated adoption and innovation.

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A PERMANENT DIGITAL DIVIDE OR ANOTHER "MISSION ACCOMPLISHED?"

From Digital Divide to Falling Behind on Broadband

Barely a decade after the Internet became widely, commercially available and at a moment when high-speed Internet access was just becoming widely available in the mass market, the digital Divide had already become a topic of vigorous debate in Washington policy circles. The debate over the speed of the penetration of the new communications technology became a permanent fixture of technology policy discussions.

This paper addresses three empirical questions that have been at the center of the now decade long debate over the digital divide.

- Does the digital divide still exist; is there a significant difference in penetration among specific groups in the population?
- Does it matter that households are not connected; does being disconnected cause households to be disadvantaged or disenfranchised?
- Is the U.S. ahead of other nations or behind in the penetration of this technology and what does that mean for the policies chosen to promote the deployment of the technology?

The issue was originally framed by the Clinton administration in the late 1990s as a concern that instead of being a great leveler of opportunity, the uneven penetration of Internet service was replicating and reinforcing existing social divisions (e.g. Wilhelm, 2000; Cooper 2001). However, others argued that the normal pattern of adoption of mass market goods was for upper income households to be early adopters but, ultimately, the good would spread throughout society (Thierer, 2000; Compaine, 2001). With the rapid uptake of the Internet and broadband being faster than other consumer goods and services like telephones, televisions, and VCRs, they argued there was little cause for concern.

Reactions to a *Washington Post* (Schwartz, 1999) article summarizing the findings of a mid-1999 report on the digital divide suggest how prominent the debate had become. In a front-page story the newspaper summarized the report from the National Telecommunications Information Administration (1999), entitled *Falling through the Net*, as follows, "Despite plummeting computer prices and billions of dollars spent wiring public schools and libraries, high-income Americans continue to predominate in the online world" (Schwartz, 1999, p. A-1).

This conclusion was immediately cast in highly charged public policy terms by President Clinton.

There is a growing digital divide between those who have access to the digital economy and the Internet and those who don't, and that divide exists along the lines of education, income, region, and race… If we want to unlock the potential of our workers, we have to close that gap (Schwartz, 1999, p. A-1).

By contrast, a spokesman for the ultraconservative Cato institute – Executive Vice President David Boaz – dismissed the notion of the digital divide:

We've got a new technology spreading more rapidly than any new technology has spread in history. And of course, it doesn't spread absolutely evenly. Richer people have always adopted new technology first – and that's not news. There's no such thing as information haves and have-nots, there are have-nows and have-laters. The families that don't have computers now are going to have them in a few years (Schwartz, 1999, p. A-1).

With a change in Administrations in 2001, the alternative view became the official view in Washington, a shift made clear just weeks after the inauguration of President Bush, when Michael Powell, newly appointed Chairman of the Federal Communications Commission, declared at his first press conference that at worst there was a "Mercedes Benz divide."

I think the term ["digital divide"] sometimes is dangerous in the sense that it suggests that the minute a new and innovative technology is introduced in the market; there is a divide unless it is equitably distributed among every part of society, and that is just an unreal understanding of an American capitalist system… I think there's a Mercedes Benz divide, I'd like one, but I can't afford it… it shouldn't be used to justify the notion of, essentially, the socialization of deployment of infrastructure (Powell, 2001).

Chairman Powell articulated the Bush administration's policy as a reliance on laissez faire, trickle down of technology and a rejection of policies to stimulate the spread of Internet service. "We have a clear vision for this migration to advanced platforms: stimulate investment in next-generation architectures, apply a light hand and let entrepreneurs bring the future to the American people (Powell, 2001)."

Two years later, in March of 2004, in the midst of his re-election campaign, President Bush reiterated the policy. He declared a national policy goal and an approach to achieving it, stating, "this country needs a national goal for broadband technology, for the spread of broadband technology… The role of government is to create an environment in which the entrepreneurial spirit is strong and in which people can realize their dreams" (Bush, 2004).

The justification for the policy helps to establish the criteria by which its success should be measured. The primary justification was to provide a wide range of services to consumers, with market forces driving prices down and expanding choice for consumers. Ultimately, the market process would keep the U.S. at the leading edge of technology development.

We ought to have universal, affordable access for broadband technology by the year 2007, and then we ought to make sure as soon as possible thereafter, consumers have got plenty of choices when it comes to purchasing their broadband carrier. The more choices there are, the more the price will come down; and the more the price comes down, the more users there will be; and the more users there are, the more likely it is America will stay on the competitive edge of world trade. The more users there are, the more likely it is people will be able to receive doctor's advice in the home. The more affordable broadband technology is, the more innovative we can be with education. It is important that we stay on the cutting edge of technological change and one way to do so is to have a bold plan for broadband (Bush 2004).

Perhaps inadvertently, President Bush had shifted the emphasis in the public policy debate over Internet deployment and penetration. The focus of the debate changed in two respects when the framing shifted from the from a digital divide that needed to be addressed by public policy to a Mercedes Benz divide that would be addressed by market forces.

First, the Powell/Bush Mercedes Benz formulation places greatest emphasis on the supply-side production of services to be consumed, while the digital divide framing shows greater concern for the consumer use and citizen participation aspects of the communications. Bush's emphasis on services is quite different from Clinton's emphasis on unlocking the potential of workers.

Second, concern about the rate of adoption of Internet across groups within the U.S. was replaced by concern about the overall rate of U.S. adoption compared to other nations. This highlights the public policy differences between nations, based on the need to "stay on the cutting edge of world trade." Whether inadvertent or not, the digital divide debate became a "falling behind on broadband" debate.

Over the course of the 2004 presidential campaign, members of the White House staff made it clear that broadband deployment would not be the object of active policy. "In explaining the Administration's policy on broadband, the Associate Director of the Office of Science & Technology Policy has declared that 'we have not come out with a universal service platform' (Patrick, 2004). When pressed about whether broadband should be the target of social policy the Administration spokesman reaffirmed that it simply was not part of the program. "Asked whether the Universal Service Fund should be used for broadband, as many suggest, Russell said 'then you automatically assume that broadband pays into Universal Service. Cable, he noted, does not'" (Patrick, 2004). Cable does not pay into the Universal Service Fund because the Powell-led FCC has decided it should not.

This *laissez faire*, trickle down theme was reiterated by others in the Administration, as well. Undersecretary of Commerce- Technology, Phil Bond "reiterated Bush's goal of universal access to broadband by 2007… Bush's stated goal is universal access, not adoption, Russell said. As for broadband adoption, Marburger said new services and applications will make broadband more attractive to fence sitters. But Russell said a less-quoted line of Bush's after the 2007 promise is endorsing "competition as soon as possible thereafter." Russell predicted broadband prices will drop as more competitors enter a market (Patrick, 2004).

Four years later, in January 2008, the National Telecommunications Information Administration (2008, p. 1) declared 'mission accomplished' in a report entitled *Networked Nation: Broadband in America*, stating

four years ago President Bush articulated a National vision: universal, affordable access to broadband technology… The results have been striking… Penetration continues to grow and prices continue to fall… The President has made it a priority to ensure that all Americans have affordable access to this important resource by harnessing the power of the competitive marketplace. As this report demonstrates, a reasonable assessment of the available data indicates that the nation has, to a very great degree, realized this objective."

As discussed below, a close look at the data casts considerable doubt on this claim. The data does not support the claim to success measured by either of the policy frames.

- The digital divide has persisted. In a space that is as dynamic as cyberspace, a decade is a long time to be disconnected, rendering the disadvantage essentially permanent.
- The U.S. has fallen behind about a dozen nations in broadband and is beginning to suffer the consequences.

An understanding of the parameters of the debate and an evaluation of the extent to which the goal has been achieved is important because the issue remained front and center in the 2008 presidential campaign. The debate over public policy was renewed in exactly the same terms in the 2008 campaign (Korver, 2008; USC Annenberg 2008). Mike Powell was a prominent spokesperson for McCain on Internet policy, frequently debating Reed Hundt, President Clinton's first Chairman of the Federal Communications Commission, on these issues.

The potential role of the USF in subsidizing broadband is a currently under debate in Congress and at the FCC.

Hundt touted Obama as a candidate well versed in technology, and well equipped to use information technology to improve the operation of government.

Powell said that McCain is knowledgeable of technology through his role as former chairman of the Senate Commerce Committee.

Powell praised McCain for understanding that government must create an environment encouraging American innovation. In order to create such a model, Americans must have access to risk capital, and entrepreneurs deserve "to enjoy the fruits of their labor" (Korver, 2008).

Purpose and Outline of the Paper

Both of the threads in the debate over the adoption of Internet service focus on a very narrow set of issues – to whom is it available and which households subscribe to the service. There is a broad and valid critique of the framing of the digital divide issue to the effect that the focus on "penetration" (the calculation of the percentage of households with access) of technologies like the Internet and broadband is too narrow, ignoring a host of social, economic and psychological issues (van Dyk, 2005; Warschauer, 2003). Nevertheless, the question of penetration is an important issue, if not the only important issue. Moreover, even within the narrow question of who has adopted the service there are profound policy disputes.

The primary focus of this paper is the penetration issue. The paper is largely empirical, looking at survey, census and other data on the penetration of Internet access and its implications. It is also comparative, looking at the issue of the digital divide across time and space. The data comes from two points in time, late 2000/early 2001 and late 2007/early 2008. The first data point captures the exact moment when the framing of the digital divide debate shifted with the change in administrations. It also captures the moment when Internet access shifted from dial up to broadband.

The data is ideally suited to evaluate the claim made at the end of the Bush Administration that the goal 'to ensure that all Americans have affordable access to this important resource by harnessing the power of the competitive marketplace" has been achieved and to evaluate whether "a reasonable assessment of the available data indicates that the nation has, to a very great degree, realized this objective.'

The paper is divided into four parts. Part II provides the context for the debate by explaining the policy background as well as the social implications of the new technology.

Part III examines the status of the digital divide in terms of the adoption and use of the technology.

Part IV examines the issue of the status of the deployment of broadband technology in comparison to other nations.

Part V reviews the policy implications of the continuing digital divide and the lagging performance of the U.S. on broadband.

THE GOAL OF UBIQUITOUS, AFFORDABLE ADEQUATE COMMUNICATIONS SERVICE

The Legal Framework

The legal and policy framework in which the digital divide debate is located is important because it offers the essential rationale for carrying out the conversation and analyzing public policy. The Bush administration chose the standard by which it wanted to be measured – ubiquitous, affordable, broadband (advanced) communications. President Bush outlined some of the key reasons that achieving this goal would be important in the broadband era. In fact, the goal is nothing more than the original goal of the 1934 Communications

Act restated for the twenty first century, "to make available, so far as possible, to all people of the United States a rapid, efficient, nation-wide and world-wide wired and radio communications service with adequate facilities at reasonable charges" (U.S.C.A. 1934). The goal was always implicitly progressive – encompassing the notion that as the communications network advanced, the universal service goal should advance as well. In 1934, when universal service was first articulated as national policy, two-thirds of American households did not have a telephone (Cooper, 1996).

The 1996 Telecommunications Act amendments to the 1934 Communications Act explicitly embraced the notion that the target should evolve and include access to information services:

S. 254 (b) *Universal Service Principles – The Joint Board and the Commission shall base policies for the preservation and advancement of universal service on the following principles:*

(1) Quality and Rates **–***Quality services should be available at just reasonable, and affordable rates.*

(2) Access to Advanced Services **–** *Access to advanced telecommunications and information services should be provided in all regions of the nation.*

(3) Access in Rural and High Cost Areas **–** *Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas (U.S. Telecommunications Act, 1996).*

There is one aspect of the 1996 Act, however, that is implicitly less progressive than the underlying law that it amended. While the statute does envision the evolution of universal service, it also sees universal service policies called for only after the market has delivered the service to the majority.

S. 254 (c) (1) *Universal service is an evolving level of telecommunications service that the Commission shall establish periodically under this section, taking into account advances in telecommunications and information technologies and services. The Joint Board in recommending, and the Commission in establishing definitions of the services that are supported by Federal Universal service support mechanisms shall consider the extent to which such telecommunications services*

are essential to education, public health or public safety;

have, through the operation of market choices by customers, been subscribed to by a substantial majority of residential customers;

are being deployed to public telecommunications networks by telecommunications carriers; and

are consistent with the public interest, convenience and necessity (Telecommunications Act of 1996).

Thus, the goal is contingent upon adoption by a "substantial" majority of consumers of services that are being deployed by private sector companies, services that have other "social" characteristics. Progressive, or not, there is little doubt that Internet service meets the definition of a universal service today.

Moreover, as more and more commerce and political expression moves onto the Internet, and more and more applications require the capacity of a high-speed communications network to function, broadband communications become the standard for "adequate facilities." Indeed, the expanding importance of communications in the information economy and the convergence of communications and commerce make the need to achieve the goal of universal service even more critical. The consequences of falling off "the cutting edge of technological changes" are severe for both the nation and households.

However, the supply-side view is too narrow. Internet connectivity not only delivers goods and services to consumers, it empowers consumers and, more importantly citizens. As a potent two-way, many-to-many communications medium, not just a one-way, push consumption medium, it transforms the nature and capacity for participation in social and political activities. The importance of broadband on the supply-side, innovation front is widely recognized, but it is no more compelling as a basis for public policy to ensure ubiquitous, affordable broadband than the social and civic participation aspects. Viewing internet access as a tool for participation links it directly to the notion of equality of opportunity and equality in the political space is a much more compelling principle (Baker, 2007, pp. 7-16).

The Social and Economic Framework

The intensity of the debate over the digital divide reflects more than political opportunism by administrations and candidates, it has a firm grounding in the impact of a transformative technology on the economy, society and culture, as well as politics (Cooper 2002, 2003b, 2006; Benkler 2006)). Early in the spread of the technology, Manuel Castells, Professor of Sociology and Planning at the University of California, Berkeley and author of a three-volume work on *The Rise of the Network Society*, anticipated this rancorous debate. He noted that timing in the distribution and adoption of technology is a critical factor in determining economic chances, especially in a digital age.

There are large areas of the world, and considerable segments of the population, switched off from the new technological system . . . Furthermore, speed of technological diffusion is selective, both socially and functionally. Differential timing in access to the power of technology for people, countries, and regions is a critical source of inequality in our society (Castells, 1996: p. 34).

One does not have to be a left-leaning, academic sociologist to arrive at the conclusion that lack of access to the new technologies puts people at a severe disadvantage. Not long before he became Secretary of State, Colin Powell, Chairman Michael Powell's father, described the problem in dramatic terms.

We hear today about the "digital divide" – the gap between those who have access to the wonders of digital technology and the Internet and those who do not. When I address this issue I use an even stronger term: digital apartheid. What is at stake is today's digital "have nots" – especially the young – and whether they may find themselves marginalized for life because they lack the skills and tools to participate in our globalized, knowledge-based economy. This is true in America and in the rest of the world (Colin Powell, 2000).

Perhaps in the early days of the analysis of the digital divide, it was possible to downplay the importance of the penetration of the new communications medium into society, but after a decade there can be little doubt that Internet and activities in cyberspace are transforming society powerfully and rapidly (Benkler, 2006). Because the Internet has been an open and accessible place for new forms of expression, it was hoped (believed) that it would democratize society and equalize opportunity (Cooper, 2003a, pp. 92-95). The maldistribution of access to cyberspace flies in the face of that hope. In fact, because the opportunity to participate is less equally distributed in cyberspace than in physical space, the persistence of this problem may make matters worse; it may become is a new source of inequality in society.

Access to the Internet at home has been the focal point for U.S. policy debates for good reason. Because the U.S. is not a “café” culture, most personal business is conducted from the home. Searching for information, looking for a job, and entertainment activities (especially TV viewing) are typically done in the privacy of the residence. For this reason, we have measured the digital divide, as we have measured universal telephone service, by the availability of the means of communications (telephone or the Internet) in the home. Stopping by the library to use the Internet or using it at work may be transitional steps useful for creating skills in the population, or carrying out specific tasks associated with the activities of those locations, but they are not a replacement for its availability in the home.

The urgency to close the digital divide faster reflects two important characteristics of the Internet age (Cooper, 2002). First, it is well recognized that things happen much more quickly in cyberspace. If a household is cut off for a decade, its ability to participate and prosper in the new economy may be permanently impaired. If a groups is not well represented as the architecture of the Internet becomes defined and the patterns of deployment established, the needs of the group may never be well represented in cyberspace. Second, the convergence of commerce and communications in the digital information age gives this technology a special transformative power (Cooper 2003b; Benkler 2006)). The Internet is not just communications or just a means of commerce. It promises to enhance productivity in many aspects of life and to transform the production of goods and services (Cooper 2006).

According to this line of reasoning, in the digital age, waiting “a few years” for technology to trickle down may seriously impede the economic aspirations of the “have laters.” “Having later” may be almost as bad as “having not” because the good opportunities are gone and the patterns of activity are set, leaving latecomers excluded and switched off. The important point about the digital divide is not simply that some people have the technology and others do not, but that not having it puts people at a disadvantage and cuts them off from participation in important economic, social, cultural and political activities.

This leads directly to the second major point of emphasis in our analysis. It is what people can do with the Internet that makes it so important and makes closing the divide so critical. We reject the argument of some critics of the digital divide concept who claim we should not worry because Internet access is spreading as rapidly as some consumer appliances, like TVs and VCRs. Access to the Internet is much more important than access to a VCR. It may be an overstatement to say that the Internet changes everything, but it changes a lot of important things. Not having access seriously disadvantages the household. Acquisition of these new and powerful means of communications becomes the central determinant of participation in the digital information age. Routine use of these technologies makes for more efficient consumers and more effective citizens.

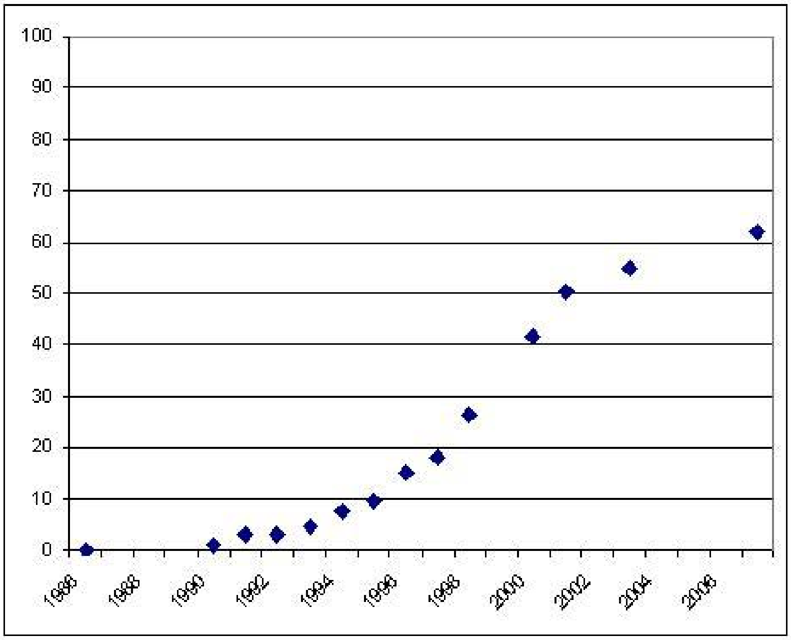
THE ENDURING DIGITAL DIVIDE

Because the digital divide has been a major concern since the Internet became widely available to the public and for commercial activities, the Bureau of the Census collects and makes available the raw data on how Internet access and advanced communications facilities are spreading throughout the nation. With these data available, it is hard to gloss over the failure to close the **digital divide**.

Internet Penetration Has Stalled

The overall spread of Internet service is captured in an innovation adoption curve (see Figures 1 and 2). The curve has the typical shape of a logistic or S-curves, with a slow initial period,

Figure 1. Percentage of household with Internet service



Source: National Telecommunications Information Administration, *Networked Nation: Broadband in America* **(Washington, D.C.: January 2008) for 2007; U.S. Census Bureau,** *Computer and Internet Use in the United States: 2003* **(Washington D.C.: October 2005) for 1997 – 2003; Mark Cooper,** *Developing the Information Age in the 1990s: A Pragmatic Consumer View.* **(Washington, D.C. Consumer Federation of America, June 8, 1992).**

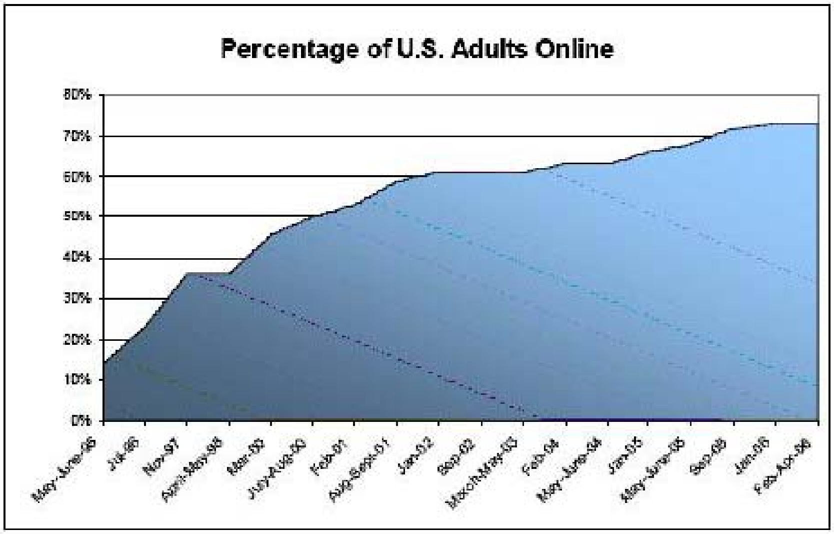
a rapid build up, and then a leveling off. The percentage of households with Internet service at home (the penetration rate) has generally been about 5 to 10 percentage points behind the percentage of adults who have access to the Internet more broadly (Pew Internet and American Life Project). The difference is generally made up by access to the Internet at work. Both of the adoption curves suggest that Internet penetration is topping out at well below 100 percent. In 2007 over one-third of households did not have Internet service at home and over one-quarter did not use the Internet anywhere.

Thus a substantial percentage of the population is not connected. It appears that penetration of Internet at home is not only leveling off well below 100 percent, but also well below the penetration of the dominant means of communications in the twentieth century including telephone, radio, and television (see Figure 3).

The distribution of disconnectedness is not random (see Figure 4). Lower income households are much more likely to be disconnected. Households with incomes below $25,000 per year are twice as likely to be among the disconnected. They account for 52 percent of all households without Internet at home, while they constitute only 27 percent of the total of households. They are also less likely to have broadband. Almost three quarters of households with income below $25,000 did not have Internet service at home. In contrast, among households with incomes above $25,000 about four-fifths had broadband. About 90 percent of households with incomes above $75,000 have broadband at home; over 70% of households with incomes below $25,000 do not.

The most recent data confirms a second aspect of the digital divide that was at the heart of the early identification of the problem (National Telecommunication Information Administration,

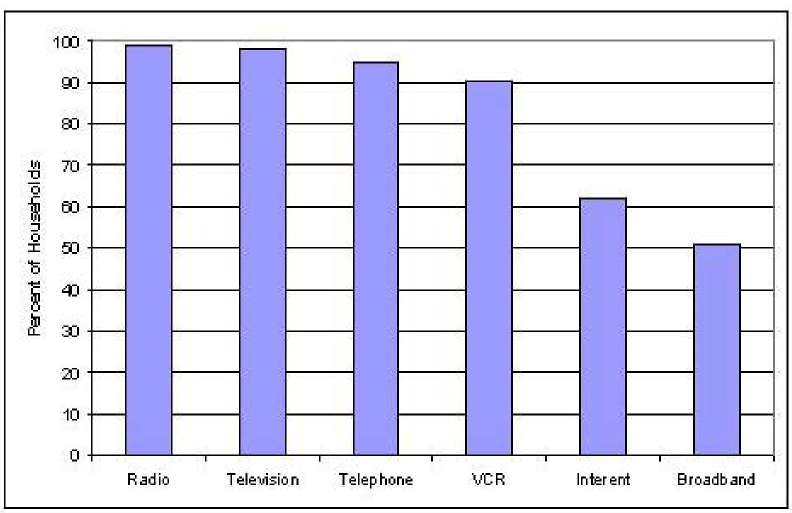
Figure 2. Percentage of U.S. adults online



Source: Pew Internet & American Life Project Surveys, March 2000-April 2006. All surveys prior to March 2000 were conducted by the Pew Research Center for People & the Press.[2]

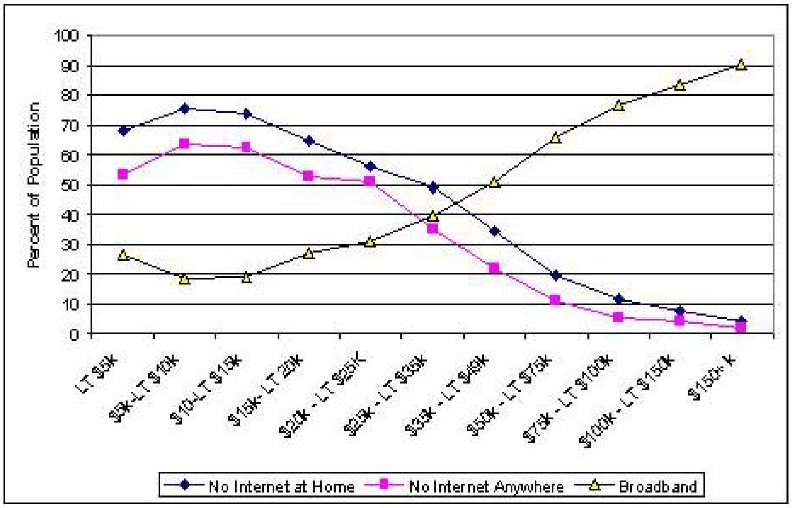
2008, Appendices). Income is associated with race and ethnicity in America, so we find that White, non-Hispanics are much more likely to have broadband (69 percent) than Blacks and Hispanics (46 percent and 43 percent, respectively). White, non-Hispanics are less likely not to have Internet at home (23 percent) than Blacks and Hispanics (39 percent and 45 percent, respectively).

Figure 3. Percent of households with various communications technologies



Sources: U.S Bureau of the Census, *Statistical Abstract of the United States: 2007, Table 1099,* **2005 for radio, TV, VCR; National Telecommunications and Information Administration,** *Netwrked Nation: Braodband in America* **(Washington, D.C. January 2008), Appendices Federal Communications Commission, Monitoring Report, 2007, Table 6-1, March 2007 for telephone.**

Figure 4. Household without Internet at home by level of income



Source: National Telecommunications and Information Administration, *Netwrked Nation: Braodband in America* **(Washington, D.C. January 2008), Appendices**

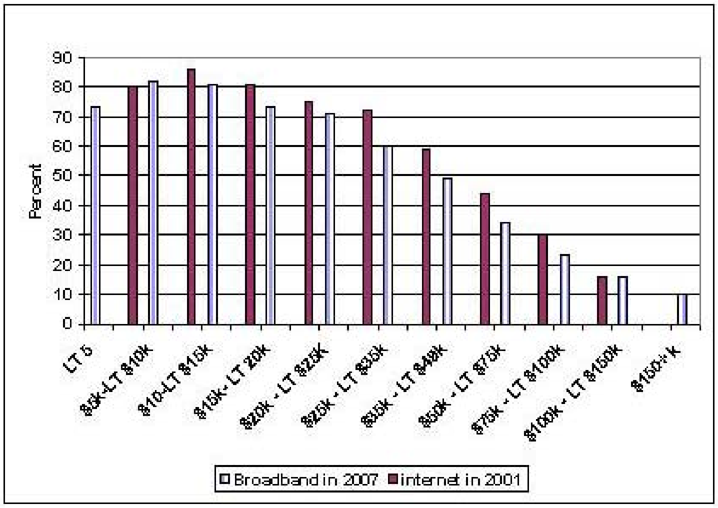
The persistence of the digital divide can best be seen when we compare Internet access in 2001 to broadband access in 2007. Overall, 54 percent of households did not have the Internet in 2001; 49 percent of households did not have broadband in 2007 (see Figure 5). For households with incomes below $25,000 per year, about 75 percent did not have broadband; the same percentage as did not have Internet in 2001. For households with incomes between $25,000 and $50,000, over 50 percent did not have broadband in 2007, as opposed to 60 percent who did not have Internet in 2001. In contrast, for households with incomes above $75,000 almost 90 percent have broadband, a slightly higher percentage than had the Internet in 2001. It may not be a Mercedes Benz divide, but there is still a wide rich-poor gap in access to broadband in the home.

The most recent census data also confirm a third aspect of the digital divide, the rural - urban divide. Rural households are slightly less likely to have Internet at home (42 percent without access in rural areas compared to 38 percent without access in urban areas), but there are two other aspects of the digital divide in rural America that are notable. First, the distribution of access is somewhat more skewed across income groups in rural areas. Lower income rural households are somewhat less likely to have Internet access than urban lower income households. Second, although rural households have caught up in dial up Internet, they are lagging behind in broadband (see Figure 6). Here the problem is the high cost of getting high-speed to rural areas. We see a substantial difference in penetration of broadband, with the principal cities having penetration rates that are 10 to 20 percentage points higher. Interestingly, the larger differences are at higher income levels. This suggests that the availability of rural broadband is likely the problem. Upper income households are most able to afford broadband, but are unable to access it in rural areas.

Empirical Evidence on the Importance of Connectedness

In assessing the impact of the digital divide in the early years of the debate we examined the patterns

Figure 5. The digital divide persists in broadband: households without broadband 2007 v. households without internet 2001



Source: National Telecommunications and Information Administration, *Netwrked Nation: Braodband in America* **(Washington, D.C. January 2008), Appendices**

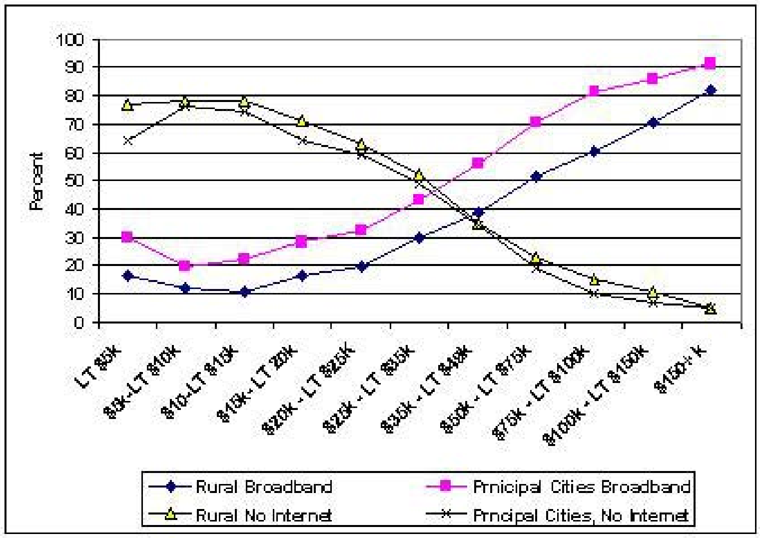
of utilization of the Internet and rates of participation in various social, political and economic activities for two reasons (Cooper, 2000, 2002). First, since it was unclear what the impact of the technology would be, it was important to chart its uses. Second, if the technology became an important means of commerce, communications and expression, it was important to document what it means to be disconnected. Are those who are disconnected, really disadvantaged or disenfranchised as a result? In particular, if the disconnected did not participate in social, economic and political discourse in either physical space or cyberspace, then the digital divide would not be a unique new source of inequality, it would just replicate existing inequalities in society. If people have higher rates of participation in physical space than cyberspace, then it is a new source of inequality.

We captured the difference by matching activities. We covered a range of economic/commercial activities (job search, commercial information gathering, online purchases) as well as civic and political activities such as gathering information (e.g. read a newspaper or magazine, attend a lecture), engaging in political activity (e.g. contact a public official, circulate a petition, attend a political rally) or engaging in civic discourse (e.g. write a letter to the editor, discuss politics with a neighbor).

In 2000 the connected respondents had dial-up at home, while the disconnected had no Internet access. The middle category included people who had some Internet access or digital devices. For 2005, we distinguish between broadband at home, on one side, and those who say they do not use the Internet on the other side. In the middle are those with dial-up and those who use the Internet but not at home. The percentage of people who are disconnected has increased somewhat because of the change in definition, but the 35 percent figure is consistent with the percentage who do not have Internet at home in 2008, as noted above.

For the economic activities, we simply identified the level of activity in physical space and did not include questions on physical space activities, since most households engage in basic economic activities (see Table 1)

Figure 6. Rural v. urban Internet and broadband penetration



Source: National Telecommunications and Information Administration, ***Netwrked Nation: Broadband in America*** **(Washington, D.C. January 2008), Appendices**

Here the growth of the activities is what is striking. Online information seeking, purchases and banking have become common activities for those with Internet access. Half of all respondents have engaged in these activities, which suggests that two thirds or more of those with Internet access have done so. A world of economic commerce has been built in cyberspace from which those who lack access are excluded. The disconnected are placed at an increasing disadvantage.

Table 1. Commercial activities on the Internet across time

	2002	2007
Ever purchased a product	22%	49%
Ever made travel reservations	**18**	**47**
Ever done online banking	9	39
Sought online information daily	7	?
Used Internet to acquire music	na	46
Looked for real estate	na	49

Source: John B. Horrigan, Online Shoping (Washington, D.C.: Pew Internet and American Life Project, February 13, 2008), The Internet and Consumer Choice: Online American Use Different Search and Purchase Strategies for Different Goods, (Washington, D.C.: Pew Internet and American Life Project, May 18, 2008).

For the social and political activities we included items to compare physical space activities and cyberspace activities. Table 2 presents the result from both surveys.

Survey research in 2000 showed that the digital divide magnified inequalities of involvement and participation (see Table 2). The disconnected in society participated much more in physical space than they do in cyberspace. Replication in 2005 confirms those earlier findings.[1] The differences between those who are connected and the disconnected in key physical space activities are small or non-existent, with those who were connected being only slightly more likely to be active in some measures of civic discourse. The advantage of the connected was much greater when cyberspace activities were considered.

While physical space activities still dominate, cyberspace activities are quite extensive. Evaluating the relative magnitude of the impact requires complex econometric modeling. Such an approach has been applied to the large data set in which the 2000 measures of media usage were embedded. The conclusion was striking, even then, with lower

Table 2. Survey results - percent of respondents engaging in selected social, civic and political activities in physical space and cyberspace (cyberspace activities in bold)

2000 Survey	**Disconnected**	**Partially Connected**	**Fully Connected**
Percent of population	26	38	36
Information Gathering			
Read a newspaper	92	95	97
Obtained online news or sports results	24	43	65
Read a news magazine	62	69	79
Visit a news website	18	41	70
Attended a lecture	29	48	55
Obtained educational information	26	55	73
Political Activity			
Contacted a local official	31	37	40
Visited a gov't agency website	13	26	40
Circulated a petition for a politician	10	11	12
Signed or forwarded a petition	5	7	14
Attended a political rally	22	21	19
Visited a politician's website	8	12	19
Civic Discourse			
Wrote a letter to the editor	20	21	27
E-mailed a newspaper	8	10	16
Discussed politics with a neighbor	46	51	50
Discussed politics in e-mail	7	6	12
2005 Survey	**Disconnected**	**Partially Connected**	**Fully Connected**
	Do not use	**Dial-up**	**Broadband**
Percent of population	35	42	24
Information Gathering			
Local TV new***	96	95	92
Morning news show	70	68	63
Checked news online***	19	67	64
Political Activity			
Attended a political rally	10	10	10
Visited political web site***	3	13	9
Circulated a petition	7	10	9
Political discussion with e-mail***	5	17	13
Sought/Expressed political opinion in blogs***	2	8	7
Civic Discourse			
Wrote a letter to the editor	12	11	12
E-mailed editor or politician***	5	17	12
Participated in a community project*	25	24	29
E-mailed to organize community project***	3	12	13
Went to a club	34	39	40
Participated in a chat room*	6	14	14

Table 2. continued

Forwarded a news article with e-mail***	10	36	33
Worked for a social group or cause		23	24
Visited we site of a social group or cause***	5	30	15

Source: The data for the 2000 analysis was supported by the Digital Media Forum, a media policy consortium established by the Ford Foundation. Additional support was provided by research funding to Dhavan Shah from the School of Journalism and Mass Communications, University of Wisconsin, Madison, as well as grants to William Eveland form the Institute for Social, Behavioral, and Economic Research and the Department of Communications, University of California at Santa Barbara. Access was also provided to DDB-Chicago for some data. The for 2005 data analyzed in this report was collected with the support of grants from the Carnegie Corporation of New York, Pew Charitable Trusts through the Center for Information & Research On Civic Learning & Engagement (CIRCLE), Rockefeller Brother Fund, and Damm Fund of the Journal Foundation to Dhavan Shah (Principal Investigator) and Douglas McLeod (Co-Principal Investigator). The authors would like to thank DDB-Chicago for access to the Life Style Study, and Marty Horn and Chris Callahan, in particular, for making the survey data available and sharing methodological details. Opinions, findings, and conclusions in this report are those of the authors and do not necessarily reflect the views of the supporting sources or DDB-Chicago.

levels of overall activity: "Online information seeking and interactive civic messaging – uses of the Web as a source and a forum – both strongly influence civic engagement, often more so than do traditional print and broadcast media and face-to-face communications… [B]oth online and offline channels culminate in actual participation (Shah, et al. pp. pp. 551…553). The disconnected do participate in physical space; they are disenfranchised in cyberspace.

FALLING BEHIND ON BROADBAND

The fact that the Bush Administration shifted the focus of policy to "being on the cutting edge" is reason enough to examine the performance of the U.S. compared to other nations, but there is a second reason to do so. In order to reach a final conclusion on the digital divide issue, one other possibility must be considered. Maybe it is not a problem of *laissez faire* trickle down economics, but a real "Mercedes Benz Divide." Maybe broadband is an expensive technology that will never reach the broad penetration of a communications platform that the telephone did. The U.S. chose a particular policy path to deployment of broadband technology and has failed to achieve the goal of ubiquitous affordable service that is adopted by almost all households. Is it the technology or the policy that is the problem?

Falling Off the Cutting Edge

When the Bush Administration took office the U.S. ranked third in the world in the penetration of broadband (see Table 3). In the following seven years, the U.S. slipped behind more than a dozen industrial nations. By some measures, it is behind two dozen.

The reason that the other nations have passed the U.S. and the reason there is still a big digital divide is that Americans pay higher prices for slower speeds services than in many other advanced industrial nations (see Figure 7). While the Administration has tried to downplay this failure, the *Economist* magazine, hardly a radical, left wing publication, took American policy to task in an editorial entitled "Open Up Those Highways," pointing out that "A New Yorker who wants the same quality of services of broadband has to pay around $150 more per month than a Parisian" (Anonymous, 2008). And, the French, who get, on average, three times the speed at one third the cost as Americans, are not the world leader by any stretch of the imagination, as Figure 5 shows. The Asian nations of Korea and Japan have speeds that are almost ten times faster at prices that are less

Table 3. Falling behind on broadband (subscribers per 100 population)

Rank	2001	2007
1	Canada	Denmark
2	Sweden	Netherlands
3	*United States	Iceland
4	Belgium	Norway
5	Denmark	Switzerland
6	Netherlands	Finland
7	Iceland	Korea
8	Austria	Sweden
9	Germany	Luxembourg
10	Japan	Canada
11	Switzerland	United Kingdom
12	Korea	Belgium
13	Norway	France
14	Finland	Germany
15	Spain	*United States
16	France	Australia
17	Portugal	Japan
18	Australia	Austria
19	Italy	New Zealand
20	New Zealand	Ireland
21	United Kingdom	Spain
22	Hungary	Italy
23	Luxembourg	Czech Republic
24	Czech Republic	Portugal
25	Mexico	Hungary
26	Poland	Greece
27	Greece	Poland
28	Ireland	Slovak Republic
29	Slovak Republic	Turkey
30	Turkey	Mexico

Source: Organization for Economic Cooperation and Development, Broadband Statistics to December 2006, June 2007; Broadband Subscribers December 2007.

than half of what U.S. consumers pay. High prices are a major cause of the digital divide. Slow speeds are a major component of the wider problem of lagging performance on broadband.

An analysis prepared by the Said Business School at Oxford University and the University of Oveido highlighted the issue of "staying on the cutting edge" by developing a broadband quality score that measured "*download* and *upload* throughput and latency" (Said Business School 2008: 2). The logic of the approach was to move beyond the simple numbers of the penetration of broadband.

A nation's leadership in broadband was typically deteremined by its ranking on penetration, and now we know that this will not be enough. This study gives broadband stakeholders, from governments to telecom and cable operators and vendors like Cisco, as well as consumers a better understnading of the importance of quality broadband connections. Without high-quality broadband, we will not be able to take full advantage of the next waved of productivity, collaboration and entertianment that can be gained from the web" (Said Business School 2008:2).

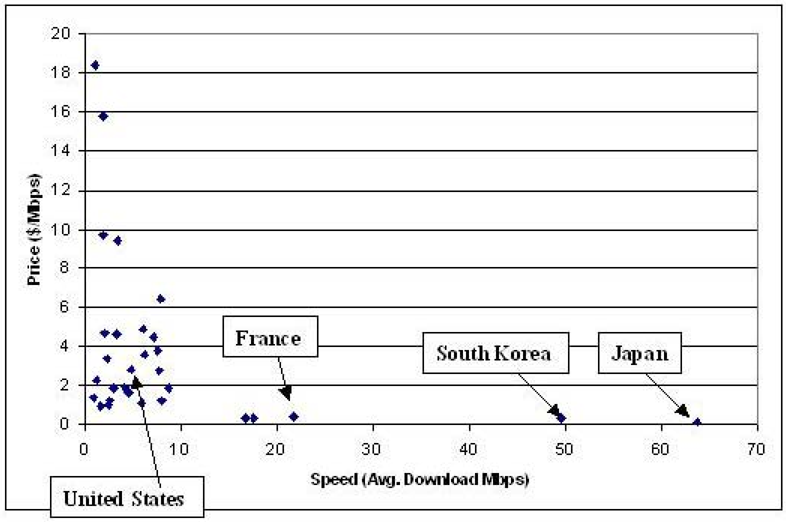
The U.S. ranked 16th among the 42 nation's studied including the same dozen nations ranked ahead of of the U.S. based on simple penetration.

Efforts to Explain Away the Inconvenient Truth

Stung by the findings that the U.S. is falling behind and the implication that the policy has failed, three general types of responses have been offered by governmental and industry spokesmen to explain the fact that the U.S. is not doing so well.

The first approach to explaining away the declining status of the U.S. calls for more independent variables. It points to other factors that might account for differences between broadband penetration including -- population density, market concentration, household size, income levels, income inequality, education, and age, among other factors. By creating a predicted score for penetration based on these other factors, these

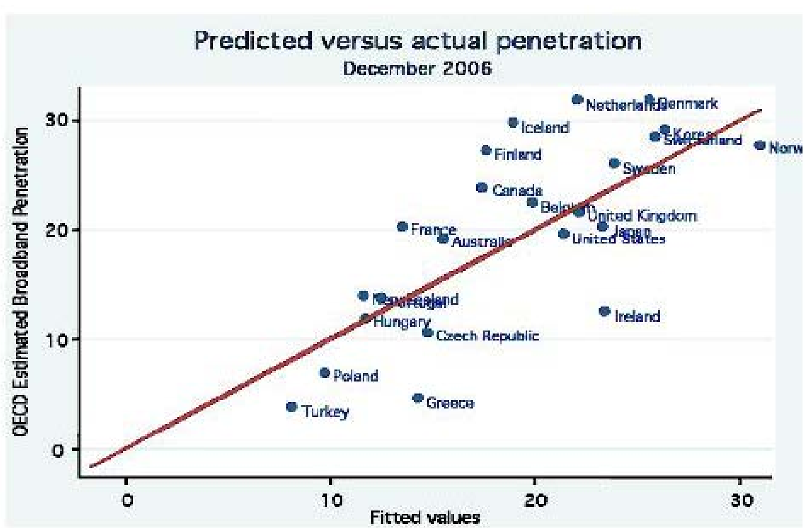
Figure 7. Mediocre speeds and mediocre prices result in mediocre penetration



Source: Robert Atkinson, Daniel K. Correa and Julie A. Hedlund, *Explaining International Broadband Leadership* **(Information Technology and Innovation Foundation, May 1, 2008), page 6.**

studies tried to absolve policy as the cause of falling behind, claiming that the U.S. is doing as well as could be predicted/expected given its income, income inequality, population density, etc. Figure 8 presents the results of one of several studies of this type (Wallenstein 2007). There are at least

Figure 8. Controlling for urbanicity and industry concentration, the U.S. is outperformed by 15 OECD nations



Scott Wallenstein, *Everything You Heard About Broadband in the U.S. is Wrong,* **Progress and Freedom Foundation, June 2007**

three other similar studies (Atkinson, Correa, and Hedlund 2008; Ford, Koutsky and Spiwak 2008' Turner, 2005). All of these analyses tell essentially the same story. The U.S. is below the regression line that relates actual performance to predicted performance and well behind about a dozen nations. The very same nations that lead the U.S. in the simple speed, penetration, and price comparisons also outperform the U.S. in the more complex analyses.

The second approach to explaining away the poor U. S. performance is to redefine the dependent variable. Here the claim is that other technologies, like G3 wireless should be included. However, these technologies do not come close to matching the speeds of wire line broadband and appear to be used as a complement for mobile communications by the very same people who have wireline broadband, not as a substitute for full service wire line broadband (Horrigan 2008c). Although Europeans have been ahead of the U.S. on wireless telephony, the wireless broadband services have fared much worse in Europe than in the U.S., suggesting that the availability of much more attractive wireline broadband speed/price options is crucial. Ironically, a global index that includes penetration of cellular and wireless technologies with equal weight to wireline service, the Digital Opportunity Index sponsored by the World Summit on the Information Society (2008), ranks the U.S. 16th among the OECD national analyzed by the above indices.

Taken together, the six different rankings present a dramatic picture of the U.S. falling behind on broadband. Eleven nations of the thirty OECD nations are ranked ahead of the U.S. in a majority of the evaluation approaches (6-0: Denmark, Finland, Sweden, Switzerland; 5-1: Belgium, France, Korea, Netherlands, Iceland; 4-2 United Kingdom, Norway). Another two that were certainly behind the U.S. in 2001 now split the rankings 3 to 3 with the U.S. (Portugal, Japan). Looking back at Table 3 we find that after controlling for a variety of other factors and seeking to measure the outcome in different ways, the same set of countries has caught up to or passed the U.S. in broadband deployment.

The third approach to explaining away the poor U.S. performance is an extension of the second. It expands the dependent variable to include a whole range of factors beyond technology. This multi-attribute approach essentially skips over the basic issue as laid out by the President. A report from an international business school in France prepared for an anti-regulation, free trade group (Markhoff, 2008) provides a perspective on this approach. The report glosses over the questions of infrastructure deployment and adoption by focusing on "cultural, economic and political" factors to conclude that the U.S. is fourth in Internet readiness, broadly defined. The criticism of France offered by the director of the study reveals the not-so-hidden agenda. Whereas France is well ahead of the U.S. in broadband capacity and price, as noted above,

in the study it ranked at 21… It's not because France is lacking in technology, Professor Dutta said. 'If you look at other kinds of regulatory issues and labor conditions, you find a rigid situation that prohibits its companies from making the most effective use of technology." In contrast, "the United States came in fourth, which is up three places from last year. It's rated highly for its research institutions, innovation – the U.S. files for the most patents of any country – and thriving marketplace (Worthen, 2008).

While some multi-attribute approaches to measuring Internet readiness may gloss over the infrastructure problems and rank the U.S. higher, others do not. Broader measures of competitiveness suggest that President Bush was right to identify broadband deployment as a critical aspect of remaining "on the competitive edge of world trade… and the cutting edge of technological change." With lagging broadband penetration, innovation in the applications layer and the services that use the physical connection had gone abroad. Even the multi-attribute studies suggest problems. For example, the U. S. ranks seventh on the A.T. Kearney Globalization Index (2008). Six of the seven nations are included in the OECD studies and all of them rank ahead of the U.S. on at least three of the indices of broadband performance. Singapore, Taiwan and Hong Kong, which are not included in the OECD studies, also are consistently ranked ahead of the U.S. on broadband and in some of the multi-attribute studies.

THE POLICY IMPLICATIONS OF FALLING BEHIND

A Policy of Neglect is Not Benign

Ultimately, the intent of both the "digital divide" and "falling behind on broadband" debates is to influence policy. The differences in performance between nations are correlated with sharp differences in policy. The observations on and reactions to U.S. broadband deployment and adoption stimulated by the INSEAD study are particularly revealing in the context of the long running debate over broadband policy. David J. Faber, "an Internet pioneer and professor of computer science at Carnegie Mellon University observed 'My gut felling is that we don't have the type of deployment you have abroad. If you are looking at broadband, we have a lot of problems. We are slow as molasses in deploying the next generation'" (Markhoff, 2008a). Moreover, the article points out that the network that is deployed is not being taken up as fast as in other countries. "More customers have retained dial-up service than most countries, which might be explained by price or lack of attractive broadband services" (Markhoff, 2008a). Whatever the 68 variable approach to Internet readiness used by INSEAD is measuring, it cannot gloss over the basic fact that technology use and take-up have not accomplished the President's goal.

An economist from the Organization for Economic Co-operation and Development (O.E.C.D.), commenting on the INSEAD study, attributed the problem to a policy choice made by the U.S.

I think we can say that a lot of the situation in the United States is a result of the lack of competition," said Taylor Reynolds, an economist in the Internet and Telecommunications Policy section of the O.E.C.D. "In Europe we have adopted an unbundling strategy wholeheartedly." That has led to more competition in markets outside the United States, he said, which in turn has driven Internet service providers elsewhere to offer speedier service and lower prices. (Markhoff, 2008a)

The loss of U.S. leadership can be measured in the routing of Internet traffic. Over the course of a decade, the share of global traffic routed through the U.S. declined from 70 percent to 25 percent.[2] While some of the decline was inevitable, as Internet usage spread, "economics also plays a role (Markoff, 2008b)." Policies to capture the flow of traffic for economic and strategic reasons were pursued by individual nations.

Indeed, more countries are becoming aware of how their dependence on other countries for their Internet traffic makes them vulnerable. Because of tariffs, pricing anomalies and even corporate cultures, Internet providers will often not exchange data with their local competitors. They prefer instead to send and receive traffic with larger international Internet service providers…. [T]he shift away from the United States was not limited to developing countries. The Japanese "are on a rampage to build out across India and China so they have alternative routes and so they don't have to route through the U.S… International networks that carry data into and out of the United States are still being expanded at a sharp rate, but the Internet infrastructure in many other regions of the world is growing even more quickly. (Markoff, 2008b)

The potential harm in these shifts is loss of leadership in this critical sector. "The risk, Internet technologists say, is that upstarts like China and India are making larger investments in next-generation Internet technology that is likely to be crucial in determining the future of the network, with investment, innovation and profits going first to overseas companies (Markoff, 2008b)."

The investment pattern reflects a mix of government policies that promote the deployment of the technology and private sector investment decisions that neglect it.

Internet technologists say that the global data network that was once a competitive advantage for the United States is now increasingly outside the control of American companies. They decided not to invest in lower-cost optical fiber lines, which have rapidly become a commodity business.

While there has been some concern over a looming Internet traffic jam because of the rise in Internet use worldwide, the congestion is generally not on the Internet's main trunk lines, but on neighborhood switches, routers and the wires into a house.

The increasing role of new competitors has shown up in data collected annually by Renesys, a firm in Manchester, N.H., that monitors the connections between Internet providers. The Renesys rankings of Internet connections, an indirect measure of growth, show that the big winners in the last three years have been the Italian Internet provider Tiscali, China Telecom and the Japanese telecommunications operator KDDI.

Firms that have slipped in the rankings have all been American: Verizon, Savvis, AT&T, Qwest, Cogent and AboveNet.

The U.S. telecommunications firms haven't invested," said Earl Zmijewski, vice president and general manager for Internet data services at Renesys. "The rest of the world has caught up. I don't see the AT&T's and Sprints making the investments because they see Internet service as a commodity (Markoff 2008b)

The Importance of Price

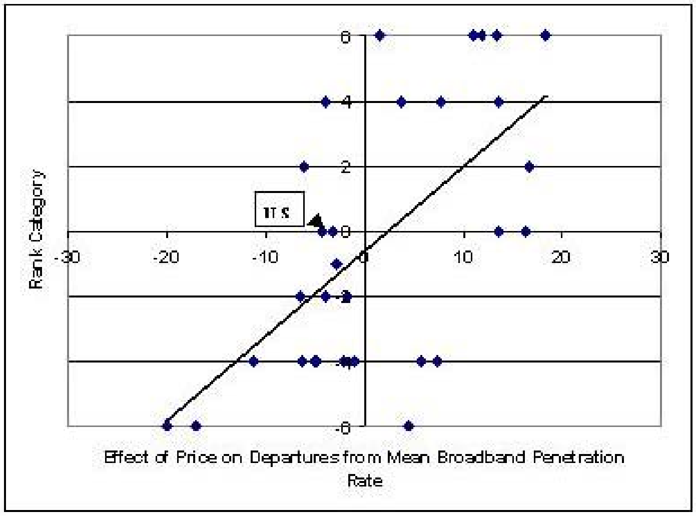
The nations that have passed the U.S. on broadband have not relied on trickle down economics to get the job done, but have implemented much more aggressive policies to promote broadband. Instead of relying on weak competition between, at most, a couple of advanced communications service providers, they required the dominant networks to be open to competition in Internet services. This kept the price down and stimulated innovation.

Econometric analyses by the critics of the simple ranking approaches include a price variable and it is one of the most important factors affecting penetration.[3] Ironically, they do not consider price to be a "policy" variable, although many others do.[4] Price has been a policy variable in the U.S. for at least three-quarters of a century, since the Communications Act of 1934 which included the goal of making available "adequate facilities at reasonable charges."

Even controlling for the large number of demographic and other factors, the importance of price can be seen if we plot the effect of price on the relative ranking of the nations. Figure 9 shows the nations arrayed by the net number of times they were ranked higher than the U.S. in

the six studies cited above plotted against the impact of pricing on the penetration rate. There is a strong relationship between price and performance of broadband. Nine of the thirteen nations that outperform the U.S. have a positive pricing policy. In all of these analyses, if the U.S. had the same "average" pricing policy as the nations ranked ahead of it, it would be outperforming most of them.

Figure 9. Nations ranked ahead of the U.S. on six indices and effects of price



Source: Robert Atkinson, Daniel K. Correa and Julie A. Hedlund, *Explaining International Broadband Leadership* **(Information Technology and Innovation Foundation, May 1, 2001); Organization for Economic Cooperation and Development,** *Broadband Statistics to December 2006, June 2007; Broadband Subscribers December 2007;* **Scott Wallenstein,** *Everything You Heard About Broadband in the U.S. is Wrong,* **Progress and Freedom Foundation, June 2007; George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak,** *The Broadband Efficiency Index: What Really Drives Broadband Adoption Across the OECD?* **(Phoenix Center Policy Paper Number 33, May 2008).**

The Broad Policy Palate

While the studies that call for more complex analysis of the broadband issue tend to reject price as a policy variable, they do not conclude that there is no room for policies to promote broadband penetration. Some explicitly accept the idea of a market failure.

The United States can learn from the broadband policy best practices in other nations. First and foremost, America needs a national broadband strategy that focuses on both broadband supply as well as broadband demand. Some may argue that national strategy is unnecessary because the United States already has strong intermodal broadband competition. In part because of significant market failures with regard to the provision of broadband, relying on market forces alone will not meet our country's future broadband need (Atkinson Correa and Hedlund, 2008: 40).

Others see the problem flowing from basic demographic factors that reduce subscription to Internet service that can be addressed by policy.

We do not mean to suggest that policymakers should be content with the current level of performance, or that broadband policy is irrelevant. Indeed, our results should encourage policymakers to focus their attention on policies that will cultivate or enhance the endowments that increase broadband adoption or that will counterbalance the adverse effect of endowments that suppress broadband adoption. For example, programs focused on overcoming the effects of income and income inequality might significantly spur broadband adoption (Ford, Koutsky and Spiwak, 2008:15).

Programs to address the adverse effects of income and income distribution are very much in the "digital divide" frame – suggesting universal service approaches, which are precisely the policies rejected by the Bush administration.

Contrasting the policies of the Bush and Clinton administrations is informative.

The Bush Administration

The policy outlined by Chairman Powell at the start of the Bush Administration and implemented by both Chairman Powell and later Chairman Kevin Martin was essentially to let a duopoly of cable and telephone companies dribble out broadband at high prices without obligations to allow competition to flourish on their networks or policies to promote universal service.

Attempting to provide incentives to the incumbent duopolists to roll out the new technology quickly and keep the price low, the FCC abandoned one of the cornerstone of communications policy in America, the obligation that communications network be available without discrimination. It also abandoned the efforts to support vigorous service competition on advanced networks, which was the cornerstone of the success abroad.

After failing to promote competition within the telephone network, it allowed a merger wave to dramatically reduce the number of potential competitors who could build networks dramatically. The dominant telephone companies were rewarded for failing to compete with one another by being allowed to buy each other up. When competition floundered under the weight of decisions that made it impossible for even giants like AT&T and MCI to compete in local phone service, the FCC let the largest Baby Bells buy out their biggest actual and potential competitors.

The FCC also squelched competition in wireless communications by allowing the largest incumbent telephone companies to expand their control over wireless communications by lifting the cap on the amount of spectrum that an incumbent landline company could license. After the wireless mergers, the FCC then auctioned new spectrum, allowing the dominant Bell operating companies to buy up licenses to use more spectrum, closing out new entrants.

Having allowed the incumbent wireline companies to achieve market power over price through mergers, the FCC failed to prevent pricing abuse of key network services (like wholesale loops and special access) that were critical for new entrants (either landline or wireless) to compete.

While competition floundered, the FCC did little to promote universal service. In eight years, the FCC failed to reform the universal service fund so that it would support advanced communications facilities in rural areas or make them more affordable in urban area. The fund grew dramatically, enriching the incumbent telephone companies, without promoting the public interest in a ubiquitous broadband network.

Finally, the FCC sought to slash the power of local governments to establish the public interest obligation on cable communications companies, who were moving into the communications business, to meet the needs of local communities, without establishing public interest obligations at the federal level. This triggered a race to the bottom, restricting the ability of local governments to deploy advance communications networks for public services.

The Clinton Administration

Although the Clinton Administration identified the universal service problem early, its policy was mixed. On the universal service front, the Clinton administration embraced an expansive approach to the e-rate programs that supported advanced service for schools and libraries and implemented other institutional programs to promote technology literacy and use in institutional settings, but it did not reform universal service to promote broadband penetration.

On the broader telecommunications policy front, it fully embraced platform service competition, attempting to ensure that unbundling of network elements would make the monopoly elements available to competitors, but it struggled to keep the platform open under the convoluted language of the Telecommunications Act. It repeatedly lost court cases to the Regional Bell Operating companies, cases that ultimately allowed Michael Powell to implement his full-throated hostility to platform service competition.

While the Clinton administration embraced platform service competition, it set the precedent of allowing local telephone companies to merge, undermining the possibility for vigorous head-to-head competition between telephone companies. The Bell Atlantic/NYNEX and SBC/Ameritech mergers were crucial in this regard, as they were mergers between contiguous service areas, where cross-border competition was likely and in the later case actually existed. While the Clinton Administration made it clear it would oppose mergers between local and long distance companies, the loss of the local companies as potential competitors severely limited the prospects for facilities based competition and placed much more pressure on the platform service competition model to deliver effective competition. Ironically, at the very same time that this model succeeded abroad, it was abandoned in the U.S.

In the wireless space, the Clinton Administration preserved the cap on the holding of wireless licenses in place, but it did not expand the unlicensed use of spectrum.

CONCLUSION

Neither the digital divide nor the precipitous decline in the U.S. standing in broadband was inevitable. The Clinton Administration's declaration of a digital divide problem may have seemed to come a bit early in the process of deployment of the new technology and may have been driven by a desire to exploit a political opportunity because of the constituencies that would be served by implementing policies to close the divide. However, given the immense importance that the Internet has taken on in social, economic and political life and the persistence of the digital divide, early attention given to the issues seems more like good foresight than politically motivated analysis. On the other hand, the Bush Administration's declaration of "mission accomplished" in broadband seems to play out in the opposite manner; bad analysis put forward in defense of bad policy.

Those who argued for the "have later" position have had the ground cut from under them. A decade and a half after the Internet began its powerful penetration and transformation of economic, political and social life, more than one-third of American households remain disconnected, disadvantaged and disenfranchised. TV, radios, telephone, VCRs DVD players, cell phones, have all achieved higher levels of penetration and several of them achieved it faster than Internet connectivity. The households that are disconnected are overwhelmingly low income and tend to be disproportionately, minority households; the digital divide compounds existing fault lines in the U.S.

A decade and a half of policy implementation may have closed off some policy options, like the mergers and auctioning of spectrum to the large incumbents, but others remain open.

The reliance on a cozy duopoly of facilities-based competitors to achieve the goal of universal service appears to have failed and is not likely to deliver service that will match the nations that have passed the U.S. The FCC could ensure that the dominant networks allow competition in services without discrimination. This would spur the development of applications and services that would stimulate demand. Promoting within platform competition and the deployment of the dominant platform were the keys to the success of other nations. They were also central to U.S. world leadership in telecommunications prior to the passage of the Telecommunications Act of 1996.

The FCC could make more airwaves available for unlicensed use, which would avoid the stranglehold that the deep-pocketed incumbents have on the auction of spectrum, and expand the scope of WiFi approaches to service.

The FCC could aggressively reform universal service funds to support broadband.

Ultimately, Congress could conclude that more vigorous efforts are necessary to ensure leadership in broadband, but that would require policymakers to abandon the do nothing approach that has failed over the past eight years.

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KEY TERMS AND DEFINITIONS

Broadband: in telecommunications refers to a signaling method that includes or handles a relatively wide range of frequencies, which may be divided into channels or frequency bins. Broadband is always a relative term, understood according to its context. The wider the bandwidth, the greater the information-carrying capacity. In data communications an analogue modem will transmit a bandwidth of 56 kilobits per seconds (kbit/s) over a telephone line; over the same telephone line a bandwidth of several megabits per second can be handled by ADSL, which is described as broadband (relative to a modem over a telephone line, although much less than can be achieved over a fibre optic circuit). The threshold for defining boradband has been controversial in the Uinted States.

Communications Act of 1934: was a United States federal law enacted as Public Law Number 416, Act of June 19, 1934, ch. 652, 48 Stat. 1064, by the 73rd Congress, codified as Chapter 5 of Title 47 of the United States Code, 47 U.S.C. § 151 et seq. The Act replaced the Federal Radio Commission with the Federal Communications Commission (FCC). It also transferred regulation of interstate telephone services from the Interstate Commerce Commission to the FCC.

Digital Divide: refers to the gap between people with effective access to digital and information technology and those with very limited or no access at all. It includes the imbalances in physical access to technology as well as the imbalances in resources and skills needed to effectively participate as a digital citizen.

Laissez-Faire: is a term used to describe a policy of allowing events to take their own course. The term is a French phrase literally meaning "let do". It is a doctrine that states that government generally should not intervene in the marketplace. The term is often used to refer to various economic philosophies and political philosophies which seek to minimize or eliminate government intervention in most or all aspects of society.

Michael Kevin Powell: (born March 23, 1963) is an American Republican politician. He was appointed to the Federal Communications Commission by President Bill Clinton on 3 November 1997. President George W. Bush designated him chairman of the commission on January 22, 2001. Powell is the son of former Secretary of State Colin Powell and Alma Powell.

Penetration: is given as a percentage of a country's households who have have subscribed to a particular service.

Telecommunications Act of 1996: was the first major overhaul of United States telecommunications law in nearly 62 years, amending the Communications Act of 1934. It was approved by the 104th Congress on January 3, 1996 and signed into law on February 8, 1996 by President Bill Clinton.

Trickle-Down Economics: and "trickle-down theory" are terms of political rhetoric that refer to the policy of providing tax cuts or other benefits to businesses and rich individuals, in the belief that this will indirectly benefit the broad population. Proponents argue economic growth flows down from the top to the bottom, indirectly benefiting those who do not directly benefit from the policy changes. However, others have argued that "trickle-down" policies generally do not work, and that the trickle-down effect might be very slim. Today "trickle-down economics" is most closely identified with the economic policies known as Reaganomics or supply-side economics.

ENDNOTES

1 The primary shift between 2005, when this data was gathered, and 2008 has been a shift from dial-up to broadband, but as the title of a study from the Pew Internet and American Life Project suggests the 2005 results apply to 2008: "Adoption Stalls for Low-Income Americans even as many Broadband Users Opt for Premium Services that Give them More Speed" (Horrigan, 2008c).

2 Andrew M. Odlyzko, a professor at the University of Minnesota who tracks the growth of the global Internet, added, "We discovered the Internet, but we couldn't keep it a secret." While the United States carried 70 percent of the world's Internet traffic a decade ago, he estimates that portion has fallen to about 25 percent.

3 Atkinson, Correa and Hedlun (2008: 14) find price to be the most important factor. Ford, Koutsky and Spiwak (2008) rank income, income inequality and telephone penetration ahead of price.

4 Atkinson, Correa, and Hedlund (2008: 14) include price in a model labled, "Non-policy Variables Related to Broadband Penetration in OECD Countries. " Similarly, Ford, Koutsky and Spiwak (2008:12) state that "non-policy variables explain nearly all variations in subscription rates" and include price among the non-policy variables. When they turn to recommendations, they point to policies to influence several variables in the non-policy model, but not price, when at lease some of those variables have smaller coefficients (2008: 1, 18).

Chapter 21

Digital Divide and Rural Communities:
Practical Solutions and Policies

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ABSTRACT

During the last years, due to the wide spread of World Wide Web (WWW), the Internet has become one of the most valuable and effective communications media and the most inclusive source of information. However, in many cases the difficulties of establishing universal effective access could serve to reinforce current patterns of social exclusion and produce barriers to balanced development instead of supporting it. World widely there is a rising concern over the so-called "digital divide"–a term that refers to the gap existing in the opportunities to access advanced information and communication technologies between geographic areas or by individuals at different socioeconomic levels. The experience shows that specialized initiatives are needed for disadvantaged areas in order to anticipate expansion of current digital divide. This chapter is focusing on the specific instance of digital divide occurring in rural territories, and examines the ways to foster digital culture among citizens, utilizing a specific initiative (the so called "Telecentres").

INTRODUCTION

During the last years the wide spread of WWW has led to a new form of illiteracy, a "digital" one. Only those who can afford the PC and fast Internet connection are able to take advantage of it. By most counts, the number of PC and Internet users is very small compared to the numbers that would use it if they could. As more individuals are connected online, those who are not connected are increasingly in danger for becoming more marginalized within society. World widely there is a rising concern over this "digital divide" (Brachos, Kostopoulos, Soderquist, 2003; Reddy, 2005; Schloman, 2004; OECD, 2001).

The fact nowadays is that "The network society is creating parallel communications systems: one for those with income, education and literacy

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connections, giving plentiful information at low cost and high speed; the other are those without connections, blocked by high barriers of time, cost and uncertainty and dependent upon outdated information" (Globalization with a Human Face, p 63, 1999).

The key factors leading to the digital divide are:

- Missing infrastructure or access
- Missing incentives to use ICTs
- Lack of the computer literacy or skills necessary to take part in the information society
- Poverty and social exclusion

Most countries that have been concerned about this problem have instituted policies aimed at reducing aspects of it. In reality there are several possible concrete cases of the digital divide gap occurrence (Bridging the "Digital Divide", 2001). One important subset of the digital divide issue concerns high-speed Internet access, also known as "broadband". Broadband refers to data transmission where multiple pieces of data are sent simultaneously to increase the effective rate of transmission, regardless of actual data rate. The "broadband divide" may be defined by those with rich, interactive audio and video services in the home and those with low-bandwidth, text-driven services. This divide will become increasingly important as the availability of advanced telecommunications become essential to the development of business, industry, shopping and trade, as well as distance learning, telemedicine, and telecommuting. The international digital divide also exists between different countries, with the ability of individuals to take advantage of the Internet varying significantly across the OECD area (OECD, 2008) and between OECD and other countries. There are concerns that unless access to the use of Information and Communication Technology is broadened, the majority of people, particularly in the developing countries, will not enjoy the benefits of the new knowledge-based economy.

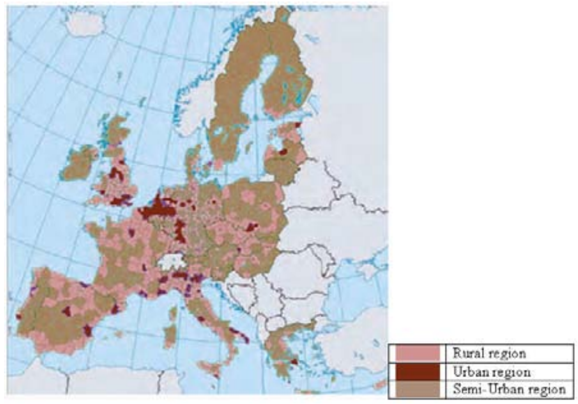
The Urban/rural divide refers to those set of people without an enhanced data capability which will lead them to be unable accessing the expected benefits particularly in relation to health and education. This concern is seen to be greatest in relation to those living and working in rural and remote areas since the lower rates for data access for these consumers place them at a disadvantage in comparison to metropolitan consumers. For these citizens the problems of missing infrastructures, incentives and computer literacy (the factors leading to Digital divide) are bigger and more difficult to solve. The world widely experience shows the several specialized initiatives are needed for rural areas in order to anticipate expansion of current digital divide and at the same time to provide solutions to deal with the actual problem.

Most of the effective solutions (Closing the Digital Divide in Rural Communities, 2001; Courtright, Robbin, 2001; Xavier, 2001; Bridging the "Digital Divide", 2001; Fung, 2006; The Digital Divide in Austria, 2000), focused directly on ensuring access to technology; the majority of access-based successful initiatives also involved training.

This Chapter examines the ways in order to foster digital culture among rural citizens by demonstrating initiatives to bridge the digital divide through advanced broadband telecommunications and services providing remote areas with access to the Info-Society. Its specific objectives are:

- To present the situation concerning the digital divide problem in rural areas, with emphasis on situation around Europe Community.
- To study the reasons behind the problem (lack of infrastructure, computer literacy, access to e-services etc)
- To study existing initiatives in relation with:

Figure 1. Rural Europe



    - Infrastructures
    - Services
    - Support activities
    - Education/Training
    - Policies
- To emphasize to a specific type of support mechanism dealing with the problem of rural digital divide based on the specific needs of each territory (utilization of customised telecentres).

BACKGROUND ISSUES: THE DIGITAL DIVIDE PROBLEM IN RURAL AREAS AROUND EUROPE – REASONS AND INITIATIVES TO DEAL WITH

In this Section we present the background issues in relation with the problem addressed in the Chapter. We give the existing situation concerning:

- Rural Europe (situation and problems)
- ICT penetration in Rural Europe (current situation)
- Reasons behind lack of ICT penetration
- Initiatives to deal with the problem (categories, success stories, lessons learned)
- Conclusions

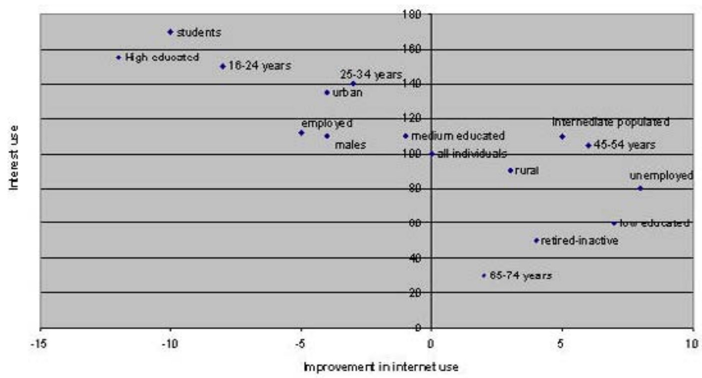
Based on the outcomes, we proceed to present, in the next Section, a specific case of a successful support mechanism on how existing local establishments can be turned into local learning hubs, which provide the local labour force and citizens of all ages with fast Internet access and opportunities for lifelong learning creativity and development.

Rural Europe

Rural areas account for 80% to 90% of the European territory and about half of its population (Foundation for future Generations, 2007). These figures are approximate as it is not always easy to define an area as rural, which some people have described as “the vacuum left after urban has been defined”.

Healthy rural communities have to share several basic characteristics such as: maintaining a viable aged population, assure poverty and unemployment rates not very far from the nearby urban average ones, maintain good level of public health, value from their historical, cultural and environmental characteristics, share a relatively high rate of economic growth, assure effective public administration and finally being able to assure sustainable development on their own without depending on central government actions.

Figure 2. Trend on Internet use in the EU



It is evident that in Europe there are many things that need to be done to achieve the beforehand characteristics for its rural territories. There is a need for both EU and national policies to work in a more integrated way to address all issues. There exist several past and current initiatives leading to some progress (e.g. EU agricultural policy, the "LEADER" initiative ("LEADER" 2008), EU Regional and Cohesion policies) but significant challenges remain. There is a need for learning from the success stories and transfer experiences between rural areas in an as much as possible wider level.

The Rural Development policy after 2006 is therefore focusing on:

- Increasing the competitiveness of the agricultural sector
- Enhance the environment and the countryside
- Enhance the quality of life in rural areas and promote diversification of economic activities

The effort is based on dealing with two major economic problems: a) The need to restructure agricultural production in order to support and increase agricultural incomes and sustain a fair standard of living for farm households and b) the need to diversify the economic activity base of such areas in order to reduce dependence on a single sector or activity, and offer new opportunities for employment.

Internet Penetration in Rural Europe

Under this perspective, a very important issue to deal is the so called Digital Divide. ICTs effective penetration is a lever which helps horizontally towards all development factors. The most important factor to measure this, is the Internet access penetration because of the wide spread of World Wide Web (WWW) within the last years, and the rich information/services spectrum provided by it to the citizens. As a result, the Internet has become one of the most valuable and effective communications media and the most inclusive source of information.

On average, 8% of households living in rural areas in the European Union subscribe to broadband (high speed internet access), compared with 18% in urban areas (Foundation for future Generations, 2007). This "digital divide" is explained by the higher cost of the service in areas with a low population density and lower incomes. In some of the more isolated rural areas, it is still not possible to connect to a broadband network and therefore benefit from the opportunities derived from the ICTs application.

From the above graph (based on studies presented in (EUROPEAN COMMISSION, *Information Society and Media Directorate-General, 2007)*, it is evident that several independent factors are causing digital divide: age, education, settlement etc.

In this Chapter we deal with the specific case of Urban/Rural Digital divide which is one of the cases presented in the graph. The graph does not imply that all EU rural population if facing a primitive Digital Divide problem (comparing for example with the situation outside Europe).

However it makes clear that there exist a Urban/Rural Digital Divide and therefore a major drawback on the effort to achieve European Cohesion. EU Broadband gap policy (http://ec.europa.eu/information_society/eeurope/i2010/digital_divide/index_en.htm) is concerned with the geographical aspects of the digital divide among EU regions.

This policy seeks to bridge the gap of access, speed, quality of service and price in broadband between urban and rural/remote areas. However the risk of the widening of the Internet broadband divide, despite the fact that connected population is increasing, is very high due to the specific case and problems of rural communities.

In such communities distance, economic and social barriers constrain the rural population in its access to the many facilities our civilization has to offer, that urban populations have easy access to. In more details the specific causes of this divide, specifically for rural territories, can identified as follows: (Bridging the Rural Digital Divide, 2008).

1. Lack of telecommunications and other connectivity infrastructure
2. Lack of skills and institutional capacity
3. Lack of representation and participation in development processes
4. Lack of financial resources
5. Lack of education and as a result of needed computer literacy

Concerning the factors that influence this specific instance of Digital Divide, the characteristics of human capital are the most significant ones (lack of skills and computer literacy, resulting lack of motivation) (Kalogeressis, Labrianidis, 2006). If we are to solve the problem and avoid the info-poor exclusion in Europe, we must take steps to ensure that all rural citizens are able to receive diverse content that is relevant to their lives, as well as produce their own content for their families, their communities and for the Internet at large.

In general, the world wide experience shows that most of the effective solutions to ensure access to technology, are involving also successful training. All these initiatives lead to the conclusion that for local communities to achieve their needed steps towards the forefront of the Information Revolution, there is a need to:

- promote competition and a deregulatory environment in industries that deliver broadband services (Thierer, 1999);
- maintain, and possibly expand, existing government grant and loan programs designed to assist the broadband build-out (Gilroy, Kruger, 2008);
- increase investment in research and development in existing and alternative technologies (EUROPEAN COMMISSION, Information Society and Media Directorate-General, 2004);
- publish “best practices” information to facilitate the sharing of ideas that work (Angelidis, Mili, Verikoukis, 2004)

However, especially for the case of businesses and citizens in rural communities, there is an additional need for the provision of cost-effective, reliable access to the information superhighway. Policymakers should consider new and creative ways to (Reddy, 2005):

- Connectivity: Deliver broadband to the Village (EUROPEAN COMMISSION, Directorate General for Agriculture and Rural Development, 2007)

- Computer Access: Information Appliance for use by illiterate people in rural communities
- Build Digital Literacy for the Masses
- Content (Provide Digital Libraries, eLearning tools, Tele-Medicine, Easily searchable information)

Initiatives to Fight Digital Divide

In the next paragraphs we are trying to categorize the initiatives which can be utilized to present concrete solutions and we give specific examples from the bibliography. In the next chapter we are focusing in a specific support activity on how existing local establishments can be turned into local learning hubs, which provide the local labour force and citizens of all ages with fast Internet access and opportunities for lifelong learning creativity and development.

In the last years a wide variety of strategies and activities have been formulated and implemented world widely, targeted to the rural digital divide problem and ranging from new policies, infrastructure development through community-based specific projects. Trying to categorize these efforts we propose the following list.

Infrastructures

Broadband is a key element of the developments that are taking place in the electronic communications markets. Therefore, one of the main objectives in many countries is the support of broadband growth (Bouras, Giannaka, Gkamas, Tsiatsos, 2008). In urban territories, this is easy and can be based purely on private initiated findings (since there is a great investment potential). For rural territories an initial "push" is needed to assure that the broadband implementation will not lack. In general, according to a report of ITU (ITU, 2008), broadband promotion is mainly based on two factors: (a) on the growth of broadband demand and (b) on the growth of broadband supply. Countries that have achieved important broadband promotion have followed common directions, independent from their cultural and geopolitical differences and their technological growth. Furthermore, OECD has created a line of recommendations so that member countries can encourage the growth of broadband markets and the effective use of broadband services. With the relative decision in the 12/2/2004, OECD recommended among others: (a) a combined approach so that the growth of infrastructures, services and requirements are encouraged, as well as the aggregation of demand in under populated regions, as means for the promotion and the effective use of broadband services, (b) the policies that promote access, with equal terms and at competitive prices, in all social groups, (c) the assessment of availability and the diffusion of broadband services in the market, so as to determine whether the undertaken initiatives are suitable.

The European Commission has been particularly active in promoting broadband developments. The EC adopted an initiative supporting the Lisbon 2010 goals, i2010, where broadband take-up is considered an important factor for the emerging digital economy and competitiveness. In the last years, significant progress has been done to deal with specific technological barriers faced in remote rural communities. These efforts include implementation of specific innovative architectures, use of Satellite and Wireless technologies.

Education and Training Initiatives

Infrastructure by its own is not sufficient for the solution of the rural digital divide. The low level of associated computer literacy preserves the barriers and there is a need of proper target education/training and lifelong learning activities. (Koulouris, Sotiriou, 2008; Abbasi, Kretschmer, Makropoulos, Pitsilis, Stergioulas, 2008; Hvorecky, 2004). Effective efforts include:

- training of rural school teachers in order to provide them with the proper qualifications to bring new technologies opportunities to local students.
- utilize remote teaching methods to provide to the local population lifelong learning opportunities
- organization of targeted seminars for local population based on specific needs (e.g. seminars on the benefits of new ICTs for cattle-breeders)

Innovative e-Services Provision

To enhance rural population's Computer Literacy it is important (apart from providing effective training initiatives as mentioned above) to convince about the importance of ICT's. The most effective way to do this is by providing practical solutions to every day problems and demonstrates how these can lead to an improved social and economic situation. The provision Inclusive eServices has been identified as one of the five priority objectives of the European Commission's i2010 eGovernment Action Plan (EUROPEAN COMMISSION, i2010 – A European Information Society for growth and employment, 2008). The aim is to provide all citizens with access to services from administrations at different levels using different eChannels. Economic and Social activities of population (like Small and Medium Enterprises –SMEs- activation, dealing with health problems, interaction with the government etc) can benefit directly from e-services and therefore affective applications of ICTs to support them will demonstrate the need to utilize new technologies and provide the needed lever for e-Inclusion (of course accompanied by the needed infrastructures and training as already stated). E-business opportunities provision (Roach, Stoica 2006)., telemedicine (Kawasumi, Trotter 2004), e-Tourism (Christodoulopoulou, Garofalakis, Koskeris 2006), e-Government (Kamar, Ongo'ndo 2007) are some of the most effective demonstrators.

Support Activities

Going one step further on dealing with the Digital Divide problem in rural territories, in many cases there is a need to support all the above mentioned activities (training and e-services provision). Someone has to manage and organize their provision and as a result there is another important need. To have the proper support structures providing the initial "push" before being able to base on household infrastructures and own self-interest. The most successful cases of such support activity are the so called "Telecentres". Telecentres have been hailed as the solution to development problems around the world because of their ability to provide desperately needed access to Information and Communication Technologies. A significant number of such centres have been piloted and implemented by various governmental and development agencies across the globe. Several specific success cases of their effective application can be found around Europe (International Telecommunication Union, 2001), (Christodoulopoulou, Garofalakis, Koskeris, Michalopoulos, 2007). Their goals are to contribute on rural modernization, economic development and strengthening of democracy and civil society. More specifically, the goals are provision of services to as many as possible with their help as a supporting structure. It has to be mentioned that such kind of activities are complementary, and not competitive, to the previous ones (infrastructures development, training, services). They provide the needed further support for rural and remote populations and create a user basis which will accelerate the demand of broadband at home.

The main focus of this Chapter is related with this specific support activity and a more comprehensive analysis will follow in the next Section.

Policies

Last, but not least, activities and initiatives will never be effective, viable and feasible if not accompanied by relevant policies to endorse them (Nicholas, 2003). Such policies can include: Centrally funded programs (e.g. free internet initiatives, Broadband expansion policies), legislations (e.g. telecommunication regulations, eGovernment regulations), tax policies, community and NGOs efforts (e.g. Locally funded and managed telecentres), public/private partnerships (e.g. PPPs for broadband infrastructure expansion).

Above all, in Europe, the central e-Inclusion policy aims at reducing gaps and disparities in ICT usage. Such policy is the basis for the promotion of the use of ICT to overcome social exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion.

In Conclusion the most important lesson from the past experience on initiatives to deal with the rural Digital Divide is that there is an absolute necessity to work on, access, training, and contents at the same time to promote access to Internet. The experience is showing that in order to achieve these goals for rural communities we cannot based on households infrastructures. Of course there is a need to work for achieving "broadband at home" but for the case of rural citizens, lacking on literacy and motivation, the first steps must be supported from the local public administration using its infrastructures and capabilities. In the next Section of this Chapter, we focus in a specific type of such support mechanisms, the "Telecentres". Initially, we present their potentials, relevant successful experiences from their application in Europe and later on we give a specific suggested methodology for the establishment of specialized telecentres based on specific needs of rural populations.

TELECENTRES AS A SUPPORT MECHANISM TO BOOST THE ICT PENETRATION IN RURAL COMMUNITIES OF EUROPE

Introduction

A telecentre may be defined as a "shared site that provides public access to information and communications technologies" (Bastidas-Buch, Montero, Proenza, 2001). Their main purpose is to increase public access to the Internet and to services available over the Internet. Telecentres first started appearing in Europe and North America in the mid-1980s. Since then, the telecentre movement has grown quickly and spread to almost every corner of the world (Telecentre.org, 2008).

There have been no marketing campaigns to make it grow, and no big organization to "manage" its expansion. Instead, the telecentre movement has been fueled by the power of its ideas, values, and relevance — by different people asking the same basic question: "How can my community participate in and benefit from the social and economic opportunities associated with the information age?" The answer: a common meeting place where people can be exposed to the tools, skills, attitudes, and values of information and network technologies.

Telecentres have the potential to help break down some of the largest barriers to development that are presently faced by low-income populations, particularly in rural areas, and world widely there have been several successful examples of their implementation. Their particular benefit is related with the fact that they encourage and support communities to manage their own development through access to appropriate facilities, resources, training and services. Successful telecentres are able to provide different user groups within a community, with a range of services relating to different domains (from education/training to business, from health to local governance), by offering several technologies. (United Nations Educational Scientific and Cultural

Organization, 2006). Their impact is very important to provide the initial "push" towards digital inclusion, for populations having difficulties to achieve this by their own (using home based infrastructures). As mentioned also in previous Section, such kind of support activities are complementary, and not competitive, to the infrastructures development) providing the needed further support for rural and remote populations and therefore assuring effective future utilization of deployed infrastructures (broadband connectivity, e-services etc).

Telecentres in Europe

In Europe the first step originated in Sweden around 1985. Telecentres (also known as "telecottages") experienced rapid growth in Western Europe in areas where rural isolation, lack of purchasing power and low-quality telecommunications and information technology facilities were seen to be a hindrance to participation in the information economy. By 1994, there were more than 100 telecentres in Austria, Denmark, Finland, Germany, Ireland, Norway, Sweden, Italy and the UK (Xavier, 2001). The idea then spread and has become adapted to the needs of emerging markets and developing countries. Following these leads Hungary (and afterwards several other ones) is the first country in Central Europe to establish a large number of rural telecottages (International Telecommunication Union, 2001; Electronic Journal of Information Systems in Developing Countries, 2001). Below we give some examples of successful Telecentres operation within Europe:

The explicit goals of the **Hungarian** telecottage movement (International Telecommunication Union, 2001) is, on the more general level, rural modernization, economic development, and a strengthening of democracy and civil society. More specifically, the goals are provision of services to as many as possible with the help of telecottages as an infrastructure. The support from the government must be emphasized. In the case of Hungary, the government has inserted the telecottage programme into its IT strategy and has provided funding for the establishment of telecottages.

Telecentres in **UK** allow public agencies and private telecommunications and information technology companies to assess the demand for products and services while creating the market through exposing the public to the applications. Thus, they provide a means to explore rural locations as potential markets for those companies. Experience in the UK suggests that profitability in the developed world is possible, though universally that has not been the case. Many telecentres have not been able to move beyond dependency on institutional or volunteer support and donations of equipment.

Telecentres in **Haskovo** region (Stambolovo and Mineralni Bani municipalities) in Bulgaria were established on 2007 within these territories focused on local businessmen and general public and they provide specialized e-services and consultancy/training on ICT. Even from the first months of pilot operation, exist several positive outcomes which are giving an positive evaluation that telecentres are very useful to-

Figure 3. Local students in Stambolovo's Telecentre

wards the dealing with the digital divide problem in rural territories, with existing primitive problem (general lack of access and low level computer literacy). The established telecentres have become a "social centre" gathering the local population. For example, in Stambolovo Municipality, there will be no exaggeration to say that the telecentre building is now the central meeting point of the population, providing the local people with opportunities to access innovative services which have never been used until now.

All these past experiences shows, that telecentres are very useful and important levers to help towards the dealing with the digital divide problem in rural areas around Europe (since the causes of the problem for such areas are common in all cases as presented in previous Chapter). As the telecentre movement is maturing and several countries are forging ahead with national telecentre programmes, those that lag behind can learn from the early international experiences and they can implement national telecentre programmes without conducting further experimentation. There are sufficient learning opportunities and experienced agencies to provide assistance for them to accelerate their progress towards widespread telecentre deployment, thereby achieving national e-inclusion and contributing to the international development goals. At this point, there is a need to go on step further in the effort, strengthening the movement towards widespread enjoyment of the benefits that telecentres bring. Establishment of telecentres is not effective by its own. It has to be supported and sustained actively by local stakeholders and it has also to be based on the actual local needs and situation. There is a need for a methodology in order to create telecentres fully customised based on the specific economic situation, existing barriers and problems, and local users needs. The methodology we are presenting in this Chapter is derived from a project which funded under the Interreg III B CADSES program (www.cadses.net). The project "Creation of telecentres to support learning, entrepreneurship and access to Information Society, in isolated areas" (Acronym: "TELEACCESS") had as its main aim to present a methodology for the creation of telecentres in digitally disadvantaged and rural areas.

A Methodology for the Establishment of Rural Telecentres

This methodology is meant as a flexible, locally customizable tool that provides help in identifying all those parameters and issues that need to be taken into account when an initiative sets out to establish a local mechanism, aiming to address real local needs. All efforts to provide local Information Society solutions in rural areas need to take primarily into consideration the local perceptions of the needs of the community, as well as factual information about the local settings and conditions, which only members and/or collective bodies within the local community can provide validly. Therefore, it is advisable to proceed with several steps which will all include the local community. **The first step** has to be the collection of needs and problems in relation with the use of new ICTs. The scope of this initial field work is to help identify the characteristics of the local rural territories, on the following sectors:

1. Strategic background and community needs (administration model, relation with national and regional strategies, current useful services, potential useful services for the local groups)
2. Economic situation (main economical activities and problems)
3. Geographical description
4. Internet penetration (for business and at home)
5. Additional problems (situation on computer literacy, and motivation on using new ICTs)
6. Existing mechanisms to support the use of new ICTS in the territory (What kind,

What they are offering, Problems, Positive impact)

Based on this initial work, the **next step** would be the identification of:

- Where to create a telecentre in order to cover the needs and provide solutions
- By Whom and How (local force to operate it and how will organize it)

In a **next step** it is important to run a small-scale survey, to ask the local community, possibly through the completion of a questionnaire by an informed local agent (or more than one, if appropriate), about issues such as the following:

Target Group(s) and Useful Services

The main principal is to address potentially all citizens of the remote area, without exclusions or discriminations by taking into consideration criteria such as geographical disadvantage, remoteness, and digital exclusion. For each of the chosen groups of users, the local informant should give a description concerning their current problems which can be solved, and needs which can be covered. It is also necessary to take into account any local sensitivity to certain issues, which could have an impact on the successful deployment of e-services and applications in the telecentre.

Existing Premises and Equipment that Could be Used for the Telecentre

One of the major issues for the establishment of a telecentre is the identification of the appropriate place for it. The TELEACCESS methodology lies on the principal that the telecentres in rural areas do not need new buildings, as already existing local entities can host such new developments. Therefore, an issue of priority is to locate and describe existing premises within the area in which the telecentre is to be established, which could be used for this purpose. It is also advisable to think of all possible existing equipment which they think could be used. A list of equipment should be compiled, with as a detailed description of specifications as possible. Possible needs for upgrades to the existing equipment should also be recorded.

Local Structures which Can Operate and / or Support the Telecentre

The success or not will greatly depend on local organisations and institutions in the area of the planned telecentre that may be interested in using and/or supporting the telecentre.

Existing Broadband Connectivity

For the different internet connection technologies, such as DSL, wireless, satellite, etc., a clear understanding should be established of issues such as availability of the technology in the area of the telecentre, the extent of its use, its costs, average waiting time and cost for its installation.

Establishment Plan and Actual Establishment

The information on all the above issues that will be gathered needs to be considered and analysed coherently, leading to an informed decision of the kind of telecentre that should be established in this specific area, the services to be offered, the needed infrastructure, the appropriate time and synergies for its creation, as well as to an overall initial estimation of actions to be taken and their timing.

In the following paragraphs we briefly present the case of three territories in which within the project we tested the methodology. These territories include isolated rural areas with strong digital divide problem occurrence and low level of computer literacy and new technologies use motivation. Therefore, the utilization of “telecentres” was decided as useful for the initial "push". Each case was different and leaded to different results after the application of the methodology.

The first case involves a rural Municipal area in Western Greece, called **Dymi**. The initial field work lead to the following conclusions concerning its basic characteristics. Municipality of DYMI is a Local Government which belongs to the Region of Western Greece. In order to deal with the current Digital Divide problem, the municipality is based on the national strategy for the Information Society. However, the effective application of new ICT in Dymi has been slow because of the lack of cooperation between the state, the private sector and the citizens and the lack of strong motivation for the local people. The farmers/grangers, the small and media merchants/entrepreneurs and the hotel owners are the major professionals. So much the Primary sector (agriculture) as long as the Tertiary sector (tourism) are unfortunately not in prosperity the last years. Although internet access and basic e-services are accepted as very useful for the local development, the outcomes until now are not satisfying. The internet penetration is very low, especially in the distant rural areas, the computer skills are less than basic and the majority of internet users have low connection.

The municipality administration has identified that the establishment of a telecentre will contribute positively to the bluntness of the digital "divide problem". Until now there are no telecentres existing in the territory, focused in distant rural businesses (which are the ones lacking much more behind). The only related info-centres are private owned training centres and public e-services offices. All these are very much specialized and not focused on the problems of local rural businesses. Based on the above outcomes of the initial research work, the municipality took the decision to establish a telecentre in an ex-school structure in a distant village of the municipality. In that way, it will be possible to cover the needs of spread users and enhance their computer literacy providing them with an opportunity to get in touch with new technologies applications and services. From that point, a second detailed study carried out in order to:

- produce conclusions on which services will have to be delivered and for which target groups
- fully specify the current infrastructure situation and the additional needs in order to effectively operate the telecentre

The user groups that identified as the ones lacking more behind, and their specific needs in relation with new ICTs effective use were:

1. Tourists: There are no info points to help them access information. A telecentre can give them such opportunity.
2. Farmers: Cultivators and graziers are not having access to Internet.
3. Women: Disadvantaged groups in a bad economic situation which need to find new opportunities.

The second case involved the regional area of **Umbria** in Italy. It is administered by a regional government, including several municipal rural areas. Its economy is based on four strong lines: manufacturing, handicrafts, agricultural, and tourism. Weakness points are the deficiency of infrastructures, the disequilibria related to geographical characters, social economy and environment. Positive elements can have an effect on the region, such as an uncontaminated environment, a cultural heritage as basis for tourism, social cohesion: an almost good quality of life, which can become unsustainable, without the development of new ICT. The decision of the regional government was to establish 2 telecentres in respective region's municipalities (and enhance the operation of an existing additional one). These telecentres will act as innovation learning hubs to help the people from the nearby territories having an easy way to effectively use new technologies

Table 1. TELEACCESS Pilot telecentres

Casarano - ITALY
Narni - ITALY
Perugia - ITALY
Piegaro - ITALY
Urbino - ITALY
Dresden - GERMANY
Raba Wyzna - POLAND
Mineralni bani - BULGARIA
Stambolovo - BULGARIA
Vinkovci- *CROATIA*
Skrad - CROATIA
Kato Achaia town - GREECE
Patitiri village - GREECE

(which until now were not used). Each one will focus on different target group and will provide different services based on the specific needs of each group. All of them will be established using of existing infrastructure of the respective municipalities, having the administrative support of the regional government.

The later case involves the **Haskovo** region in Bulgaria. Haskovo region is situated in central part of South Bulgaria. The population is 270 096 people. 70.6% of the population live in cities and 29.4% in the villages. Geographically the region covers parts of the Upper Thracian Lowlands and parts of the Eastern Rhodopes. The regional internet penetration is satisfying but the fast connection on WWW is very much lacking behind and therefore there is no effective use of specialised new ICT applications. The digital divide is much stronger in the small settlements. The basic national initiative in order to deal with the problem ("e-Bulgaria") unites all national programmes and projects in the area of ICT. Coordination for the implementation until now is not efficient and as a result, the region has decided to utilize 2 telecentres in order to help specific small municipalities with increased Digital Divide situation. Mineralni bani is a rural municipality with population of 7000 people who are employed in agriculture, light industry and tourism. On the territory of the municipality there are no big industrial enterprises, which is one of the reasons for the high rate of unemployment. Stambolovo Municipality is a rural municipality with most of its settlements having population under 300 people. For the last few years, there has been an intensive migration. The *economy* of the municipality is concentrated mainly in the municipal centre. The *communication services* are limited. Existing telecentres in Haskovo are until now very few, public owned, situated in the capital and other big cities of the region, and they provide a very limited set of services. The additional ones which will be established in Mineralni and Stambolovo will focus on local businessmen and they will provide specialized e-services and consultancy/training on ICT.

Results Obtained from the Pilot Application of the Methodology

Based on the previous presented methodology within the TELEACCESS project, 13 pilot telecentres were established in areas around Central (Germany), MED (Italy, Greece) and East (Poland, Bulgaria, Croatia) Europe, trying to cover several regional territories and characteristics. More precisely, the list of telecentres established in order to evaluate the methodology included:

The TELEACCESS pilot telecentres, represent several sets of concerete cases dealing with different needs. Based on pilot operation assesment and evaluation, these concrete cases identified, are:

1. Telecentres to cover the needs of rural population for accessing new technologies and services (with no possibilities to do so until now) – e.g. Stambolovo case in Bulgaria –

This first case involves the following rural municipalities:

Figure 4. The Telecentre in Dymi

- Stambolovo and Mineralni Bani in Bulgaria
- Vinkovci and Skrad in Croatia
- Dymi in Greece
- Raba Wyzna in Poland

Such territories are having the following main characteristics:

- Low density populated
- Not satisfying penetration of high speed internet usage
- No effective use of ICT applications from local citizens and low level of Computer Literacy
- Main economic branch of activities are either: forestry, agriculture.

The digital divide in such territories is basic and it refers to the low capabilities/possibilities to access the internet and therefore innovative ICT applications through it. The needed Telecentres which were established in these territories (based on the methodology proposed by the project) focused on local businessmen and general public and they provide specialized e-services and consultancy/training on ICT. The further contribution of these telecentres to the development of the region will be sought in several directions:

- economic impact (percentage of (youth) employment; percentage of successful job searches, household engaged in small enterprises, increased number of markets for buying and selling)
- social impact (percentage of specialists residing in the community, opportunities for distance and life-long learning)
- impact on local organizations (networking, sharing information with similar organizations, participation in discussion groups)

For this specific case of telecentre, even from the first months of pilot operation, exists several positive outcomes which are giving an positive evaluation that telecentres are very useful towards the dealing with the digital divide problem in rural territories with existing primitive Digital Divide problem (general lack of access and low level computer literacy). The established telecentres have become a "social centre" gathering the local population. For example in Stambolovo Municipality there will be no exaggeration to say that the telecentre building is now the central meeting point of the population, providing the local people with opportunities to access innovative services which have never been used until now.

Figure 5. The Urbino Telecentre

2. Telecentres to assist tourists, with no possibility to have an innovative info-point while visiting an outlying rural destination – e.g. Urbino case in Marche Region of Italy –

This second case involves the following telecentres:

- Urbino in Marche Region (Italy)
- Allonisos Island in Greece

Such territories are having the following main characteristics:

- They form a very important tourist attractions based on cultural and/or environmental strong point
- No effective use of ICT applications to support the tourists communicated to them all possible tourism services

The digital divide in such territories is related with the low level of ICT services provision for tourists. This created a significant problem for the relevant tourism economy since on the one hand there is a lack of capabilities in order to effectively communicate all possible services offered and on the other hand a weak point is created in comparison with competitive tourist attractions near by (e.g. nearby Allonisos islands with effective info points existing).

The Telecentres which were established in these two territories focused on visitors/tourists and they provide to them specialized information provision (info point) and e-services (e-booking for specialised services).

The contribution of these telecentres to the development of the region will be sought in relation with the provision of an effective answer to the basic question: “how we can effectively communicate a remote tourism territory and support it visitors to make them come back?”

The established telecentres, situated in strategically selected points (central square, harbor, library) have already provided a usesful experience and gain significan interest from the tourists providing them with useful information and services (e.g. booking of tours during their staying in Urbino).

3. Telecentres to provide additional opoortunities, for access to new technologies, to students – e.g. Casarano case in Puglia Region of Italy –

This second case involves the following telecentres:

Figure 6. e-learning presentation in Casarano Telecentre

- Casarano in Puglia Region (Italy)
- Narni in Umbria Region (Italy)

Such territories are having the following main characteristics:

- Remoteness (mountainous or distant areas)
- Lack of initiatives and encouragement for young people to use new ICT applications due to isolation

The main focus for such territories is to work on the digital divide issue focusing on young people and students.

As a result and based on the initial study of needs the Telecentres which were established in these two territories situated in areas accessible by these target groups (library and central place near main school) providing basic internet access and also e-learning applications (focusing on training to use the internet and the opportunities derived from it).

The contribution of these kind of telecentres is high in order to encourage young people to use Internet access (and consequently all citizens) and to set the base for the provision of additional possibilities for the provision of innovative ICT applications.

4. Telecentres to cover specific needs of specific target groups of disadvantaged people – e.g. Piegaro case in Umbria Region of Italy –

In some cases the Digital Divide problem is related with the lack of opportunities for people with disabilities, to access the Internet and services derived from its effective usage. For the specific case of rural territories already active in the field of activities to support Internet penetration and effective usage, a very important next step is to take this situation into account, and try to provide solutions.

This was the case of the established Telecentre in Piegaro. Its main scope is to provide specialised internet accesibility services for the disables, by means of installing specific software for "not being able to see people".

5. Telecentres acting as innovation hubs providing innovative training and services to groups of people already in touch with new technologies and web – e.g. Dresden case in Germany-

This last case involves the following telecentres:

Figure 7. Training in Piegaro Telecentre

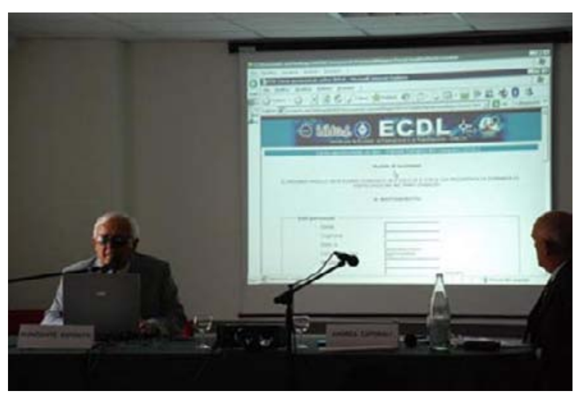


Figure 8. The Dresden Telecentre

In these territories, there is no existence of primitive digital divide (lack of computer literacy, lack of access to internet and to basic ICT services, lack to lifelong learning opportunities through the use of new ICT), but there exist disparities among the population in relation with the provision of innovative services and support for innovation. So the need for theses cases was to create new opportunities for all local population using specialized services. As a result, either specialized telecentres have been created or additional services to existing ones that have been established.

For the case of Dresden, three-in-one setting was being developed which offers different strongly distinctive features of spatial flexibility for users and providers. This is facilitated by a service centre, located at the telecentre, in which the servers with the platforms for the education contents and services are operating stationary. The main services at the telecentre are e-learning and innovative training. The contents for the services are provided over the broadband networks, i.e. the internet. So the place of studying is determined merely by the parameters internet connection and technical equipment. Further influences are type and size of the technical previous knowledge and skills and the individual preference to work alone or in the group respectively as an autodidact or taught by teaching staff.

1. The first possibility for the users is to learn at a classic telecentre. The connection can be realized by the broadband LAN and the WLAN connection of the university.
2. The second scenario is addressed to the learning setting in the companies or administration departments. Employees also can use the services of the telecentre at work. Another possibility for the companies/ administration departments is using a mobile telecentre. Therefore the provider offers to borrow needed equipment.
3. Furthermore, there can be a third setting which provides a mobile solution. The user can make demands on the offered e-learning services at home or by mobile work stations. Moreover, it is possible to borrow equipment from the telecentre.

According to the scenario-based configuration, the central telecentre (setting 1) is located at the campus of the Technische Universität Dresden. This location was chosen because Dresden, as an urban agglomeration, is of prime economical and social relevance for its surrounding rural areas. But the two other flexible settings are decisive important to get through to the purposed user groups. In this context, it is rather necessary to know, that the so called setting 1 serves as expedient addition.

The main services of the Dresden telecentre are e-learning and further training in the area of information and communications technologies. It is geared towards lecturers, students, the personnel in the area of education and government employees. Other interested people can use the services of the telecentre, too.

In the case of Perugia Italy, the choice, based on identification of needs, was to enhance existing telecentres with an additional service.

Perugia Municipality's telecentres experience has grown with success from 2003 until now. Telecentres, which have been introduced just as containers of equipments, soon demonstrated their utility as an active communication net.

This past experience seems to encourage not only to continue this effort, but also to further enhance it. Telecentres in Perugia Municipality meaningfully increased their customers for every kind of services, most traditional ones included.

The new service that has been chosen in order to further enhance the role of existing telecentres was the so-called "WebTV".

Web Tv is conceived as a web-based network of tv points with the aim of diffusion and broadcasting of local public interest information and in-depth news. This is done through a content publishing tool organized in thematic channels, with dedicated programs timetable, customized upon local community needs (layout, specific contents). Web Tv is dedicated to the part of citizens and SMEs that are not able to reach and receive information about town day life (no newspapers and no internet) like news, weather reports, public policies, events and about public local administration services. Furthermore the objective is to improve citizen participation to public administration decision-making policies.

Summary

In an effort to summarize the findings of this Section we can conclude that the experience presented here, derived from the Interreg IIIB CADSES project TELEACCESS (www.teleaccess.org), showed that a helpful initiative towards this direction can be the creation of local "learning hubs" (telecentres) which will act as a lever to promote and support the use of information society from all local people within a disadvantaged (isolated, rural, mountainous, island) territory (which normally lack motivation and opportunities to acquire it).

As these new learning hubs have been created and operate within the pilot territories, they created opportunities for the local population in order to come closer and use effectively the new opportunities provided through ICTs. As a result, new opportunities to take disadvantaged territories one step further are now provided.

Pilot telecentres, created by the project TELEACCESS, represent several sets of concerete cases dealing with different needs. These concrete cases indetified are:

1. Telecentres to cover the needs of rural population for accessing new technologies and services (with no possibilities to do so until now)
2. Telecentres to assist tourists, with no possibility to have an innovative info-point while visiting an outlying rural destination
3. Telecentres to provide additional opoortunities, for access to new technologies, to students
4. Telecentres to cover specific needs of specific target groups of disadvantaged people
5. Telecentres acting as innovation hubs providing support for innovation enhancement to groups of people already in touch with new technologies/services and www.

FUTURE TRENDS

The future of efforts in order to deal with the digital divide problem (based on EU Ministerial Declaration on e-inclusion, 2008*)* will continue to stress actions in the following areas:

- Using ICT to address the needs of older workers and elderly people;
- Reducing geographical digital divides;
- Enhancing e-accessibility and ICT usability for people of all abilities;
- Improving digital literacy and competences;
- Using ICT to promote cultural diversity; and
- Promoting inclusive e-government.

Initiatives will not be different that the ones presented in the previous partner. The effort will have to be constant to avoid Digital Divide growth due to difference in speed. Each "digitally divided" group will have to proceed with two steps every time the normal groups are proceeding with a normal one, in the "ICT era". For the specific case of rural digital divide, this can be achieved based on a constantly increasing:

- Relevance, interest and aspirations

First of all, it is important to constantly communicate the fact that the problem of digital divide is crucial to deal with, because on the one hand, it undermines the basic rights of every individual and on the other hand, it holds back personal and social development. Secondly, we need to make all the necessary efforts to attract non-users and give them clear messages on perspectives and benefits derived from new ICTs effective application. A range of incentives have to be provided targeted people's everyday life and encourage skills acquisition. And last, but not least, it is equally important to utilize social groups acting as "pioneers" (e.g. teachers, young people) to train and support the "unconnected"

- Access and support

The most important issue is to provide constant assistant to local communities, in the development of existing resources and locations, including educational establishments, to help offer further access and training.

- Literacy

Design, develop and apply tailored made software and courses for those with limited literacy and develop initiatives providing literacy support to the local population.

- Joined-up approaches

Design the proper Government (national and local) policies for the effective activation towards the above directions. In the same time, it is important to constantly assess initiatives results and drawbacks, in order to come up with more effective and coordinated solutions. Apart from that, it needs to mention the importance of involvement of the private sector and the research community in initiatives to further grow the needed social capital for local groups and to effectively mobilize ICT.

Finally, it has to be considered that to provide effective practices to deal with the digital divide, we have to avoid universal "Ready made" models. Taking into account other experiences and successful initiatives, a specific activation has to adapt appropriate approaches and develop methods and tools suitable for the context of a specific territory.

CONCLUSION

As mentioned earlier in this Chapter, the key factors leading to the digital divide are: Missing infrastructure or access, Missing incentives to use ICTs, Lack of the computer literacy or skills, Poverty and social exclusion. These barriers are very difficult to overcome in rural territories (especially distant isolated ones) and therefore the solution for these cases must include, apart from traditional efforts, (establish the needed infrastructure and provide financial help in order to have access) some additional support ones from the local actors (administrations, business chambers etc).

The experience, until now, showed that a helpful initiative towards this direction can be the creation of local telecentres which will act as a lever to promote and support the use of information society from all local people in a territory lacking motivation and opportunities to acquire it.

As the telecentre movement is maturing, there is a need to go on step further in the effort to strengthen the movement towards widespread enjoyment of the benefits that telecentres bring. Establishment of telecentres has to be supported and sustained actively by local stakeholders and it has also to be based on the actual local needs and situation. There is a need for a methodology in order to create customised telecentres fully tailored based on the specific economic situation, existing barriers and problems, and local users needs.

A suggested methodology presented in this Chapter, derived from the TELEACCESS interregional collaboration project, suggests several concrete steps towards the creation of customised telecentres based on local needs. We presented the steps of the application of this methodology in several local rural communities in Greece, Italy and Bulgaria in order to establish local telecentres and how this leaded to different solutions.

Efforts to overcome the Rural Digital Divide will have to be constant and well administered, based on joined-up approaches. Thus, the effort should be, to utilize successful experience (like the ones presented in this Chapter) towards going one step further providing more opportunities on rural communities to work on overcoming their digital divide problem (create the second step in the effort to "catch up" with the not disadvantaged territories).

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KEY TERMS AND DEFINITIONS

Broadband: A signaling method that includes or handles a relatively wide range of frequencies. Broadband internet access is high-speed Internet access—typically contrasted with dial-up access

Digital Divide: A term that refers to the gap existing in the opportunities to access advanced information and communication technologies between geographic areas or by individuals at different socio-economic levels

Information and Communication Technologies (ICT): A term that includes all technologies for the manipulation and communication of information

Rural Digital Divide: The type of Digital Divide referred to those living and working in rural and remote areas since the lower rates for data access for these citizens place them at a disadvantage in comparison to metropolitan ones. For these citizens the problems of missing infrastructures, incentives and computer literacy (the factors leading to Digital divide) are bigger and more difficult to solve

Rural Territory: An area outside larger and medium-sized cities and surrounding population concentrations, generally characterized by farms, ranches, small towns, and unpopulated regions

Telecentre: A shared site that provides public access to information and communications technologies; enables and promotes the Information Society; provides support services or advice to SMEs and the community; focuses on work-related activities and professional activities including services for social groups

telecottage: See Telecentre definition.

Chapter 22
Public Policies for Broadband Development in the European Union:
New Trends for Universalisation of Services

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ABSTRACT

The European Lisbon strategy considers that the generalised availability of broadband accesses is one of the European Union's greatest challenges. In this context, the EU member states have launched information society development programmes which dedicate major sections to fighting against the digital exclusion and plan the geographical extension of broadband accesses. In all of them, it is acknowledged the role of public policies in complementing the effective operation of the market, addressing both the supply and demand sides. The aim of this chapter is to review how the objective of generalised broadband deployment can be achieved, and what instruments the public administrations are using to pursue it. The chapter includes, in particular, a comparison of practical implementations of broadband development policies, their relationships with universal service obligations, and, finally, the implications of using this segmented approach.

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INTRODUCTION

Realising the potential of the information society requires an adequate infrastructure to smoothly support the supply of contents and services. This is why achieving a fast and generalised broadband deployment is viewed by most governments around the world as an important challenge to their immediate future. It is also the case of the European Union, as proven by the various recommendations and action plans presented in the last years, all of them acknowledging the importance of broadband development as a critical issue for economic growth, productivity and competitiveness[1], and as a guarantee of social cohesion among the various European regions. According to the already concluded eEurope 2005 Action Plan, a "widespread availability of broadband access at competitive prices" would act as the enabler for the objectives summarised in the keystone of eEurope: "an Information Society for all" (European Commission, 2002). The next stage in the European Union's public policy towards the information society, the i2010 programme, confirmed this line of action (European Commission, 2005b). More recently, additional initiatives coming both from the Parliament (European Parliament, 2007) and the Commission (European Commission, 2006) have stressed and reiterated the importance of further broadband deployment. Indeed and to illustrate this fact, Commissioner for Information Society and Media, Viviane Reding, has stated that "broadband means better access to business services, faster and cheaper ways of doing business, overcoming the disadvantage of distance, attracting inward investment and retaining jobs"[2].

Investment in broadband, requiring a significant improvement of the existing infrastructures or even a new network deployment[3], will mainly come from the private sector. The public sector must help create a favourable environment for such investment to take place and stimulate demand. However, given the existence of regions, in particular rural areas, with no interest for private initiative since they would represent no profit at all for them, governments must also consider taking action on the supply side of the market. In this context, the EU member states have already launched information society development programmes which dedicate major sections to fighting against the digital exclusion and plan, among other measures, the geographical extension of broadband accesses.

The aim of this chapter is, precisely, to review how this objective of broadband development can be achieved, and what instruments the public administrations are using.

The chapter starts by assessing the background importance of accessing advanced telecommunication infrastructures in the new socioeconomic paradigm of the information society; it is in the framework of the fight against the *digital divide* that public intervention for boosting the development of broadband should be examined. The following section provides a quick review of the different mechanisms traditionally used to guarantee generalised access to telecommunication services and identifies the reasons why, at least to date, the universal service obligations have not been extended (or have been only timidly extended) to advanced services. Finally, a full description of the tools used for universalisation in this new stage, studying the characteristics and specificities of the European broadband support programmes, is provided in the next section. The critical analysis is left for the conclusions with which this chapter ends.

BACKGROUND: ACCESS AS A MAIN CAUSE OF THE DIGITAL DIVIDE

Two are the key factors on which actions should be taken to fight against the digital divide: *access*, that is, providing connection to the appropriate infrastructures, and *adoption*, or, in other words, encouraging their usage considering the social, economic and political characteristics of the targeted clients and communities. Access is the prior condition: the first requirement for "digital conduct" is the physical infrastructure (ECLAC, 2002). Adoption gives economical and social meaning to access and, consistently, is a much more complex question: content, applications and language, literacy and education, entry barriers (penetration of personal computers, for example), and community and institutional structures must all be taken into account if meaningful access to technologies is to be provided (Warschauer, 2002).

In those countries with the highest levels of development, where the universalisation of telephone lines is already completed, the access problem focuses on achieving an equivalent degree of penetration for broadband infrastructures. The deregulation process of their telecommunication markets was completed several years ago and, although with unequal success, competition has reached a certain degree of maturity. As a consequence, the competing operators, in their fight for the most profitable market segments, are the actors that invest the most in broadband. There is already and for some time now clear evidence (European Commission, 2004b; European Commission, 2008a) of the positive impact of competition in the availability and conditions of broadband access.

However, since it is unlikely that operators will maintain any interest outside grouped-and-profitable-customer-filled urban areas, isolated and rural areas may have to wait quite some time until they can enjoy, not the arrival of effective competition, but any broadband connection. Not surprisingly, Grubesic (2004) concludes that, at the most basic level, accessibility is linked with population: more populated areas have more choices of broadband providers. Likewise, Strover (2003) provides some support for the importance of simple market conditions summarized by per capita income and population density in prompting market entry by competitors. Indeed, the European Commission recognises this fact as it states that "despite the general increase in broadband connectivity, access in more remote and rural regions is limited because of high costs due to low density of population and remoteness"[4] (European Commission, 2006).

In many cases the access problem is directly linked to the adoption issue. A greater penetration of the services would imply an increase in the demand for connectivity. Once a minimum profitability threshold is surpassed, the supply would react to that demand. In any case, it seems that, with the costs inherent to current technologies, there are a series of minimum parameters which, if not reached, create an objective barrier[5]. In these cases, even with high potential adoption levels among the available population, not enough aggregate demand will be created to cover the costs of providing access. Despite orography and territory occupation conditions can determine results of quite a different nature, we can use as an example the study on a Spanish region by Gómez-Barroso and Pérez-Martínez (2007) establishing the difficulty of ADSL or cable[6] operators reaching localities of less than 500 inhabitants.

As a consequence, public intervention is necessary if the universalisation of these infrastructures is intended. Most governments are designing (or have already designed) broadband plans pursuing their ubiquity and an increase in usage of the applications that can be provided thanks to it. Conceptually, this is nothing new. Generalised access to telecommunication services has been, in general and regardless of the degree of success achieved, an objective of every government during the last century. This suggests that the advantages of a massive connection to telecommunication services have been understood regardless of the political option in power.

MECHANISMS FOR TELECOMMUNICATION SERVICES ACCESS UNIVERSALISATION

One of the main justifications protecting the existence of the monopoly was its condition of being in charge of a public service. Despite this public service aspect, in most countries the commitment to extending the service was more implicit than explicit. Citizens did not benefit from an individual right of demanding the telephone service, or, from the opposite perspective, telecommunications administrations were not legally bound to providing this service (OECD, 1991). Thus, the development of both networks and services was interpreted essentially in a voluntaristic way by administrations, being subject to the political changes and/or administrative priorities, the sensitivity and interest of the governing class towards the industry, and the degree of general development of each country[7].

In the liberalised environment, the figure of universal service appears as an attempt to reconcile the principles of public service with those of the market economy (Rapp, 1995). There is no single global definition for universal service. There is however an agreement on the basic core of the concept that usually covers national availability of a series of specific services for which non-discriminatory access, generalised economic affordability and some level of quality are guaranteed (ITU, 1998).

At present, universal service guarantees, essentially, access to the fixed telephone network. The decision of extending universal service to new and advanced services (or to the infrastructures required to provide them) would find coverage in economic rigor: Gómez-Barroso and Pérez-Martínez (2005) analyse the presence of the causes that "justify" state intervention in industry activities ("market failures") and conclude that the greater part of these circumstances could justify public intervention[8]. Moreover, it is now widely accepted that the universal service concept will have to be redefined time and again (Sawhney, 2003). However, problems exist for adapting this figure to the new stage which is currently opening.

The *European concept* for the universal service faces three major problems that have corrupted the idea used in its initial development: its identification with one of the possible practical articulations (the one financed by the sector's companies), its improper usage as a regulation instrument and, particularly, its inflexibility to adapt to conceptual shifts.

- First, there is a dangerous association between universal service and "operators-financed mechanism". This is, without a doubt, the circumstance that has fed its armies of critics and poisoned any debate on its evolution.
- Second, the regulation of universal service is plagued with "open" terms; the need for interpretation gives rise to forms of action that are poorly regulated[9]. Therefore, universal service is sent to the toolbox of the competition policy, thus "contaminating" its first and utmost nature of being a social policy.
- The third problem is the lack of flexibility of universal service to adapt to the new stage of broadband development that is currently arising. The specific legal instrument defined as universal service in European countries' legislation is designed to support the corrective notion of the concept (correcting problems in the supply side of a network which is almost universal by now) making it difficult to introduce any alternative driving conceptions into it (referred, for instance, to the deployment of new broadband infrastructures).

In addition to the above, we must not lose sight of the economic dimension of a series of obligations which could extend to broadband accesses

(Falch and Henten, 2008). The final consequence is that, today, broadband universalisation mainly faces other instruments. Governments seek solutions that are more flexible than those provided by universal service as regulated at present. The "information society development programmes" are, therefore, the tool that allows the public sector to tailor the intervention pattern to the measure of their preferences and possibilities[10].

EUROPEAN PROGRAMMES FOR BROADBAND DEVELOPMENT

European countries have been launching information society development programmes that dedicate major sections to fighting against the *digital exclusion* and plan, among other measures, the geographical extension of broadband accesses, even when some operators are still moving towards covering the territory with their offer.

The need for public intervention in order to help deploy the broadband networks had been officially assumed while the current Directive on universal service[11] was being debated. However, the 2002 Directive, which is basically continuistic, never refers to broadband. As a consequence, national broadband strategies have been taking other courses.

The boost of the different national strategies (as well as their orientation) comes from the *e*Europe programme. *e*Europe was set out as a basic piece of the so-called Lisbon strategy, targeted at turning the European Union into the most competitive and dynamic *knowledge-based* economy by 2010. The objectives established in the first *e*Europe presentation document were truly ambitious: "bringing every citizen, home and school, every business and administration, into the digital age and online" while guaranteeing that "the whole process is socially inclusive, builds consumer trust and strengthens social cohesion" (European Commission, 2000).

The *e*Europe 2002 Progress Report addressed to the Stockholm Spring Council refers to investment in broadband for the first time, defending that it will *mainly* come from the private sector, without specifically referring to state intervention on the offer side (European Commission, 2001). Its successor, *e*Europe 2005, maintained the predominant role of the private operators, although it authorised the member states to support, where necessary, deployment in less favoured areas. The Action Plan also proposes a series of initiatives to accelerate the taking-up of broadband. As stated previously, i2010 and more modern initiatives have kept following this same line of action.

Considering the master guidelines set out by these programmes, all national strategies acknowledge the primary role of the market in broadband deployment. They also admit the role of public policy in complementing the effective operation of the market[12], addressing both the supply and demand sides to stimulate a virtuous circle whereby development of better content and services depends on infrastructure deployment and vice-versa (European Commission, 2004a; European Commission, 2006).

As a consequence, public intervention is moving forward on two separate paths: contributing to network deployment directly as well indirectly, promoting demand, in the latter case, in order for currently non-profitable regions to exceed the business threshold required by operators for investing and providing service.

Direct Measures: Network Deployment

As stated above, *e*Europe 2005 maintains the predominant role awarded to the private sector although, among the proposed actions for broadband development, it declares that "member states, in co-operation with the Commission, should support, where necessary, deployment in less favoured areas, and where possible may use structural funds[13] and/or financial incentives (without prejudice to competition rules)" (European Commission, 2002).

Making use of this authorisation, most central governments in the Europe of the Fifteen allocate public funds, or have declared they will do so shortly, to programmes related to broadband development.

Following the recommendation, part of the money comes from structural funds, wherever the conditions for their usage apply[14]. The Commission released a working paper with the guidelines for their usage (European Commission, 2003a). Over the period 2000-06, the structural funds were expected to allocate €6.1 billion for investment in electronic communications and the information society (European Commission, 2003b). Giving a more defined form to these initiatives, the Initiative for Growth (European Commission, 2003b) announced "Digital-Divide Quick-Start projects" to accelerate broadband deployment in remote and rural areas through a technology-neutral approach.

Central government plans are not, however, the only ones allocating funds to broadband network progress. Regional and municipal governments are, frequently, those taking the initiative of promoting and extending broadband in their territories. Sometimes their actions are included within national programmes, but in many other cases they are independent. Given that regional and municipal governments can manage an important part of the structural funds, the fact that a considerable number of broadband universalisation programmes will be boosted from local decision centres is thus confirmed.

Their participation allows to extend the range of conceivable solutions. Avoiding the multiple peculiarities resulting from heterogeneous realities and requirements, the different interventions can be grouped into the following categories, which are not mutually excluding[15]:

- Municipality-driven wholesale networks[16] (Denmark; Belgian municipalities have historically invested in cable networks where no private network already existed).
- Public-private partnerships (Greece, Ireland, Austria).
- Direct construction of the infrastructure (Ireland, Southern Italy).
- Subsidies to network-builders operating in the private sector offered to the market through a tender (some regions in Austria) or a public procurement process (Sweden, where if private contractors are not interested, municipalities may build the infrastructure themselves).
- Long-term reimbursable loans (Spain) or preferential loans (France) to operators for the deployment of infrastructure in selected areas.

The technological trend is also manifold: some municipalities have intervened by rolling out fibre optic rings; others intend to look into wireless technologies to extend connectivity. When no other technological alternatives exist, the establishment of free public access points based on satellite technology is usual. In some cases, local governments have installed Wi-Fi networks extending the connection to the whole municipality.

Public access points are one of the most usual tools used in universalisation programmes. Despite the most ambitious projects have been launched in France, Italy and Spain, their usage can be considered generalised. Their installation expects to meet several objectives simultaneously. Where there are no other broadband alternatives at that locality, their construction can be included in this section dedicated to network extension. However, they also promote digital literacy of marginal groups and stimulate the usage of advanced services, thus boosting the future demand, a fact that connects with the other relevant branch of the broadband promotion strategies.

Indirect Measures: Demand Aggregation and Stimulation

As stated previously, from the market perspective, the access and adoption issues are clearly interwoven: adoption is impossible without access, but access is economically difficult to provide without the prospect of rapid and widespread adoption (Hollifield and Donnermeyer, 2003). Occasionally, the encouragement of adoption can lead to generating the sufficient increase in demand to attract the offer, thus resolving some of the access problems. Encouraging and aggregating demand is, thus, a policy that should result effective.

Aggregating customers is common in urban areas, where providers compete to hook office buildings and other nearby clusters of "data customers" to Internet backbones; it is more difficult in rural communities, yet not to do so virtually guarantees that rural demand will remain "off the radar screen" of large service providers (Malecki, 2003). As a consequence, a chapter shared by many national strategies consists in grouping the broadband requirements of all public institutions located in the appropriate area to provide a crucial pull for new networks. The United Kingdom and especially the Netherlands are the countries where more trials and experiments are being carried out in this direction, leading, in some Dutch regions, to bundling the demand of consumers, schools, libraries, hospitals and companies.

On the other hand, demand stimulation offers an enormous field for public activity. Although demand stimulation policies can include from digital literacy promotion to initiatives addressing the development of new contents, applications and services, there is a group of core measures we could consider directly targeted towards improving the appeal of broadband in the short term:

- All member states are promoting the development and use of online e-government, e-health and e-learning services as part of their national strategies.
- All plans are also focusing on promoting ICT in enterprises (particularly SMEs)[17].
- Work is being carried out to increase the number of broadband accesses in schools and libraries. As we noted above, the establishment of public access points complements this strategy.
- Some countries are or have been providing financial incentives (Austria for any new broadband access; Denmark for companies; Italy for broadband access, digital TV and PCs; Sweden for broadband access costs in excess of a threshold).
- In almost all cases these actions are accompanied by an effort to improve confidence in the usage of networks and stimulate consumers' trust in information society services such as electronic signature and e-payments[18].

FUTURE TRENDS

Universal service is the figure that guarantees European citizens the access to basic telecommunication services. As a consequence, the "natural" option to achieve broadband access universalisation would be to establish some sort of universal service obligation. However, the magnitude of this task leads one to thinking that, similarly to telephone universalisation being achieved thanks to consecutively securing increasingly more ambitious objectives during the monopolistic stage, broadband deployment is requiring a scenario that provides for a greater staggering of the actions.

This relaxation implies destroying the homogeneity: the objectives set forth, the mechanisms and the deadline for its achievement as well as the participating actors can be disparate. This disparity covers, in the most extreme case, inaction. Thus, it is possible for the chance of every citizen to be conditioned by the interest their local or regional government shows for including general broadband deployment (or promotion) plans, resulting in an arbitrary design of the digital divide map within countries.

This situation should be corrected in the long term. The most probable scenario seems to be that, once the geographic coverage stage is well underway (and the financial effort it entails has been faced), universal service will be extended to broadband infrastructures. It would thus take up anew the *corrective* role it has at present as regards the telephone service.

This modification should be used to deeply reform the current concept of universal service (see an analysis of new themes and trends in Feijóo and Milne, 2008). The universal service definition must be separated from a portfolio of specific services to become the provision of sufficient connectivity to the users. This change would allow to move forward towards a true technological neutrality since it would separate the provision of universal services from specific technological solutions. This would be a perspective which would not be restricted to the basic telecommunication services, but focused on the global requirements of the users instead; it is the natural step from a sectorial matter (telecommunications regulation) to a social matter (public policies regarding the information society) (Ramos et al, 2004).

Article 15 of the 2002 Universal Service Directive sated that "the Commission shall periodically review the scope of universal service, in particular with a view to proposing that the scope be changed or redefined". In 2005, the European Commission adopted the first of these reviews (European Commission, 2005a). As expected, the proposal was to maintain the scope unchanged at this time, i.e. not to extend it to mobile communications and to broadband access[19]. The second review has recently been kicked off (European Commission, 2008b). It is hard to say whether a re-definition of the concept and scope of the universal service in the European Union will be finally proposed after the debate that will take place over 2009 (see an analysis in Blackman and Forge, 2008).

CONCLUSION

Regardless of the hypothesis on the evolution of universal service materialising or not, the fact is that the boost to the overall geographic extension of broadband is being carried out with what we could generally call "universalisation mechanisms". The European Union, a true melting pot of cultures, lifestyles and political conceptions in itself, is maybe the best example of the plurality of actions that can be conceived to achieve this challenging goal.

The direct interventions being promoted in the areas lacking any interest for operators can be sorted in a scale that adjusts the different intensity of public participation. This scale ends with the creation of a public operator that builds the network and provides the services. This decision resolves, completely and immediately, the problem, but would have a negative impact on competition in the long-term and would imply a financial risk for the public sector who also needs not only technical but also commercial expertise. As the role of the public sector is reduced (it builds the networks but does not offer the services or simply provides or facilitates in some way the deployment of the infrastructure), the risks taken on and the market distortion are reduced, although, in turn, it needs a private agent to be involved in the project. At the end, the decision should be taken based on a prospective assessment of the concrete circunstances and rationale for public intervention (including demand and offer-side constraints), giving priority to promoting market-led initiatives where possible.

To this end, it has to be taken into account that any proposed measure has to be compatible with the Common market rules. Article 87.1 of the EC Treaty provides for the general principle of prohibition of State aid within the Community. Article 87.2 and 87.3 of the EC Treaty provide exemptions to the general incompatibility principle as stated in Article 87.1. Specifically, Article 87.3.c of the EC Treaty states that: "aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest" may be considered to be compatible with the common market. In order to be compatible with Article 87.3.c an aid must pursue an objective of common interest in a necessary and proportionate way. The Commission has a positive stance regarding the application of the state aid rules to public funding for broadband. A number of broadband projects have been approved lately[20]. The Commission concluded that either the aid was compatible with state aid rules or that there was no state aid involved.

For their part, the demand aggregation models do not imply any financial risks although in the long term, they could represent a barrier for the entry of other operators or service providers. In fact, the tenders offering an exclusive supply agreement for more than one specific percentage of the market should be meticulously designed to avoid being anti-competitive.

In parallel with the actions for access are those concentrating on the adoption side. Apart from the measures that are specifically targeted to this end that have been described above, it is also important that the regulators promote (or at least do not prevent) the release of innovative and attractive user services. Among these, the probable progress of VoIP could be of an undoubtable importance (Feijóo et al, 2005); IP-based services can be the element attracting towards broadband the attention of a great deal of users that are not interested yet on the services provided in the current offers. Looking further to the deployment of next generation infrastructures the range and relevance of indirect policy instruments, both supply and demand side oriented, is but increasing (see an overview in Gómez-Barroso and Feijoo, 2009).

In any case, acting on the factors that can contribute to increasing the usage of services and applications seems to be an increasingly relevant requirement for closing the digital divide. We cannot forget that the digital divide cannot be resolved by simply providing access to the infrastructures. Communications technology is not an end in itself, but a means of supplying quality content in the information society. Waving the "icon" of the Internet does not, per se, mobilize customers: it is its pertinence to people's professional priorities or to their most fundamental needs that matters (Ricci, 2000). Being as obvious as it really is, this fact should be carefully taken into account in any public intervention.

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KEY TERMS AND DEFINITIONS

Broadband: "Broad bandwidth" connection which allows a large amount of data to travel through a medium at the same time. There are many definitions about what a "large amount of data" entails. They are all relative and changing with time.

Demand Aggregation: Method that provides "visibility" to the purchasing requests generally through the process of coordinating and consolidating individual requirements.

Digital divide: Expression useful for informing of the existence of groups or regions which will not be prepared to make the most of the important social and economic opportunities promised by the emerging society of information.

Directive: European Union law which lays down certain end results that must be achieved in every Member State. National authorities have to adapt their laws to meet these goals, but are free to decide how to do so.

European Commission: Institution of the European Community (Commission of the European Communities) which ensures the application of the provisions of the Treaty. The Commission develops Community policies, proposes Community legislation and exercises powers in specific areas.

Market Failure: Economic term that encompasses a situation where, in a given market, the market mechanism fails to allocate goods or resources efficiently.

Member State: Anyone of the twenty-seven sovereign nation states that have acceded the European Union.

Universal Service: Availability of specific services for which non-discriminatory access and generalized economic affordability are guaranteed.

Universal Service Obligation: Mechanism (usually, a requirement made to a private company) needed for users to exercise the rights which are included in the universal service concept.

ENDNOTES

1. Various studies have focused on this issue. Gillett et al (2006) measure the economic impact of broadband applying econometric techniques to national-scale US data. This research shows that communities for which broadband was available between 1998 and 2002 experienced more rapid growth in employment (1%), in the number of businesses (0.5%) and in the number of businesses in IT-intensive sectors (0.5%).
2. Reding, Viviane. *How Europe can bridge the broadband gap*. Welcome speech to the "Bridging the broadband gap" conference. Brussels, 14 May 2007. Available at http://ec.europa.eu/commission_barroso/reding/docs/speeches/brussels_20070514.pdf
3. Nowadays, any new network deployment is somehow related to the so-called as Next Generation Networks (NGNs) which refer to new infrastructures offering advanced capabilities in terms of traffic transmission and management techniques.
4. In this document, the European Commission estimates that, in 2005, broadband was available to only about 60% of businesses and households in the remote and rural areas of the EU15, compared to over 90% in the urban areas.
5. Technological evolution, in particular wireless solutions, might contribute to lower the above mentioned "barriers", as recognised by the European Commission itself (European Commission, 2007).
6. Affordability is another parameter that must be taken into consideration. Satellite-based broadband solutions are available anywhere throughout a territory although, for now, their prices are, generally, much more expensive than those of wire-based broadband solutions.
7. In the United States, network deployment was quite regular: residential telephone penetration had exceeded 40% around 1945 continuing, from that moment on, with a sustainable growth until reaching an asymptote during the initial seventies when 90% of the homes were connected (Sawhney, 1994; Albery, 1995). European countries

had to wait for the seventies for service universalisation to really move forward. So much that Noam (1987) considers that the role of the monopoly in the extension of the service is incorrectly taken as a historic rule extrapolating the investments made during this period.

8 Obviously, *finding coverage* for the intervention does not imply *having* to intervene.

9 Consider the evaluation of the "net cost" of universal service obligations (and the decision about whether to consider it an *unfair burden*): much closer to politics than mathematical economics, its calculation has often become a weapon in the State's global negotiations with operators, especially with the incumbent one. Also consider the debatable translation into practical terms of the concept "functional" access to Internet, included in the 2002 review of universal service

10 Picot and Wernick (2007) compare market regulation and public activities in furthering broadband deployment in Europe and in other regions (the United States, Korea).

11 Directive 2002/22/EC of the European Parliament and of the Council, of 7 March 2002, on universal service and users' rights relating to electronic communications networks and services. Official Journal of the European Communities L 108, 24.4.2002, p. 51.

12 OECD (2008) also recognises this fact as a general policy trend among OECD members.

13 Those not familiar with the financial instruments of the European Union can learn about the nature and objective of the structural funds in http://www.europa.eu.int/scadplus/glossary/structural_cohesion_fund_en.htm

14 This is a very important factor in all the initiatives launched by the new member states, since most of their regions (in many cases, the whole country) meet the economic conditions required to receive structural funds.

15 Besides general examples cited in the text, a description of most of the concrete projects across the different countries can be found at the *European Broadband Portal* accessible at http://www.broadband-europe.eu/Pages/Home.aspx

16 The new regulatory framework would require that access to such networks be available at non-discriminatory conditions (European Commission, 2004a).

17 This can be a very effective policy, since, according to the study by Hollifield and Donnermeyer (2003), employment by a company that was using specific information technologies is the strongest predictor of individual adoption; the effect is particularly strong among those with less formal education.

18 More generally, the security and resilience of electronic networks and services are of increasing concern to society as proves the recent launching by the European Commission of a public consultation on "Towards a strengthened network and information security in Europe" (available at http://ec.europa.eu/information_society/tl/activities/consultations/index_en.htm#open_consultations)

19 "Having examined the technological, market and social developments affecting consumers of e-communications services, having analysed the mobile and broadband markets, and having applied the criteria for determining the scope of universal service set out in the Universal Service Directive, the Commission concludes that neither of these services fulfils the condition for inclusion in the scope at this time" European Commission (2005a).

20 Although there are also some exceptions; for example in 2006, following a complaint, the Commission stopped a project for a fibre access network in the Dutch town of Appingedam, concerned that the project might have crowded out investments by commercial operators.

Section 3

Digital Divides, Competitiveness, and Development

Chapter 23
Solving the Paradoxes of the Information Technology Revolution:
Productivity and Inequality

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ABSTRACT

The research on the digital divide usually analyzes the differences between those who have access to information technology and those who have not. This approach typically considers information technology a homogeneous set of technologies. In this chapter, we will break this assumption establishing different subsets of information technologies according to their impact on the task productivity and the firm's demand for high skilled labour. This new focus reveals that depending on the information technology used by the firm to perform a given task, the demand for high skilled and low skilled workers may vary and consequently their wages and income, producing in some cases a new and till now unobserved digital divide.

INTRODUCTION

The Industrial Revolution in the eighteenth century changed the shape of the world. The adoption of new inventions and methods of production triggered a spectacular climb of productivity and wealth that lasted for years. Nowadays, nobody denies the benefits and the economic growth due to the new economic framework created by the Industrial Revolution. However, the Industrial Revolution shown also a dark side in terms of pollution, unregulated urbanization, physical and moral degradation of the population, as well as the increase in power and wealth inequality. Towards the end of the twentieth century the invention of the microprocessor by Ted Hoff, Intel engineer, and some other engineers from the Japanese firm Busicom may have started a new Revolution: The Information Technology Revolution. As well as the Industrial Revolution, the redesign of business processes and production methods as well as new inventions, such as the mobile telephone or the Internet, characterized the current Information Technology Revolution. Moreover, the Information Technology Revolution that

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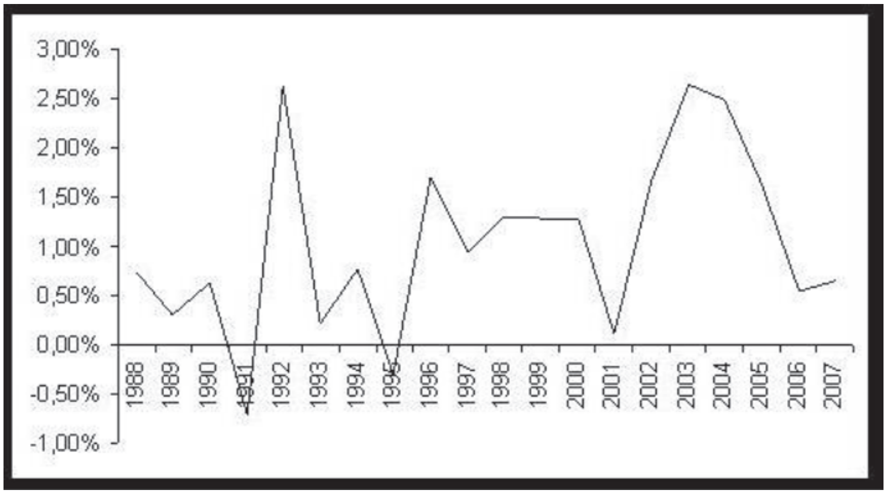
is still in process may have some impact on both the productivity and the wealth distribution.

Access to Information Technology varies widely. A consistent amount of research (see for instance some cross-country analyses in Hiroshi, 2005; Demoussiss and Giannokopulos, 2006; Greenstein and Prince, 2006; Chinn and Fairlie, 2007) shown that income, gender, ethnicity or education among other factors explain this variability in the access and use of Information Technology. These factors may act as barriers to access to the technology and create a divide between the social groups with access to the new technologies and those groups without it. This phenomenon has been defined as Digital Divide and has received a great deal of attention in the academic and political world. The fact that Digital Divide may increase the income gap between workers with computer literacy and workers without it explains this interest. Lack of access to Information Technology may prevent disadvantaged individuals from overcoming the over-riding cause of their disadvantage, which is low income. The persistence of a Digital Divide is not only an impediment to the development of individuals and regions, but it may also worsen the gap between low-income and high-income communities. For instance, in words of the International Labour Organization (2001) "the employment aspirations and productivity potential of millions of workers won't be realized if the Digital Divide problem is not solved". In this chapter we will not revise the causes of the Digital Divide but its effects on income distribution. We will address the relationship between the Digital Divide and the Income Divide between high and low skilled workers. We will study how the use of Information Technology in productive tasks may shift the demand for high and low skilled workers and consequently may widen or shrink the income gap between these two groups of workers.

To address this task we must first explain the link between access to and use of Information Technology and income. Trying to simplifying the phenomenon the economic rationale behind the income effects of Digital Divide is the following: having better technology, in our case Information Technology (IT), and more capital tends to raise the marginal productivity of labour and therefore the demand for IT labour and its wages (i.e. income). In the initial stages of development of a technology only high skilled workers tend to have computer literacy. The reason is that high skilled workers usually have higher income levels, so they can afford IT education as well as IT products and services. Comparing to low skilled workers, workers with more skills and income will have better chances of accessing and learning to use information technology sooner. From this statement we could infer that having better access to IT, high skilled workers tend to have a higher likelihood of further increasing its productivity, and consequently will tend to receive higher wages increases than those individuals without access, use and knowledge of these new technologies. This effect, already largely studied, will be out of the scope of this chapter. However, we believe that this dynamic will work for a certain period especially in the developed economies, but with the time the prices of the new technology will tend to diminish and an increasing proportion of low income workers will start having IT access and literacy.

We will go one step further in the study of Digital Divide considering what will happen when most workers in a community or society will have access to Information Technology. So, our main proposition will be that even assuming that basic IT literacy is homogenously distributed among the workers population (for instance, in several countries there is already almost universal access to mobile technology, see ITU, 2008) Information Technology use wont have a neutral effect on the income of low and high skilled workers. As we will discuss below, we will consider the Information Technology as a heterogeneous set of technologies with different effects on the demand for skills and consequently on the income divide between unskilled and skilled workers. From our

Figure 1. Multifactor productivity annual growth rates in the US



point of view, the next step in the study of the Digital Divide should be to overcome the having versus not having debate and to reorient the focus towards the detection of the income effects of the different subcategories of Information Technology we identified in this paper.

The chapter is organized as follows: First we will discuss the relationship between Information Technology investment and productivity. Then we will build a theoretical model describing the contribution of different subsets of Information Technology to the productivity at the task level. In the next section, we will use this model to explain how Information Technology may have some influence on the demand for high skilled and low skilled workers. We will demonstrate some of the implications of this relationship with a short business case study, an explorative methodology that we considered adequate to contrast a novel theory, and finally we will draw some conclusions and future research lines.

THE PRODUCTIVITY PARADOX

In 1987 Nobel Prize Robert Solow has shaken the minds of scholars, managers and politicians with his phrase "computers are found everywhere but in the productivity data". Since then, legions of scholars have studied the relationship between Information Technology and productivity. After quite relevant empirical findings, some scholars claimed that the productivity paradox was solved. The facts have shown that during the period from around 1970 until 1995 productivity growth was very slow, and that was the period during which the computer was initially penetrating developed economies. Then, the period from about 1995 until 2000 has seen a much faster productivity growth. Finally, when the US economy slowed down toward the end of 2000, productivity slowed down but not quite as much as in other recessions, and after 2001 it boosted again (see Figure 1).

Economists believe that it may be plausible that some or all of the behaviour of productivity since 1995 is the result of the computer revolution at last bearing fruits. However, there is not a clear certainty. Because of these doubts, comparing the impact of computers on the productivity with the impact of some other technological innovations such as the electricity or the internal combustion engine may seem to be not justified yet.

In spite of these criticisms, it is clear that Information Technology played some role in the productivity behaviour during the last years of the twentieth century. At the macro level, the theory suggests that rapid technological progress in the production of Information Technology and the induced accumulation of Information Technology capital raised productivity growth during that period (see for instance Jorgenson, 2001). However, things changed with the beginning of the next century. Oliner et al., (2007) observed that the post-2000 acceleration in productivity did not appear tied to the accumulation of Information Technology assets in the late 1990s. In particular, they commented that there was no evidence that industries that sowed lots of Information Technology capital in the late 1990s reaped a particularly large productivity payoff after 2000. In fact, aggregate productivity growth since 2000 is better explained by industry restructuring in response to profit pressures and by a reallocation of material and labour inputs across industries, than by Information Technology intensity. Nonetheless, these authors confirmed the existence of a positive relationship between Information Technology investment and productivity from 1995 to the end of the last century.

We believe that the big issue related to the solution of the productivity paradox is the difficulty in detecting what mechanisms are moving the productivity wheel of the Information Technology revolution. Until now, a relevant stake of the research was focused on the macro level of analysis, studying the relationship between Information Technology investments and productivity at the country or industry level. Those works that used data from the 1995-2000 period, found a strong relationship between country or industry productivity and Information Technology investment, those works that used data from 2000, had some doubts about the existence of this relationship.

Information Technology has to be understood as a set of heterogeneous technologies (ranging from text processor software to supercomputers) with different impacts on the organization of work. However, because of accountability problems of the disaggregation of the investment on different subcategories of Information Technology at the industry and country level, most of the research using the macro level of analysis to approach the productivity paradox problem had to conceive Information Technology as a single entity and a black box. Approaching the productivity paradox at the task level instead, will allow us to identify and classify the different technologies included within the Information Technology construct according to their impact on the task performance. A second important problem in studying the information technology paradox at the macroeconomic level is that it is quite difficult to reflect the Information Technology implementation process and its impact on the organizations. At the macroeconomic level, Stiroh (2006) already observed that the pervasiveness of Information Technology made it difficult to identify a link econometrically between Information Technology and productivity, and that in addition to the technology something else should explain the growth in productivity. Even some of the research at the firm level (Brynjolfsson & Hitt, 1996 or Brynjolfsson & Hitt, 2003) did not consider the issues associated to Information Technology implementation. These same authors (Brynjolfsson & Hitt, 1998) suggested that the correlation of Information Technology capital with other factors such as management skills or intangible capital might explain the great heterogeneity at the firm level in the returns to Information Technology. Brynjolfsson & Hitt (2003) stressed the relevance of the contribution of these complementary inputs, such as organizational capital, that may increase up-to 5 times the Information Technology contributions to productivity. These factors make that the Information Technology productivity gains cannot be considered separately from the whole suite of business activities that accompany Information Technology investment. Breshanan et al., (2002) found evidence of complementarities between information technology, product innovation and workplace reorganization in productivity regressions. These authors also found that firms that combine these three factors tend to demand for more skilled labour, especially when Information Technology investment is combined with organizational change.

Following this research framework, some scholars turned the focus toward organizational change and those workplace practices that appeared to explain higher performance. Decentralization and increase in the autonomy of the workers seem to be the most common practices that interacting with Information Technology implementation result in productivity increases (see among others Breshanan et al., 2002; Dostie et al., 2006; Garicano & Heaton, 2007).

Despite these efforts, some of the reasons that explain why Information Technology may or may not raise productivity are still unclear. Compiling previous research and using some interesting new developments we will try to describe a general theory of the relationship between Information Technology and productivity. Our theory will study this relationship at the lowest level of analysis, the task level, and will take into consideration the knowledge of the labour force as a relevant factor of the productivity. A recent paper from Aral et al., (2006) shares our vision on the relevance of the task level analysis of the skills of workers. This research found that one of the sources of productivity gains was multitasking, namely the ability of employees to work in several projects at the same time, even if multitasked employees needed longer times to finish their tasks. It is important to notice that the multitasking effect had an inverted U-shape relationship with the productivity, namely the authors found that at certain level of multitasking there are diminishing marginal returns, then negative returns to increased multitasking. These authors also found evidence of the relationship between communication and task performance. More precisely, asynchronous communication provided by email and Information Technology means was more productive than synchronous communication such as the telephone. We will return later to multitasking and communication as drivers of productivity gains.

Our first significant contribution will be to use the task level of analysis to study the relationship between productivity and Information Technology. When using this level of analysis we should put significant attention on the impact of Information Technology on the level of skills needed to perform a given task. A huge stream of research that followed the pencils paradox stated by DiNardo & Pischke (1997) supports this emphasis on the skills of the worker. These authors criticized the contribution of computers to productivity as they observed pencils productivity to be very similar to computer productivity. They considered that the higher wages associated with pencils use may simply be a reward to unobserved worker characteristics (i.e. skills) and also that computers as well as pencils or the right to sit down while working were simply production tools given to workers with these characteristics. According to this argument, Information Technology productivity revolution may be simply the visible face of an invisible skills productivity revolution. If this conclusion would be true, the research focus should have changed to the discovery of those specific skills that produced the productivity gains in the late nineties. However, recent research confirmed the inexistence of a pencils paradox. As well as skills, computers play some role in the productivity of the firms while pencils do not (Spitz-Oener, 2007). Nevertheless, the lesson that the pencils paradox taught us is that in order to solve the productivity paradox it was important to study the interactions between skills and computers.

A THEORETICAL MODEL OF RELATIONSHIP BETWEEN INFORMATION TECHNOLOGY; TASK PRODUCTIVITY AND KNOWLEDGE

In the section above, we have commented the convenience of studying the productivity paradox at the task level. Moreover, we have learned that skills and knowledge have some influence on the productivity of Information Technologies. Upon these two ideas we will build our theoretical model.

Our starting point will be a very interesting framework developed by Garicano & Rossi-Hansberg (2006). These authors understand the economy as a universe of knowledge hierarchies formed by production workers, managers and entrepreneurs. Production workers solve draw problems and learn how to solve the routine ones. Managers solve more difficult and unstructured problems and contribute their knowledge to production workers as needed. Entrepreneurs are the managers in the highest layer of the hierarchy. In this context, Information Technology may have two different effects. First, Information Technology can reduce communication costs, driving to hierarchies where production workers have very low knowledge, while managers acquire more knowledge as they solve an increasing number of problems. The result of decreasing communication costs is that the firm will need less skilled workers reducing the demand for skilled workers. The firm will hire less skilled workers who consequently will receive lower wages. In the firm, wage inequality between production workers and managers increases. A second effect of Information Technology is the reduction of learning costs so that production workers solve a larger proportion of problems. This situation will reduce the demand for manager skills, so that the manager wages will be reduced. Then, the differences between production workers and managers will diminish, while the differences between entrepreneurs and managers will increase. We will keep in mind these two effects of Information Technology for our next discussion.

Computers can substitute for low- and middle-skilled white collar workers whose tasks can be regularized and routinized, however complex tasks performed by highly-skilled workers are difficult to automate (Bresnahan 1999; Bresnahan et al., 2002; Autor, et al., 2003). Labour is a productive input. However, what is the actual contribution of labour to the firm? The answer is that labour contribution consists of manual work and knowledge. Thus in order to study the impact of Information Technology on the productivity, we should study the relationship between this new technology and the amount of manual work and knowledge needed to obtain some amount of output. According to the impact of the technology on the amount of knowledge and manual work we will identify three different non excluding categories of Information Technologies: Automation Technology, Knowledge Technology and Communication Technology.

For our research purposes, we will suppose that every employee performs a given number of tasks and needs a certain amount of manual work and knowledge to perform them.

Our first category of Information Technology, Automation Technology, is the technology that reduces the amount of manual work needed to perform those tasks. For instance, if an accounting clerk of the sales department instead of writing manually the invoices for the customers uses a text processor, he will probably increase his productivity. The main effect of Automation Technology on task productivity is the reduction of the amount of manual work needed to perform a given task. As shown in Aral et al., (2006), using Automation Technology may facilitate multitasking, because with the same effort the employee can perform a higher number of tasks. Automation Technology may also reduce the number of employees needed. Autor et al., (2000) described an example of this process in a Bank where the introduction of image processing of checks led to the substitution of computers for tasks formerly performed by high school graduate employees, the elimination of 180 high school graduate positions, and placed downward pressure on high school graduates wages.

Knowledge Technology is the technology that includes some part of the amount of knowledge needed to perform a task. To understand how this technology works we will suppose that the knowledge needed for the correct performance of a task has five different sources. The first knowledge source is the employee himself. During his life the employee has acquired a body of truth, information and principles from teaching, books and experiences. The employee then applies his knowledge to perform the task. The second knowledge source is the Knowledge Technology. In this case, the software contains some of the knowledge required to perform a task. For instance, some text processors have spell and grammar check functions, which include spelling and grammatical rules and knowledge. Firm's managers and workmates are respectively the third and fourth source of knowledge. Finally, we will consider all the knowledge provided by external sources such as customers, providers, friends, experts, the Internet and so on. Since one of our main research goals consists of discussing the impact of Information Technology on the wage structure of the firm, we will pay attention to the first three sources of knowledge: the employee himself, Information Technology and managers.

Let us start with the relationship between software and the employee knowledge. In this first case, using software may produce what Adler & Clark (1991) called the first-order learning based on repetition and incremental development of expertise. For instance, an employee may improve his grammar by using the grammar and spell check of the text processor the same way a junior accountant may learn some new accounting rules by using an accounting information system. Hence, Knowledge Technology may increase the amount of knowledge provided by the employee, as he learns it from using knowledge embedded software.

The second source of knowledge input is the technology. A program is a set of ordered operations and rules reflecting the knowledge of those people who created it. When the employee is using a program to perform a task, actually he is using the knowledge of the people who created that program as an input for that task. From our point of view, what is interesting for our analysis is the substitution process between the employee's knowledge and the software's knowledge. Suppose that a task needs some amount of knowledge provided by a given employee. When firms buy new software including some of the knowledge formerly provided by the employee, there will be an excess in the amount of knowledge used by the firm to perform that task, as the employee's knowledge and the program's knowledge are overlapping. In this case, the firm is not using efficiently the knowledge input, which has to be reduced. Once the investment in the new program has been done, the easier way to reduce the amount of knowledge used in that task is to replace the former employee with a new employee with less knowledge. Doing this, the firm optimizes the amount of knowledge used to perform a task and in addition, as usually wages correlate to the skills and knowledge provided by the employee, replacing the former employee with an employee with lower skills, might also result in labour cost savings for the firm.

Therefore, when a firm is considering implementing Knowledge Technology, she should consider to which extent software knowledge overlaps with the existing skills of their workers. Software will substitute the employee's knowledge more easily when it involves routine and repetitive tasks. The higher the knowledge substitution, the less valuable will be the employee pre-existing knowledge. When the knowledge substitution is almost total, computer and software literacy of the worker will be more important than task specific knowledge. When processing a regular invoice, most accounting systems embed most of the specific knowledge associated to this task. The accounting clerk does not need any longer to know legal and accounting issues related to the invoicing process, instead he will just need to know how to use properly the accounting system. In this case the most valuable knowledge to the firm concerns

Table 1. Impact of information technology on the knowledge and manual work

	Effect on the amount of manual work	Effect on the relative amount of employee knowledge	Effect on the relative amount of manager knowledge
Automation Technology	Reduction	None	None
Knowledge Technology	None	Increase (First-order learning) Reduction (Substitution)	Reduction (Substitution)
Communication Technology	Reduction	Reduction	Increase

computer and software literacy rather than the legal and accounting rules applying when processing an invoice. This argument is supported by the research of Pabilonia & Zoghi (2005) who found that when considering computer returns, there was no return to computer use, but rather a return to computer experience, when considering both new users and more experienced users.

In third place, we will consider all that knowledge needed to perform a task that is provided by managers and supervisors. Usually, the firm will use this knowledge when the employee does not know how to solve a problem. Similarly to employee's knowledge, software can also be a substitute for manager's knowledge. Again, the higher the share of manager's knowledge included into the firm's software, the lower the value of these managers to the firm. Logically and similarly to the findings of Garicano & Rossi-Hansberg (2006), the substitution of manager's knowledge will increase decentralization and decrease the number of layers of the organization.

The third Information Technology category considered in our model is Communication Technology. This technology can facilitate the communication between the employee and managers first by reducing the amount of manual work associated to communication and consequently improving coordination, second by smoothing the progress of transfer knowledge. The Garicano & Rossi-Hansberg (2006) model reflects that the lower the communication costs between employees and managers, the higher will be the amount of manager's knowledge employed by the employees to perform their tasks. In order to use the efficient amount of knowledge, if the share of manager's knowledge for a given task increases, the firm will reduce the share of employee's knowledge. The use of Communication Technology may reduce the number of employees needed for a given task.

Overall, we would like to stress that current research on the relationship between Information Technology and productivity believed that indistinctly of the specific category considered, Information Technology had homogeneous effects on the productivity. Actually we have demonstrated that this supposition is not true and that it is very convenient to isolate the specific technology involved and its effect on employee productivity at the task level. In fact some Information Technologies can reduce the amount of manual work, others can be a substitute for either employee's or manager's knowledge and finally some others can facilitate the knowledge transfer costs (Table 1).

Finally we would like to remind that some forces might counterbalance the productivity benefits of Information Technology. The implementation process of information technology sometimes requests a learning and change process. This is especially critical if as a result of the Information Technology implementation a reorganization of the work is going to take place both at the individual and organizational levels. However these organizational adjustments are not always successful, at least in the short term (see for instance McAfee, 2003). The returns to Information Technology need time to be grasped (see Brynjolfsson & Hitt, 2003). To obtain these results the reorganization of the work or of the labour structure is normally needed but not always executed by the firms. For instance, when Knowledge Technology is implemented, some firms do not replace existing workers for lower skilled and cheaper workers, loosing the positive effects of the Information Technology investment.

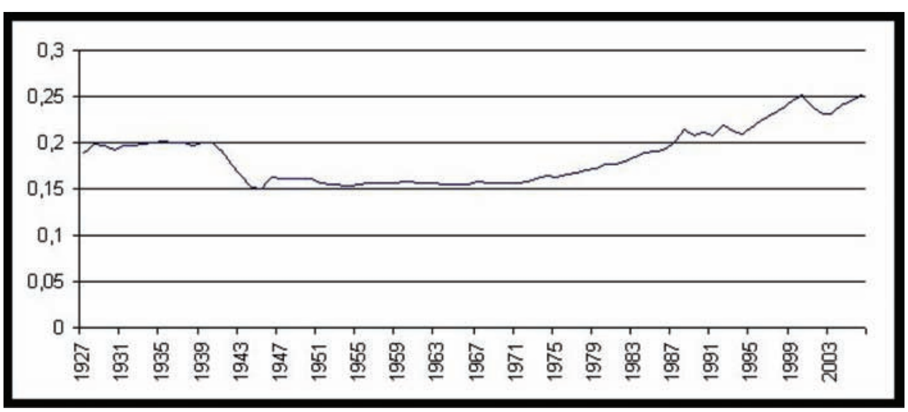
APPLICATION OF THE THEORETICAL MODEL TO THE SKILL-BIASED ORGANIZATIONAL CHANGE

In the section above we have described the impacts of Information Technology on the amount of labour inputs, knowledge and manual work needed to perform a given task. As we have already mentioned, by modifying the relative composition of labour inputs, Information Technology will modify both the demand for knowledge and the organization of the work, producing subsequent effects in the wage structure. A common view is that Information Technology investments increase the productivity of high skilled employees and their wages (see Bartel & Lichtemberg, 1987; Krueger, 1993; Autor et al., 1998 among others), leading to a widening in the distribution of wages and an increasing income inequality.

From the beginning of the 1950s until the mid-1970s, the U.S. distribution of real earnings was stable; since then earnings dispersion has increased rapidly while only the top quintile of the male U.S. working population experienced rising earnings (See Figure 2).

By several alternative measures of skill (education premium, experience premium, non-production premium), the earnings of skilled workers have risen relative to those of unskilled workers over the past decades. As commented above empirical studies infer the shift in demand for skills from the facts that the relative wages for workers in more skilled categories (those with post-secondary education or those in non-production jobs) have increased at the same time that the employment share of these categories has grown (Berman et al., 1997; Machin & Van Reenen, 1998). Because most of this shift occurs within industries, it is not likely to be the result of final product demand. There are a few possible explanations to the upward trend in inequality such as Tax policies that favour high incomes, the stagnation of the minimum salary, the increasing high costs of graduate education that stays reserved to elites, or the uneven geographical distribution of wealth. However, we will point our attention to the correlation between income distribution and the use of computers, suggesting that scarce computer skills may be involved (Autor et al., 1998).

Figure 2. US top decile income share 1927-2006



Autor, et al., (1998) or Bresnahan et al., (2002) observed that the spread of computers don't has to be understood as simply increasing the demand for computer users and technicians, but more broadly as part of technological change that has altered the organization of work and thereby more generally affected the demand for workers with various skills. In the new Information Technology based organizations, computerization produces some contrasting effects. By one side it increases both skill requirements and worker autonomy while at the same time it also increases management's ability to monitor workers. Guy (1999) considers that greater flexibility and reduced planning error are to the advantage of managers' and the detriment of workers' bargaining power, and for this reason earnings inequality has increased in the post-bureaucratic era in favour of managers.

However there is not clear evidence of the existence of a premium wage related to computer use. A relevant number of papers could not find any evidence of this wage (see among others Haysken-De New & Schmidt, 1999; Doms & Lewis, 2006; Muysken et al., 2006). We will use the theoretical model developed in the section above to understand how the use of Information Technology produces contrasting outcomes on the demand for high-skilled workers depending on the specific category of Information Technology considered. Therefore, as well as for productivity, the relationship between Information Technology and the demand for high-skilled workers has to be studied taking into account which specific Information Technology we are considering.

We have described how both Automation Technology and Communication Technology can reduce the amount of manual work needed to perform a given task. Workload will be lower for workers and managers when these are responsible for coordination tasks. Unless the firm finds new tasks for these employees, the likely outcome will be a reduction in the number of employees. Dewan & Min (1997) provided empirical evidence of how Automation Technology produces a decrease in the demand for low skilled workers. Garicano & Rossi-Hansberg (2006) described how Communication Technology cut control costs and also produced a decrease in the demand for managers.

However, what is the difference between low and high skilled workers? There are two different answers depending on the redistribution of tasks among employees. If the firm does not assign new tasks to the existing employees we will support the Pabilonia & Zoghi (2005) argument that the difference between low and high skilled labour is prevalently explained by their computer experience. In order to the new technology to be effective, the firm will need workers with some computer skills. Given the current correlation between computer literacy, age (Friedberg, 2003) and education levels, quite likely the firm will increase the demand for workers with higher degrees of education. Computer literacy may explain in part the premium wage of workers with higher degrees of education. If there is not new task assignment, Automation Technology and Communication Technology may reduce the demand for workers with lower computer skills.

Nevertheless, the firm may also assign new functions and responsibilities to the employees. As shown in the Aral et al., (2006) paper, the nature of Information Technology related tasks becomes increasingly heterogeneous, and the firm will demand for workers with a more complex portfolio of occupation skills. Therefore, when a firm implements Information Technology that reduces the amount of manual work we will expect an increase in the demand for employees with richer skills. In this case, in addition to computer literacy, the difference between low and high skilled workers will be given by the diversity of tasks an employee can perform. Automation Technology and Communication Technology may reduce the demand for workers with poorer portfolios of occupation skills.

Regarding managers, we will expect also an increase in the demand for managers with computer skills as they will need to coordinate and control computer based activities. Moreover, especially if the firm implements Communication Technology, the control and coordination tasks may be computer based. If the firm reorganizes task work at the employee level, introducing new responsibilities and functions for production workers, firms will ask managers to understand the impact of computers on the tasks they are controlling and to control fewer workers but the same number of tasks. Therefore, we will expect that this type of technology will raise the demand for managers with computer literacy, and reduce the demand for managers without computer skills.

Concluding, the Information Technology reduction of manual work and communication costs is in line with the skill-biased organizational change and may explain the increasing wage inequality between low skilled and high skilled workers and managers. However, as long as in the future computer literacy will spread among the workforce, the computer literacy premium wage will be reduced. Then, skill-biased organizational change premium wage will be explained by the differences in the employee' skill portfolios and the degree of multitasking in the new organizational design. At the empirical level Maurin & Thesmar (2004) or Borghans & ter Weel (2004a) observed that reducing the workload of routine tasks new information technologies make it possible to reallocate more human and material resources to non routine tasks. Borghans & ter Weel (2004b) already observed in the United Kingdom that higher wages of computer users are unrelated to computer skills.

In the section above, we have described how Knowledge Technology may be a substitute for employee and manager knowledge. Obviously, if Knowledge Technology reduces the amount of knowledge needed to perform a task, the firm will reduce the demand for high skilled workers. If not only worker's knowledge but also manager's knowledge is embedded in the Knowledge Technology implemented by the firm, the demand for managers will also be reduced. Therefore, an important corollary is that under this assumption skill-biased organizational change premium wage is not supported. In fact within this context skill-biased wage inequality will decrease. In a similar framework, Garicano & Rossi-Hansberg (2006) believed that entrepreneurs would be the most benefited from the knowledge substitution. Thereby we would expect that Knowledge Technology would broaden the earnings gap between entrepreneurs and workers, but not between low and high skilled workers. In fact, the main impact of Knowledge Technology is the increase in the demand for low skilled workers and sometimes also the reduction in the number of managers.

We have already discussed that Information Technology may cut communication costs. When this happens, Information Technology makes less difficult the transfer of knowledge and the control across the different layers of the organization. We have already commented the reduction of control costs, so we will analyse the reduction of the knowledge transfer costs between individuals. The reduction of these costs diminishes the demand for knowledge. Consequently, the demand for skilled labour will decrease. Similarly to the knowledge substitution, wage differences between low and high skilled workforce will be thinner, although the earnings inequality between managers and non managers broadens. Even if we won't study in depth the relationship between the skill wage premium and offshoring (see for instance Canals, 2006), we have to mention that the reduction of knowledge transfer costs also makes easier some outsourcing and offshoring decisions that have an impact on the wages of the local workers (Antras et al.; 2006).

Summarizing our arguments, we defend that there is not a single effect of Information Technology on the skilled wage premium and this is why there is contrasting empirical evidence. The substitution of manual work by Information Technology increases the skilled wage premium, while the substitution of knowledge and the reduction of

Table 2. Impact of information technology on the demand for skilled workers

	Demand for low skilled workers	Demand for high skilled workers	Demand for managers
Automation Technology	Reduction	Increase	Reduction
Knowledge Technology	Increase	Reduction	Reduction
Communication Technology	Increase	Reduction	Increase

communication costs mainly benefits managers and entrepreneurs.

A first reason for the skill-biased technological change premium wage is that computer literacy is not an asset in a relevant share of the workforce. For instance, even if for some occupational groups computer literacy is almost an universal asset, in the 27 countries of the European Union just a scarce 13 percent of all individuals older than 15 years have carried out some computer activity. As we have commented above, in the future when computer literacy will be a common skill for most of the workers we should search elsewhere for the reasons of the premium wage. In second place, the empirical evidence of the premium wage would suggest that today Automation Technology prevails over Knowledge Technology. As long as Knowledge Technology will include more knowledge, the substitution process will get stronger and thus the demand for skilled-labour will diminish as well as the premium wage. When this will happen, the premium wage will be paid to those who create the software, the software industry, to those who create the business rules included into the software, namely the entrepreneurs, and generally to those workers whose knowledge cannot be reduced to a routine, that is tacit knowledge such as engineering and innovation. From an economic policy point of view, countries should take care of protecting those economic agents with this valuable knowledge, as they will be the source for competitive advantage in the future.

A PRACTICAL EXAMPLE

We will illustrate some of the arguments detailed above with a short business case. We have studied the implementation of a wireless sales support electronic device for the shop clerks of a retail company with several stores in Spain. The firm decided to implement the device because they were having serious problems in retaining talent in the firm due to the high personnel turnover, in some stores close to 80 percent, and the difficulties in finding and hiring salespeople with some experience in the industry. The device had installed sales support software. The device had information of the complete catalogue of products of the firm. For every item in the catalogue, the device provided information such as the description of the features of the item, its current availability, the potential substitutes in case the item was not available, and the possible complementary items. The system also provided product bundling suggestions with some discounts and special offers related to the selected item. The information provided by the sales system was updated at the headquarters of the firm by people from the marketing department.

The main advantage of this new device was improved sales effectiveness. First, the sales clerk does not need to know by heart the characteristics, substitutes, offers, product bundling and discounts for every item in the catalogue. Therefore, the level of sales skills needed to perform the selling task was reduced by the use of this technology. After some customer satisfaction surveys, the firm observed that customers believed that they had a better purchase experience because sales clerk were more helpful. Second, before the implementation of the new sales support system, every time a customer was interested in a given product, the sales clerk had to walk into the stockroom to check its availability. With the use of the new device, the sales clerk could immediately check the availability saving time and without loosing the contact with the customer, a relevant advantage in the sale process in the retail industry, and therefore increasing sales likelihood. Another interesting outcome of the implementation of the device was the reduction in the market knowledge needed by salespeople, since it was already embedded in the sales system. This solved the personnel turnover and high skilled workers scarcity problems. In fact, the average salary paid to the sales clerk was significantly reduced after the implementation of the device.

With this short example we have shown how our theory works. The sales device may be included within both the Automation and Knowledge Technology categories. From the Automation Technology point of view, the new technology reduced the amount of manual work (in this case the time needed to walk to the stockroom to check the availability). Saved time was now devoted to intensified sales tasks and consequently from this point of view the new sales system has not produced any effect on the demand for skills. Nevertheless, when considering the device as a Knowledge Technology, we have observed that the device reduced the skill levels needed by the sales clerks as well as their average wage, as a consequence of the reduction in the demand for skills. Our business case resulted in a similar effect to what was found by Autor et al., (2000) in the banking industry. The device also reduced, even if in a small amount, the number of doubts posed by the sales clerk to the shop supervisor who has not been significantly affected by the new technology. Finally, the operation of the device was extremely easy, with similar functions to an electronic agenda or a mobile telephone. Thereby, in this specific case computer literacy was not a requisite in the hiring process of the new sales clerks.

Summarizing the results of our case study, by reducing the demand for and wages of high skilled workers the implementation of the new system increased the wage differences between the shop managers and the shop clerks. If this technology became widely distributed in the retail industry, we would probably see an increase in the income differences between managers and workers by exerting downward pressure on the latter’s average wage. Despite of having access to Information Technology, a large social group, in our case workers, would suffer from the implementation of Information Technology.

CONCLUSION

The most important remark of this chapter is that Digital Divide cannot be simplistically reduced to the study of the differences between the haves and the have nots access to Information Technology, but needs a deeper understanding of the manifold impacts of Information Technology on wealth and income distribution. Apparently, the Information Technology Revolution shares some of the features of the Industrial Revolution. Two of the features that received a significant attention by scholars deal with the study of the relationship between Information Technology, productivity and the increasing wage dispersion in developed countries. Both research streams are related and despite some advances, there are still some dark points to solve. We have discussed in this paper how both topics do share the same problem. Information Technology has been considered a homogeneous set of technologies with a single impact either on the productivity either on the wage structure. We have explained that there are three different categories of Information Technology with different impacts on the demand for manual work and knowledge. While Automation Technology tends to reduce the demand for manual work and increases the employee supply of knowledge, while Knowledge Technology and Communication Technology tend to reduce the demand for employee knowledge. We have seen these mechanisms working in the retail industry.

We believe that the model explained in this framework may be very useful in the future to solve both the productivity paradox and the inequality paradox posed by the Information Technology Revolution. The model described here has to be understood as a first draft towards a more complete understanding of the Information Technology paradoxes, as for simplicity some aspects have not been taking into consideration. For instance, we analysed three out of five sources for knowledge, we still need to understand the mechanisms behind the interchange of knowledge between colleagues and between the employee and external agents such as customers and suppliers. We have to approach the task reorganization more formally, since in this paper the relationship between work reorganization and knowledge has been simply stated. Finally, we considered a firm operating in a single country with a homogeneous wage distribution at the geographical level. Considering the links between offshoring and skill biased organizational change that we have just mentioned in this paper, we believe that a more detailed research should be conducted to improve this initial model.

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KEY TERMS AND DEFINITIONS

Computer Literacy: Ability to use computers and related information technologies.

Inequality Paradox: The inequality paradox reflects the fact that there is some, still unclear, evidence that Information Technology may be related to the widening wage and income gap in developed societies.

Information Technology: Broad set of technologies used to manage, transfer, process and store information.

Labour Inputs: Is something that every worker provides to the production system. The two most important labour inputs are knowledge and manual work.

Productivity Paradox: The productivity paradox reflects the lack of irrefutable and clear evidence of the contribution of Information Technology to the increase of productivity in the last 30 years.

Productivity: Measures the changes in output per unit of input. To better understand the complementarities between Information Technology capital and other inputs, the use of multifactor or total productivity is widely used in the study of the relationship between productivity and changes in the Information Technology capital.

Skill-Biased Technological Change: This is the technological change that benefits only those workers with higher skills in detriment of workers with lower skills who lose their jobs or see their wages diminished.

Wage Dispersion: Wage Dispersion measures pay differentials among workers.fu

Chapter 24
Shifting Focus from Access to Impact:
Can Computers Alleviate Poverty?

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ABSTRACT

This chapter contains two main messages: first, the concept of the 'digital divide' should be seen as part of the problem rather than as part of the solution. Therefore, the sooner this concept-and with it the binary categories and the 'one size fits all' simplified model of 'development'-is discarded the better. Second, the main recommendation for strategies to be adopted in ICT4D projects is that focus should be on the information and communication needs of poor people rather than on technologies; beneficiaries should be actively involved in identification of their needs, in decision making about ways and means to satisfy the identified needs, about purchase of equipment and inputs and about implementation of solutions. Only by actively pursuing participatory design and participatory 'development' can the goal of achieving a free, fair and equal 'information society,' benefitting poor and rich people alike, be reached.

INTRODUCTION

For more than fifteen years the discourse on information and communication technologies for 'development' has been ongoing. As part of this discourse the contested concept of the 'digital divide' and the associated binary categories of the 'information rich' versus the 'information poor', and the 'knows' versus the 'know-nots' have been used to describe the difference in terms of availability of information and communication technologies between rich and poor countries. The discourse has been accompanied by a large number of development initiatives by multilateral, bilateral and non-governmental organisations alike. These initiatives have been focusing upon providing access to information and communication technologies, mainly in the form of computers and Internet connection, to poor people in poor countries. The question arising is to which extent these many initiatives have brought about 'development' in the form of a positive change of livelihood for the poor people involved.

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Attempts to measure the 'digital divide' draw upon the concepts of 'universal service', used to measure availability in rich countries and 'universal access', a more realistically achievable goal in poor countries. These concepts have for many years been used by the telecommunications industry to measure the penetration level of telephone services and attempts have been made to adapt the concepts to also include other information and communication technology services. The indicators used for measuring service and access have mainly been per capita stock or penetration levels of different types of technologies, such as telephones, computers and Internet hosts and users. But after fifteen or more years of many initiatives and meager results it has become increasingly clear that there is a need to move beyond measuring availability and accessibility, to measuring usage and, more importantly, to measuring impact, a challenge which development researchers and practitioners alike have been struggling with for many years.

The two main questions discussed in this chapter are the following:

- To which extent is the concept of the 'digital divide' part of the solution or part of the problem?
- What strategies should be adopted to achieve the ultimate goal: A free, fair and equal global 'Information Society', benefiting poor and rich people alike?

The first section of the chapter is this overview, presenting the main questions and giving a chapter overview. The second section of the chapter sets out with a discussion of the concept of the 'digital divide' and a presentation of different methods of calculating the divide, as well as a discussion of trends. The origins of the concept are explored, followed by a discussion of the 'power divide', i.e. the global power imbalance between rich and poor countries.

In the third section the two concepts of universal service and universal access are presented, together with the three main criteria underlying these concepts: availability, accessibility and affordability, and a model of telecommunication network development. The fourth section discusses the criteria of accessibility in more detail. From accessibility the discussion moves to the concept of usage, including a discussion of usage indicators and usage studies. Also, the concept of impact and of how to measure the socio-economic 'developmental' impact of initiatives within the area of information and communication technologies for 'development' in a meaningful way are discussed.

The fifth section describes the results of a small pilot study on access, usage and impact of information and communication technologies carried out in the small district town of Sengerema in the north western part of Tanzania, where a so called Multipurpose Community Telecentre with computers and Internet access was established in December 2000 and where mobile telephony is widespread. The study was carried out in an attempt to answer the question: Has the high rate of deployment of information and communication technologies in Sengerema town led to related 'development'?

Finally, the sixth and last section attempts to answer the two main questions: Firstly, the concept of the 'digital divide' should be seen as part of the problem rather than as part of the solution. Therefore, the sooner this concept - and with it the binary categories and the 'one size fits all' simplified model of 'development' - is discarded the better. Secondly, the main recommendation for strategies to be adopted is that focus should be on the information and communication needs of poor people; they should be actively involved in identification of the needs, in decision making about ways and means to satisfy the identified needs, about purchase of equipment and inputs and about implementation of solutions. Only by actively pursuing participatory design and participatory 'development' can positive impacts and better living for poor people be achieved.

THE DIGITAL DIVIDE - GROWING OR SHRINKING?

The concept of the 'digital divide' is used to describe the difference in terms of availability of information and communication technologies (ICT), such as telephones, computers and the Internet, between rich and poor countries, as well as between urban and rural areas within the same country.

In this section the concept of the 'digital divide' is introduced and different methods of measuring the divide are presented, together with calculations based on statistics from the International Telecommunications Union. Based on the calculations, trends in the 'digital divide' are discussed. Furthermore, the origins of the concept are explored in some detail, leading to a discussion of the 'power divide', i.e. the global power imbalance between rich and poor countries. Finally, a call is issued for discarding the not very helpful dichotomies in the ICT for development discourse and instead let diversity and user participation be guiding principles for new and innovative ICT for development initiatives.

The Beginning

It all began with "The Missing Link", the report presented to the Secretary General of the International Telecommunication Union (ITU) in January 1985 by the Independent Commission for World Wide Telecommunications Development, later renamed the "Maitland Commission" after the Commission Chair, Sir Donald Maitland. The overriding objective set by the Commission was to achieve universal telephone access by the early part of the 21st century (ITU, 1984, p. 4), the underlying rational being the uneven distribution of main telephone lines among countries and within countries. The objective and the focus on telephones were reinforced eight years later as being "no less appropriate and no less attainable" (Maitland, 1992, p. 5). Another six years later focus had shifted towards information and communication technologies (ICTs) and concerns were voiced about "the opening up of a new gap - between 'information-rich' and 'information-poor ' societies" (Maitland, 1998, p. 1-2). Thus, the focus on telephones was replaced with a focus on the broader concept of ICTs from around the mid-1990s. Simultaneously, the debate about 'ICT for development' (ICT4D) took off and the concept of the 'digital divide' replaced the 'missing link'.

The 'Digital Divide' Redefined

The term 'digital divide' was first coined as a description of a national ICT problem within the USA in connection with visions about the 'National Information Infrastructure'. When Senator Al Gore in a speech to the ITU First World Telecommunication Development Conference in Buenos Aires in 1994 proposed the establishment of the Global Information Infrastructure, the 'global digital divide' came on the agenda of the ITU and other telecommunications actors (ITU, 1994; Gammeltoft, 2002).

Based on the original measure of 'teledensity' (i.e. main telephone lines per 100 inhabitants), widely used by the telecommunications industry and by the Maitland Commission, the main interpretation of the 'digital divide' found in the literature on ICT4D is a statistical measure of availability, based on per capita stock - f. ex.: numbers of main telephone lines per 100 inhabitants, Internet users per 1000 inhabitants etc. Using this absolute measure, there is an overall trend of a growing 'digital divide' (Fink & Kenny, 2003; Gillwald, 2005) - but using other units of measurement may reveal other trends, as is very convincingly argued by Fink and Kenny (2003). They document that, when measured in relative terms, i.e. when measuring the rate of growth rather than the absolute stock, the ICT gap is rapidly closing (Fink & Kenny, 2003, pp. 5-8), an observation which is also documented in other reports (ITU, 2004, p. 35; ITU, 2006, p. 1).

A simple calculation[1] based on figures from the ITU World Telecommunication Development Reports 1998 and 2006, for Denmark and Tanzania, respectively, demonstrates this (see Appendix): In terms of the number of mobile telephone subscribers, calculations show an increase of the absolute digital divide of 2.7 times over the 8 years from 1996 to 2004, but the relative growth rate of mobile subscribers per 100 inhabitants was 51 times higher in Tanzania. So in spite of huge and growing absolute differences, "it is mathematically inevitable that, at some point, [the poor countries] surpass the rich world - notwithstanding the possibility that in the short term, the absolute gap may continue to widen." (Fink & Kenny, 2003, p. 5). The same conclusion is reached by the ITU, based on a different method of calculating the relative digital divide (ITU, 2006, p. 1).

Fink and Kenny further documents that using a different unit of measurement, such as per income stock - i.e. telephones per US$ of Gross Domestic Product per Capita - the gap is not only closed but middle and low income countries have overtaken high income countries several years ago (Fink & Kenny, 2003, pp. 8-11). A calculation based on the two cases above illustrates that in 2004 mobile telephone subscribers per US$ GDP per capita was 44 times higher in Tanzania than in Denmark, and similarly Internet users per US$ GDP per capita was 14 times higher in Tanzania. This illustrates a point made many years ago by Hudson that people living in rural areas (as do most of the population in Tanzania) are prepared to pay relatively more for telecommunications services (Hudson, 1984, p. 64). The same point is made by the ITU (2006, p. 52) and further confirmed by Gillwald and Esselaar who state that "...consumers across Africa are willing to pay a much greater portion of their income for communications technologies than in developed countries." (Gillwald & Esselaar, 2005, p. 18).

In spite of the above documentation showing that the 'digital divide' is rapidly shrinking, the myth of a growing digital divide is still widespread. A search via Google for 'growing digital divide' gave 29,000 hits in July 2008; thus, the question arises: Why is it that

...the original sense of the digital divide term - which attached overriding importance to the physical availability of computers and connectivity, rather than to issues of content, language, education, literacy, or community and social resources - is difficult to overcome in people's minds. (Warschauer, 2002, p. 5)

Where did the concept of the 'digital divide' originate from, who was behind its creation and who has an interest in perpetuating the concept? These are the questions dealt with in the next subsection.

Origins of the 'Digital Divide'

Even a superficial analysis of contributions to the debate about the 'digital divide' and initiatives to bridge this divide, reveals that the voices of the poor, i.e. the people who presumably are to benefit from 'bridging the divide', are hardly ever heard in the debate. This does not indicate that poor people are not aware of the benefits of telecommunications, as documented in the World Bank report 'Voices of the Poor', where a search for ICT issues reveals that "[m]ore in some parts of the world than in others, poor people talk about the importance of telephones to increase their connectivity to information..." (Narayan et. al., 2000, p. 239). Overall, however, ICT plays a minor role when poor people are asked to express their needs (Narayan et. al., 2000, p. 274).

In reflecting upon the origins of the concept of the 'digital divide' and of ICT4D initiatives to bridge the divide, Gammeltoft argues that the driving forces are to be found in the ICT-industry in the rich countries, mainly in the US, where markets for ICT products are near-saturated, demand is leveling out and overproduction is threatening (Gammeltoft, 2002, pp. 142 - 145).

The statement is supported by the observation that when the Nasdaq index dropped between March 2000 and May 2002, the number of articles on the global 'digital divide' indexed by Social Science Citation Index during the same period increased markedly (Gammeltoft, 2002, p. 143). This point of view was underscored by the focus on telecommunications markets already present in "The Missing Link" (ITU, 1984, p. 3-4). Years later, the UNDP was worrying about this situation stating that "Technology is created in response to market pressures - not to the needs of poor people, who have little purchasing power." (UNDP, 2001, p. 3)

Thus, governments in poor countries have for a long time been under international pressure to expand ICT infrastructure, and - in spite of the shrinking 'digital divide' - the international pressure is still maintained. In the introduction to the ITU World Telecommunication/ICT Development Report (WTDR) 2006, giving an overview of global ICT development, it is stated:

This overview suggests that while the digital divide keeps shrinking, the world continues to be separated by major differences and disparities in terms of ICT levels. ... many developing countries risk falling behind, particularly in terms of Internet access and newer technologies such as 3G and broadband. (ITU, 2006, p. 8)

It may indeed be correct that many so-called 'developing' countries risk falling behind because of lack of ICT infrastructure, resources, skills etc. - but also because of lack of influence, representation and power in the ICT standard-setting bodies, such as the ITU and the Internet Corporation for Assigned Names and Numbers (ICANN). Thus, the international ICT standards and rules are benefiting ICT companies more than poor countries (Wade, 2002, p. 463).

In all fairness it should be mentioned that to the international pressure for expansion of telecommunications in poor countries has been added a domestic pressure for such expansion, coming from high- and middle-class sectors of society, involved in industrial production, trade and transportation. A decade ago this pressure resulted in long waiting lists and long waiting time for a telephone connection, a situation which has, however, been changed by the roll-out of the mobile telephone (ITU, 1998; ITU, 2006).

The point made above is that the debate on ICT4D and the accompanying concept of the 'digital divide' is driven more by the supply side, i.e. by the powerful ICT industry in rich countries, rather than by the demand side, i.e. by the rural poor in the poor countries. This situation is in contrast to a strong claim made by the World Bank in the World Development Report 1994 about a shift in the delivery of infrastructure from being supply driven to being demand driven:

Infrastructure can deliver major benefits in economic growth, poverty alleviation, and environmental sustainability - but only when it provides services that respond to effective demand and does so efficiently. ... Give users and other stakeholders a strong voice and real responsibility. (World Bank, 1994, p. 2; emphasis added)

In the debate about ICT, admittedly an important enabling infrastructure, the end users' strong voices are seldom heard and they are hardly ever left with real responsibility for the ICT4D initiatives.

The 'Digital Divide' - Part of the Problem?

The 'digital divide' is defined by the rich countries, as is/was the modernisation paradigm, framing the discourse on ICT4D (Wilson, 2003). According to the modernisation paradigm, the dominant 'development' paradigm formed more than forty years ago, 'development' is perceived as a simple linear and staged process. This in turn means that so called 'developing' countries have to 'catch-up' with and become like so called 'developed' countries stage by stage - or better still: to 'leapfrog' stages on the way to becoming like the 'developed' countries. This perception of 'development' was criticised years ago for being too simplistic and for glossing over important issues of local cultural, socio-economic and political factors influencing poverty and inequity within countries as well as between countries.

Nevertheless, it is within this simplistic view of 'development' that the present discourse on ICT4D is framed, giving rise to two main problems: One is that multiple alternative paths to 'development' are overlooked and therefore never followed. Another, more imminent, problem is that the technological determinism, inherent in the modernisation paradigm and underlined by the fallacy of the 'digital divide', tends to emphasise advanced, i.e. digitalised, technical solutions and detract attention from other, more important contextual factors, rooted in social, cultural, political and economic realities, including the information and communication needs of the poor which the technology was supposed to fulfill (Thompson, 2004).

Elsewhere (Dahms, 2002a, b) it has been argued that information and communication is indeed crucial to 'development' since information is the input to learning processes, individual as well as collective, which are equivalent to 'development' processes. Therefore, the concern about fulfilling communication needs and providing information services needed for poverty eradication is warranted - but the technology to fulfill these needs comes second and should only be chosen once the needs have been identified. Although in the opinion of this author dichotomies are never helpful in trying to understand complex realities, if at all using dichotomies we should be talking about an 'information divide' and a 'communication divide' rather than about a 'digital divide'.

The concept of the 'digital divide' and its accompanying dichotomist categories such as 'developed countries' versus 'developing countries', 'the information-rich' versus 'the information-poor' or 'the knows' versus 'the know-nots' (UNDP, 1999, p. 57) are eurocentric statements which ignore the wealth of local and indigenous information and knowledge in non-western cultures (Dahms, 2001a). As such they reflect the one overall and very real existing world divide: the 'power divide' which separates the powerful rich countries from the powerless poor countries: "The real power of the West is not located in its economic muscle and technological might. Rather, it resides in its power to define." (Sardar, 1999, p. 53; here quoted from: Müller & Bertelsen, 2001, p.3). In a strive for a fair 'Information Society' the focus should be on bridging the 'power divide' through a stronger user voice and equal participation via participatory design and development methods in ICT4D initiatives (Wilson, 2003; Dahms & Faust-Ramos, 2002).

Summing Up

In this section the concept of 'digital divide' was discussed and it was documented that, depending upon the way one chooses to measure, this so-called 'divide' is rapidly closing, if not already closed. The origins of the concept was shown to be located mainly within the powerful telecommunications and computer industry in the rich countries, i.e. the pressure for expansion of telecommunications infrastructure is driven from the supply side, not from the demand side. The two main problematic aspects of the concept of 'digital divide' were pointed out: Firstly, 'development' is perceived as a 'one size fits all' process of poor countries becoming like rich countries and secondly, the technological determinism inherent in the concept focus attention on technical issues and draws away attention from more important social, cultural, political and economic factors. It was proposed that if not discarding all talk about 'divides' completely, then at least in the discourse replace the 'digital divide' with an 'information divide' and a 'communication divide', introducing the only real existing divide, namely the 'power divide' between rich and poor countries. In the next section measures of the information and communication divides will be presented and it will be argued that the communication divide is nearly closed, while an information divide still remains.

FROM UNIVERSAL SERVICE TO UNIVERSAL ACCESS

Universal service is a concept which has been used by the telecommunications industry as a yardstick to measure household fixed telephone penetration rates in rich countries. In poor countries, due to a very different economic situation, universal service has been considered unachievable within the near future. Instead, a more flexible and more realistically achievable goal of universal access has been introduced to describe a situation where all individuals have access to a telephone within a reasonable distance from their home.

In this section the two concepts of universal service and universal access, as applied within the telecommunications industry, are presented. Furthermore, the three main criteria underlying universal service or universal access: availability, accessibility and affordability, are discussed, together with a model for network development. Finally, a proposal for the expansion of the concepts of universal service and access to include not only more advanced information and communication services, such as mobile telephones, computers and the Internet but also more traditional information and communication technologies, such as radio and television, is presented.

Universal Service and Universal Access

The concept of 'universal service', defined as 'a telephone in every household' - or more precisely: in 90% of households - emerged in rich countries in the mid-1960s, when most countries had state owned monopoly telecommunications, so-called Public Telephone Operators (PTOs) and telephone penetration rates were already quite high, usually above 60%. It was, however, not until liberalisation of telecommunications, after around 90 years of monopoly services and with service rates already well above 90% in most of the rich countries, when concern about exclusion of marginalised groups in geographically remote rural areas surfaced, that universal service obligations came into focus. Therefore, the issue was one of securing connection of the few without telephone services while the majority of the population already enjoyed such services (ITU, 1998, pp. 62-63; Benjamin & Dahms, 1999, p. 7).

In poor countries today the situation is radically different, with privatisation and liberalisation of telecommunications having been already fully or partially completed in many countries (ITU, 2006, p. 2) while the diffusion of services still is far from being 'universal'. A concern about the large 'unconnected' proportion of the population is therefore well placed in these countries. While the goal of universal service may be appropriate for rich countries, poor countries are focusing their efforts on achieving 'universal access', meaning that everyone should be within a reasonable distance of a telephone, thus shifting the focus from providing services to individuals and individual households to providing services to groups of people. What is to be considered a 'reasonable distance' varies from one country to another and definitions depend upon the local context, including factors such as geography, population density and network coverage (ITU, 1998, p. 70).

Universal service and universal access are different goals and thus require different policies to be achieved but they are both part of the same continuum - from no services at all to universal individual services for everyone, with universal access somewhere in between. Another common characteristic is that both of the two concepts are so-called 'moving targets', i.e. they are dynamic and changing over time, depending upon two main and related factors: Network growth and technological development, more specifically digitisation and wireless technology (ITU, 1998).

Criteria for Service and Access

There is a general consensus within the ITU that the contemporary concepts of 'universal service' and 'universal access' should encompass three criteria: Availability, i.e. geographically nationwide telecommunications network coverage; accessibility, i.e. non-discriminatory access to equity services for all users, independent upon their geographical location, ethnicity, religion, gender etc.; affordability, i.e. pricing of services at a level that most users can afford (ITU, 1998, p. 63).

Pursuing these three criteria simultaneously might easily lead to conflicting policies; for example, extending the network to increase availability demands investments which may work against the criteria of affordability; subsidising users in sparsely populated rural areas to achieve affordable access for such users (as was done in many rich countries during monopoly operations) might lead to less revenue and thus less money for expansion of the network (ITU, 1998, p. 65; Benjamin & Dahms, 1999, p. 10).

The three criteria should be seen not as conflicting but rather as different priorities at different stages of the telecommunications network development process. According to the ITU (1998, p. 65) this process may be conceived as a five-stage process:

1. Network establishment, i.e. providing long distance service to major urban centers.
2. Wide national reach, i.e. expansion of the network to all geographical areas.
3. Mass market expansion, i.e. mass usage encouraged by low prices of services.
4. Network completion, i.e. focus upon social services and special needs.
5. Complete individual services, i.e. individual access to all types of services, including advanced information services.

During the first two phases, as the network grows to achieve nationwide geographic coverage, the criterion of availability is in focus. Already in 1998 the technology for global coverage was in place, thus availability was technically achievable (ITU, 1998, p. 92-93). During the third phase, focus might shift from availability to affordability. Like accessibility which will be discussed in more detail in the next section, affordability may be defined in different ways. Seen from the supply side, i.e. from the perspective of the service provider, the important question is how much it costs to produce a telephone call, including all necessary supporting functions. Seen from the demand side, i.e. from the perspective of the user, a relevant measure would be a certain percentage of household income for spending on telecommunications costs. Pricing of telephone services is a matter of finding the balance between supply and demand, i.e. financial sustainability for the operator and affordability for the user.

Based on a calculation of world average annual operating costs for telephone services and an estimated affordability threshold of 5% of household income, the ITU estimated in 1998 that out of the total 1,466 million world households, households already with telephone services numbered 504 million or 34%, households which probably could afford such services numbered 286 million, while the number of households which could not afford such services was 676 million or 46% of world households (ITU, 1998, p. 36).

A comparison of trends in mobile services prices over the 8 years between 1996 and 2004 shows that connection charges have decreased dramatically, while costs of calling have remained fairly stable. A comparison of prices of mobile services in low income countries with prices in high income countries for the year 2004 shows one significant difference: The average cost of

100 minutes of prepaid mobile use as a percentage of the GDP per capita is 4.2% for low income countries, while it is only 0.09% for high income countries, i.e. almost 50 times higher for the low income countries (ITU, 2006).

During the fourth and the fifth phases of the network development process, focus will mainly be upon universal accessibility and universal services. The ITU estimated in 1998 that most rich countries and a handful of middle income countries had successfully reached stage four, with a number of middle- and lower income countries at stages 3 and 2 and the poorest countries still struggling at stage 1 to provide access to basic infrastructure (ITU, 1998, p. 66).

This picture had shifted in 2004, where the ‘connected’ proportion of the world population amounted to 2,963 million (main telephone lines plus mobile cellular subscribers) or 46% of the total world population of 6,363 million individuals (ITU, 2006). Approximately 1,757 million or 28% of the world’s citizens owned a mobile telephone (ITU, 2006, p. 173). Given predominant usage patterns in poor countries where usage rates are estimated at five to ten times higher than ownership rates and where usage via mediators is widespread (Heeks, 2005) there is reason to believe that many more could use a phone if needed. Furthermore, average global mobile population coverage stood at 86.9% and even in low income countries 60% of the population was covered by the mobile network, with some countries in this category having mobile population coverage of more than 80% (ITU, 2006).

Another model that might be useful for analysing the telecommunication network development process is the diffusion of innovation model described by Rogers (2003). This model, which has its focus on socio-economic characteristics of the diffusion process rather than on technical development, operates with four main elements: An innovation which is being diffused through channels of communication over a certain time to the members of a social system. An important aspect of this model is the consequences of the introduction of the innovation into the social system. The model may be graphically described by an S-shaped curve, depicting the percentage of adoption as a function of time, with a low rate of adoption up to a certain ‘take-off’ point after which time the rate of adoption increases until, at the point of ‘leveling-off’, the rate of adoption again drops to a fairly low level. Obviously, the specific shape of this S-shaped curve will vary from society to society and from one type of innovation to another (Rogers, 2003, p. 11).

This model has been widely applied to study a number of innovations throughout the world. For the model to be useful with ICT, however, two special characteristics of these interactive technologies have to be acknowledged (Markus, 1987). Firstly, telecommunication networks are characterised by network externalities, i.e. the fact that for every new subscriber who adopts the innovation, value is added to the network, not only for the new subscriber (personal valuation) but also for all existing subscribers (social valuation) because they now have yet another person they may contact via the network. The concept of ‘critical mass’ is closely connected with this network externalities characteristic. Once the point of critical mass occurs on the S-curve, i.e. a critical mass of adopters have adopted the innovation (or in other words: a critical number of subscribers have signed up with the network) the diffusion process will become self-sustaining (Rogers, 2003). Secondly, the use of interactive technologies, such as telephones and the Internet, relies upon mutual interdependency. For example, in the communication process there needs to be a sender and a receiver to create a beneficial communication service. Similarly, to create beneficial information service there needs to be an information provider and an information user (Markus, 1987).

As has been argued above the objective of the Maitland Commission seems indeed to be within reach less than a decade into the 21st century, due to the expansion of the mobile network, an expansion which has been made possible mainly due to rapid network growth, a highly competitive market and the introduction of prepaid services (ITU, 2006, p. 5). Thus, the 'communication divide' is almost closed - but the 'information divide' remains a concern.

From POTS to PANS - and Back

There has been a marked shift in the debate about universal service and universal access, from focusing upon 'plain old telephone services' (POTS) to focusing upon 'pretty amazing new services' (PANS) which have become available with new technologies (Benjamin & Dahms, 1999, p. 19). The digitalisation of the network and of different information and communication services means that, technically speaking, there is no longer any difference between voice telephone services and data services, such as fax, voice mail and the Internet - the different services have converged to the point where any telecommunications line - whether cabled or wireless - can carry any kind of service - whether voice, audio, video or data (ITU, 1998, p. 84).

Such technological development obviously does influence the definitions of 'universal service' and 'universal access'. The ITU did, however, in 1998 advice the low income countries that: "There is no compelling reason, at present, to expand the definition of universal service to include individual access to information services." (ITU, 1998, p. 85; emphasis in the original text), an advice which was mainly based upon concern about the criterion of affordability. Only eight years later the same ITU was advising the same countries to invest in broadband wireless access in order to become part of the Information Society (ITU, 2006, p. 87), although the average GDP per capita for low income countries had decreased from US$471 in 1995 to US$468 in 2003 (ITU, 1998; ITU, 2006).

As was pointed out above many ICT4D initiatives have been driven more by the commercial interests of telecommunications and computer companies than by the actual information and communication needs of the end users and therefore the focus has often been on new and advanced technologies, mainly computers and the Internet, while more traditional information technologies, such as books, newspapers, radios and television have been neglected (Deane, 2005; Dahms, 2002a, b). James (2005) argues for the introduction of the concept of 'technological blending', i.e. of combining traditional forms of information and communication technologies with newer forms, rather than replacing the old with the new. This is:

... a way of ensuring that the benefits of new technology do not accrue only to a tiny minority of the rural population ... Blending may contribute to an inclusive rather than an exclusive outcome ... [because] the widespread reach of the more traditional technology, reduces the costs of bringing the new technology to a wide audience. (James, 2005, p. 286)

Relevant examples of technological blending mentioned by James (2005) are: the Internet with community radio; the Internet with telephony; voicemail with public pay phones. Similarly, Deane stresses the importance of traditional information technologies, especially the radio, because: "old, pervasive communication technologies sometimes offer a more appropriate solution than new, more exclusive ones." (Deane, 2005, p. 53). The pervasiveness of radio is confirmed by the ITU statistics which documents that in low income countries radio is the most common type of ICT technology. In Tanzania, for example, the number of fixed line telephone subscribers is 0.4, mobile subscribers 4.35, computers 0.7, radios 41.8 and television 4.2, all per 100 inhabitants (ITU, 2006, p. 173).

Furthermore, as a result of a transformation of the media landscape towards more democratic and more dynamic media, many local community FM radio stations have sprung up and "[r]adio has become an interactive medium not, perhaps to the same extent as telephony, but certainly one that makes it a far more significant communication - and voice - provider than was envisaged 20 years ago." (Deane, 2005, p. 59).

A well known example of blending community radio with the Internet is the Kothmale Internet Community Radio Project in Sri Lanka, which has combined conventional community radio broadcasting with Internet access, using the community radio as interface between local rural communities and the Internet. In the Multipurpose Community Telecentre, Sengerema, Tanzania, where this author has carried out research, the same combination of community radio and Internet is found and the radio clearly has a much wider outreach than the Internet, as will be documented later in this chapter.

Interestingly, although the ITU is the international UN body for radio communication, and "[t]he most popularly collected indicators in developing countries have been those on radio and TV" (ITU, 2006, p. 14), statistics about radio as an important information technology were not included in the World Telecommunication Development Report (WTDR) 1998 but have been included in the WTDR 2006 (ITU, 2006).

The main point is not to argue that any one information technology is superior to another but to point to the fact that the range of information and communication technologies available is very wide and includes both modern and traditional technologies. Therefore, the concepts of universal service and universal access should be expanded to include a broader range of ICTs, at least in the poor countries where even traditional technologies still are not widespread. Another point is that the choice of technological solution should be based on a thorough analysis of the information and/or communication needs to be fulfilled, before any investment in technology is made. Providing a solution without knowing what the problem is has too often led to the creation of 'white elephants' and a waste of money.

Summing Up

In this section universal service and universal access have been discussed as 'moving targets', the definitions of which are depending upon the technological development and the network growth. The three criteria underlying universal service and universal access: availability, accessibility and affordability, were introduced. While availability and affordability were discussed at some length, the concept of accessibility still remains to be more closely examined. It was documented that the 'communication divide' is rapidly closing, due to the spread of mobile telephony, while an 'information divide' remains to be dealt with. Finally, it was argued that the concepts of universal service and universal access should be expanded to not only include new technologies, such as computers and the Internet, but to also include more traditional technologies, for example, radio and TV. The next section will deal with the concepts of accessibility, usage and impact and the relationship between these concepts. Since it was argued in this section that the 'communication divide' is all but closed by the mobile telephone but that an 'information divide' may still exist, the next section will focus mainly on the 'information divide'.

FROM ACCESS VIA USAGE TO IMPACT

The historic emphasis on ICT indicators such as per capita stock or penetration levels, demonstrated in the available statistics, "does not mean that per capita measurements are necessarily the best way of measuring ICT access and use. They are, rather, the easiest way of measurement" (ITU, 2006, p. 11). After fifteen years of ICT4D initiatives and very meager results on the ground it has become clear that it is necessary to go beyond measuring availability and accessibility. The need for not only usage indicators but also impact indicators has been voiced as necessary means of documenting 'development' - i.e. positive socio-economic impact of the ICT4D initiatives on people's livelihoods.

In this section first of all the criteria of accessibility which was mentioned in the previous section and which is the most complex of the three criteria underlying universal service and universal access, will be explored in more detail. From accessibility the discussion moves on to the concept of usage with a discussion of newly introduced usage indicators and a short summary of some recent usage studies. Finally, the concept of impact is discussed and the complex issue of how to measure socio-economic 'developmental' impact of ICT4D initiatives in a meaningful way is touched upon briefly.

Accessibility - A Multifaceted Concept

The concept of accessibility was defined above as 'non-discriminatory access to equity services for all users, independent upon their geographical location, ethnicity, religion, gender etc.' (ITU, 1998, p. 63; emphasis added). The problem with this definition is that it uses the word access to define the word accessibility, and therefore a more detailed discussion of what might be understood by access is needed. When applied as in the term 'universal access' in the ITU report (ITU, 1998) the meaning is simply availability, not only of the network as such but also of the connected telecommunication equipment, whether a telephone, a radio or a computer, within a reasonable distance from either the home or the workplace of the individual.

But the fact that the telecommunication equipment is available does not necessarily lead to access because a number of factors influence meaningful individual access, some of which are:

- The existence of the network and the equipment, i.e. availability.
- The user can afford to use the equipment, i.e. affordability.
- The user has the required skills and knowledge to use the equipment, i.e. usability.
- The equipment is located where the user can get at it, i.e. physical access.
- It is considered culturally appropriate, based on religious and/or ethnic considerations, for the user to be in the location and use the equipment, i.e. cultural access.
- The equipment can be used at a time suitable for the user, i.e. timely access.
- The user herself feels comfortable about using the equipment, i.e. psychological access.

Based on a discussion of the 'literacy divide' Warschauer makes an interesting comparison between the acquisition of literacy and the access to ICT, stating, among other points, that there are many types of ICT access, the meaning and value of which varies in particular social contexts and that ICT access is not only a matter of education but also of power (Warschauer, 2002, p. 10).

Depending upon which particular type of information technology is being considered, different factors may form barriers to access. As an example take usability: Compare access to information on the Internet with access to information from the radio: While illiteracy and lack of English language skills may constitute major barriers to access for rural villagers to most of the contents on the Internet, a local radio station broadcasting in local language can be accessed by the majority of the population in rural areas.

Illustrating the usability aspect a historical comparison may be appropriate: The telephone was invented in 1876, approximately 30 years after the electric telegraph which had quickly become a commercial success with a widespread global network. It took, however, only a few years for the telephone to surpass the telegraph in popularity, because: “[a]s Bell himself pointed out in a memorandum from 1878 about the future prospective of the telephone, its major advantage over the telegraph is that you do not need special training to use the telephone” (Nielsen et.al., 1990, p. 152; emphasis in original text; own translation). This observation confirms one of Rogers’ points about the attributes of an innovation: “The complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption” (Rogers, 2003, p. 257).

Even if all of the above factors are positive, access alone may not lead to ‘development’. The ‘value chain of information’: Data → Capta → Information → Knowledge → Wisdom (modified from Fuchs, 1997) describes how value is added from one stage to the next. When combined with the 4 A’s model developed by Heeks (1999) describing the value adding process, from data via capta to information and beyond: Data → Access → Assess → Capta → Adapt/Apply → Information → Act, the combination of the two become a powerful tool for making visible the qualitative difference and the considerable gap between data placed on the Internet and knowledge as the main driver of ‘development’ (Dahms, 2002a, b) and it brings into the open a number of implicit assumptions about access to and usage of ICTs (Dahms, 2001b).

The value adding process, transforming information into knowledge is a learning process which may be perceived as a ‘development’ process, especially when the individual learning is linked with collective learning in a community of practice (Dahms, 2002a, pp. 323 - 324). But before ‘development’ happens, i.e. before any noticeable (positive) impact can be observed, the IT equipment has to be used, i.e. the concept of usage is important.

Usage - Necessary but not Sufficient

There is a general consensus among actors in the ICT arena that there is a lack of reliable statistics going beyond the per capita measurements - there is a ‘statistical divide’ (ITU, 2006, p. 11). In an attempt to overcome this divide and provide comparable and reliable statistical information on ICTs, the ‘Partnership on Measuring ICT for Development’ was established in June 2004 as a multi-stakeholder initiative, including a number of UN-, regional- and national organisations (ITU, 2006, p. 12). The Partnership adopted a ‘Core list of ICT indicators’ in 2005. Some of the indicators appearing on this list deal with usage.

The concept of usage is not as complex as the concept of access, since it simply implies a user having overcome the barriers to accessibility and making use of the available and accessible ICT equipment in question. Some of the indicators included in the ‘Core list of ICT indicators’ focusing on individual use are the following (ITU, 2006, p. 17):

- HH6 Proportion of individuals who used a computer (from any location) in the last 12 months
- HH8 Proportion of individuals who used the Internet (from any location) in the last 12 months
- HH10 Internet activities undertaken by individuals in the last 12 months (with a choice of types of activities)
- HH11 Proportion of individuals with use of a mobile telephone

Although indicators of availability of radio and television are included in the core list, no indicators deal with the use of either of these information technologies. Indicators for business use of ICTs are also included in the list, as are indicators on the ICT sector and trade in ICT (ITU, 2005). The list of indicators is still new and has not yet been used in many surveys. Therefore, the amount of statistics of usage of ICT is presently limited and is almost exclusively focused on the use of the Internet.

A number of studies document the unequal use of ICTs within countries, most impressive of which is the study on an African e-index, including national surveys from 10 African countries. In the introduction to this study Gillwald states that "[t]he characteristic user of the Internet and other ICTs ... is often young, male, well-educated, relatively wealthy, tends to live in the capital city of their country, and is likely to be a member of the dominant ethnic group of their country." (Gillwald, 2005, p. 8). This description succinctly sums up the different internal divides appearing in poor countries with the advance of ICTs. The 'digital divide' between countries is being replaced by multiple 'digital divides' within countries, between urban and rural areas, between men and women, between rich and poor people and between different religious and ethnic groups.

Furthermore, the description coincides in many aspects with Rogers' characteristics of 'earlier adopters' as better educated, with a higher social status, more cosmopolite and with greater exposure to mass media communication and to interpersonal communication channels (Rogers, 2003, p. 288 - 291). On age Rogers is inconclusive while the two important social factors: gender and ethnicity are not included in Rogers' discussion at all, although the discourse on gender and development has been widespread since the early 1970s and gender is included as an explicit cross-cutting element in many ICT4D initiatives.

A study from Pakistan indicated limited productive usage of the Internet (Mahmood, 2005). In the Republic of Korea the three main activities undertaken by individuals using the Internet were: getting information, communicating and leisure (ITU, 2006, fig. 2.2, p. 15). An ICT user study at Bagamoyo College of Arts, Tanzania, focusing on the use of computers by 18 teachers and 50 students, found that the computers were mostly used for Internet access and that e-mail for social communication was by far the most popular service used (Uimonen, 2006). Another Internet study from Tanzania documented that very few people use the Internet for work related information. The main use of Internet in Tanzania was e-mail and web browsing for "news, sports, music, study and sponsorship opportunities, business news and 'general browsing'." (Mercer, 2005, p. 9). Not immediately apparent from the research results was that pornography accounted for approximately 25% of Internet use (Mercer, 2005, p. 10). The point made by Mercer is that Internet use in Tanzania is very similar to use in other countries, i.e. the 'developmental' usage is very limited.

A comprehensive study on community telecentres concluded that the centres were mainly used for personal social motives, maintaining contacts with family and friends (Etta & Parvyn-Wamahiu, 2003). The researchers conclude that "[i]t is hard to see how this type of use can lead to large-scale education or transformation if this is the desired end result." (Etta & Parvyn-Wamahiu, 2003, p. 162).

The ITU agrees that "[t]he evidence for the impacts remain scattered" (ITU, 2006, p. 39) and the answer is twofold: 1) More ICTs: "... it is obvious that the lack of critical mass will limit the effects of ICTs.... This highlights the importance of developing countries ... to make broadband deployment a priority" (ITU, 2006, p. 39 - 40) and 2) more statistics: "... there is an urgent need to complement access and usage indicators with impact indicators." (ITU, 2006, p. 20). This prompts us on to the issue of impact.

Impact - the Crucial Issue

As already pointed out above, positive impacts of ICT investments are not well documented and recent concerns have been voiced over this lack of proof. Thus, the ITU states that "[e]vidence remains largely anecdotal and the link between ICT deployment and development remains vague in many ways." (ITU, 2006, p. 19). UNDP states that "[t]here is very little solid evidence to convince a sceptic that ICTs are reducing poverty in more than a handful of the (often quoted) examples. Overall, there is more promise than reality..." (UNDP, 2005, p. 2). Gillwald states:

"... until recently the empirical evidence of a casual link between ICTs and economic growth remained tentative and very little has focused on developing countries, and Africa in particular." (Gillwald, 2005, p. 9).

When discussing socio-economic impact of ICTs it is useful to distinguish between two different types of impact: The direct impact of the ICT sector on the national economy and the indirect economic impact that ICT may have in other sectors of the economy and on people's livelihoods. The direct impact in terms of ICT products and services cannot be ruled out completely for poor countries, as demonstrated by the GrameenPhone Village Phone Program in Bangladesh. The programme not only enables rural people who cannot afford a telephone access to telephone services but also provides a good income-earning opportunity for more than 280,000 mostly women Village Phone operators living in rural areas (ITU, 2006, p. 51). In this chapter, however, the emphasis will mainly be on the indirect impact because "it has been highlighted that the real potential for ICTs lies more in their use, and their ability to impact productivity of the wider economy, than in the ICT sector itself." (ITU, 2006, p. 35).

Concerning the indirect impact early studies from the 1970s and 1980s in the rich countries on impacts of ICT investment on productivity in companies showed zero or negative impact, a fact which was called the 'productivity paradox' (Pilat, 2004, p. 43; Nielsen & Thomsen, 2008, p. 50). Later studies, however, have found a positive impact of ICT investments but have also pointed out that "turning investment in ICT into higher productivity is not straightforward. It typically requires complementary investments and changes, e.g. in human capital, organisational change and innovation" (Pilat, 2004, p. 58). Another study found that wealth, measured as GDP per capita, was the single most important factor influencing ICT investment in poor countries (Shih et.al., 2008).

These important findings have to be acknowledged by actors in the ICT4D arena if investments in ICT are to lead to the required goal of 'development'. A certain level of acknowledgement is apparent in this quote: "It needs to be acknowledged, however, that ICTs are not the answer to all social issues and it is important to list some of the barriers that limit their impact." (ITU, 2006, p. 73). According to the ITU the two main barriers to achieving beneficial impact of ICTs are 1) the costs of connectivity (i.e. the cost of the equipment and of a connection) and 2) the achievement of critical mass (ITU, 2006, p. 77). Pointing to these two issues as the main barriers confirms the above focus on 'more ICTs' by implicitly assuming that 'connectivity' is a must, thus, overlooking the potential of traditional information technologies, such as, for example, the radio, the 'connectivity' of which costs nothing and by once again stating that more will be better.

At the people level a survey in Tanzania documented that two thirds of the surveyed population said that mobile phones helped them save both travel time and travel costs, and the same survey found that households in South Africa and in Tanzania spend 6.8% and 5.9%, respectively, compared to an estimated 3% in rich countries (ITU, 2006, p. 52). A number of other concrete project examples of the positive impact of ICTs - in farming, in education, in environmental protection and in health - have been listed by ITU (ITU; 2006, p. 79).

The challenge of measuring developmental impacts of so called 'development' projects and initiatives in a meaningful way is one that researchers and practitioners alike have been struggling with for years. It seems, however, that the dialogue between those involved in ICT4D and arguing for ICT investments and those involved in more traditional 'development' activities and often opposed to ICT spending has only recently started to become more fruitful and has resulted in a proposal for measuring the impact of ICTs (ITU, 2006, 78).

The ITU proposal has substantial similarities to the so called Logical Framework Analysis (LFA) which has been applied by many development organisations as a tool for planning, monitoring and evaluation of projects since the 1970s. Thus, the ITU proposal includes some of the same elements as the LFA: objectives, inputs, outputs and outcomes (which ideally should be equivalent to the objectives). It stresses the importance of distinguishing between the different elements while also devising ways of measuring all of them (ITU, 2006, p. 78). The ITU emphasises that measuring inputs, say, the number of computers made available in a primary school, is not sufficient; nor is measuring outputs, such as, the number of teachers having been trained to use computers. Real impact needs to be measured at the outcomes level, i.e. documented improvement of teaching, leading to improved learning for pupils because the teachers use their computer skills. Furthermore, ITU recommends that in the process of measuring outcomes it is necessary to use "a combination of hard or soft performance measures" (ITU, 2006, p. 80) i.e. both quantitative and qualitative methods.

According to critiques of LFA the model for measurement of impact proposed by ITU is not very conducive to participatory approaches. Originally taken from engineering and management the LFA was introduced as a planning tool and as such it served well to shift focus from technology to people and to emphasise the importance of outcomes. Its use has, however, been extended to the processes of monitoring, evaluation and measurement of impacts as well, with considerably poorer results. Reporting requirements of donor organisations have kept project managers around the world busy writing - sometimes deceptive - reports on LFA plans and indicators rather than pursuing project tasks, such as improving livelihoods or increasing empowerment (Earle, 2002). On the issue of reporting ITU comments as follows:

... often the relationship between the supporter/donor and the funded means that there is a pressure to report success. This pressure, which exists at all levels in the system, can undermine the ability of all involved to learn from failure, which is often a better teacher than success. (ITU, 2006, p. 82-83).

The two major problems with the LFA are, firstly, that the oversimplified, linear stage model of change (similar to the modernisation paradigm) underlying the approach strives for a universal 'one size fits all' model of 'development', disregarding cultural complexity and diversity. Secondly, it is based on a Western perception of logic and as such is often alien to people from the South (Earle, 2002).

Applying the LFA is often a top-down, hierarchical and constraining process which does not leave much room for participation, especially not participation of the poor people who are the intended beneficiaries and whose priorities are often different from those of outsiders and local elite. The LFA approach to monitoring and evaluation is more focused on control of achievements rather than on learning. Thus, the use of LFA as a tool for measurement of impact may serve to reinforce unequal power relations and to induce lack of trust between donors and beneficiaries (Chambers & Pettis, 2004; Earle, 2002).

Summing Up

This section started out with a discussion of the multifaceted and complex concept of accessibility, showing that accessibility depends upon a number of contextualised factors and in some ways can be likened to literacy. It went on to discuss the much simpler concept of usage and presented a selection of usage indicators adopted in the recent Core list of ICT indicators. A number of usage surveys were summarised, leading to the somewhat depressing conclusion that there is not much evidence of positive impacts of ICTs. This brought into focus the concept of impact and the categories of direct and indirect impacts, the indirect impacts assumed to be the most important in poor countries. An important finding concerning the impact of ICTs is that a range of other simultaneous activities, such as, skills development, organisational change and innovation, are needed to achieve the expected positive impacts of ICT investments. Finally, an ITU proposal for measuring impact, similar to the well known Logical Framework Approach (LFA), was presented and discussed. In the next section a micro-level study on access, usage and impact is presented.

ICT ACCESS, USAGE AND IMPACT IN SENGEREMA, TANZANIA

In the small district town of Sengerema in the north western part of Tanzania a so called Multipurpose Community Telecentre (MCT) with computers and Internet access was established in December 2000; the first mobile telephone operator, Vodacom, introduced services in August 2001; the second mobile operator, Celtel, started services mid 2002; ultimo 2002, the formerly national monopoly telephone company, Tanzania Telecommunication Company Limited (TTCL), digitalised the trunk and the access network as a national TTCL contribution to the MCT project; a third mobile operator, Mobitel, started operations in November 2003. Thus, the ICT deployment in Sengerema town has been extraordinarily high over the last 7 years – but has it led to related 'development'? In an attempt to find an answer to this question a small pilot study on access, usage and impact in Sengerema District was carried out. This section describes and discusses the results of this study.

The Telecentre Project and the Pilot Study

The pilot study is part of ongoing research since 1999 on the impact of the Multipurpose Community Telecentre (MCT) in Sengerema, Tanzania. This centre was established as a pilot project in December 2000, funded partly by three international donors (ITU, UNESCO and IDRC), partly by national organisations and by local contributions. One of the objectives of the MCT project was:

To demonstrate the impact and usefulness of the accelerated introduction of information and communications enabled services and programmes into rural community life in Tanzania with special emphasis upon the rural development, small business, education, health and government service sectors. (Tanzania, 1999; emphasis added).

Services offered at the MCT are, among others: Computer training; Internet access (e-mail and Web-surfing); secretarial services, including typing, photocopying, binding; computer consultancy; telephony; telefax; local radio broadcast via Radio Sengerema FM; Internet Service Provision to institutions (the last two services were not part of the original project plan). For a more detailed description of the Sengerema MCT, see Dahms, 2004.

The pilot study on access, usage and impact of ICTs was carried out in Sengerema District, Mwanza Region, Tanzania, during April - May, 2008. The study included 14 women's groups, i.e. groups of women who collectively carry out some form of joint production, such as, for example, tailoring, gardening, fishing and processing of fish, agricultural activities etc.. Each of the groups were 'talked through' a questionnaire, including closed quantitative questions on access and usage as well as open qualitative questions on impact. The 'talk through' was done with the assistance of a research assistant capable of speaking the local language, Kiswahili, and also capable of reading and writing English. Answers to the questions were noted in the questionnaire in English by the research assistant.

The questionnaire was administered to 14 women's groups, evenly distributed throughout the district and representing a total of 349 women, 1/3 of whom have tertiary (3), secondary (52) or vocational (52) education, while 2/3 have primary (224) or informal (18) education. The questions were categorised into questions on ‘sources of information’ and ‘means of communication’.

Results

Results concerning access to and usage of sources of information were as follows: All 14 groups have a radio and all listen to Radio Sengerema FM regularly. Other radio channels are listened to but not by all groups. All groups state that the most important information on the radio is ‘development programs’, especially business and agriculture. Concerning TV only one group has an own TV but 10 groups use TV regularly for information, again with ‘development programs’ as the most important type of information. Three groups, all located within less than 10 km from Sengerema town and the MCT, state that they use the Internet for searching for information about prices and markets.

Results concerning access to and usage of means of communication were as follows: No groups have a fixed line telephone but all 14 groups have mobile phones and in some groups several of the members have mobiles. All members have access to a mobile through each other. The most frequent uses of the mobile are for social networking and for business, 9 of the 14 groups stating social networking as the most important use and five groups stating business as the most important use. Only one group located in Sengerema town has an e-mail for communication and this group states that they use the e-mail for business and for social networking, with business being the most important use.

Results concerning the impact of sources of information are given in the form of some characteristic quotes from the questionnaires, structured according to the source of information.

On radio impact:

We learn about the modern method of fishing through the radio and we learn the types of fish and at what time a certain fish should be fished. We also know the prices of goods at a certain time.

Through the radio we manage to know what to produce, when to produce and for whom. Our group deals with garden. We manage to get the proper seeds and insecticides.

According to the price fluctuation we control the price of our goods throughout the year. We advertise our work monthly through Radio Sengerema FM, this enables us to get more customers.

By hearing news from the radio sometimes we buy the commodities, particularly rice and maize, when they are plenty and cheap and sell them in a period when they are scarce and at high prices.

On TV impact:

Through TV we manage to discover different designs or fashions, we design and make them. This helps us to get more customers for the case of tailoring.

Through watching TV group members are able to appropriate technology like irrigation, post harvest programs etc.

On Internet impact:

They are able to market their product to Uganda, especially pad (?) and cassava flour.

We have now customers from our district, where they send fishes (fried ones) to other places outside our country.

We managed to get customers from Kenya and Uganda for some rice. Most of them come direct to our group during harvest time.

Results concerning the impact of means of communication are given in the form of some characteristic quotes from the questionnaires, structured according to the means of communication.

On mobile impact:

We manage to meet our goals through simple communication. It saves us time and costs.

Meeting together, business information exchange, reminding ourselves on the responsibilities we have, knowing one another's condition.

We have customer phone numbers among us, most of these government employees, they take crops regularly and pay for a month.

The mobile telephones help us be aware of bad news, particularly thieves. We manage to work as a team through this simple means of communication. We also get more customers through it.

We manage to communicate simply. We also save time for other activities instead of walking far distance to send a message. We get customers through our mobile telephone.

Some of our customers have our mobile telephone numbers. We communicate with them regularly on the production because of the quantity demanded.

Impact of the e-mail:

By sending e-mail the group has got a grant of US$ 6000 from Self-help Fund, USA Embassy, Dar es Salaam.

Discussion of Results

When comparing the above results on access to and usage of ICTs among women in rural Tanzania to the previous more general discussion on access and usage in poor countries, these micro-level findings confirm the overall tendencies in a number of ways. The widespread diffusion of radio is confirmed, as is the widespread use of mobile phones. It might be somewhat unusual that so many women, and many of them rural women, own (or have access to) mobile telephones but this may be explained by the tough competition between the three operators in Sengerema District. Also the usage of TV is rather high, with 10 groups out of 14 using it regularly for information. As mentioned above the three groups using the Internet in the telecentre are all located within less than 10 km from the centre. The study did not go to the individual level and therefore the question of who is actually capable of using the Internet cannot be answered.

A finding which is not in accordance with the general usage studies reported above is the fact that all groups specify that they consider 'development programs' the most important programs both on radio and on TV. Also, 'business information' features relatively high on the list of uses of the mobile telephone. There may be two possible explanations for this discrepancy: One is that women in general are (considered to be) more serious in their consumption of information, maybe because they do not have so much time to sit and listen to the radio or watch the TV and therefore want to gain something useful from this type of activity. Another explanation may be that the research assistants carrying out the study were assistants of the local 'Business Development Coordinator' for a well known United Nations Capital Development Fund (UNCDF) project in the district and this may have biased the answers towards more focus on business.

In terms of ICT impact on group activities the findings are as follows: The radio is mainly used for innovative purpose, getting information about new ways of doing things, including knowledge about new raw materials and new methods of production. Also, it gives information about prices, both prices of raw materials but also prices of produced goods, allowing the women to achieve higher gains when trading. Some groups use the local radio for advertising their produce and thus attract more customers. The TV is mainly used for getting new ideas, i.e. for innovation, while the use of the Internet seems to be closely connected with identifying and developing markets abroad, in this case in Kenya and Uganda.

The use of the mobile telephone has benefits in terms of saving of time and money as compared to having to use another form of communication, for example, traveling by bus. It also has benefits in terms of communication, both with customers and among the group members themselves. One of the remarks worth noting is the repeated use of the word ‘simple’ - even these rural women find the mobile technology simple to use.

In the diffusion of innovation model by Rogers the following five attributes of innovations are singled out as important for the rate of adoption: Relative advantage, i.e. whether the innovation is better than what it replaces; compatibility, i.e. consistent with existing values, beliefs and needs; complexity, i.e. the ease with which the innovation can be used by all; trialability, i.e. possibilities for trying out the innovation on a limited basis; observability, i.e. the visibility of being a user of the innovation (Rogers, 2003). Using these attributes some possible explanations may be given to the above findings.

Radio is a well known innovation which became widespread in Tanzania in the first decade of independence when adult literacy programmes were broadcast throughout the country by the national radio, as were speeches by the charismatic first Tanzanian President Nyerere. Thus, it is consistent with existing values. The relative advantage of the local radio as compared to the national radio is the fact that local news of importance to the local community is broadcast on the local radio but not on the national radio. The radio is easy to use (complexity) and sufficiently widespread that everybody has a chance to try out using it before eventually deciding to invest in an own radio (trialability). Because the radio has been around for a long time and is widespread in the community the observability does not seem to play an important role for the women’s groups.

In the case of mobile telephones Rogers states that they “have an almost ideal set of perceived attributes, which is one reason for this innovation’s very rapid rate of adoption” (Rogers, 2003, p. 261). This is confirmed in the above study, where relative advantage (saving of time and money), complexity (simple to use) and trialability (borrow from another group member) are obvious from the women’s statements. Concerning compatibility and observability the study does not give any information on these two attributes.

Looking at the attributes of the computers and the Internet in the Telecentre, the main barrier to the use of this innovation may be the complexity, as mentioned before. The relative advantage is not (yet) clear to most people in the community since the majority does not have family or friends with an e-mail, nor do they know what information may be found in the Internet. Compatibility with existing values is an important issue, especially in connection with the amount of pornographic sites found on the web, as documented in Mercer’s study mentioned above. Yet another barrier is the trialability which the Telecentre has tried to overcome by having free introductory computer sessions every month. Finally, the observability is one positive attribute of the Telecentre - it is perceived as a sign of modernity to be seen using the Telecentre services (Mercer, 2005).

Summing Up

Although a small pilot study with no quantitative indicators of impact collected, there seems to have been a positive impact from the usage of the local radio station and from the widespread use of mobile telephones. The impact seems to be mainly in terms of innovation and better information about prices and markets but also the social networking is an important impact. Thus, it is fair to say that the radio and the mobile phone have led to 'development' in Sengerema District, while the computers and the Internet have contributed to 'development' only for a minority located close to the telecentre.

Although Sengerema may not be typical for semi-urban, semi-rural areas of Tanzania because of the location of the Sengerema MCT which is by far the biggest and the most expensive telecentre in the country the results from the study might be useful in planning new ICT4D initiatives in Tanzania, as well as in other poor countries in Africa and elsewhere. This is emphasised by the fact that the results found in the pilot study seem to confirm the overall tendency towards the widespread use of mobile telephones and local radio in rural areas of poor countries. Furthermore, the results are confirmed by the Rogers model of diffusion of innovation.

CONCLUSION AND RECOMMENDATIONS

The main objective of this chapter has been to issue a call for discarding the concept of the 'digital divide' and instead focus attention on bridging the real existing overall world divide, the 'power divide'. The argument for this call was developed through four sections.

After an introductory section the second section discussed the concept of 'digital divide' and documented that this so-called 'divide' is rapidly closing, if not already closed. The origins of the concept were shown to be mainly the powerful telecommunications and computer industry in rich countries, i.e. the supply side rather than the demand side. The two main problematic aspects of the concept of 'digital divide' were pointed out: 1) 'Development' is perceived as a 'one size fits all' process of 'catching up, whether stage by stage or 'leapfrogging' and 2) the technological determinism inherent in the concept focus attention on technical issues and draws away attention from the needs to be fulfilled to alleviate poverty. Finally, it was proposed that if not discarding dichotomist discourses of 'divides' completely then at least replace the 'digital divide' with an 'information divide' and a 'communication divide' and instead focus attention on overcoming the existing 'power divide'.

The third section discussed universal service and universal access as 'moving targets', based on the three underlying criteria: availability, accessibility and affordability. It was documented that a 'communication divide' is rapidly closing, due to the widespread use of mobile telephony, while an 'information divide' remains to be dealt with. Furthermore, it was argued that the concepts of universal service and universal access should be expanded to include both new advanced technologies and more traditional technologies, for example, radio and TV which are still not universally accessible in poor countries.

In the fourth section the multifaceted and complex concept of accessibility was discussed at some length, showing that it depends upon context and may be likened to literacy. The discussion went on to the concept of usage and presented a selection of usage indicators as well as a number of usage surveys. The conclusion was that so far there is not much evidence of positive impacts of ICT4D initiatives. This brought into focus the concept of impact, including categories of direct and indirect impacts. An important finding concerning the impact of ICTs was pointed out: A range of other activities, such as, skills development, organisational change and innovation, are needed to achieve positive impacts of ICT investments. An ITU proposal for measuring impact, similar to the well known Logical Framework Approach (LFA), was presented and critiqued from a participatory perspective.

The fifth section presented a small pilot study on access, usage and impact of ICTs among 14 women's groups in Sengerema District, Tanzania. The results seemed to confirm the overall tendency towards the widespread use of mobile telephones and local radio as the most influential forms of ICT in rural areas of poor countries. Although it is not claimed that the study location of Sengerema is typical for rural areas of Tanzania the results from the study might be useful in planning new ICT4D initiatives in Tanzania, as well as in other poor countries in Africa and elsewhere.

The two main questions listed in the Introduction to this chapter, repeated here for convenience, were as follows:

- To which extent is the concept of the 'digital divide' part of the solution or part of the problem?
- What strategies should be adopted to achieve the ultimate goal: A free, fair and equal global 'Information Society', benefiting poor and rich people alike?

The answers to these two questions form the main message of this chapter. The answer to the first question is that the 'digital divide' with its associated binary categories is a useless concept which has led to overly focus on advanced technical issues instead of focusing on the information and communication needs to be fulfilled. The use of this concept may well be part of the reason why there is a glaring lack of impressive evidence of positive impacts of the many ICT4D initiatives undertaken over the last fifteen years. Thus, the concept is part of the problem rather than of any solution and therefore, it should be discarded, together with the 'one size fits all' model of 'development'.

Exactly because there is no universal 'one size fits all' model of 'development' there is not one answer to the second question - strategies for successful ICT4D initiatives have to be designed anew for every project and every context. In the following some overall recommendations, useful in any 'development' project, are given.

Firstly, well intentioned project planners and so called experts should stop considering the intended project beneficiaries, most often poor people, as

... generic subjects ... [who] have, for the purposes of the planning exercise, no gender, no tastes, no history, no values, no opinions, or original ideas, no traditions, and no distinctive personalities to contribute to the enterprise. They have none of the particular, situated, and contextual attributes that one would expect of any population and that we, as a matter of course, always attribute to elites. (Scott, 1998, p. 346).

Instead of 'one size fits all' models suitable only for non-existing generic subjects, the cultural complexity and diversity of poor people and their context, including their information and communication needs, should be acknowledged and appreciated. In order to manage this complexity in ICT4D initiatives, the poor people themselves should be given a strong voice and real responsibility in initiatives focusing on providing information and communication services for poverty eradication. This means that poor people should have decision making power and be involved at all levels and all stages of the 'developmental' project cycle, from identification of information and communication needs to be fulfilled, via planning and design of ICT solutions, implementation through installation of carefully selected ICT equipment to maintenance and repair. In other words: Participatory design and participatory 'development' are key words in a strategy for achieving positive impact of ICT4D initiatives.

In emphasising participation it is, however, important to not be blinded by the "homogenous blob syndrome" (Guijt & Shah, 1998, p. 8) or, in other words, to recognise that in any community there are issues of power imbalance, inequities and social hierarchies. Thus, there is a need to engage with conflict, ambiguity and uncertainty and to acknowledge and accept that change is depending not only upon planned processes but even more so on informal and non-linear unplanned processes (Earle, 2002).

Secondly, in the selection of technology to satisfy identified information and communication needs, the full and broad range of useful technologies, from the very traditional, such as books and the radio, to the very advanced, such as computers and the Internet, should be considered, and appropriate choice of technology, including technological blending wherever possible, should be made, based upon the context and the end user's needs. One issue which has not been discussed very much above is that information and communication technologies which will allow poor people to have a voice and to make their voice heard in the global community should be given preference. Giving poor people voice and letting them become information providers will help overcome a very pressing problem of lack of relevant 'developmental' information content, especially in the Internet but also to some extent in other sources of information, such as commercialised radio and TV.

Thirdly, instead of designing costly grand schemes of ICT4D project planning should follow the simple rules of thumb proposed by Scott "Take small steps ... Favor reversibility ... Plan on surprise ... Plan on human inventiveness" (Scott, 1998, p. 345). These simple and elegant rules do not encourage the use of elaborate LFA planning processes with burdensome reporting demands and pre-determined criteria for success. They rather call for integration into the project plan of time and space for collaborative review and reflection, allowance for failure and ample opportunities for learning and innovation by all stakeholders, individually as well as collectively, in networks and in communities of practice.

Fourthly, attempts to dismantle the unequal power balance between North and South, between donor and beneficiary, should be pursued to the greatest extent. If this power imbalance could be dismantled it would have far reaching consequences for 'development' projects, as stated by Robert Chambers in this concluding quote:

The drive to disburse, the rushed visits, top-down logical planning, upward accountability, and many deceptions would diminish or disappear. Each level would empower and trust the levels below to exercise discretion, to foster diversity and to learn from mistakes. (Chambers, 1995, p. 212; here quoted from Earle, 2002, p. 14).

It is hoped that the above discussion may challenge researchers and development practitioners alike to be(come) critically aware of underlying assumptions and to give up the divisive dichotomies, in discourse as well as in practical work. Instead, we should embrace cultural complexity and diversity and let user participation be a guiding principle for new ways of creating innovative ICT for development initiatives, thereby achieving the overarching main objective of bridging the global 'power divide' in the strive for a free, fair and equal global 'Information Society', benefiting poor and rich people alike.

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KEY TERMS AND DEFINITIONS

Accessibility: non-discriminatory access to telecom services

Affordability: pricing of services that most users can afford

Availability: telecommunications network coverage

Diffusion: the spreading, adoption and integration into a given society of an innovation

Divisive Dichotomies: categorisation into only two categories of countries and people, thus artificially creating binary simplicity out of complex diversity

Impact: positive change in livelihood of ICT4D beneficiaries

Learning: equivalent to 'development', i.e. the (positive) change in behavior of project stakeholders as a result of project activities

Logical Framework Analysis: a preferred tool for project planning which has wrongly been applied also for project evaluation and impact measurement.

Participation: involvement of beneficiaries in all stages and at all levels of project planning for 'development'

Power Divide: the existing divide between rich and poor countries in terms of influence on global affairs, including trade conditions,

Technological Blending: mixing old traditional ICTs with more modern and advanced ICTs for better impact

Universal Access: every person within easy access of a telephone

Universal Service: a teledensity (= percentage of households with a telephone) above 90%

Usage: a user making use of available and accessible ICT

APPENDIX

[1] The calculations below are based on figures from the ITU World Telecommunication Development Report 1996 and the ITU World Telecommunication/ICT Development Report 2006.

	Pop (mio)	GDP/cap (US$)	Mobile subs. (,000)	Mobile subs. per 100 inhabitants	Internet users (,000)	Internet users per 10,000 inhabitants
Tanzania 1996	30.80	177 (1995)	9.0	0.03	0.5	0.16
Tanzania 2004	37.67	282 (year ?)	1,640	4.35	333.0	88
Denmark 1996	5.26	32,990 (1995)	1,316.6	25.02	300.0	570.13
Denmark 2004	5.41	39,412	5,168	95.51	3,269.0	6041
Absolute difference 1996 (1)	-25.54	32,813	1,307.6	24.99	299.5	569.97
Absolute difference 2004 (1)	-32.26	39,130	3,528	91.16	2,936	5,953
Growing absolute digital divide (4)			**2.7**	3.6	**9.8**	10
Total growth % Tanzania (2)	22.3%	59.32%	18,122%	14,400%	66,500%	54,900%
Total growth % Denmark (2)	2.85%	19.46%	293%	282%	990%	960%
Average annual growth rate % Tanzania (3)	2.78%	7.42%	2,265%	1,800%	8,313%	6,863%
Average annual growth rate % Denmark (3)	0.36%	2.43%	37%	35%	124%	120%
Shrinking relative digital divide (5)			61	**51**	67	**57**
Shrinking relative digital divide 1996/2004 (6)				**From 834 in 1996 to 22 in 2004**		**From 3,563 in 1996 to 69 in 2004**
Stock per GDP Tanzania 2004 (7)			5816		1181	
Stock per GDP Denmark 2004 (7)			131		83	
Inverse digital divide 2004 (8)			**44**		**14**	

(1): Calculated as (Number of ICT stock Denmark - Number of ICT stock Tanzania)

(2):Calculated as (Country2004 - Country1996) divided by Country1996 and multiplied with 100%

(3): Calculated as (Total growth country) divided by 8 years.

(4): Calculated as (Absolute difference 2004) divided by (Absolute difference 1996).

(5): Calculated as (Average annual growth rate Tanzania) divided by (Average annual growth rate Denmark)

(6): Calculated as (ICT stock per 100 (10,000) inhabitants Denmark) divided by (ICT stock per 100 (10,000) inhabitants Tanzania) for the years 1996 and 2004, respectively (ITU, 2006, p.1).

(7): Calculated as (Number of ICT stock) divided by (US$ GDP per capita).

(8): Calculated as (Stock per GDP per capita Tanzania) divided by (Stock per GDP per capita Denmark).

Chapter 25
Mobiles for Development:
The Case of M-Banking

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ABSTRACT

This chapter offers a survey of recent literature on access gaps that focuses on pro-poor market solutions provided by mobile applications. The emerging literature on mobile uses in developing countries has focused on the benefits of voice and text messaging. However, there is little academic research on mobile applications such as m-banking. While a large number of low income people have access to mobile phones, these groups are excluded from the financial market. M-banking offers the opportunity to diminish this financial exclusion by offering access to credit and to savings which are key tools capable of transforming the livelihoods of the poor and the efficiency of the market. Accessibility is the major barrier for the expansion of mobile adoption by the poor. There is an important role for regulators to play in enabling an appropriate environment for the increase in the mobile penetration as well as business models for m-banking.

INTRODUCTION[1 2]

The surge of technological optimism that began in the 1990s with the expansion of the economies based on information and knowledge promised to significantly diminish social exclusion. However, as with other technological innovations, the growth of the information communications technologies (ICTs) sector has two sides of the coin. On the one hand, they offer a window of opportunities for the marginalized sector of the economy by inserting themselves in new productive processes, and on the other hand, they can reinforce existing disadvantages if few points of access are provided for them.

Latin American governments have responded to the risk of increased ICTs exclusion largely by implementing universal access programs that offer shared access initiatives in low income communities. These supply side solutions often with a top down approach have had little knowledge about

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the needs of low income groups and thus with some exceptions have provided limited impact on poor communities. Additionally, the level of public funding is not enough to address the ICTs needs and scale of demand of the underserved population in the region.

These programs are consistent with the view ICTs access gaps are the result of an unavoidable market failure. Low income people or those that live in remote areas cannot afford to pay the market prices of ICTs services. Thus, the government must intervene, offering subsidies or directly providing connectivity to the undeserved population. The argument in this paper is that the most effective policies to address access gaps have a pro-market approach. A successful example of a market solution is the dramatic increase in mobile phones that has offered the most cost-effective and accessible alternative to communications for low income groups. Innovative business strategies such as pre-paid systems have contributed to dramatically increase mobile penetration in developing countries. These market strategies reached an increase in ICTs access by low income groups that no public initiative has achieved to date.

This chapter offers a survey of recent literature on access gaps that focuses on pro-poor market solutions provided by mobile applications, specifically, mobile banking (m-banking). During the last years, there has been a surge of empirical studies that document the striking level of adoption of mobile telephones by the poor. This emerging literature on mobile uses in developing countries has focused on the benefits of voice and text messaging. However, there is very little academic research on mobile applications such as m-banking. While a large number of low income people have access to mobile phones; these very groups are currently excluded from the financial market. M-banking offers the opportunity to diminish this financial exclusion by offering access to credit and to savings which are key tools capable of transforming the livelihoods of the poor as well as the efficiency of the market. Indeed, inequality and social exclusion diminish economic growth and create inefficiencies in the function of the market in a country (Aghion, Howitt, & Mayer-Foulkes, 2005; Bordeau de Fontenay & Beltran, 2008). The most important role for regulatory policy is to promote an enabling environment for these strategies to flourish.

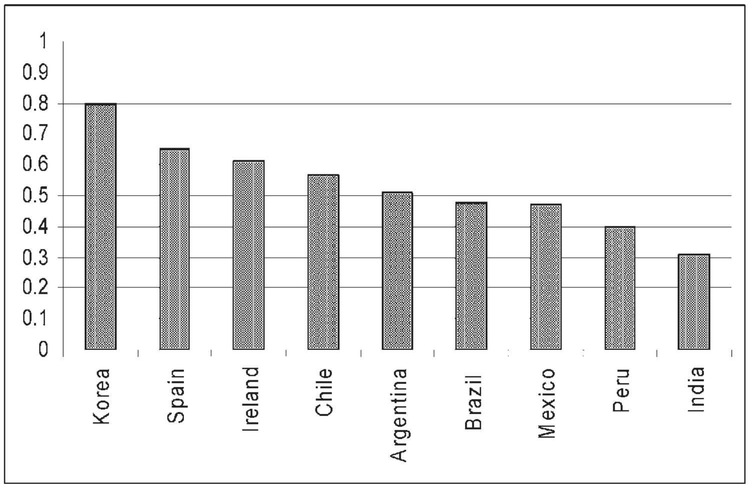
The first section presents indicators that show the level of digital adoption in Latin America followed by the literature on uses of mobile phones and its impact on pro-poor development. The third section presents recent studies on mobile banking that are portrayed as a transformative market solution to the access gap faced by low income groups and identifies the role of regulatory policy in this area. This paper concludes with suggestions on the role of regulation in fostering pro-market solutions to help diminish social and economic exclusion through mobile services.

ICTs ADOPTION IN LATIN AMERICA

Latin America still faces the problem of a significant number of underserved groups of the population; this lack of connectivity and significant adoption of ICTs in the region varies across income groups, countries and technologies. As shown Digital Opportunities Index (DOI) in figure 1, Latin America is behind other developing regions in terms of ICT adoption, especially those that have implemented successful ICTs strategies, such as Korea and Ireland.[3] The low level of adoption, illustrated by these measures of digital competitiveness is limiting the opportunities to use ICTs for social and economic development.

There are a number of factors that hinder upon the level of adoption of ICTs in the region including low national income, unequal distribution of rents and regulatory policies that maintain barriers to entry. As a result of this accessibility to ICTs is a key barrier to use. The tariffs expressed in percentage of income per capita are much higher in Latin America than in developed countries. For

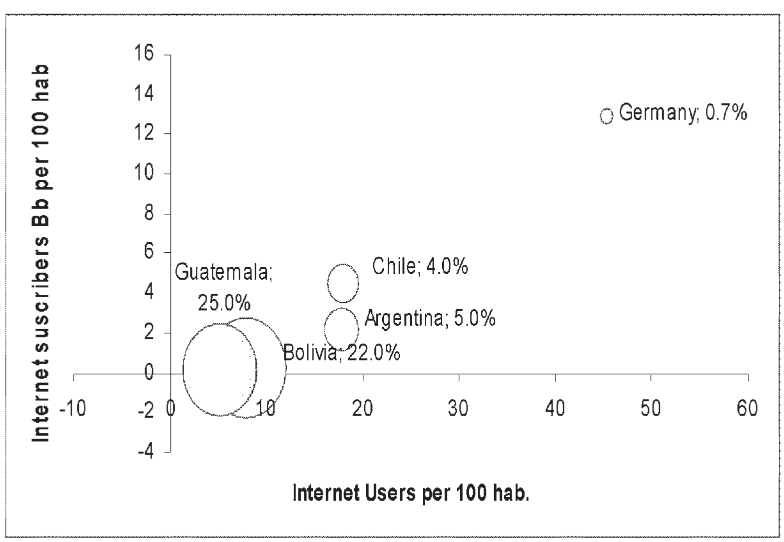
Figure 1. Digital Opportunities Index (DOI)[4] (2006)



example, mobile tariffs represent 9 percent of average income per capita in the region, while in developed countries it is no more than 1 percent of average income per capita (Economic Commission for Latin America and the Caribbean [ECLAC], 2007). Accessibility as a barrier is more significant with advanced technologies, such as Internet and broadband services; Internet tariffs in Latin American countries represent on average 12 percent of income per capita while in developed countries they are less than 1 percent of income per capita (see figure 2).

Moreover, there is an acute unequal access within most countries in the region. As figure 3 shows, broad band availability is concentrated in urban areas. Low income areas have practi-

Figure 2. Broadband Internet subscribers per 100 hab, Internet subscribers per 100 hab and connection tariff of Internet as a % of income per capita (2005)



cally no access to the potential benefits such as e-education and e-health.

The following section will present two bodies of literature that focus on the benefits of ICTs and mobile services in particular as mechanisms to diminish ICT exclusion and thus obstacles faced by the poor.

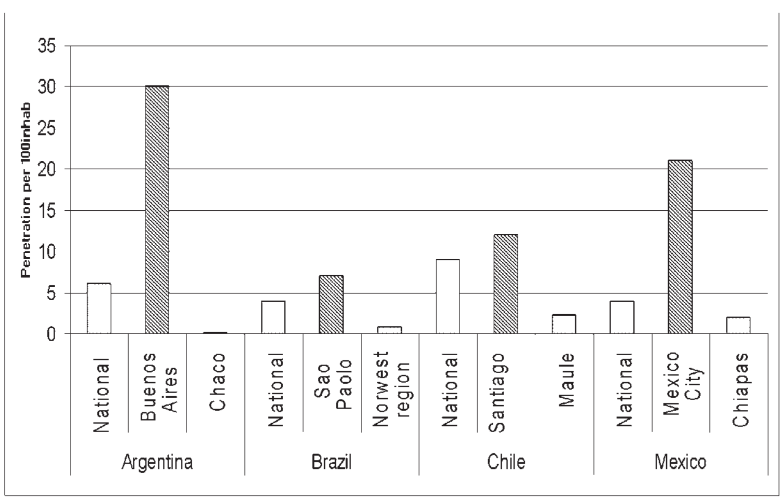
MOBILE SERVICES AND THE UNDERSERVED POPULATION

Studies that empirically document ICTs contributions to economic and social development are multidisciplinary and vary across segments of the ICTs market as well as across regions (Meijers, 2004; Madden & Savage, 1998; Roeller & Waverman, 2001; Waverman, Meschi, & Fuss, 2005). Recently, however, there has been an increased academic interest in understanding the causes and impacts of the dramatic spread in the use of mobile telephony in developing countries. From the supply-side perspective, studies find that market mechanisms such as pre-paid and calling party pays have significantly contributed to mobile expansion in developing countries (Hodge, 2005; Mariscal & Bonina, 2006; Stork, Esselaar, & Ndiwalana, 2006).

A key variable identified with network deployment is competition; the higher degree of competition in the mobile sector relative to the fixed sector played an important role in the growth of mobiles around the world (Petrazzini & Clark, 1996; Wallsten, 2001). This is a result, to a significant degree, of the fact that mobile services were initiated in a more liberalized market than fixed services. There are a number of empirical studies that focus in great detail on the impact of different liberalization processes on ICT penetration in general (Borttoloti, D'Souza, Fantini, & Megginson, 2002; Fink, Mattoo, & Rathindran, 2001; Wallsten, 2001, 2003).

Most of the literature, in the early 1990s, that analyzed the factors that led to telecommunications reform focused on market variables. Later, during the late 1990s, the institutional factor received increasing attention; the efficiency of regulatory institutions became a key factor to explain network deployment. The process by which institutions have an impact on telecommunications development is through the use of norms, rules and contracts to provide incentives which seek to align the firms' decisions to the more general objectives of society (public interest). Thus, the possibilities of success of regulatory policies are

Figure 3. Differences in broad band penetration across regions in some Latin American Countries



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crucially dependent on the effectiveness of institutions where the regulatory process takes place. Heinz & Zelner (2001) as well as Levy & Spiller (1996) suggest that differences in the provision of telecommunications services arise from institutional frameworks that condition investment through the provision of property rights as well as credible and effective governance. Specifically, an effective regulatory institution delivers policies that are transparent, predictable and credible (Noll, 1999).

Recent econometric studies construct indexes that try to measure these characteristics through specific country variables and evaluate their impact on network deployment (Gutiérrez & Berg, 2000; Gutiérrez, 2003; Jordana & Sancho, 1999; Ros, 1999). The results of these studies empirically support the basic intuition; a regulatory agency that has autonomy and independence, accountability, clarity of roles and objectives as well as transparency and participation leads to an effective regulation.

Following the institutional perspective but analyzing the more broad political systems, Andonova (2006) compares mobile deployment with Internet penetration in developing countries through an econometric exercise that includes variables which try to capture the quality of institutional factors such as political rights and liberties. Internet and fixed penetration result highly correlated with institutional efficiency which suggests that the digital divide is the result of an institutional divide. However, she finds that mobile deployment is less dependent on a solid institutional environment than is Internet infrastructure. The rationale behind this is that mobile technologies contain less site-specific assets; it is built on cheaper, easily re-deployable infrastructure than fixed or Internet technology. Thus, mobile telephony has expanded in less friendly institutional environments that generally prevail in developing countries.

In terms of the impact of mobile diffusion, studies interested in the development component of ICTs (Information Communications Technologies for Development; ICT4D) seek to identify how mobiles may contribute to economic growth as well as to poverty reduction. At the macroeconomic level, Thompson & Garbacz (2007) identify a positive impact of mobiles on productive efficiency in developing countries while Waverman et al. (2005) find that the mobile dividend in developing countries is higher than in developed countries given that it is largely the only source of communication.

"Mobile telephony has a positive and significant impact on economic growth and this impact may be twice as large in developing countries compared to developed countries" (Waverman et al. 2005, p. 11).

Robert Jensen's study (2007) on the fisheries market is perhaps one of the most influential papers that, from a microeconomic perspective, analyses the impact of ICTs on welfare. Through a weekly survey applied in three districts in Kerala during six years, Jensen finds a significant positive impact of information in these poorly developed markets. He finds that the addition of mobile phones reduced price dispersion, waste and increased fishermen's profits and consumer welfare. These findings offer evidence that counters the criticism ICTs should not be a priority for poor countries that lack access to health and education.

From a sociological perspective, the impact of ICTs has been studied from a social capital analysis. In these studies, the economic sphere is not separated from the social context; the concept of social capital is useful as a lens to study economic activities. ICTs and mobile services, in particular, contribute to create or strengthen some of the fundamental features of social capital such as networks, shared values, social trust and norms of a community (Chapman, 2004). Fafchamps & Minten (2002) provides evidence that social capital has a significant effect on the performance of the economic agents separate from human and physical capital.

However, some of the results of studies that link social capital to ICTs conclude that this relationship is ambivalent (Huysman & Wulf, 2004). In communities where there is a pre-existing high level of social networks (or capital) it is easier to establish ICTs networks. At the same time, the establishment of ICTs networks leads to the creation of social capital but high levels of social capital make ICTs communication less useful (Huysman & Wulf, 2004).

Following the same line of inquiry, seeking to identify the social role of mobile phones, Goodman (2005) applies a survey in South Africa and Tanzania and finds that mobile uses increases social capital in the communities under study. Using the topology of Granovetter (1973), Goodman finds that mobile telephony use mediates strong links with family members and close friends while weak links with others such as businessmen, teachers or doctors provide information and possible economic and social opportunities (Goodman, 2005, p 63). Mobiles facilitated participation in social networks and thus enabling people to strengthen social capital and benefitting from the opportunities provided.

On a more broad economic and social perspective, recently, there has been a number of surveys that explore if and how mobile phones are helpful to diminish poverty by identifying the patterns of use by poor income groups in developing countries (Donner, 2007a; Horst & Miller, 2006; Zainudeen, A., Samarajiva, R., & Abeysuriya, A., 2006). The application of surveys by Horst & Miller (2004) in Jamaica and Paragas (2005) in the Philippines show that diasporas use mobile phones to communicate with family for both economic and social reasons. Donner (2007a) finds that mobile ownership increases the income of micro entrepreneurs in Rwanda by increasing communication and enriching social networks. In this same area, Molony (2006) finds that mobile phones are used by micro entrepreneurs in Tanzania to manage reputation while creating virtual offices.

For the case of Latin America and the Caribbean, we, at DIRSI, applied a survey to 7,000 individuals with the objective of understanding the strategies employed by the poor in the region to access and use mobile telephony services. The results of our survey are consistent with the general trend observed in region; the general growth in the mobile market has had a significant impact on telephony access for the poor. With the exception of Mexico, the majority of respondents in the countries studied had used a mobile phone in the past three months and in most cases users own their own handset. The exceptions are Colombia and Peru, where a service resale market in urban areas (with very competitive tariffs) reduces ownership incentives.

As is the case with low income sectors in developing countries, the great majority of users prefer prepaid service given their fluctuating incomes and limited insertion in the formal economy. Service affordability remains a key barrier for increased adoption; non-users identify tariffs as the main reason for not using a mobile. Moreover, most users in Latin America make less than one call a day, though in Caribbean countries usage levels rise as a result of more affordable tariffs. However, low income users highly value the few calls made or received; they would not significantly change usage patterns as a result of price increases. In other words, demand for mobile services at the bottom of the pyramid appears to be rather inelastic to tariff variations.

Even though in most markets the current structure of tariffs creates incentives for an intensive use of text messaging (SMS, Short Message Service) and despite increased adoption, users are not taking full advantage of the services enabled by the mobile platform. SMS is the only service beyond voice that is being more intensively used. However, there appears to be problems such as low literacy levels that are a barrier to its use. Beyond text messaging, low-income users make little use of mobile services beyond voice. In the more developed mobile markets such as Jamaica and Trinidad and Tobago, there is some usage related to downloading ringtones and participating in radio/TV games, but the use of more sophisticated services such as banking and government services is practically non existent. This represents a significant untapped opportunity for the delivery of information and transaction services by the government as well as market actors, given the relatively high level of adoption of this transaction platform among the poor.

The key perceived benefit of mobile use among the poor is associated with improved communication with family and friends; it strengthens existing ties. Increased business opportunities are beginning to be significant. For example, in the case of Mexico and Peru, those who use the phone for work-related reasons tend to have higher call volumes. However, our results suggest that the main current impact of mobile adoption by the poor is mediated by social capital variables such as the strengthening of trust networks and better coordination of informal job markets. These result reinforce the findings in the survey applied in Tanzania, by Goodman (2005) which associates mobile use with the increase of social capital as its use promote bear a tight-knit support networks. As Goodman (2005) states:

"Mobile phones were being used to mediate both strong links (with family, close friends and others in the community), essential for maintaining support networks, and weak links ("others outside the community", businessmen, tradesmen, government officials such as teachers and doctors, as well as the police), providing access to information and possible social and economic opportunities". (p. 65).

The growing importance in the use and the positive impact of mobile phones for the developing world bring back the issue of the digital divide. New perspectives on this old issue identify the risks associated with the inequality in access to ICTs and mobiles phones specifically. Tongia & Wilson (2007) focus on the costs of exclusion and find that these rise faster than the growth of the network. De Fontenay & Beltran (2008) understand the digital divide as a force that limits society's ability to achieve a higher productivity. Inequality in ICTs access represents a shortfall of inputs to the production process; i.e. the economy is performing away from the production frontier and thus inequality in general, and ICTs inequality in particular, distorts the development and allocation of human capital. The following section will provide an analysis of the different degrees of ICTs adoption in the Latin American region.

MOBILE BANKING EXPERIENCES IN DEVELOPING COUNTRIES

Despite the fact that the Latin-American region has made significant progress in adopting low-cost technologies through commercial innovations and thus has made ICTs services and mobile phones in particular, more available to low income sectors, mobile applications are still in their infancy. M-banking is beginning to be recognized as a profitable market for companies and development agencies are promoting its expansion as it provides a means for economic and social inclusion as lack of financial access is considered a crucial factor that explains income inequality and slow growth.

Modern development theories identify the financial market as an essential part of the development process. Financial development fosters capital investment; the entry of new firms to the market and innovation which produces economic growth. The removal of capital market imperfections has a disproportional higher effect on smaller firms, as these are the ones that face higher constraints in accessing the financial market. Empirical findings point to an unambiguous relation; greater inequality leads to slower economic growth and the fact small enterprises in poor countries lack access to credit leads to a sustained underdevelopment (Aghion, Caroli, & Garcia-Penalosa, 1998; Benabou, 1996). Moreover, capital market imperfections are the root of the negative correlation between inequality and growth.

By not participating in the financial sector, the poor of the region are severely constrained; access to transaction services such as debit cards and checking accounts can produce significant savings in a period of time. A savings account is particularly important to the poor as they are more vulnerable to situation of crisis such as job loss or health problems. Access to savings can help individuals to smooth consumption and access to credit is a key vehicle for the creation and sustainability of microenterprises. Reducing financial markets imperfections, expanding access creates positive incentives by equalizing opportunities as well as providing poverty alleviation (World Bank, 2008).

Financial inclusion then is a high priority policy for development, but there is still much to know about how to design efficient policies that address financial inclusion. There is a lack of concrete knowledge on the policy barriers to financial inclusion, on who is excluded; it is important to distinguish between voluntary and involuntary exclusion; this difference is the result of choice or of affordability, lack of appropriate financial products and lack of geographic availability.

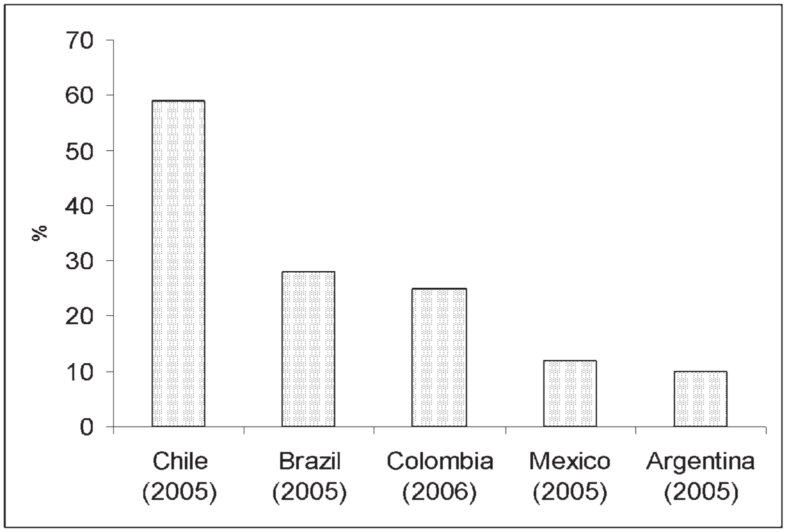
Seeking to address these knowledge gaps, different household surveys have recently been applied throughout the developing region (World Bank, 2008 for a review). These surveys and other empirical studies find that the lack of financial access depends foremost on background conditions where, not surprisingly, the institutional variable is crucial in providing information and solving agency problems. Background conditions include, at a macro level, a well developed rule of law that generally translates into share holder rights, confidence on and stability of the financial system. Financial market imperfections such as information asymmetries and transaction costs become a barrier to all types of enterprises. Strengthening or reforming an existing institutional framework is a long term venture that is essential for government to undertake. However, in the short run, progress can be made by diminishing information asymmetries as it appears to be an important issue in developing countries according to a study carried out by Djankov, Hart, McLiiesh, & Shleifer (2007).

However, even in countries with a moderately developed financial system, there are significant barriers to financial access for the poor; transactions costs have a stronger negative impact on the poor who have no collaterals or credit histories. In order to open an account, banks commonly require formal documents such as proof of address and of an employment (Ketley, Davis, & Truen, 2005). Beck, Demirgüç-Kunt, & Martinez Peria (2007) carry out a survey in fifty-eight countries and find that the requirements of a formal employment and identity documents hinder the majority of the population in developing countries from having a bank account. High minimum balances, monthly and transaction fees and availability of locations are important barriers to the entrance of low-income to the banking sector. Moreover, as the World Bank (2008) report suggest, the quality of access to the service may constitute a barrier to the poor; service may be available but not customized to the need of low income groups.

In Latin America there are still large shares of the population whose financial transactions take place within the informal financial sector. In Latin America, in 2006, with a population of approximately 570 million, only 14.5 percent of poor households had a savings account and only 3.3 percent had access to credit. These figures vary across the region, from the highest in Chile of 65 percent to the low levels in Mexico, where in 2005, 70 percent of the population of Mexico over 18 years had no access to basic financial services (see Figure 4).

Tejerina & Westley's (2007) survey of twelve countries in Latin America and the Caribbean find that in Jamaica, Panama, and the Dominican Republic less than 50 percent of the population have a savings account while in Peru, Paraguay, Nicaragua and Bolivia, this rate is less than 10 percent. Moreover, the level of inequality within

Figure 4. Credit to the private sector as a percentage of GDP (selected countries)



each country is dramatic, across the countries surveyed, 28.3 percent of the non-poor have a savings account while only 10 percent of the poor do.

Technology today has changed the landscape for financial inclusion; it has enabled new entrants to the banking system offering lower costs and the possibility of ubiquitous access to the banking service. Mobile banking uses mobile telephony or a different mobile device to undertake financial transactions such as the storage of value in an account via the handset, the ability to convert cash in and out of the stored value account and the ability to transfer stored value between accounts (Donner, 2007b). In cases where stored value functions are not available users have found creative strategies such as the exchange of airtime or minutes that are managed as quasi currency.

Mobile banking provides the possibility of addressing two key barriers to financial inclusion for the poor: affordability and physical availability. Compared to branch based banks, mobile banking does not incur in the cost of roll-out and faces lower cost of handling low-value transactions. Mobile banking delivery is commonly set up with existing networks that already reaches poor un-banked people; adding a bank account to the mobile phone can channel the power of new distribution networks for cash transactions such as airtime merchants (Gamos LTD, 2006). The use of the existing mobile infrastructure and the fact it delivers all services online gives m-banking the possibility to bring cost efficiency to the provision of cash in and cash out services for the poor people even in rural areas.

Indeed, the dramatic adoption of mobile services by low income groups offers the opportunity of providing financial services through ICT as mobile users already exceed the number of banked people in many developing countries (Porteus, 2006). In Pakistan, for example, only one million people have bank accounts while 70 million have mobile phones (Jenkins, 2008). As table 1 depicts, there are a very low percentage of banked individuals in these selected developing countries; however, the unbanked do have access to a mobile phone. Empirical studies show that the solution for the poor is to rely on informal financial services which are more expensive than formal financial and often times unsafe (Coyle, 2007; Donner, 2007b; Porteus & Wishart, 2006). By filling a financial vacuum for the poor it offers

Table 1. Penetration of mobile phones and bank accounts in selected countries

	Gross National Income Per Capita (US$)	Mobile Penetration (%)	Banked (%)
Mexico	7310	54.71	25
Brazil	3460	56.03	46
Nicaragua	910	32.62	5
Guatemala	2400	55.60	32
Argentina	4460	80.52	28
Chile	6040	75.62	60
Colombia	2340	64.31	41
Peru	2640	30.92	26
South Africa	4960	77.06	46
China	1740	34.71	42
India	720	14.76	48
Kenya	530	19.92	10

Source: Own based on Ivatury & Mas (2008), Honohan (2007), World Bank (2008) and ICT Statistics from ITU web page.

the possibility of gaining access to savings, micro-credits and receiving remittances; in this sense mobile banking is portrayed as a transformative resource towards economic development.

The transformative nature of these new services depends, to a significant degree, on their capacity to be integrated into consumers' economic lives. (Jenkins, 2008) In a globalized world, where current migrations occur at a very large scale, remittances and remote payments are an important use of mobile money. Worldwide flows of remittances reached the amount of $318 billion dollars in 2007. Latin America and the Caribbean (LAC) region remains the largest recipient of (recorded) remittances (Rhata, Mohapatra, Vijayalakshmi, & Xu, 2007). According to the Inter-American Development Bank ([IDB], 2008), LAC received remittances of USD$ 65,000 million. Mexico is the leading receiver (24 million), while for countries like Guatemala, El Salvador, Honduras and Nicaragua, remittances account for more than 10 percent of its Gross Domestic Product (GDP).

However, the great majority of the population in these countries does not have a bank account. For example in México the remittance recipient with bank account is 29 percent, in Guatemala 40 percent, in El Salvador 31 percent, in Colombia 50 percent and in Peru 37 percent (IDB, 2008). Moreover, remittances sent through formal channels are commonly subject to high costs which drive many remittance senders to informal remittance agencies. The consultancy Gamos LTD (2006) estimates that the average cost is 12 percent. Payment systems based on electronic fund transfers rather than checks can substantially reduce the costs of payment transfers and very importantly receiving remittances through the formal banking system allows individuals to enter the financial market and access other financial services such as savings accounts.

As may be expected, most of the m-bank initiatives have emerged in developing countries where the number of unbanked is very high. Mobile phone operators and financial institutions have begun to identify m-banking as a significant opportunity to widen their market and to obtain high profits given the volume of transactions (William & Torma, 2007). Some examples of these initiatives are:

- M-PESA in Kenya. Safaricom, a mobile operator jointly owned by Vodafone and the Kenyan government, initiated services funded in part by an English development agency. The rate of early adoption of M-PESA is very significant: over 6000 people per day; it has attracted close to a million registered users. (Nokia, 2008a; Vaughan, 2007).
- Global G-Cash and Smart Money in the Philippines. These cash platforms are used largely by small and medium enterprises and provide deposit, credit and money transfers through mobile phones. Introduced by the Central Bank, Global G-Cash has more than 1.5 m customers and Smart Money more than 2.5m customers; the rate of adoption has been 2000 clients registered weekly (Nokia, 2008b; Roman, 2006).
- Wizzit in South-Africa. Launched by the South African Bank of Athens, it offers person-to-person payments, transfer money, purchase prepaid electricity and buy airtime for a prepaid mobile phone. Wizzit does not have a minimum balance requirement and does not charge fixed monthly fees (Ivatury & Pickens, 2006; Williams & Torma, 2007).
- BANSEFI, in Mexico. Government-owned institution that offers through a technological platform, savings deposits to unbanked groups as well as technical assistance. Minimum banking fees and no transaction fees (Taber & Cuevas, 2004). BANSEFI program has extended savings accounts in Mexico increasing from 850,000 in 2001 to 3.3 million five years later. By 2006, there were 523 BANSEFI branches, one-half located in areas un-served by commercial banks (Gavito Mohar, 2006). Seventy percent of BANSEFI's customers are women, with average savings balances of US$150.8.

However, these models are still at a very incipient stage and their development towards a critical mass of mobile money still faces significant barriers. One of these is the issue of interoperability with other payment systems and other mobile devices. M-PESA has eliminated this barrier by allowing consumers to send money to any phone, even non-Safaricom phones. However, this is not a widespread practice among m-banking providers; there is a need for bilateral agreements to be forged or as some experts suggest a multilateral or networked hub model. A Global Service for Mobile Communication Association ([GSMA], 2007) study points: "To be a compelling consumer proposition, there has to be a critical mass of uses of mobile money." (p. 14). These uses include besides sending remittances, the capacity to pay utilities, receipt and repayment of loans, savings, as well as wage deposits (Jenkins, 2008).

REGULATORY POLICY: THE ROLE FOR GOVERNMENT

Since the 1990s, governments in Latin America have largely faced the digital divide problem with shared access points, the creation of connectivity centers, known in some countries as telecenters. A considerable amount of resources has been invested in telecenters; however, the impact of these points of connection has been limited. There are few successful experiences; due to a significant degree to the design these programs followed: they were neither sustainable in the long run nor adapted to the local needs (Maeso & Hilbert, 2006; Villatoro & Silva 2005). Moreover, as shown in table 1 the increasing number of potential users makes it difficult for government telecenters to meet the pent-up demand. The market response to the unmet demand has been the creation of private telecenters or cybercafés that, as depicted in table 2 have covered a significant higher proportion of customers than government telecenters have (Robinson 2001).

Table 2. Public and private telecenters in some Latin American countries (2006)

Country	Government TC	Private TC	Total TC	Proportion of Gov. TC over the total (%)	Potential users for each TC
Argentina	9,555	20,647	30,202	32	889
Chile	2,476	587	3,063	81	3,454
Brazil	9,976	1,178	11,154	89	8,143
Mexico	10,034	50,164	60,198	17	1,300
Costa Rica	484	715	1,199	40	2,238
Peru	1,171	18,765	19,936	6	1,017
Guatemala	54	20	74	73	2,423

Source: ECLAC (2007)

Still, in spite of the low purchasing power of the poor in Latin America, there is a potential demand that has not been met. Recently, low income groups have began to spend a considerable percentage of their income on telecommunications. For example, studies have found that even though rural income is significantly lower than urban, the rural population in Mexico spends almost the same as the urban population (Bjärhov & Weidman, 2007; Frost & Sullivan, 2006). Mobile penetration in D and E socioeconomic groups grew more than 20 percent just in two years (Bonina, Piedras, & Verut; 2006).[5]

Despite this fact, universal access programs in Latin America follow the view that ICTs access gaps are the result of an unavoidable market failure. Low income people or those that live in remote areas cannot afford to pay the market prices of ICTs services. In this context, the policy suggestion is for government to offer subsidies or directly provide connectivity to the undeserved population. The underpinning dual concept of market gaps and access gaps is analytically useful to distinguish two different policy issues: that of a competitive and efficient market from an underserved market that cannot afford ICTs services at prevailing market prices (Navas-Sabater, Dymond, & Juntunen, 2002). However, the policy suggestions that have been interpreted from this view have led to limited success in bridging the digital divide.

For those at the bottom of the income pyramid, access to telephony is largely based on different strategies of use around mobile telephony that was made accessible to these groups, to a significant degree, by pre-paid mechanisms; that is by market strategies. Moreover, mobile banking is a business strategy that provides the possibility of transforming the livelihoods of the poor that are excluded from the market. The most important role for regulatory policy is to promote an enabling environment for these strategies to flourish.

In terms of market development, the evidence provided is not intended to be an argument for "regulatory holidays"; there are still barriers to entry into the ICTs market that must be eliminated by regulatory policy. The ICTs sector has evolved in the context of technological convergence to the point where the literature on regulation prescribes deregulation with ex-post antitrust enforcement for the sector. Wherever facilities-based competition (intra-modal) is feasible, market power is diminished and price competition can be strong. A discussion of recent developments in the literature of ICTs regulatory policy is beyond the scope of this paper, however, in terms of the general trends towards promoting solutions to access gaps, there are at least two key regulatory actions. One of these is spectrum allocation that is a crucial variable in promoting investment and competition; moreover when spectrum licensees are technologically neutral, operators can exploit economies of scale and scope diminishing costs (Hazlett, 2008; Mariscal & Ramírez; Picth, 2008) A second key variable is interconnection; the provision of high quality interconnection is a process in which the regulator must intervene to eliminate bottlenecks and promote competition. Also, high interconnection rates in mobile services increases tariffs for the consumer; the mechanism "caller party pays" provides a negative incentive for mobile operators to diminish tariffs as customers cannot choose the network they use.

Accessibility is still the major barrier for the expansion of mobile adoption by the poor. Moreover, evidence shows that the poor largely use the pre-paid mechanism which is significantly more expensive than post-paid packages; in Peru the differential reaches up to 40 percent. Even when, the operator faces less administrative costs in a pre-paid scheme, those who do not have access to formal channels of credit are penalized with higher prices. Still in Chile, where ICT penetration is higher than in other countries in the region, both of these schemes are offered at practically the same price. Regulatory policies should encourage business models tailored for the patterns of consumption and expenditure of the poor such as micro-charges (allowing very small amounts of money to obtain an increase in credit) as well as tariffs charges per second instead of minutes.

In terms of mobile banking, regulatory policy needs to create an environment for innovation and competition among financial sector operators. Barriers to entrance to this sector need to be eliminated; there is still a lack of openness to new models and lack of policy certainty that contribute to a high perceived level of risk among potential customers. Public confidence and trust is an essential pre-requisite for the creation of a mobile money market; market inefficiencies and a secure environment needs to be addressed.

It is necessary to maintain a balance between certainty and innovation through the coordination of at least two separate entities: banking and telecommunications. Indeed, boundaries between several sectors have been eliminated and have come together in the creation of this new market where there is an interaction between banks, mobile carriers, utilities, microfinance institutions and other high technology providers. Several models of interaction have been implemented in different countries; some m-banking is provided solely by banks while some by a partnership between a bank and a mobile provider. Other actors, that are not providers but play a key role are international financial institutions and donors and civil society organizations.

Some of the issues needed to be addressed by regulators to create an enabling environment for mobile money are summarized by Lyman, Pickens, & Porteous (2008), Mas & Kumar (2008) and Mas (2008) in three Consultative Group to Assist the Poor (CGAP) papers. The success and sustainability of mobile banking depends on at least these key requirements:

- Clarity in the requirements of becoming an agent that can use the existing retail network for mobile money deliveries.
- Effective regulatory rules for the issuance of electronic money by nonbanks or on the outsourcing of the operation of bank accounts to nonbanks.
- Effective consumer protection minimum data security levels as well as customer privacy.
- Regulation of payment system.
- Regulation of competition among providers; offering incentives for entrants into the markets (interoperability).

Thus, there is an important role for ICTs and financial regulators to play in enabling an appropriate environment for these models to expand. There is a need to promote competition in the telecommunications market which may contribute to diminish mobile tariffs which are still not accessible for a significant portion of the population, extending coverage requirements to un-served locations and setting interoperability standards. The transformational impact of mobile banking depends on resolving the challenges this service faces.

CONCLUSION

The adoption of mobile phones by the poor has been an unexpected phenomenon that is having a remarkable impact on social and economic development. The significance of this adoption is now beginning to be understood by scholars and policy makers. This paper has presented evidence that has been provided by different studies, from the mobile phones patterns of use to the more potentially transformative implementation of mobile banking. The emergence of m-banking/m-payments systems has implications for the more general set of discussions around the role of mobile telephony in the developing world.

The studies presented here offer evidence that counters the criticism ICTs should not be a priority for poor countries that lack access to health and education. There is a positive impact of mobiles on productive efficiency in developing countries and, as the fishermen's study shows, the addition of mobile phones reduces price dispersion, and increases profits and consumer welfare. Mobile use facilitates participation in social networks and thus enables people to strengthen social capital.

Mobile banking initiatives have achieved a great degree of success in a very short period. However, their expansion and sustainability depend on an enabling environment that should be promoted by regulatory policies. There is still much to be learned about the limits and opportunities of mobile banking for financial inclusion. How will these services be used to help alleviate other economic needs? What are the impacts of mobile phones and mobile applications such as m-banking on other social and economic relationships? As Donner (2007b) suggests the mobile phenomenon is in need of a research agenda that studies how this technology is changing the structure of transactional networks.

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KEY TERMS AND DEFINITIONS

Accessibility: refers to the situation where the people have access to some Information and Communications services.

Access Gap: refers to the unavoidable market failures where some population groups are not serviced because their access is not considered profitable.

Bank Access: refers to the possibility to access to banking services like an open an account for deposits or withdraws.

ICT4D: refers to use of Information and Communications Technologies to accomplish economic and social development goals.

Market Gap: refers to the difference between the penetration level that could be reached under non-optimal market conditions and under optimal conditions.

Mobile Banking: refers to ability of made banking transactions through the mobile telephony like remittances or payment of bills.

Underserved Population: refers to people who does not have available some Information and Communication Technologies services for any reason, but especially because their low income.

ENDNOTES

[1] This paper presents a survey undertaken by the research network Diálogo Regional sobre la Sociedad de la Información (DIRSI, Latin American and Caribbean network of researchers focused on Information and Communication Technology for Development) and funded by International Development Research Center (IDRC) in 2007 and builds upon a paper that analyzed its results which was co-authored with Hernan Galperin (www.dirsi.net).

[2] I acknowledge the valuable support of Armando Aldama and Fernando Ramírez in the research process.

[3] For more information about ICT strategy in Korea see www.nia.or.kr/open_content/board/fileDownload.jsp?tn=MO_0000097&id=4941&seq=1&fl=7 – About Ireland's ICT strategy see: http://www.taoiseach.gov.ie/upload/publications/238.pdf

[4] The DOI measures the progress a country has made on bridging the digital divide. For more information see: http://www.itu.int/ITU-D/ict/doi/material/WISR07-chapter3.pdf

[5] In order to have an instrument for income comparison among its member agencies, the Mexican Association of Marketing and Public Opinion Research Agencies (AMAI) developed a socio-economic classification system made up of six levels: A/B, C+, C, D+, D and E, where A/B represents the highest level of income and E represents the lowest.

Chapter 26
The Influence of Time on Transactional Use of the Internet:
Buying, Banking, and Investing Online

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ABSTRACT

The major objective of this chapter was to test the effect of online time and adoption time on the frequency of transactional use of the Internet. Transactional use of the Internet includes activities such as buying products, banking, and investing online. Findings support the hypothesis that online time and adoption time positively and significantly influence the frequency of transactional use of the Internet. Theoretical and strategic implications and recommendations for future research are presented.

INTRODUCTION

The transactional use of the Internet is not as widespread as some of the other uses, such as emailing, networking, and information gathering. As new businesses continue to come online and existing businesses reconfigure their business models to achieve a competitive advantage, knowledge about the profile of consumers who conduct online transactions versus those who do not would be helpful to managers in developing effective marketing strategies. Turban et al. (1999) emphasized the significance of this knowledge by noting that the identification of actual and potential consumers is a key task for electronic commerce, and Citrin et al. (2000) noted that the future commercial success of the Internet depends, to some extent, on whether current users use it for product purchases. This paper focuses on this key task by addressing the question, what individual characteristics explain variations in the frequency of use of the Internet for transactional purposes. The main thesis of this paper is that time (online time and adoption time) significantly impacts the frequency of transactional use of the Internet. Online time refers to the average number of hours spent online per week, and adoption time refers to the number of years online. Transactional use of the Internet includes three activities: buying products, banking, and investing online.

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BACKGROUND

In the last two decades the Internet has had a significant impact on buying behaviors of consumers. Hailed as a path breaking discontinuous innovation, it was not surprising to see predictions of how this new medium would make traditional retail outlets irrelevant. Schneiderman (1980), for example, predicted that Americans would buy fully one-half of all general merchandise without setting foot in a retail store, and Rosenberg and Hirschman (1980) opined that electronic shopping would irreversibly transform conventional retailing. Somewhat later, Benjamin and Wigand (1995) went so far as to suggest that the Internet has the capacity to "eliminate retailers and wholesalers entirely" (p.62). These predictions, of course, have not materialized. The Internet has not made brick and mortar stores irrelevant, but it has established itself as an integral part of modern commerce and commercial discourse.

The commercial use of the Internet has transformed value creation and value delivery activities. Its unique configuration of capabilities has significantly influenced the practice of marketing (Hoffman & Novak, 1996; Quelch & Klein, 1996). Businesses have adopted the medium not only to communicate with customers but also to provide them with a platform for conducting transactions. Most businesses, large as well as small, now have an Internet presence where people can browse, chat, shop, buy, and sell. Online retail sales, as a result, increased from $87 billion in 2005 to $107 billion in 2006 (U.S. Department of Commerce, 2008).

While the growth of online retail sales appears encouraging, recent data on Internet usage continue to show that people are not fully utilizing the transactional capabilities of the Internet. In a Carnegie Mellon University study, for example, the most popular uses of the Internet were obtaining hobby-related information, communicating with family and friends, and enjoying oneself (Kraut et al., 2002). The Stanford University study found that 90% of respondents reported using the Internet for emailing, whereas only 7% used it for trading stocks (www.stanford.edu). More recently, findings from the Pew Internet Project indicate that, on an average day, 77% of Internet users use the Internet for emailing, 46% for news gathering, and only 18% for online banking (Rainie, 2005). These and other studies show that compared to emailing, chatting, networking, or reading newspapers, other activities such as buying products, banking, and investing online are not as popular.

In this study, we focus on buying products, banking, and investing online, and combine these three activities under the construct, transactional use of the Internet. The study is conducted in the U.S., a leading country in Internet adoption and usage. The study of transactional use is important for three reasons. First, compared to emailing or reading newspapers, the transactional use of the Internet is more advanced. Second, given the assumption that there will eventually be near-universal access to the Internet, at least in the U.S. (Peterson et al., 1997), the study of how people use the Internet becomes a substantive question that needs to be answered. Third, the transactional use of the Internet will play a key role in the commercial success of the Internet and in generating revenues for firms (Citrin et al., 2000; Shi & Salesky, 1994).

The study achieves three goals. First, it fills a gap in the literature by adding banking and investing online to online product buying. Second, it proposes that time (online time and adoption time) has a significant effect on the frequency of transactional use of the Internet. Third, it extends the product diffusion model by focusing on the second half of the diffusion process, how consumers use a product (Internet) after adopting it.

CONCEPTUAL MODEL

In marketing and consumer behavior a significant amount of scholarly attention has been directed to understanding how product and consumer characteristics affect the product diffusion process (Mahajan & Muller, 1979; Rogers, 1995). While this stream of research has yielded many theoretical and strategic insights, its main focus has remained limited to the first half of the diffusion process (Anderson & Ortinau, 1988; Golder & Tellis, 1998). The second half of the process, that is, how consumers use an adopted product, has not been addressed satisfactorily. This gap in the literature prompted Robertson and Gatignon (1986) to note that "adoption is not the only relevant concern of diffusion research. The *degree of use* [authors' italics] of that technology is also an important variable that describes the extent of diffusion of that innovation …." (p. 3).

Research on digital divide addresses the above issue. Digital access divide and digital usage divide correspond to product diffusion and product usage. As the access divide, the gap between those who have access to the Internet versus those who do not, is narrowing in developed economies due to infrastructural developments and reduced cost of the Internet service, attention is shifting to understanding the digital usage divide. Data show that people with access to the Internet do not fully exploit its capabilities. Access to the Internet does not imply its usage for different purposes (Fryer & Granger, 2008).

Adapting the theory of reasoned action (Fishbein & Ajzen, 1975), Davis (1986) developed the intention-based technology acceptance model to explain technology acceptance. The model posits that perceived usefulness and perceived ease of use are of primary relevance in explaining technology acceptance. The model has been extensively used to explain and predict user acceptance and use of computer technology (Davis et al., 1989; Hsu & Lu, 2004; Hu et al., 1999). Findings from this body of research show that while perceived usefulness is significant, perceived ease of use is either not important or not as important (Chau, 1996; Hu et al., 1999). A plausible explanation for this outcome is that perceived ease of use becomes insignificant in explaining technology acceptance after prolonged exposure of the user to the technology (Hu et al., 1999).

Our contention is that exposure to the Internet can enhance ease of use and, therefore, time becomes relevant in explaining complex tasks such as using the Internet for transactional purposes. Prolonged exposure to a technology such as the Internet has a temporal dimension, which suggests that perceived ease of use of the Internet is linked with the time people spend online and the number of years they have been online. It can thus be argued that online time and adoption time, by improving knowledge and skills and enhancing learning, can affect the use of the Internet for transactional purposes. In this study, we develop and test hypotheses on how online time and adoption time impact the use of Internet for transactional purposes. Based on existing research, gender, age, education, and income were used as control variables.

RESEARCH HYPOTHESES

Gender and Online Transactions

Gender has been shown to be a significant determinant of different types of consumer behavior. The psychology of this demographic variable puts men and women at different points on attitudinal and behavioral scales. In an extensive review of recent literature, Eagly (1995, p. 148) examined these differences and concluded that psychologists are "in general agreement that their meta-analytic findings yield evidence of differences." Gender differences also show up in perception of Internet and usage behavior. Research shows that men have more favorable attitudes toward online shopping than women (Wu, 2003) and are also more likely to engage in online purchasing (Teo, 2001). Furthermore, results showed that men outspent women in online purchasing (Lohse et al., 2000). On the other hand, women found

Internet shopping to be cumbersome (Fram & Grady, 1997). Women also think of shopping to be a social and pleasurable activity and are thus more likely to go shopping with friends or family (Alreck & Settle, 2002). These findings suggest that women will use the Internet less frequently than men for transactional purposes. Thus, the following is hypothesized:

H1: Gender has a negative influence on the frequency of transactional use of the Internet.

Age and Online Transactions

Findings on the influence of age on attitudes toward online buying and buying behavior are mixed. For example, Wu (2003) found that attitudes toward online purchasing improved, then declined, and then improved again with age. Donthu and Garcia (1999) found that older Internet users were more likely than younger users to buy online. Kargaonkar and Wolin (1999) also found that older males had the highest incidence of online purchasing behavior. In contrast to the above findings, Joines et al. (2003) found that younger consumers were more likely to shop online, and Goldsmith and Flynn (2005) found age to be uncorrelated with Internet buying. In comparing such studies, Sorce et al. (2005) observed that it was difficult to compare the findings because the dependent variables varied widely across the different studies. In their own study, they found mixed evidence of online buying behavior, with differences based on the type of products.

Using the Internet for conducting transactions requires new sets of skills. As people age, acquiring and developing these new skills might become difficult. The process of aging has an effect on attitudes and behavior (Beatty & Smith, 1987). As people age, they become less inclined to adopt new technologies (Gilly & Ziethaml, 1985) and are more likely to be satisfied with traditional in-store shopping experiences (Dholakia & Uusitalo, 2002). They will also be reluctant to use the Internet for online banking and investing. Thus, the following is hypothesized:

H2: Age has a negative influence on the frequency of transactional use of the Internet.

Education and Online Transactions

Education gives people the opportunity to transcend their circumstances through the acquisition of new attitudes and habits. The effect of education is also transferred to consumption behaviors where education favorably affects information acquisition and product evaluation behavior (Doti & Sharir, 1981; Murthi & Srinivasan, 1999). Although education has been shown to influence consumer behavior, the link between education and online purchasing behavior is not unequivocal. For example, Dholakia and Uusitalo (2002) and Teo (2001) found no significant relationship between education and online purchasing. However, Madden (2003) and Donthu and Garcia (1999) indicate that high levels of education will result in greater likelihood of online buying. Vrechopoulos et al. (2001) also found education to be positively related to Internet shopping. We also suggest that education will have a positive effect on the frequency of online transactions because conducting online transactions requires familiarity with the workings of the Internet. Thus, the following is proposed:

H3: Education has a positive influence on the frequency of transactional use of the Internet.

Income and Online Transactions

Research shows that perception and evaluation of time change with income. As income increases, the opportunity cost of time also increases (Goldman & Johansson, 1978) and people begin to evaluate time spent on a task differently. Convenience becomes an important consideration in buying products. Donthu and Garcia (1999) found that use of the Internet for online shopping increased with increasing income. As use of the Internet is time efficient, people with higher incomes will also be more inclined to choose the Internet for transactional purposes. Thus, the following is proposed.

H4: Income has a positive influence on the frequency of transactional use of the Internet.

Online Time and Online Transactions

Usage of a product increases product knowledge. The more time people spend on using a product the more comfortable they feel in using it for different purposes. Lohse et al. (2000) found that the longer people spent time online, the higher the probability that they would make a purchase online. As the transactional use of the Internet requires different kinds of knowledge and skills, the more time people spend online, the higher the likelihood that they will learn to use the Internet for transactional purposes. Citrin et al. (2000) found that higher levels of Internet usage lead to adoption of the Internet for shopping. Thus, the following is proposed.

H5: Online time has a positive influence on the frequency of transactional use of the Internet.

Adoption Time and Online Transactions

The diffusion hypothesis links the rate of adoption of a new product to time. The basic premise is that at the initial stage of the introduction of a new product very few people (innovators) buy and adopt the product. As time goes by, the adoption rate increases and the product disseminates into different segments. The role of time has mostly been studied with respect to product adoption, but not the use of the product after it has been adopted. However, the arguments used for the association between time and product adoption can also be generalized to product use. That is, with the passage of time, people will explore the different uses of the product they own, especially of a high technology product with multiple uses such as the Internet. Bellman et al. (1999) found number of months online to be a good predictor of online buying behavior. As the adoption time increases, people will begin to use the Internet for purposes that go beyond emailing or reading newspapers. Thus, the following is proposed.

H6: Adoption time has a positive influence on the frequency of transactional use of the Internet.

METHOD

The hypothesized relations between independent and dependent variables were tested in a multiple regression model. The SPSS16 statistical package was used to estimate the regression model.

Questionnaire and Sample

A survey questionnaire was mailed to 5,000 Internet subscribers in three Midwest states in the United States. The list was randomly generated from a data base of Internet users. Following the initial mailing of the questionnaire, a postcard was mailed reminding people to respond to the questionnaire. A total of 1,190 responses were received. A listwise deletion procedure was used to generate the data set for statistical analysis. This procedure is recommended because the analysis is conducted with the same number of cases (Kline, 2005). The listwise deletion reduced the usable sample to 1,119, which represented a response rate of 22.4%.

Variables

Six independent variables were used. Among these six were four demographic variables—gender, age, education, and income—that served as control

Table 1.

		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t-value	p-value
	(Constant)	4.569	.787		5.802	.000
	Gender	-.323	.266	-.035	-1.215	.225
	Age	-.672	.144	-.136	-4.682	.000
	Education	.053	.092	.018	.578	.563
	Income	.319	.075	.129	4.240	.000
	Online time	.711	.130	.159	5.449	.000
	Adoption time	.531	.104	.152	5.125	.000
Adjusted R-square: 0.091; F-value: 19.657, p-value: 0.000						

variables. Gender was coded as (0) male and (1) female. Age was divided into six groups and coded 1 to 6 -- under 19, between 20 and 34, between 35 and 54, between 55 and 64, between 65 and 84, and over 84 years -- respectively. Education was divided into seven groups and coded 1 to 7-- less than 9th grade, 9th to 12th grade, high school graduate, some college but no degree, associate degree, bachelor's degree, and graduate or professional degree -- respectively. Income was divided into nine groups and coded as 1 to 9 -- under $14,999, between 15,000 and $24, 999, between 25,000 and $34,999, between $35,000 and $49,999, between $50,000 and $74,999, between $75,000 and $99,999, between $100,000 and $149,999, between $150,000 and $199,999, and over $200,000 -- respectively. The other two independent variables of interest were online time (average number of hours spent online per week) and adoption time (number of years online).

The dependent variable measured the frequency of use of the Internet for transactional purposes, which included buying products, banking, and investing online. Respondents were asked to indicate how frequently they used the Internet for the following purposes: purchasing products online, investing online, and banking online. Response was obtained on a scale of 0 (not at all) to 7 (very frequently). The frequency scores on these three items were added to develop a composite score of the frequency of use of the Internet for transactional purposes, which served as the measure of the dependent variable.

FINDINGS

Regression results showed the following. On the transactional use of the Internet, gender did not have a significant influence (H1); age had a negative and significant influence (H2); education did not have a significant influence (H3); and income had a positive and significant influence (H4). The two main hypotheses of interest were supported. Online time (H5) and adoption time (H6) were positively and significantly related to the transactional use of the Internet (See Table 1).

CONCLUSION

Some comments are in order regarding the findings of this study. The dependent variable is a composite measure of the frequency of use of the Internet for transactional purposes, obtained by adding the frequency of use for each of the three activities: buying products online, banking online, and investing online. The dependent variable thus does not show variety of transactional uses, but frequency of transactional uses.

The findings support the main hypothesis of the effect of time on the use of the Internet for transactional purposes. While the findings support the proposed model, the percentage of variance explained is not very high, as indicated by the low adjusted R-Square. This is not surprising, considering that the study is cross-sectional and some of the social and psychological factors that could influence the use of the Internet for transactional purposes were not included in the model. However, the F-statistic is highly significant, and the results are not trivial. Online time and adoption time significantly influence transactional use of the Internet, after controlling for gender, age, education, and income. Both coefficients are significant and in the hypothesized direction. The implications of the findings are presented next.

Theoretical Implications

Gender did not have a significant effect on transactional use of the Internet. Compared to studies that have found differences in behavior between men and women, this study shows that women are closing the gap. The difference between men and women in the frequency of use of the Internet for transactional purposes appears to be disappearing over time. One explanation is that skills can be acquired over time through the use of the Internet, and, therefore, the constraints of skills may no longer be a factor in maintaining gender differences.

Age is shown to have a significant and negative impact on the frequency of Internet usage for transactional purposes. As people age they become set in their ways and, thus, are more likely to conduct transactional activities in the manner they are most comfortable with. The Internet is a new medium and requires new skills and new ways of doing things. Age may act as a psychological inhibitor for acquiring these new skills and experimenting with the use of the Internet for transactional purposes. We will thus continue to see Internet usage differences in people of different ages.

Education does not have an impact on the frequency of use of the Internet for transactional purposes. This lack of significance can be attributed to the fact that people with a higher education are no more likely to conduct transactions on the Internet than those with less education. People with a higher education may use the Internet to acquire or transmit information, but may not find any specific advantage in using the Internet for transactional purposes, in comparison to those with less education.

Income is shown to have a positive and significant impact on the frequency of use of the Internet for transactional purposes. This finding corroborates existing findings on the effect of income. Increasing income acts as a facilitator, allowing people to take more risks with new mediums such as the Internet. Increasing income also increases the value of time. People with higher incomes will thus show a preference for time saving devices. Conducting transactions over the Internet is a way to economize on the expenditure of time and, thus, there will remain an income difference in the frequency of use of the Internet for transactional purposes.

A major contribution of this study is the link it establishes between online time and adoption time and the frequency of transactional use of the Internet. Findings suggest that both online time and adoption time positively and significantly influence the transactional use of the Internet. Online time and adoption time can be viewed as operational measures of interactions between people and the Internet. These interactions, over time, can help build skill sets for people that can facilitate a variety of uses of the Internet, among which are included transactional uses.

Strategic Implications

The significance of online time and adoption time suggests that online transactional activities will continue to increase in the future. Companies that have established their presence on the Internet and are profiling and targeting their customers meaningfully will benefit from these initiatives. Competition in the virtual world of business will increase, as expected. This will require firms to develop a business model that exploits the versatility of the Internet and create an exchange environment that is more in line with the expectations of consumers. Even though differences among consumers will remain, the overall frequency of use of the Internet for transactional purposes will increase over time. For marketers, this is a significant finding suggesting that firms that have a strong Internet presence will be able to take advantage of this development in the future.

Marketers divide a market into distinct groups of consumers with common needs and wants and a disposition to respond to marketing offerings in a similar way. The more well-defined the target market is, the easier it is to construct a cohesive message and deliver products that will appeal to different target groups. The advantage of demographic and usage based segmentation approaches is the ease of developing consumer profiles. The profile of consumers who use the Internet for transactional purposes is that of young males and females with money who have had access to the Internet for a long time and who spend more time online.

Directions for Future Research

Several areas of research seem feasible, based on findings from this study. Transactional uses of the Internet are different from news gathering and emailing. In the latter cases, consumers do not have to provide sensitive personal information. For example, emails can be sent and received without providing financial information. However, for conducting transactions on the Internet, people must provide financial information such as credit card numbers and other sensitive information. These requirements can inhibit people from using the Internet for transactional purposes because of privacy and security concerns. Future research can focus on how these concerns affect the transactional use of the Internet of different demographic groups and how online time and adoption time affect privacy and security concerns.

There are environmental differences between the virtual world of the Internet and the real world. The research questions that can be addressed are how people perceive these differences, how they behave in these environments, and how these perceptions and behaviors affect the transactional use of the Internet. Another research question related to the virtual environment of the Internet involves the steps firms can take to motivate and facilitate interactions that can lead to the transactional use of the Internet. What information firms can provide to consumers and how they can design their website to encourage people to use the Internet for transactional purposes are substantive questions that can be explored. These related areas of research will provide useful insights into the psychology and behavior of consumers.

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KEY TERMS AND DEFINITIONS

Digital Access Divide: the gap between those with access to the Internet versus those without.

Digital Usage Divide: the gap between those who use the Internet for a variety of purposes versus those who do not.

Internet Adoption Time: the total number of years online.

online time: the average number of hours spent online per week.

Online Transactions: using the Internet for buying products, banking, and investing.

Section 4
Digital Divides, E-Government, and E-Democracy

Chapter 27
Beyond the Online Transaction:
Enhancement of Citizen Participation via the Web in Ontario Provincial Government[1]

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ABSTRACT

Among North American state and provincial governments, there are only a handful of chief executives who make the most of the Internet as a tool for gaining citizen input on policy questions and disseminating a clear and well-crafted agenda. Dalton McGuinty, the Premier of Ontario since 2003, was the first to push the Web beyond conventional e-government functions such as tax or fee payment, the filing applications for programs, and report dissemination, into a realm of interactive facilitation of democratic governance. This chapter describes the context of Ontario politics and establishment of common e-government techniques before McGuinty became his government's leader, the responsive digital strategies that he adopted to treat Ontario's situation as he came to office, and an assessment of these strategies five years into his leadership of this diverse province.

INTRODUCTION: A HIGHER ORDER OF DIGITAL ENGAGEMENT

When initiating the field of public administration in North America late in the 19th century, Woodrow Wilson declared, "It is getting to be harder to run a constitution than to frame one."(1887) With over a century of history passed since this statement and much development of the field of public administration, it is clear that one cannot run a constitution or other guiding institutions of governance without informed support and consensus of the citizenry. This is a major current challenge, as citizen trust in government can scarcely fall lower than its current levels. Support for government agencies such as the police and military average approximately 50 percent worldwide; however legislative actors are granted much lower support from citizens. Parliaments in Africa and East Asia have the positive endorsement of approximately 40 percent of their citizenries, support in the European Union is as low as 35 percent, and in Latin America public trust in

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the political process is as low as 15 percent (Blind 2007). In the United States, the drop-off over the past few decades is dramatic; from approximately 60 percent support in the 1960's, trust in government among Americans fell to 20 percent by the turn of the century (Bok 1997). When this is the case, who is left to sustain progressive change in democratic societies? What policies and administrative mechanisms will it take to bring citizens back to a reasonable level of trust in governing institutions?

A range of internal or administrative reforms implemented during the 1990's and into this century attempt to reengage citizens and stakeholders in their governments' programs and administration. Under titles such as "reinventing government" or the "New Public Management," nations and their subnational governments have made strides to meet public expectations for responsiveness, effectiveness, and accountability (Kettl 2005). The main interest within this book falls to on-line provision of public services, such as processing of governmental business transactions and the dissemination of information related to governmental services and programs. Indeed, there has been tremendous success in these areas, with much greater efficiency, economy, and flexibility in how governments worldwide meet their constituents' needs (Fountain 2001; Coursey and Norris 2008). One direction for this book's enhancement of knowledge about Internet-based innovation relates to a conventional view of the "digital divide," the gap between haves and have-nots regarding contemporary or current technological access to on-line services and information (Dewan and Riggins 2005). It is possible, however, to expand the discussion of digital access and application to look beyond service transactions, to the Internet's role in enhancing democratic participation as part of an attempt to reduce the chasm within levels of citizen trust in government. Citizen participation was discussed, at least in theory, within the reform writings of the 1990's, but few worthwhile examples of effective participation initiatives arose above the community level. The Canadian province of Ontario provides a rich case of well-crafted citizen participation initiatives using both face-to-face techniques as well as Internet-based mechanisms. This chapter builds an understanding of this successful case as a discussion point for the prospects and pitfalls of e-government effort that moves beyond citizen-government transactions toward facilitation of community dialog on behalf of its own self-determination.

Since 2003, the executive in the Canadian province of Ontario, Premier Dalton McGuinty, has made strong strides to expand discourse on policy and administration through a combination of public forums and on-line citizen input mechanisms. This chapter, in turn, discusses the historical precedents driving a need for enhanced citizen input in Ontario, the E-government mechanisms that enabled a combined on-line and face-to-face system for raising citizen input, and the mixed results of these initiatives for altering the face of trust in Ontario government. The case history of Ontario's political and administrative efforts prior to and during the McGuinty government also inform us about the place of a "next generation of E-government" (Management Board Secretariat 2004) in the variety of governmental reforms under way around the world since the 1990's.

Reform is a current by-word in government throughout the world, be it a move toward democratic political processes or a variation of "New Public Management" in the functioning of government agencies, programs, and administration (Kettl 2005). Democratic reform is a fascinating current story, given the dramatic numbers of nations that claim a move toward democratic processes but which do so in a manner lacking authenticity (Ginsborg 2005). This chapter is focused, however, on the public administrative side of governmental reform with its ways to reinvigorate existing democracies in their quest to bolster the citizen-civil service relationship, especially with the help of information technology innovations. A range of improvements to the management of public services promoted goals of increased efficiency, effectiveness, accountability, and responsiveness even prior to the advent of E-government, and now with an increased focus on information technology, all four of these goals press further forward. The next section lays the context for the current reform wave under way in Ontario, under the leadership of Premier McGuinty.

CONTEXT FOR VIRTUAL DEMOCRATIC REFORM: E-GOVERNMENT TRENDS, REFORM "TIDES," AND RECENT ONTARIO POLITICAL HISTORY

Before describing the unique participative reforms under way in Ontario, it is necessary to define, in turn, the historical development of E-government, administrative reform, and recent Ontario politics and administration. Research on E-government is still in its infancy (Coursey and Norris 2008), only slightly ahead of the implementation of varied, jurisdiction-specific technological initiatives. Thus far, scholars have identified a list of steps or stages of growth and development of application or utility (Baum and DiMaio 2000; Hiller and Belanger 2001). The generalized steps need not be taken in order, nor does a given public organization need to engage in any specific prerequisite action, though the first three types of reform are far more prevalent than the last one. Simplifying the list of steps, we see governments engaging in several distinct categories of activity:

1. *Information Dissemination/Presence*: Governments provide a variety of guides, reports, instruction protocols, and legal documents on the Web. Depending on the jurisdiction, governments may enable Web users to quickly access background information that in the past would involve a trip to government offices or libraries; citizens or other applicants thus gain an understanding of the process of engaging government for acquisition of permits, payment of taxes, and other more complex processes. The Web user has saved time, if the Web site is well designed, and the government worker who otherwise would have responded to the applicant can use his or her time in other productive ways. In addition, government transfers the cost of paper and other report production to the user, if the user needs a hard copy of documentation.
2. *Interaction/Two-way Communication*: E-mail enables quick communication between the users and providers of government services. Both the service user and the provider save time, the user avoiding lines to engage government and the provider responding when she desires and has no other pressing work. The process of interaction has been improved and made less expensive.
3. *Integration/Transaction* is a combination of the previous two developments. Services previously purchased in city hall or government offices are purchased directly on-line, if no personal verification is necessary. Speed of acquisition of the government product (driver's licenses and other permits, for example) is increased, and production cost is minimized with the reduction of necessary staff time, facilities, and collation of paperwork.
4. *Participation* is the least developed of these steps or stages, including on-line viewing of government meetings as well as outlets to offer one's opinion on public matters. Democratic processes do not necessarily beg for more efficient and cost-effective functioning; citizens desire to be heard at their own pace, with the education of both citizens and government actors occurring through a slower deliberative process. But with all else in the busy lives of citizens and governmental staff, on-line forums

can reduce travel to and from meetings that have two core disadvantages: Public meetings tend to be scheduled when the most stakeholders can come, late into the evening, and they tend to include many different stakeholder needs through diverse and varied agendas. This type of E-government reform could help overcome the need to give up the limited free time of citizens, as well as prevent the need to tie up much of this time waiting through others' issues on the public agenda. The alternative is less and less tolerance among citizens to attend and endure public processes. The "savings" of participation reforms is on the stress of public involvement on our daily lives.

The "digital divide" is usually discussed in the context of the first three types of E-government reform. By the middle 1990's, the technology to drive basic transactional improvements via the Internet was in place, and the new concern of driving broad access arose at the national level in a second round of "reinventing government" initiatives in the United States and in other countries (Kettl 2005; Dewan and Riggins 2005). The "digital divide" dialog attempts to expand equity and fairness, such that individuals and communities without computer and broadband access are not left out of government services and information provision. When it comes to E-government initiatives to enhance or facilitate participation, the target group is much narrower. Almost all citizens of a given jurisdiction need to apply for licenses or to pay their taxes, and thus should have computer access, but only a small proportion of citizens participate in public hearings and meetings. The problem of their lack of access is substantially different, as the tendency is for the wealthier and more educated to participate in these processes (Verba, Schlozman, and Brady 1995). Nevertheless, those few who want to participate but are prevented by their lack of on-line access have as legitimate a claim to E-deliberation as any others. This issue will be expanded in subsequent sections of the chapter.

E-government reforms of all kinds fit within a broader range of possible administrative reform strategies; there is not only "one best way" to improve government operations. Light (2002) contends that reform often occurs more than once per new regime, and that reform efforts tend to occur at odds with each other, even before the first reform wave has a chance to produce distinct results. For example, when an executive proposes a movement toward enhanced citizen and client participation in governmental programs ("bottom-up" policy setting), it is not long before the same executive or a competing legislature enacts new policies and structures to focus decision making and accountability back toward the experts in management ("top-down" guidance). Light points out that administrative reform is not uniform; it is not only present when leaders actively pursue it, and absent when leaders ignore the idea. Instead, it is almost always under way, at times on several dimensions that may be compatible in some ways, but also in other possibilities like the example above, where the reform efforts are at odds with each other and may even cancel each other out.

Light offers four lines of strategy, using a metaphor of different "tides." These are not comprehensive characterizations of reform, but in his empirical research tracking legislative action between 1945 and 1997 they do cover much of the options used in the United States during the second half of the Twentieth century. The typology clearly applies to reform across a broader swath of government types, including both industrialized and developing countries, nations and subnational units, and varied institutional structures. The four "tides" are:

1. *Scientific Management*: Classic bureaucratic enhancements, based in the strengthening of command and control structure, clear rule orientations, the use of expertise to run systems and processes, and rational, informed

decision making. In American government, there is a steady progression of efforts to bring about Scientific Management, including the Brownlow Commission (1930's), the two Hoover Commissions (late 1940's-early 1950's), the Ash Council (1970's), and many smaller agency-specific efforts that continue even today. Reorganization of agency relationships and structures is the most prominent scientific management reform design. On-line information dissemination tools, especially those focused on internal communication, are consistent with this reform tide.

2. *War on Waste*: Efforts to reduce fraud, abuse, and even straightforward financial inefficiency in the pursuit of governmental duties. The War on Waste is symbolized by the formation of Inspectors General and enhanced auditing procedures, to find fiscal problems and offer potential solutions to enhance efficiency in operations; but waste might as easily be reduced by the direct participants in an inefficient agency or process through quality improvement and "Total Quality Management" processes. Ironically, the best example of a U.S. national focus on this reform wave is the Grace Commission of the 1980's, which corresponded with the greatest rise in deficit spending during the Twentieth century. The states, provinces, and large municipal governments of the United States and Canada have incorporated strong audit functions during the past two decades, most of which provide an on-line presence to provide audit results. Scientific Management and War on Waste are relatively compatible reforms, as both share a focus on efficiency in governmental operations. The movement of government transactions to on-line delivery is an e-government reform line consistent with the Scientific Management/War on Waste pairing.
3. *Watchful Eye*: The enhancement of citizen and interest group participation in governmental decisions. The U.S. Administrative Procedures Act of 1946, with its requirements for public hearings on legislation, was one of the single largest American national advancements toward bridging the gap for citizens to speak their piece. Also included in this reform tide is the ability of lower level governmental employees to speak out about abusive or misguided government policies. While this type of reform corresponds with the beginning of Light's study period, it is only the most prevalent of the four possibilities (as measured by legislative and administrative acts) during one presidency—Gerald Ford's, immediately following the Watergate scandal. In current times, the rise in focus on "transparency" as an administrative value demonstrates the current heightened significance of this reform wave. Via E-government initiatives many governments at all levels post their budgets, financial statements, and audit reports on their Web sites for public scrutiny and analysis.
4. *Liberation Management*: The movement of government services toward a more modern vision of the state, consistent with the use of business techniques and practices; a greater focus on customer or client need; and use of and responsiveness to technological and societal advancements. A core term for Liberation Management is line worker empowerment, where the relationship between government service recipients and lower level staff was strengthened and given more influence. Governments may use designs that appear and function more like businesses, or they may even go so far as to use businesses or other nongovernmental agents to provide governmental functions. While this reform tide became the dominant trend in the American and Canadian national governments during the 1990's, it has earlier roots

> in the establishment of business planning techniques in the Department of Defense in the 1960's, and the reshaping of some government functions as "enterprises" in the 1970's. Liberation Management tends to be the most recent and least developed of the reform tides, and has been only a limited focus for E-government applications as yet.

Ontario, the most populous province in Canada, has been the site of a demanding public, and the two most recent executives have concerned themselves strongly with administrative reform—Mike Harris and Dalton McGuinty. The province provides an evocative case of efforts to modernize government organization, including via E-government initiatives, to please its citizens. Ontario's history is central to Canada's history (Ibbitson 2001), frequently paralleling the trajectory for the entire nation; but even when Ontario and the rest of the country might diverge on philosophy or direction, this province's clout ensures that it will have a significant role in national developments. Until the second half of the Twentieth century, Ontario contended with Quebec for lead recognition as the most influential province in the political sense, but its industrial economy made it the economic engine of the nation. However, Ontario began to slide into a downward spiral by the 1960's, as the government in Ottawa began to shift subsidies and other preferential treatment toward Ontario. For example, the Automotive Products Trade Agreement of the 1960's reduced tariff barriers between the United States and Ontario's--not Canada's--auto industries, and the National Energy Program of 1980 gave preferential treatment, and cheap western Canadian oil, to Ontario (Ibbitson 2001). The Ontario "Golden Horseshoe's" industry thrived along the curved banks of Lake Ontario between Toronto and Hamilton, but lost its competitive edge by the early 1980's. When the economy faltered, the long powerful Progressive-Conservative Party's fortunes followed.

The two premiers who followed long-standing P-C leader Bill Davis after 1985 might have had limited opportunity for positive change, given Ontario's dire economic straits. But their policies and attention did little to revive Ontario's competitive status in Canada and North America. Liberal Party leader David Peterson (1985-1990) and New Democratic Party (NDP) leader Robert Rae (1990-1995) led Ontario down similar paths during their governments. Both premiers expanded the social welfare programs and enhanced government employee contracts during their time. This would appear to be fitting for their parties' stances, but it proved costly for the province during a period when national Prime Minister Brian Mulroney instituted the national Goods and Services Tax simultaneous with steady increases in the Ontario sales and income taxes (Bothwell 1986). Peterson and Rae would be remembered more for their efforts to assist in Quebec's negotiations for a proper place in the confederation than for any domestic achievements.

A new, though not in all ways better, Ontario was forged as the Progressive-Conservatives returned to power under Michael Harris's leadership in 1995. Harris either intentionally or unintentionally was an adherent to the "New Public Management" (NPM) strategies that had swept across a number of other Commonwealth nations, as well as the United States, beginning in the 1980's. The United Kingdom under Margaret Thatcher, New Zealand under the Labour Party, and the United States with its National Performance Review all pursued a new, entrepreneurial vision of government. Central among the NPM reforms was "market"-based reasoning and a "customer"-oriented governmental philosophy (Barzelay 2001). Harris showed his loyalty to this thinking through deregulation and privatization efforts in the Ontario public services. But his government pursued other reforms as well. Not only was Harris's "Common Sense Revolution" about simplifying rule structures and offloading functions to the private or voluntary sectors—it also simplified organizational structures, especially with a focus on reorganizing and consolidating Ontario's municipalities. The last strain of reform in Ontario under Harris was a reaction to the overextension of governmental effort during the Petersen and Rae governments that preceded it: Harris engaged in an active downsizing of agencies and programs early in his mandate.

Mike Harris had been the Progressive-Conservative Party leader since shortly before the 1990 election where the NDP and Rae gained power. During the 1990 election campaign, his most vocal policy stance was to cut taxes, but this was insufficient to win the day. But five more stagnant years, as well as an expansion of the Progressive-Conservative Party's policy stances shifted the party's fortunes, with the P-C's taking 45 percent of the provincial vote and nearly two-thirds of the provincial parliament's seats. Harris had drafted the "Common Sense Revolution" in 1994 as his party's stance for reform and reorientation of Ontario government. This proposal followed in the footsteps of Margaret Thatcher's and Ronald Reagan's policies for their countries, but with some modernization into the 1990's. The "Common Sense Revolution" was still heavy on tax cuts, with the promise to lead Ontario from its status as the most-taxed province to the least-taxed province (Ontario P-C Party 1994). As evidence of one of Kingdon's (2003) "policy windows," where a specific policy idea awaits its proper application rather than the reverse possibility of an orderly search for solutions to public problems, the province was now willing to support Harris's central policy theme. Other parts of the "Common Sense Revolution" included the reduction of government spending, deregulation of private industries, reduction in the government work force, balancing the budget, and work-oriented welfare reform similar to what had been occurring in American states like Wisconsin and Michigan (Struthers 2000).

Harris's tax and spending cuts were the most salient aspects of the "Common Sense Revolution." Commentary during the late 1990's was divided between those who contended that Ontario's economic recovery could not have happened without them, and others who lamented the shoddy status of Ontario's public services. There were other components of the Harris Revolution that drew less press attention, but were still significant. Privatization was a part of the reduction in the size of the government, and included land sales and the offloading of the Liquor Control Board of Ontario early in the new government's term. One of Harris's chief advisors, Tony Clement, led several municipal reorganizations and accountability enhancements in his role as Minister of Municipal Affairs and Housing. The "Who Does What?" task force pushed for the consolidation of smaller municipalities with surrounding jurisdictions, to create municipal economies of scale. The provincial government negotiated with municipal interests to trade management of public housing for expanded school system oversight. Harris's education reforms included standardized testing and a voucher system to provide Ontario parents with funding support to send their children to private schools. And in an effort to provide citizens and government with a better sense of the quality of municipal programs and services, Clement instituted a unique municipal benchmarking program which would be mandatory in all 448 Ontario municipalities.

Ontario may not have been the earliest implementer of E-government initiatives, but it was the location for an enduring and comprehensive engagement of the whole range of possibilities. Ontario's population of 12 million residents is spread over more than one million square kilometers (415,000 square miles). Much of the population resides in the densely populated "Golden Horseshoe" alongside Lake Ontario; but the more remote the population, the harsher the climate they endure and the more difficult their movement to urban centers. E-government entered the lexicon of Ontario government in 1998, largely in keeping with the "Common

Sense Revolution" and its pursuit of reducing the size of government and its budget ("War on Waste") but also to better coordinate services for citizen use ("Scientific Management"). The Harris government hired a Chief Information Officer (CIO) in Joan McCalla, who expanded strategic business planning in the government's ministries to include Information and Information Technology plans; one common option for which her office advocated was Electronic Service Delivery (ESD). Initially, Ontario's government pursued Information Dissemination, Interaction, and Integration/Transaction programs. While the planners recognized that Ontarians were technologically advanced, they recognized that this was not a unanimous condition among its citizens. To enable the broadest swath of the population to participate in Web-based options, they assisted with the installation of ServiceOntario kiosks in provincial and local government buildings, libraries, and shopping malls. Inclusiveness was a guiding value for E-government implementation (McCalla 2008). Within five years, the government received multiple recognitions and awards for initiatives in these areas, including:

- HealthyOntario.com, which provides consumer health information in English and French to various classes of Ontario resident (specifically, women, children, and the elderly), and serves as a portal to government and private health service acquisition. It won a 2004 "Webby" Award from the International Association of Business Communicators as well as recognition from the Canadian Public Relations Society in 2003.
- Ontario Land Information is a geographic information systems database for the entire province, used by all levels of government and real estate and land development clients. It received a Pioneer Award from the International E-Government Awards program in 2003.
- The Ontario Parks Reservation and Registration Service allows residents to reserve and pay for campsite and other recreational facility reservations throughout the province. In 2000 it won an Award of Excellence in Government from the Canadian Information Productivity Awards program.
- The Integrated Service Delivery Initiative enabled multiple agencies that deal with shared issues to communicate electronically, including human service, environmental, and public safety groupings. It won a Gold International Innovations Award for 2001-2002 from the Commonwealth Association for Public Administration and Management (MBS 2004).

This last initiative started the Harris government on the path to a larger reform involving the coordination of related programs and services that had previously suffered from a "silo" mentality. Traditionally, government agencies reside within their own areas of expertise, and have difficulty coordinating efforts to address policy problems with dissimilar service providers. The ISD broke down a technical barrier between these agencies, in keeping with the "joined-up government" philosophy pioneered by the United Kingdom in the late 1990's (Bogdanor 2005). In this way, E-government provided not only an advancement of public service provision, but a more comprehensive redesign of public policy treatment in Ontario government. This was still in keeping with the "Scientific Management" reform tide, with its focus on a change in process to bring resources and services in response to client group needs differently than had occurred in the past.

The "Common Sense Revolution" and Harris's subsequent "Blueprint," which assisted in the P-C reelection in 1999, did lead directly or indirectly to some policy failures. Environmental deregulation was partly to blame for the Walkerton tragedy, wherein seven people died and over 2,000 were made ill from an undetected e. coli outbreak in a western Ontario farming community (O'Connor 2002). Water quality control in the local water system had been privatized and occurred less frequently than in the past, both allowed under Harris's new guidance. While the welfare rolls in Ontario dropped, homelessness rose. Also in the area of privatization, the "public-private partnership" to build and operate Highway 407, a busy ring road around Toronto, was readjusted to gain short-term revenues for the provincial government, but critics claimed that the changes were unfavorable for Ontario's citizens (Mylvaganam and Borins 2004). The Progressive-Conservative Party's fortunes were not helped with the summer, 2003 blackout, shortly before the provincial election; the P-C's had been discussing the privatization of Ontario Hydro.

Harris resigned in 2002, leaving the Progressive-Conservative Party to Ernie Eves. He led until the P-C defeat in the fall, 2003 election, whereby the Liberals under Dalton McGuinty won 45 percent of the vote and almost three-quarters of the parliamentary seats. McGuinty, like Harris, had failed in his first run at the premiership in 1999. Between elections, he worked more on his presentation style than on the substance of the Liberal Party platform. His mantra in 2003 was, "choose change," a phrase that proved to be effective following the crises and disasters of the new millennium. In essence, McGuinty proposed to reverse the spending cuts of the Harris years, and to stop the pattern of tax cuts that were postponing the achievement of a balanced budget. He promised to consult with the public before instituting any tax increases, other than those involving a change to corporate tax revenues. Once in office, McGuinty pursued a spending plan that appeared to be well aimed at increasing Ontario's future prosperity. Among his spending priorities was a new infusion into the province's declining university system and the improvement of Ontario's five border crossings with the United States.

PARADIGM SHIFT TO E-DEMOCRACY

It should not be surprising that such a wide swath of change met with mixed results, including some notable successes as well as some tragic failures. In 2003, the Progresssive-Conservatives lost an election to the Liberal Party, and Dalton McGuinty rose to the premiership. He has continued some of Harris's reforms, shelved others, and instituted a new reform philosophy within the province's public services. There was one prominent line of the New Public Management that Harris neglected—enhanced mechanisms for participation and networking across stakeholders, in essence, the reinvention of governance. McGuinty saw enhanced citizen participation as a way to gain broader support for some reforms, and a way to legitimize the province's efforts at pursuing some controversial change. Enhanced democratic participation is the central tenet of McGuinty's leadership through the first years of his government.

McGuinty had been in politics since 1990, serving as a member of the provincial Parliament in the same district (riding) where his father had served before him. Dalton's brother, David, also serves in the Parliament. As leader of the Liberal Party since 1995, he was on the losing side of one election (1999) and two winning campaigns (2003 and 2007). He is an unassuming man, average in build and with a self-deprecating sense of humor about his looks and charisma. He has some effective qualities to serve a leadership style anchored in a consensus approach: First, he is naturally bilingual, having grown up in an Ottawa household with a French-speaking mother and an English-speaking father. Second, possibly as an outgrowth of his father's political roots, Dalton McGuinty stresses his desire to listen to others' opinions and ideas consistently and authentically. Among the links on his personal Web page as Ontario Premier are expected ones offering his biography, descriptions of favored policies, but also two links titled “Your Thoughts” about Ontario issues (“I’m always looking for new ideas on how to make Ontario an even better place to live and work”) and “Have Your Say” on the Province’s Poverty Reduction Strategy.

The idea of public input and a listening style were not prominent during the 2003 election, but would become important pillars once McGuinty and the Liberals gained power. Budgetary matters were prominent from the start of the new government’s mandate, but with the policy failures of recent years (Walkerton, the SARS epidemic, the major blackout, and others), McGuinty was wise to initiate a campaign to consult with citizens on major policy initiatives. In this spirit, the Ontario Ideas Campaign and the Budget Town Hall were organized, both with important E-government components.

Ontario Ideas and the Town Hall were the information-gathering component of province-wide strategic planning efforts in 2003 and 2004, respectively. The Ideas initiative wisely targeted staff input first on ways to improve existing provincial services and programs. The process was run by the Ontario Public Services (OPS) office, and included focus groups, educational sessions, and a Web page designed to gather ideas from 63,000 employees. It was important to start with staff input before gaining citizen input for two main reasons: First, staff would implement any ideas, and had the strongest ties to effective redesign and innovation implementation, since any new ideas used out of the process would directly affect their daily work lives. Second, the Ideas Campaign could serve as an effective practice run, since the same techniques would be expanded from the government work force to over 12 million citizens.

Fifteen hundred public servants participated in the focus group component of the Ideas Campaign, but these numbers were dwarfed by the participants who chose on-line input mechanisms. A password-protected Web site was created so that employees could provide ideas about improving Ontario’s government functions, costing $40,000 Canadian (about $30,000 US). For those employees uncomfortable with the Web, fax and telephone hotline options were also available. Over 90 percent of the 11,000 employee suggestions were entered on the Web site, and were used to develop agency (or ministry) Business Plans for subsequent years, as well as framing the public input for the Budget Town Hall.

In early 2004, the citizen-focused participatory planning process began. This effort actually had three components. Like the Ideas Campaign, there were focus groups throughout the province, in nine different cities, and a dedicated Web site (supplemented with phone, mail, and fax options) to gather ideas and opinions. The Budget Town Hall also included consultations between ministry civil servants and affected interest groups. Participants in both the face-to-face interactions and via the Web site were asked for their opinions on resource allocation, but with some constraints. Premier McGuinty, after all, had been elected via a campaign with a few policy priorities. Thus the citizens were asked to allocate budgetary dollars (identified as a hypothetical $100 to spend) between public health, public safety, education, workforce investment, and citizen activism. One thousand citizens attended and participated in the face-to-face forums; 12,000 citizens submitted their input via the Town Hall Web site.

There are no guarantees that budget outcomes were any different, “better” or “worse” as a result of citizen input through the Town Hall process. The core impact lies within the fact that citizens were heard in the process, leading to a greater sense of legitimacy in the resulting financial plan. Premier McGuinty cited the Town Halls frequently at the beginning of his time as Liberal Party leader, and planned several more of these participatory exercises to discuss the balance of business interests and environmental protection as well as conservation concerns throughout the most developed land in the province surrounding the cities of Toronto and Hamilton.

The movement after these initial exercises has been for Web-enhanced citizen and staff participation to be more mundane or routinized. When the provincial leadership proposes new policy matters, "Your Thoughts" are frequently requested alongside the Web reporting. There are elements of the "Scientific Management" and "War on Waste" reform tides in these on-line discussions; they are less expensive than face-to-face citizen forums and enhance the proliferation of new ideas that may make government more efficient. The Ideas Campaign has elements of "Liberation Management," as provincial staff are free to express their ideas for advancement of their services, and in turn are heard by OPS. Citizens also feel a sense of empowerment or liberation in helping to set the province's budget, even if their role is small. The Town Hall also serves a "Watchful Eye" function, as citizens engage the budget early in its formation, rather than afterwards once the plan is complete.

It is interesting to note some facets of this participatory application of E-government. First, when approximately one thousand citizens showed at public forums and nearly 12,000 responded via e-mail or the Web, it is clear that the on-line mechanism enhanced participation through its ease and reduction of other practical constraints like travel and length of the meetings. Input from the face-to-face forums and the on-line mechanisms was relatively uniform. Second, this was clearly a more productive method for gaining staff input than citizen opinion; 11,000 out of 63,000 public servants responded with ideas, while 12,000 out of 12 million citizens participated with their sentiments on the budget (with some redundancy likely among responses in both groups). Staff is more vested in the process than are citizens, because of the budget's ongoing impact on how their day-to-day work is carried out. Third, is 1,000 face-to-face participants and 12,000 on-line participants a representation of a glass that is half empty (or indeed a smaller fraction) or half full? When overall participation is so low, even in voting at general elections, any "bump" in citizen input could be regarded as a starting point for greater engagement.

CONCLUSION: THE PROSPECTS AND PERILS OF PARTICIPATORY E-GOVERNMENT

Ontario offers a wide-reaching case example of E-government experimentation, with its exercise of a wide range of technological and policy applications during the past ten years. In 2003, Ontario was unique among federal subnational governments in North America for its use of E-government in enhancing citizen participation in policymaking, and has much in common with most American states, Canadian provinces, and many municipalities for other uses of E-government in the areas of information/presence, interaction, and integration/transaction. These applications match with the reform "tides" functioning within most North American governments, though the place of participatory E-government techniques expands the most recent tides, "Watchful Eye" and "Liberation Management."

Is Ontario better off for the enhancement of citizen participation via E-government techniques? Narrower still, is Dalton McGuinty better off? McGuinty is the first Liberal Premier in Ontario to guide his party to reelection since Mitchell Hepburn led two assemblies between 1934 and 1942 (in wartime); the only other Liberal to repeat before that was Sir Oliver Mowat, during the latter third of the 19th century (Schindeler 1969). Premier McGuinty's mandate was largely maintained in his second victorious election, losing only one parliamentary seat and garnering only three percent less of the overall popular vote (42 percent). Given these historical roots, McGuinty is charting new territory in contemporary history. His uniquely well developed philosophy of citizen inclusion is a likely explanatory factor for his electoral success. In common with all successful applications of information technology, the Ideas Campaign and Town Halls were improved through optimization of E-government techniques, specifically to drive enhanced participation in the two deliberative processes.

According to John Ibbitson (2001), Ontario is a difficult province to lead; its citizens have had a difficult time adjusting to secondary status within Canada, behind more politically influential Quebec and more economically successful Alberta. Harris and McGuinty both implemented reform agendas that were supported by contemporary techniques and technology, but McGuinty pushed them further into a territory of collective political will and support, which seems to have ensured the sustainability of his electoral mandate in the face of a fickle public. There is more participation in McGuinty's public decisions, but the Web-based participation may be less developed than face-to-face focus group participation. In essence, the E-government participants may be involved in a more knee-jerk rather than a well-crafted deliberative response to policy questions. There is no substitute for personal contacts in a community setting to enhance the strength of society (Putnam 2000), and it may be dangerous for citizens to think that their Web participation is an equal alternative. McGuinty may combat some of the "shallowness" of Web participation through active use of educational components within the Web site, including a weekly personal blog or video "journal" on important policy topics. It appears that more dimensions to the E-government program in Ontario are helpful in maintaining its success; but the most important factor may be Premier McGuinty's single-minded determination to listen to input from citizens (and staff) who desire to be heard.

Ontario has pursued strong efforts to reduce the digital divide with regard to Internet access for all of its citizens, first through the broad provision of "kiosks" in public places, then through widespread Broadband access throughout the southern tier of the province. Currently, three-fourths of urban Ontarians can access the Internet, but only 65 percent of small town and rural residents can do so (Statistics Canada 2008). These figures reflect continued improvement throughout the Twenty-first century. No studies have been performed to assess whether all Ontario citizens interested in participating in Town Halls have been able to do so, but the twelve thousand on-line participants expanded dramatically upon the face-to-face focus group participants. There may remain some number of citizens left out of Premier McGuinty's participation initiatives, but the shrinking of the divide for conventional E-government access bodes well for the ability of more Ontarians to contribute to governance dialogs wherever they reside.

What remains is a need to ensure that the quality of E-deliberation contributes positively to Ontario governance. Based on some pilot Internet-based "consultations" in the United Kingdom, Stephen Coleman (2004) has recommended the following:

Citizens should not be given the impression that online consultation is a free-for-all rant fest, a virtual surgery for raising personal problems or a techno-populist experiment in direct democracy. A key to the success of online consultations is the clarification of actors' rights and responsibilities and the honest management of their expectations. (17)

The participation initiatives in Ontario hold promise as an example for other large governments to bring citizens into responsible roles in government decision making. If treated seriously by both parties, citizens and the standing government may benefit mutually from such an improved dialog.

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KEY TERMS & DEFINITIONS

Administrative Reform: Modernization techniques to improve the performance of bureaucratic programs and agencies.

Digital Democracy: The use of the Internet or other computer technologies to enhance governance processes such as voting or participation in public hearings.

Integration: The movement of government transactions to the Internet, via a combination of information databases and interactive Web sites to gather information and payments for services.

Interaction: E-government techniques to enhance two-way communication, most prominently e-mail and discussion forums.

Liberation Management: The movement of government services toward a more modern vision of the state, consistent with the use of business techniques and practices; a greater focus on customer or client need; and use of and responsiveness to technological and societal advancements.

New Public Management: A group of administrative reforms designed to modernize governments into the Twenty-first century. This term, used mostly in Europe, especially recognizes reforms that privatize or outsource the provision of governmental services.

Reinventing Government: The American version of the term, "New Public Management." This set of reforms, initiated by Vice President Al Gore in 1993 involved the use of business practices and a "customer" orientation to the delivery of bureaucratic services.

Scientific Management: Classic enhancements to bureaucratic programs and agencies, based in the strengthening of command and control structure, clear rule orientations, the use of expertise to run systems and processes, and rational, informed decision making.

Watchful Eye: The enhancement of citizen and interest group participation in governmental decisions.

ENDNOTES

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Chapter 28
Accountability and Information Technology Enactment:
Implications for Social Empowerment

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ABSTRACT

This chapter focuses on the use of information technology (IT) in government and its possible impact on governance, particularly in terms of addressing the equity concerns of meeting the basic needs of regional subpopulations. In Building the Virtual State, Jane Fountain develops her theory of technology enactment (in essence, a variety of bureaucratic behaviors reacting to IT) and then applies that framework in three case studies in the book. This inquiry examines government IT enactment in various global settings to assess (1) where and how enactment occurs and (2) what, if any, effect enactment has upon governance in particular settings. The first section traces relationships between a nation's IT development policy and that technology's potential to promote equity in that society. The next two sections report (respectively) on the study and observations that emerge. A brief case study about the Gyandoot, an intranet system in rural India, examines the reality of e-government as a means to promote social equality. A concluding discussion reviews those observations as they relate to the human initiative in efforts to harness information technology to achieve public goals, especially those intended to improve social wellbeing in poor societies.

INTRODUCTION

In October of 2005, some twenty-five members of the American Society for Public Administration attended a conference held at the University of Electronic Science and Technology of China in Chengdu. Among the 191 papers presented there, more than forty focused upon some aspect of e-government, mostly within local governments in China. Nonetheless, current scholarly interest in e-government in China and elsewhere generally follows a broader stream of public management research on the effects of computers in government dating back three decades, and that research in turn

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stemmed from earlier attention to socio-technical-systems by mid-twentieth century organization theorists.

Yet the current Chinese interest in e-government appears theoretically salient for a variety of reasons—foremost among them that it emerged amid national governmental and "free market" economic reforms during the 1990's that paralleled the New Public Management (NPM) movement in the U.S. (Lan, 2005, p. 9). Advocated by political conservatives, the NPM calls for government to reduce bureaucracy and operate "more like a business." Thus, Chinese experiences with e-governments evoke broader questions about public sector uses of information technology (IT) and the quality of governance in various national settings, particularly regarding causality—does public IT use affect (improve) governance or the other way around? And if this IT-governance relationship does exit, can it bridge the divide between rich and poor in particular nations?

This chapter focuses on IT use in government and its impacts both on the quality of governance and its potential for reducing economic and social inequality within nations. In Building the Virtual State (2001), Jane Fountain develops a theory of technology enactment (in essence, a variety of bureaucratic behaviors reacting to IT) and then applies that framework in three case studies in the book. This inquiry examines government IT enactment in various global settings to assess (1) where and how this enactment occurs and (2) what (if any) effect enactment may have upon governance in particular settings. The first section offers brief discussions of the three primary concerns under examination in this chapter: (types of) information technology systems, information technology enactment, and governance in a cross-national perspective. The second and third sections report (respectively) on the study—how cases of technology enactment were accessed—and observations that emerged from the study. A forth section discusses those observations in regard to technology enactment as it applies to cross-national settings. Supplemented by a brief case study below traces efforts that enlist e-government in central India, a fifth section examines the implications of those observations for government use of information technology to promote social end economic equity.

BACKGROUND: INFORMATION TECHNOLOGY AND GOVERNANCE

This section offers brief discussion of the three conceptual issues inter-related in this chapter.

IT System Type

In *Building the Virtual State*, Jane Fountain differentiates among four types of information systems found in government agencies—agency websites, interagency websites, agency internal networks, and cross-agency integration and system—ordered in terms of complexity and also of potential to bring about institutional and/or operational changes within bureaucracy (2001, pp. 99-100). In regard to the latter, she postulates that the more complex system types are especially likely to illicit reactive behaviors (that she identifies as enactment) within the organization setting.

Since devotees of the New Public Management (NPM)—committed to improving government *performance*—typically advocate technology utilization in government, it is useful to compare IT systems in terms of design intentions, or more specifically, the type of performance improvement designed into the system. Melvin Dubnick's work differentiates among four distinct characterizations of institutional 'performance'—production, competence, results, and productivity (2005, pp. 391-394). In particular, he suggests that the "production-oriented" view of performance represents "The most basic form of performance focuses attention on tasks being carried out by the performing agent. It is the view of performance associated with the process of "production" in the broadest and narrowest senses of that term" (2005, p. 392). IT systems intended to facilitate "production" would likely minimize user flexibility "to work the system"—metaphorically trapping bureaucrats in a technological "iron cage" (see Jorna & Waganeer, 2001, p. 189) as opposed to systems designed for greater user adaptability. Thus, the system design may well affect how IT is enacted by virtue of its performance intentions.

IT Enactment

In *Building the Virtual State*, Fountain's enactment argument asserts that information network intentions must contend with an array of other sense-making logics that are embedded within the fabric of institutional life (2001, pp. 83-103). Such a competition between imposed system intentions and embedded institutional logics can bring about varying patterns of technological enactment. On one hand, the design logic built into the IT system may be successful in facilitating intended changes in agency operations and/or institutional character. But on the other, the pre-existing structures, processes, norms, and behaviors may be so durable as to skew the actual use of the system (in different ways than intended), substantially obstruct system implementation, or possibly render the IT system ineffectual.

Keying in on these latter possibilities, Fountain in large part directs her enactment arguments toward NPM exponents who optimistically await the 'performance payoffs' of information technology in government. In fact, of the seven propositions she formulates in prefacing the three case studies on technology enactment (in the book), the first four emphasize the institutional obstacles encountered in integrating information technologies into bureaucratic settings. Specifically, she predicts (1) agency resistance to systems intent on reducing budget or personnel, (2) problems implementing interagency networks due to traditional federal resistance to cross-agency activities, (3) resource scarcities to undermine learning how to use IT systems, and (4) existing intergovernmental and public-private partnerships to overshadow new cross-agency networks (2001, p. 102). In summary, the NPM 'promise" of performance improvement, according to Fountain, runs counter to the inertia of institutional embeddedness within federal bureaucracies.

By subtle contrast, the remaining three propositions proffered by Fountain focus more on technology enactment as a serendipitous (rather than a necessarily resistant) formative influence that appears salient to governance trends in cross-national perspective—(5) agencies will be more inclined to support IT systems that serve constituencies that can act politically on the agency's behalf, (6) system success depends on the extent of change needed to enable the system, and (7) agencies dealing in scientific or technological policy areas are more likely to welcome IT systems than those focusing in non-technical policy areas (2001, p. 102-3). This seventh prediction has sweeping implications regarding the enactment of government information technology in various national settings. In cross-national settings, perhaps bureaucrats accustomed to working in science- or research-oriented are more inclined to enact IT than those with less exposure to technology.

Governance

At its core, the term 'governance' "… consists of the traditions and institutions by which authority in a country is exercised" (Governance Matters website[1]). Yet references to governance issues in the public management literature typically focus upon significant transformative processes at work within the institutions of a governmental entity that affect the capacities of that government and the expectations of those (individual citizens and corporate interests) with stakes in governmental outcomes (for example, see Kettl, 2000). In *Building the Virtual State*, Jane Fountain keys in on a number of "leveraging effects" of information technology with potential to change social structures and processes within bureaucracy as well as the way citizens interact with their governments (2001, pp. 18-30). Thus, it is telling that groups that monitor changes in governance appear as concerned with transformations in people-government linkages (such as extent of citizen voice, rule of law, and corruption control) as with developments related to capacity (political stability, government effectiveness, regulatory quality)—see *Governance Matters*, the World Bank's periodic assessment of governance indicators among nations (Kaufman, et al., 2006).

GOVERNANCE AND INFORMATION TECHNOLOGY ENACTMENT

How IT is used and adapted under varying political conditions signals its outreach potential to promote social equality in particular regional settings. This section elaborates on efforts to study the governance-enactment relationship and the observations that emerge from this study.

The Case Literature Reviewed

In large part, this inquiry encounters uncharted waters in its examination of IT enactment and subsequent impact upon quality of governance in various national settings. In essence, Fountain's three case studies—examining (1) an international trade data system involving several U.S. federal agencies, (2) Access America for Students (developed by the U.S. General Services Administration), and (3) the Maneuver Control System (a logistics system for a U.S. Army division)—comprise the known empirical applications of her IT enactment theory related to public agency operation. In her study of the international trade data system, Fountain chronicles how various federal agencies (for example, the U.S. Customs Service, the Coast Guard, and Immigration and Naturalization Service) enact and compromise system prototypes to preserve existing organization cultures (2001, 107-146). In similar respects, her examination of Access America for Students—essentially a multi-agency information system—raises issues about whether such cooperative IT efforts can engender long-term coordination among bureaucracies (2001m 147-166). Her study of a logistical data system in a US Army division traces how IT enactment alters management roles and shifts discretion in this unit's hierarchy of authority (2001167-192). The intent herein therefore is to review case studies of IT use in government bureaucracies within various national settings in search of counterpart examples of Fountain's enactment theory at work.

In search of further information regarding bureaucratic experiences related to IT-systems, inquiry here depends upon a five-year (2003-2007 inclusive) review of fourteen academic journals in the areas of public administration, development administration, technology and society, government information, and public finance[2]. This literature search was intent on locating *specific case study material* that could be gleaned to assess bureau-cratic dynamics related to IT-system experiences in government. At minimum, these articles need to comment on how bureaucrats (or in some cases, other policy actors) were affected by the technology and/or how they responded to it. In all, twenty-nine articles were located relating to various types of public agency IT-systems in thirteen national settings. It is difficult to determine if this sample is representative of IT uses generally.

The difficulties and limitations encountered in this information-gathering effort are important to note. First, some journals included (particularly those from outside the social science areas) are understandably focused upon system description or advocacy rather than upon the political implications of technology in government. In a similar vein, some authors focused their commentary on description or advocacy more so than on critical analysis.

Table 1 breaks out 28 systems by the IT system typology that Fountain introduces, wherein

Table 1. Public[a] information technology (IT) systems surveyed

System Type[b]	N	Descriptions (National Settings)
Agency Websites	10	Municipal e-government ([3] China, South Korea, Taiwan, U.S.); Federal-Level e-government ([2] U.S); Websites supporting relevant political community[a] ([2] Egypt, U.S); Other ([3] India, Taiwan[c], U.S.)
Interagency Websites	3	Municipal e-government ([3] China)
Agency Internal Networks	13[c]	Various Functions (India [2], Mozambique, Malaysia, Netherlands [2], South Africa, South Korea [2], Tanzania, U.K. [2], U.S.)
Cross-Agency Integration and Systems	2	National-Level Multi-Agency MIS (Jordan); Municipal-Level Capital Planning/Budgeting System (U.S.)

Total: 28[c]

a. Two studies of IT systems used by political communities making demands on government (Copts in Egypt [Brinkerhoff 2005] and health care advocates in the U.S. U.S. U.S. [Brainard 2003]) are included with those of governmental entities. Also, Taipei City (Taiwan) system described in two studies (Chen et al. 2003; 2006)

b. IT Types introduced by Fountain theoretically associated with varying degrees of institutional change and operational change (2001 100)

c. South African and Tanzanian systems compared in same article (de Vreede et al 2003); thus, 28 systems discussed in 27 articles.

types range from basic agency websites to complex cross-agency integration systems (2001 p. 100). Most of the technologies accessed in this study fall into either the agency website (10) or agency internal network (12) categories. It should be noted however that each type in Table 1 includes a wide variation of IT-systems. These variations are especially noticeable within the agency website category that includes systems in municipal agencies, national-level bureaucracies, and even (two) citizen-interest groups seeking access to government (Brainard, 2003; Brinkerhoff, 2005).

Observations

Essentially, the scope of inquiry here encompasses possible interactions among three variables: the IT-system, enactment behavior in response to the system, and the nature of governance in the system's national setting. (In actuality, more issues are involved since these variables subdivide into more specific component issues—for example, attention to IT focuses on design and implementation, as well as intent, of the system.) Although logic offers several combinations of conceivable interactions, five possible causal relationships surface as pertinent to the question of IT enactment as it pertains to national governance.

The first two possibilities posit governance as a determinant both of the nature (as well as design and implementation) of IT systems and how they are enacted by bureaucrats or other government actors.

1. *Current governance status determines IT-system enactment as a form of discretionary behavior.* Here, more pronounced forms of enactment might be expected in nations with more established democratic traditions that allow administrative actors discretion in how they achieve public goals. A second possibility stresses the nature of the system more so than the link between governance and discretion (assumed in the first):
2. National governance determines the function and role of the IT-system that in turn evokes particular patterns of enactment behavior.

For both possibilities 1 and 2, interactions are presumed as non-recursive—that is governance stimulates behaviors that in turn have the potential to reshape governance. Alternatively, governance can be viewed as a dependent variable affected by the impacts of IT-systems and/or its enactment. This presumes that particular system designs provoke enactment behaviors with capabilities to reshape governance:

3. IT-system use, design, and implementation evoke enactment responses that impact upon governance.

A variation on this third proposition might qualify enactment impacts on governance as occurring only in certain settings (depending upon conditions specific to the national setting)—in other words, IT-systems affect governance in "certain" situations (requiring contextual explanations specific to the situation).

Fourth and fifth possibilities would discount IT-system enactment (beyond intended system behavior) as a factor affecting governance:

4. IT-systems affect governance but merely as intended by design and function.

This implies that any institutional change brought about by "the virtual state" is a function of design and intention. Finally, it could be the case that neither systems nor the behaviors they evoke significantly affect the status of national governance:

5. Neither the IT-system nor how it is enacted has any bearing on the character of national governance.

Eighteen of the articles reviewed offer sufficient descriptions to determine enactment behavior. Table 2 orders brief enactment descriptions according to the World Bank's Voice and Accountability indicator (that ranges from -2.50 to +2.50). Table 2 also shows changes ("up" or "down") in this governance measure as the difference between 2006 and 1996 scores—the earliest and most recent indicators available (these "change" variables turn out not to be significant).

In regard to causal possibilities 1 and 2 (above), no discernable patterns emerge from the ordering in Table 2 to support the case that governance has a determining influence on how IT-systems are enacted. To the contrary, similar variations of (system-resisting, opportunistic, and norms-promoting) behaviors appear both at the low and high ends of the Voice and Accountability scale. Similar orderings emerge in arraying system enactment summaries against the Government Effectiveness and Control of Corruption scales (not shown) with only two and three ordering differences, respectively—thus, it is doubtful that patterns from any of the World Bank governance indicators would emerge supporting "governance" as an independent variable.

Nonetheless, some of the individual summaries shown in Table 2 convey enactment behaviors[3] that appear formative in changing governance norms in their respective societies. At the low end of the scale, for example, municipal information bureaus in China (see 3-1) use e-government systems intended to promote transparency but also to establish privacy norms that protect citizens from "transparency"—that is, the exposed two-way flow of information to and from government. And in Mozambique (3-5), India (3-6), and South Korea (3-9), policy actors "use" IT-systems as platforms for advancing democratic norms that have the potential to improve governance. Alternatively, at the high end of the Voice and Accountability scale, two IT-systems related to health care—monitoring nurses in the UK (3-15) and physicians in the Netherlands (3-17)—engender professional resistance with the potential to bring about institutional change in national ministries. Further, enactment in response to some systems in the US (3-11, 3-12, and 3-14) appear to position public agencies well in relation to their private-sector counterparts.

Table 2 then includes a number of assessments suggesting that human enactment behavior (apart from that intended by IT-systems) either contributes to governance or at least affects how norms

Table 2. System enactments by voice and accountability governance indicator, governance matters 2007

Voice and Accountability Scale (all system enactments found)	
Low *High*	**China: -1.66 *no change***[a] (3-1) At a decentralized level, local agencies decide what information the public "owns;" and rightful dissemination procedures on behalf of citizens amid national imperative for "open, transparent" government **Jordan: -0.62 *down .23*** (3-2) Ministry officials resist systems; don't support technology-management **Malaysia: -0.34 *down .07*** (3-3) system works against the creativeness of more experienced editors in govt. publishing house **Tanzania: -0.26 *up .44*** (3-4) Systems facilitates citizen participation through anonymity **Mozambique: -0.06 *down .04*** (3-5) use the system as argument for improving local conditions; network provides agenda for "counter-networks" **India: 0.35 *up .27*** (3-6) system reform provides policy maker a means to champion large-scale policy issues (Andrah Pradesh) (3-7) Low-cost access to information infra-structure helps grass-roots intermediaries "interpret" system information in a local context **South Africa: 0.60 *down .23*** (3-8) Manager-facilitators of citizen participation lose "face," control of dialog **South Korea: 0.71 *up .24*** (3-9) System strengthens political leader spearheading anti-corruption reform **United States: 1.08 *down .25*** (3-10) agencies establish barriers to resist IT-driven citizen participation processes (3-11) Bibliographic Reference Service seen as an incursion into the private index-citation market (3-12) IRS uses e-file as a means to strengthen collaborative alliances with the tax preparation industry (3-13) IT communications systems in human services make network more exclusive, as it constructed barriers to participation by some organizations (3-14) Budgeting and planning officials use system as a means of political positioning for upcoming bond elections **United Kingdom: 1.42 *up .38*** (3-15) Nurses use system with "resistive compliance;" the system doesn't deskill, but facilitates professional conversation (3-16) Hospital system enhances middle-management in synthesizing system information for top management decision-making **Netherlands: 1.67 *up .19*** (3-17) 50% of physicians resist prescription; adverse to professional culture (3-18) IT control systems obscure discretion (not destroy it);induce employees into interpretation that mediates human practice and system information

a. *Change, up, down* shows comparison of 2006 measure against that of 1996, the first year for these *Governance Matters* indicators.

evolve in significant bureaucratic institutions. It is instructive to determine if any of these IT-systems are essentially "designed to be enacted," and if so, how those cases differ (in terms of design, use, and/or implementation) from those that clearly are not. The "open government" system in Shanghai (see 3-1) stands out as a case where the system has been intentionally designed to incubate openness norms, not only to promote a global trade image but also to protect citizens against government misuse of transparency. A participant on the municipal information committee describes the system by focusing upon the good faith of city government in establishing such a system. In particular, this author elaborates on intentions to sustain ongoing collaborative processes within various departments to make necessary adjustments needed to support openness norms:

In terms of channels for disseminating information, we have stressed putting the people first, and providing convenience and benefits for the people. In addressing different types of information, we have tried to guide all departments to choose the public dissemination channels and methods most suited for the characteristics of each type of information…In terms of establishing mechanisms with long-term effects, we have stepped up ef-

forts. These mechanisms include a Guide to Open Government Information Norms, organizational training, supervision and inspection, dispute resolution, effectiveness evaluations, and other necessary mechanisms. All departments take open information as an opportunity to combinedaily updating and maintenance of information with the management of internal documents, construction of E-government, the reform of administrative approvals and other types of work, and to explore ways to create lasting efficiencies in our work mechanisms (Qiao, 2006, p. 30).

Designs that promote adjustment and adaptability can be found as well within prominent non-governmental organizations. A founding staff member of Transparency International (TI) explains,

Indeed, a key element of TI's success has been its choice of changing underlying structures—legal and institutional frameworks…This policy is uniquely adapted to aspects of the corruption scene. It is not the tool itself, but its finely tuned adaptability to the given context that makes it so effective (Galtung, 2001, pp. 198-199).

In a similar vein, Amnesty International's accountability statement implies methodological adaptability: "Methodologies such as impact assessment and stakeholders analysis enable us to ensure Amnesty International is delivering real and positive change for those people for whom we work."[4]

Perhaps some government agencies guided by IT-systems "designed to be enacted" can be said to take on "NGO-like" attributes—particularly, the capability to mitigate according to context in championing norms. By contrast, the Netherlands Ministry of Health adopted an electronic prescription system (to be used during patient consultation—see 3-17) that was clearly not designed to afford physicians flexibility to adapt the technology to a patient's particular situation. Since the system was not compulsory, many physicians abandoned it. Authors reporting on this system provide the following reactions from physicians: "I studied medicine to help patients as well as I can. I feel that systems like these invade my relation with patients; so I want to determine effective therapies on my own" and "I feel that the system leads to impersonal contacts, it reduces involvement. I have a lot of experience with different therapies and I want to use that" (Boonstra et al., 2004, pp. 136-137).

The Shanghai "open government" and Dutch "electronic prescription" cases appear as extremes in system design, particularly with regard to agency (or agent) capabilities to "work" the technology and adjust to context. The former might be said to resemble a "mini-Transparency International" with considerable autonomy to use its authority on behalf of openness norms. No such authority was possible in the Dutch case, short of physicians opting out of the system.

If it makes sense that some government agencies can take on "NGO-like" authority, perhaps they engage in something akin to what David Weimer calls "private rulemaking." Directing attention to how life-saving human organs are allocated for transplantation, Weimer differentiates the rulemaking processes of the Organ Procurement and Transportation Network from the standard regulatory rule procedures under the Administrative Procedures Act of 1946. In essence, private rulemaking comes about when policymakers permit a public entity to circumvent the standard procedures in favor of rule adoption through stakeholder negotiation. Weimer explains, "Private rulemaking involves the delegation of authority to an NGO for the rules governing the allocation of things of value. Private rulemaking provides an alternative to public rulemaking for developing the substantive content of rules" (2006, p. 578). Further, he offers three conditions under which policymakers are likely to grant this self-regulating authority: (1) "blame avoidance"—motivation to remove delicate issues from the political agenda, (2) "technical efficiency"—the imperative for stakeholders to encompass the expertise needed to make decisions, and (3) the extent that "the policy area must involve changing circumstances that demand frequent adjustment of the rules (pp. 579-580).

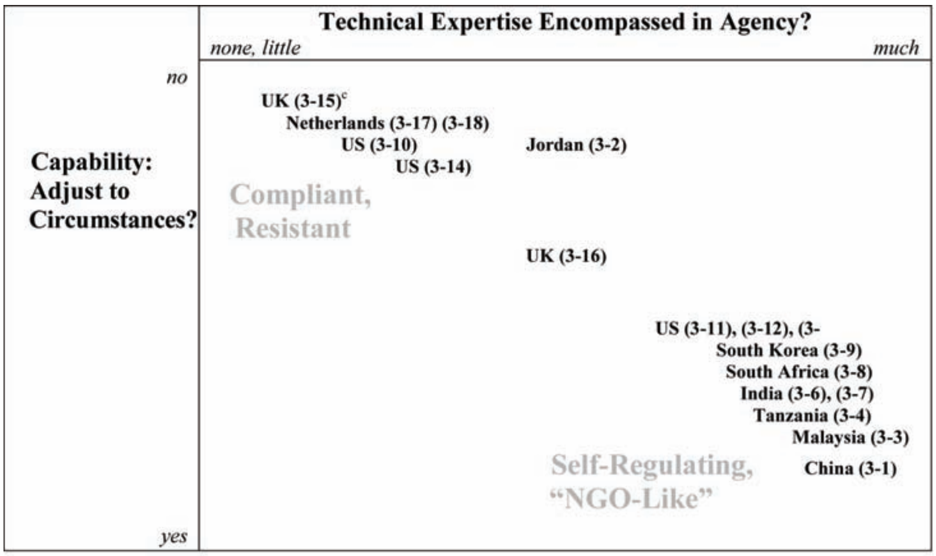
Weimer's conditions for private rulemaking authority may have applicability to the linkage between IT-system design (analogous to policy-maker intent) and agency operations affected by the system. Commentaries in some of the articles reviewed allow for rough estimates of where the IT-enactment cases plot regarding two of Weimer's three conditions—encompassed expertise and adjustment capability—but lack information about political motivations such as blame avoidance.

Figure 1 shows estimated plots5 of the IT cases on the axes of system expertise encompassed against design capability to make adjustments. Cases on the low ends of both (in the top-left) exact either compliant or resistant behaviors, while those at the high ends (bottom-right) associate with varying degrees of self-regulatory operations. The resulting differences appear more dichotomous than scalar. One of the UK cases (3-16) involving an IT systems monitoring patient diagnoses in hospital settings—yields somewhat ambiguous findings (system enhances middle-management discretion but reduces flexibility in treating patients). The plot of that case (in between the two clusters) is more representative of this ambiguity than of a "true" middle-position on the axes. Especially noticeable in Figure 1 is the clustering of comparatively self-regulating (or "NGO"-like) organizations in nations scoring low on the governance scale. Generally speaking, the systems in these cases are built upon low-end, "user friendly" technology that is widely accessible as compared to the more complex, "sophisticated" systems (for example, the Dutch electronic prescription system in the top-left cluster).

It can be said that the seventeen enactment behaviors shown in Figure 1 constitute reactions to IT-systems in place to embody regime values aligned with NPM objectives (e.g., encouraging agency coordination, promoting transparency, etc.). With one exception, systems in the top-left cluster elicit various forms of agent resistance. As mentioned above, the Dutch electronic prescription system (3-17) elicits outright resistance from physicians deciding to opt out rather than compromise their professional norms (Boonstra et al., 2004). Response to a system in Jordan appears more nuanced. There national-level bureaucrats are willing to use an imposed inter-agency system for informational purposes, but they will not incorporate it into ministry decision making (Kulchitsky, 2004). It is instructive here that this author stresses the "need for behavioral training" here to surmount this "obstacle" (a presumably managerialist interpretation.) In a second Dutch case (3-18), IT control systems are characterized as not eliminating bureaucratic discretion but instead obscuring it. This implies that reliance upon IT as a means of standardization in actuality increases (rather than reduces) the frequency of operational "blind spots" that require *more* (rather than *less*) discretion (Jorna & Wagenaar, 2007)—a paradox of sorts.

In the UK case (3-15), nurses comply with the standardization logics of a work surveillance system, but in so doing they scale back on work to the bare minimum demanded as a means of protest (Timmons, 2003). Likewise, in one US case about a system designed to enrich citizen participation (3-10), reported political and financial constraints keep municipal bureaucrats in Los Angeles from using the system beyond the perfunctory posting of public meeting notices (Musso & Weare, 2005). However, one system in this cluster did garner compliance. The integrated eCAPRIS system in Austin TX (3-14) provides standardized capital budget information needed for planning decisions in many affected departments (Canally & Neitsch, 2005). Yet even these "compliant" responses constitute significant enactment behaviors since generated information is used for political advantage in subsequent city elections.

Figure 1. IT-systems surveyed by agency (agent) technical expertise and system-adjustment capability. (a. Adapted from David L. Weimer, "The Puzzle of Private Rulemaking: Expertise, Flexibility, and Blame Avoidance in U.S. Regulation." Public Administration Review. July-August 2006, 569-582. b. Placement of systems based on rough estimates; the ordering of plots within clusters is arbitrary. c. Enactment behaviors described by corresponding entries in Table 3 and in the text.)



By contrast, IT-systems clustered in the bottom-right in Figure 1 elicit a wider range of enactment responses, a few of which appear to stretch beyond regime values. In regard to compliance, accommodation with NPM ideology in two US cases serves the entrepreneurial interests of the Department of Energy (DOE) and Internal Revenue Service (IRS). In one case (3-11), the DOE's Office of Scientific and Technical Infor-mation creates an electronic bibliographic citation system in competition with private scientific reference services (Salem, 2003). In the other (3-12), the e-file system provides the IRS leverage to partner advantageously with private sector tax preparers (Holden & Fletcher, 2005). In a similar vein, research on a number of human service agencies in the US (3-10) finds that Internet systems tend to spawn "exclusive" networks of politically influential, system-user stakeholders rather than expand agency access (Rethemeyer, 2007, 270). In each of these US cases, it appears that system responses are generally in line with NPM-induced regime values.

Yet in some of the international contexts, systems built on rather low-end technologies were indeed effective in expanding government access, particularly to marginalized subpopulations. In the Indian case focusing on the state of Andrah Predash (3-6), a top-level ministry official uses a "planned information system" to develop stakeholder partnerships among government agencies, private consultants, and marginalized groups to work effectively in a number of social as well as technical areas (Krishna & Walsham, 2005). In a similar discussion of IT systems (3-7) in rural India, authors stress that these technologies can offer "grassroots intermediaries" access in advocating for their groups at a comparatively low cost (Cecchini & Scott, 2003). From a different perspective, IT systems support the involvement of the marginalized in Tanzania (3-4) and in South Africa (3-8) by providing them the cover of anonymity in their communications with bureaucrats. Authors indicate that beneficial system impacts were more pronounced in the Tanzanian case as government officials there were originally more reticent in extending electronic participation (de Vreede et al., 2003). It should be noted that a similar case from Mozambique (3-5) is omitted from Figure 1 because the commentary lacks sufficient detail for plotting.

E-government systems were enacted in South Korea (3-9) and in Shanghai (as discussed earlier 3-1) in line with NPM objectives to make government transparent. In the former case, e-government provided the platform for "the right leader at the right time for the Seoul Metropolitan Government to launch a war on corruption" (Cho & Choi, 2004, p. 733). In Shanghai the NPM objective for transparency in government elicited the opportunity for municipal information committee members to enlist the cause of protecting citizens from government misuse of personal information (Qiao, 2006). If the design intents in these international contexts were to disseminate NPM ideals, it can be said that they also facilitated other social objectives in ways that impacted governance for the better. One "outlier" case in this cluster concerns an IT system used in a Malaysian government printing house that takes discretion away from more experienced editors (Mohmud & Sackett, 2007). With the exception of the US and Malaysian cases, the IT systems in this bottom-right cluster generally contribute to the self-regulatory capacities of agencies and tend to promote democratic social norms.

Finally, it is important to note that the various IT-systems are shown in Figure 1 as gross approximations rather than as precisely calculated plots and that the orderings of cases within the two clusters are for the most part arbitrary. And, as indicated earlier, not all of the articles reviewed focus directly on the human responses to IT systems (although some in fact do). Nonetheless, this arrangement of IT cases provides modest support for the assertion that government IT-system design and use can evoke human behaviors (or in Fountain's terminology, "be enacted"—2001, pp. 83-103) in ways that impact upon governance. Weimer's criteria for private rulemaking (2006) appear helpful in probing the link between IT-systems and human response—yet there may be other factors not uncovered in this study that could explain this relationship with more clarity.

DISCUSSION: CURRENT AND FUTURE IMPLICATIONS

This discussion section focuses on both the general implications derived from the technology-enactment studies reviewed above and specifics related to information technology as part of strategies to promote social equality. Regarding the latter, a brief case study below traces efforts that enlist e-government in central India to improve the lives of the poor.

Social Capital and Equity Issues in Developmental IT: The Case of Gynadoot in Rural India

Established in 2000, Gyandoot (meaning "ambassador of knowledge" or "messenger of information" in Sandskrit) is an intranet that connects citizens with the Dhar district government through kiosks—many of which are owned and operated by small entrepreneurs called "soochaks." The Dhar district is centrally located in Madhya Pradesh, the largest and one of the poorest among the twenty-five states in India. The Dhar government collaborates with the Gyandoot Samati, an NGO that manages the project, and with the Soochaks, in implementing this G2C system. As one analyst relates, governmental purposes in providing for the Guyandoot are two-fold:

[F]irst, to increase the international economic position of the nation by building on the success of the Indian software export industry; second, by

developing programs of "IT for the Masses" (in the words of a recent Government of India report) that would play a critical role in solving the as yet unsolved problems of development that beset large sectors of the Indian population. (Keniston, 2001, n.p.)

Through the kiosks (or "soochanalays"), citizens can access a range of departments for (about twenty) services related to financial transactions, information, or public grievance redress. In regard to citizens in rural areas, farmers frequently use the Gyandoot to access current agricultural commodity prices, land records, bank loan forms, and maps (Priya and Selvaraj, n.d.) A 2002 evaluation of the Guyandoot under the auspices of the World Bank and the Centre for Electronic Governance (CEG) lists the following among the system's stakeholders: citizens having visited kiosks, soochaks as service providers, state government employees working in Dhar, village officials, and citizens who had never sought services through the Gyandoot (Centre for Electronic Governance, 2002).

As mentioned previously, the neoliberal development agenda is to customize leveraged resources to meet country conditions—thus, the governmental goal in establishing the Gyandoot is to provide "IT for the masses." As almost a decade has elapsed since its inception, it is now fitting to ascertain both how Gyandoot "customizes" resources to the conditions in and around Dhar and whether "IT for the masses" significantly addresses social inequalities within the region. In large part, these questions can be answered by identifying particular strengths and weakness in Gyandoot implementation to date (addressed first) within a systematic framework for conceptualizing social (in)equality.

A strength of the Gyandoot can be found in its strategy to leverage social capital, or human "goodwill," in attempting to reach citizens—some of which are semi- or illiterate—with little or no experience using computers. Two elements of social capital stand out in system implementation. First, soochaks—the entrepreneurs of individual; kiosks—serve as intermediaries to assist those lacking the skills to use keyboards or to understand information technology's capabilities (Batchelor et al, 2003). To become a soochak, one must have ten years of formal education, investment capital of about $5,000 for a kiosk (if costs are shared with a village council rather than completely owned by a private entrepreneur), and attend a computer training course (although many have prior knowledge of computers). Soochaks receive specified compensation according to particular transactions undertaken in their kiosks.

Although part of the soochak's motivation to assist users is entrepreneurial (that is, to stimulate business), some of them are from the ranks of educated young people opting to maintain strong ties with their home rural villages (Cecchini & Raina, 2004). As intermediaries, Soochaks are trusted by governments, villages, and users to enact technology, both to implement Gyandoot and to offer help in developing related skills (reading, keyboard usage, information interpretation, as well as general advice)—in essence, enacting the technology. By design, this "enactor" role undercuts the traditional bureaucrat's standing to hoard information (as the gatekeeper to government) and thus to exact bribes as surcharges for access to government information.

Village councils (or Gram Panchayats) constitute another element of social capital institutionally integrated with the Gyandoot design. With the exception of the (relatively small) soochak investment, the panchayats support the Gyandoot networks and cover kiosk costs (excluding the private kiosks completely owned by entrepreneurs). As partners with the Dhar government and soochaks, village councils use leverage in establishing local priorities for how the Gyandoot is customized to meet the particular needs of a community (Cecchini & Raina, 2004). Thus, it can be said that social capital, in the form of user assistance from soochaks and system customization on the part of village councils, is a key requisite for Gyandoot success.

Weaknesses of the Gyandoot system are readily identifiable as (1) technical failures (in particular, irregularity in the electric power supply), (2) generally low usage, (3) insufficient revenue for sustainability, (4) few services actually used, and (5) non-participation of the poor. These limitations take on added significance as obstacles to human intermediaries, particularly in relation to soochaks' abilities to maintain a reasonable income. With regard to technical problems, power load-shedding in Dhar (of about six hours per day) limits the use of kiosks and undermines reliance upon information technology. The World Bank-CEG study reports that many kiosks in Dhar serve only between one and four users per day and that the average daily usage of 18 kiosks over a two-year period amounted to only 0.62. Clearly, low usage translates into revenue-generating difficulties that severely threaten the long-term sustainability of the Gyandoot. In regard to particular services, the World Bank-CEG study associates common use of Gyandoot with efforts to acquire government forms and various certifications (drivers license, caste certificates, income certificates), submit grievances against particular bureaucracies, and access current agricultural commodity (or mandi) prices (2002, pp. 11-12). Thus, the Gyandoot has provided economies preempting travel expenses and bribe payments associated with traditional means of accessing government information and services.

Yet the World Bank-CEG evaluations also reports that the poor are typically unaware that the Gyandoot exists or that it is intended for "common people" (2002, p. 25). Of (5,502) users surveyed, nearly 80% are male and 40% fall into the 30-40 age interval (17). Further, the study discloses the perception of the traditional caste barrier discourages system use by the rural poor (25). On the other hand, educated farmers are attracted to the Gynadoot as a source of reliable commodity data needed to maintain their positions in the marketplace. Here the benefits of this IT system accrue more to those with means, more so than the poor in the Dhar District.

Since program implementation is a difficult undertaking for government in any setting, it is hardly surprising that the Gyandoot has confronted substantial obstacles in its social development mission to extend technology to the poor. Questions about its longer-range potential to promote equality need to be interpreted through some appropriate theory of social equality. In his book The Spirit of Public Administration, H. George Frederickson articulates such a framework, a "compound theory of social equity," that differentiates among three types of equality:

Simple individual equalities. In individual equality there is one class of equals for which a single relationship of equality holds. The best example in the "one person, one vote" principle or the price mechanism of the marketplace that offers a Big Mac or a Whopper at a specific price for whomever wishes to buy…

Segmented equality. Any complex society with a division of labor tends to practice segmented equality. Farmers have a different system of taxation than do business owners, and both differ from wage earners. This concept assumes equality within the category (for instance, farmers) and inequality between the segments…

Block equalities. Both individual and segmented equalities are in fact individual equalities. Block equalities, on the other hand, call for equality between the groups or subclasses… (1997, p. 117).

Despite the alarming problem of low usage, a case can be made that Gyandoot has proved somewhat effective in promoting individual as well as segmented equality. With regard to the first, Gyandoot provides individuals equal access (short of differences in distance from kiosks) to access to government forms, documents, certificates, and access to data to stimulate business (primarily in agriculture). But even in reference to segmental equity among farmers, it is doubtful that this e-government system can level the agricultural playing-field between small- and large-scale farming. The ultimate success of the Gyandoot as a means of development hinges on its capability to bring about block equality between groups and subgroups, and here it struggles against the inertia of traditional caste systems and gender inequality. The efforts of soochaks in offering users assistance at the kiosks are helpful in this regard. But it appears these and other intermediary roles need to be expanded exponentially to make significant block equality advances that lift the status of the rural poor in India. In regard to the other case study findings reported earlier in this chapter, the critical need for human intermediaries underscores the necessity of IT enactment in facilitating lasting accomplishment.

Enlisting IT as a tool for promoting block equality calls for a significantly bolder commitment to the infusion of human resources for remedial outreach work as the key requisite for "reaching the masses" in regard to long-term development. It remains to be seen whether that scale of investment in labor-intensive remediation fits within the neo-liberal agenda of leveraging and customizing.

Clearly, the Gyandoot experience speaks to a number of implementation issues that temper success in bridging the digital divide in a particular rural area in central India. Nonetheless, both its weaknesses and long-term possibilities for reducing both segmental and block) inequities depend upon ultimate capabilities to create social capital, or voluntary social action based upon trust. The earlier review of technology-enactment case studies uncovered some circumstances there IT systems enabled individuals and/or bureaucracies to build social capital in such a way as to improve governance. The efforts of the Shanghai Municipal Bureau to protect citizens from the two-way flow of e-government information are notable in this respect. In other cases, IT prompted citizens to generate social capital in reaction to bureaucrats—such was the case in Tanzania where the anonymity afforded by IT facilitated citizen participation that would have been otherwise inhibited. Thus, the broader implication of the meta-study of technology-enactment cases, as supplemented by the Gyandoot analysis, relates to the opportunities that information technology systems offer for the creation of social cooperation and trust. This social capital in turn can be marshaled in efforts to reduce inequities within particular societies.

CONCLUSION

This chapter has extended Jane Fountain's theory of IT enactment—developed in reference to U.S. bureaucratic institutions—to public organizations in a range of national settings. In addition, this study examines the extent to which technology enactment on the part of those who implement IT influences the quality of governance in particular global settings. For the most part, the chapter succeeds in illustrating how bureaucratic discretion affects system adaptation, in some cases obstructing IT system development but in others steering IT toward applications that promote democratic responsiveness and/or assist poor subpopulations. However, this research does not establish a discernable relationship between IT enactment and quality of governance. Possibly, this linkage can be clarified by research efforts (not undertaken in this study) that account for the intervening role of national technology development policy (where it exists)—both as formally documented and actually applied. Such efforts take precedence on this author's research agenda.

Through its efforts to recognize Jane Fountain's enactment theory in how IT affects bureaucracies in various governments, this inquiry highlights the salience of human agency in implementing governmental IT systems. In some cases, individuals exercise their discretion in enacting IT systems in ways that promote democratic governmental processes and/or grassroots efforts to improve the quality of life of the poor. In particular, efforts on behalf of the poor in IT system implementation reported in the Tanzanian (3-4), South African (3-8), and Indian (3-6 and 3-7) case studies discussed above. Moreover, the Guyandoot mini-case attests to the specific roles of village councils and soochaks (kiosk operators) in assisting the poor.

As it relates to the digital divide, the findings from this chapter affirm the centrality of pro-poor, human intervention—apart from the mere dissemination of IT hardware and software—in addressing the digital divide in various global settings. In essence, it is this human factor in various phases of (programmatic or service-delivery) implementation that is vital in integrating IT system potential to serve the poor with user needs, awareness of technology, and personal skill levels.

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KEY TERMS AND DEFINITIONS

Accountability: the public responsibility to respond to the expectations of various stakeholders.

Block Equality: the ideal of equality between relevant groups or subclasses in a society.

Governance: the traditions and institutions by which authority in a country is exercised.

Gyandoot: an intranet e-government system in Dhar, a district in central India, intended to enlist information technology to improve the lives of the poor.

IT Enactment: behaviors of those who implement information technology that may improvise or adapt its usage from that intended by design.

New Public Management (NPM): A politically-conservative appeal for government to reduce bureaucracy and adopt private sector management practices.

Soochaks: Individual entrepreneurs who own and operate kiosks associated with the Gyandoot.

Soochanalays: Gyandoot kiosks used by citizens to access about twenty government services.

NOTES

1 see http://info.worldbank.org/governance/wgi2007/home.htm

2 Journals reviewed include the following: Administration and Society; American Review of Public Administration; Government Finance Review; Government Information Quarterly; Information Technology for Development; *International Journal of Public Administration*; Journal of Public Administration Research and Theory; New Technology, Work and Employment; Perspectives on Global Development and Technology; Public Administration; Public Administration and Development; Public Administration Review; and Technology for Development.

3 Particular enactment behaviors could be ascertained for 18 of the 24 IT systems included in table 2.

4 Text taken from the accountability statement, Amnesty International Webpage at http://www.amnesty.org/en/who-we-are/accountability.

5 Plot estimates based on a code sheet that tracks pertinent article text to Weimer's two dimensions: "technical expertise encompassed in agency" and "capability to adjust to circumstances." (2006) The code sheet is available from the author.

Chapter 29
From Inclusive Spaces to Inclusionary Texts:
How E-Participation Can Help Overcome Social Exclusion

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ABSTRACT

This account explores the use of ICT to overcome social exclusion by means of eParticipation initiatives in two spheres-health promotion and local democratic participation. They offer a contrast in terms of how we think about inclusion because the intended outcomes of their e-enablement may differ. Their construction as private or public goods affects the scope for intermediaries to act as agents of digital inclusion. In eHealth, digital inclusion is often a recruitment issue, since online discussion serves as a meeting-place where people provide mutual support to others who are co-present, whereas in local eDemocracy, inclusion is a representation issue, since online discussion is a narrative, reflecting on the political life of a territorial community. As a textual Internet is more amenable to intermediation than a spatial Internet, the possibilities for deploying ICT for social inclusion were enhanced when members of the eHealth virtual community began to 'publicise' the discursive goods they produced, which became translatable into community health benefits via intermediation and channel integration.

INTRODUCTION

It is often stated that digital inclusion or eInclusion is, or is becoming, a prerequisite for social inclusion. For example, Castells wrote that in the network society "to be switched off is to be sentenced to marginality" (2001, p.277). The Digital Inclusion Panel set up by the Office of the e-Envoy in the UK reported that "As digital communications and transactions become commonplace in many areas of daily life, people who are digitally engaged will more likely be socially engaged, and vice versa." (Office of the e-Envoy, 2004, p.34) Although there is little or no longitudinal research to demonstrate a causal relationship between digital and social inclusion (Helsper, 2008, p.17), similar assumptions are frequently internalised by users and non-users of the Internet alike, in terms of a general sense

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that not ‘having’ the Internet means ‘being left out’ or ‘missing out’. On the other hand they are implicitly challenged by the attitudes of other non-users, particularly those who have ‘dropped out’ of Internet usage not on cost grounds but stating ‘lack of interest’ or ‘no need’ to use information and communication technologies (ICT) and the Internet (Lenhart et al, 2003). Some people, that is to say, have tried the Internet, and their subjective experience is that without it they are not ‘missing out’ on anything of great significance to their lives.

The argument in this chapter questions the logic of a simple equation between digital exclusion and social exclusion, pointing to the need to qualify what it means to be ‘switched on’, ‘wired up’ or ‘digitally engaged’ in the information society. We need to remember that these are socio-technical rather than merely technological concepts, and we also need to examine critically the nature of the intended benefits of ICT use. Firstly, if we are concerned with “benefits realisation” rather than access and use, intermediation becomes a possibility for reaching the ‘digitally unengaged’, as recognised by the Digital Inclusion Panel (Office of the e-Envoy, 2004, pp.28,41). Secondly, people use ICT in a variety of settings, which act as ‘translation landscapes’ where offline and online channels intersect, so whatever information or communication processes are occurring via the Internet tend to spill over into physical settings and may be transmitted to other actors via face-to-face communication and other analogue media. The possibilities for such channel integration become more apparent when we imagine the Internet not as space but as text: whereas we commonly regard our experiences in places as unique and non-transferrable, texts are translatable and relayable. Thirdly, considering participative uses of ICT, technology offers new possibilities for producing and distributing all sorts of goods and values, and the network geometries for the distribution and consumption of different goods are not the same. In particular, when ICT is deployed to produce public goods, the consumers or beneficiaries may not need to be connected either to the Internet or to the participative process through which the public good was produced.

The aim of this chapter is to explore how these variables affect the way we might understand social inclusion when eParticipation is performed for different purposes, in different locations and in different domains. Specifically, it attempts to draw out both the differences and the commonalities between manifestations of the digital divide in the spheres of health promotion and local democracy.

BACKGROUND

This paper was inspired by the author’s personal experience as a researcher on two projects. Elsewhere (Smith et al, 2010) recruitment problems encountered in an online health promotion intervention aimed at older people with heart disease have been described. These were such that it was literally impossible to give away 180 personal computers with a year’s free Internet access. Moreover, the 108 volunteers recruited were not demographically representative, being better educated and economically better off than the priority population as a whole, indicating self-selection. This prompted reflection on the implications for social exclusion of the spread of the Internet (to rapidly become the pre-eminent information and communication conduit for a range of purposes). Given that the intervention was also designed to resemble the ‘expert patient programme’ model of healthcare, the fact that it proved so difficult to ‘market’ among a socially disadvantaged priority population, even with a substantial incentive, also raises questions about the implications of the promotion of behaviour-oriented self-care approaches, which has been characteristic of recent health policy reforms in many countries. Findings from a focus group of people who chose not to take part suggested that there was resistance to both technology adoption and to the implicit challenge to a traditional, passive model of healthcare contained in a programme designed to facilitate greater patient informedness and mutual help (Bellaby et al, 2006, Lindsay et al, 2006).

Another paper (Smith, 2008) examines the implications for social inclusion of the fact that participation in online political discussion forums is also unrepresentative, though probably no moreso than participation in traditional democratic practices. It argues that simply ‘counting heads’ or measuring socio-demographic representativeness within such arenas diverts attention from more important questions, for example about the nature of and scope for intermediation in online communication, which would be an obvious question to ask in respect of a more traditional political communication process.

The argument in the present chapter has two levels. At a first level of analysis, health promotion and local democracy are fundamentally different activities, owing to the different degrees of publicness of the resulting goods. Health is ultimately a private good, since each individual’s health status is unique, even if it is influenced by social and environmental as well as genetic and behavioural factors: action to improve health is often a very personal decision. Local democracy, whether manifest as specific policy decisions, as a generalised local political culture, or as an open public sphere, is a quintessentially public good. This has implications for who benefits from eParticipation, and what the motivations and barriers are for doing so.

In the case of the health promotion initiative, the argument then proceeds to a second level of analysis, arguing for greater focus on the collective contexts in which eHealth applications are used, in line with a social ecological model of health promotion. Some of the alarm about the potential exacerbation of social and health inequalities that may occur as the digital divide intersects with changing modes of health provision and promotion, including the growing use of online channels, results from a perspective that focuses overly on individual appropriations of technology and an individualised relationship between citizen and state. eHealth initiatives which produce organisational or community in addition to individual and inter-personal benefits would be able, like local democracy initiatives, to spread the benefits of an initiative beyond the immediate circle of direct users, through channel integration and intermediation.

Before moving on to the case studies, the following section describes in more detail three concepts that provide the chapter’s analytical framework, and attempts to distill four key research questions from the controversies surrounding their use in academic and policy-making circles.

ISSUES, CONTROVERSIES, PROBLEMS

Public Goods and eParticipation

The benefits of public participation (offline as well as online) have been the subject of considerable recent attention. According to one literature review (Involve, 2005), an important distinction can be drawn between instrumental benefits, which accrue to the sponsoring agency in terms of efficiencies or effectiveness, but also to society via improved and more legitimate decision-making, and transformative benefits, which are intrinsic to the process of participation and accrue to the participants themselves in terms of personal development, skills, confidence and social capital. A closely related distinction lies between different types of outputs of a participation process: on the one hand, public goods and values, which by definition are available to a broader section of society than only those who participate; and on the other hand, goods and values which either accrue to individuals (e.g. skills) or can be monopolised by a particular group (e.g. most forms of social capital). These distinctions have crucial implications for analysing and measuring social inclusion.

Optimistic accounts of the advent of an information society saw online resources as a public highway (Eng et al, 1998; Kollock, 1999). Kollock (1999) argues that online networking overcomes some of the motivational barriers to producing public goods (the collective action problem or social dilemma). However, their consumption also requires theoretical and empirical attention. Moreover, even if digital information is a classic public good, it is important to know how that information is used to shape 'real-world' outcomes such as health and democracy. We must deal with varying local appropriations of goods: the same goods can be socially constructed as more public in one context and more private in another (Stewart et al, 2004). ICT, for example, is typically constructed by low-income groups as a luxury item of individual consumption, to the extent that non-users may rationalise their own non-consumption of ICT and thus self-exclude themselves from its potential benefits (Schofield Clark et al, 2004; Helsper, 2008, p.20). It follows that the challenge is therefore to create alternative conceptualisations of ICT starting from a community context or a collective use habit, thus re-valuing ICT as a more public good. For example, it has been demonstrated that public Internet centres that are 'locally-owned' and adopt a 'community development approach' are more successful at helping socially excluded groups in the UK (SEU, 2005, p.43), whilst across Europe some telecentre networks are purposefully reinventing themselves as institutions embedded in a broader community context (Rissola et al, 2008; Fejer, 2008).

Research question 1: *what kind of goods are produced through eParticipation – public or private?* Are they consumed by individuals, sub-groups, communities or society as a whole?

Digital Inclusion

Digital inclusion or eInclusion can be defined narrowly in terms of increasing the use of ICT across all sections of society, or it can be defined broadly in terms of the deployment of ICT to further social inclusion goals. Most policy documents (e.g. EU Council of Ministers, 2006; Office of the e-Envoy, 2004) pay lip service to both goals, but concentrate on the former. Digital inclusion in this narrow sense is a valid policy goal, and there remains scope for further progress in most European countries, including the UK, where survey data suggest that many of those who do not use ICT are simply not aware of how they could benefit from ICT use (Office of the e-Envoy, 2004, p.67). The focus here is on issues such as access, use and digital literacy. Intermediation is increasingly recognised as a valid access channel, and in the UK there is even a cross-departmental e-government intermediaries policy for involving trusted intermediaries from the private and voluntary sectors to assist individual clients in accessing online services (Office of the e-Envoy, 2004, p.74). But intermediation tends to be seen very much as a second-best, hopefully transitional arrangement, leading towards digital inclusion in the narrow sense (DG INFSOC, 2007).

Research question 2: *- is participation inclusive (in the narrow sense)?* How many take part and are they representative of the social groups and strata in the 'community'?

Social Inclusion

The term social inclusion "expresses a dynamic and multifaceted understanding of the unfolding circumstances of people, groups or neighbourhoods at the margins of society" (Cornford & Klecun-Dabrowksa, 2003). It thus offers a more holistic perspective than a term like poverty, treating people's experiences as multi-dimensional and embedded in social relations, instead of considering only the distribution of resources in society. Social inclusion is therefore dependent on more than mere access to opportunities and to the resources an individual would need to make use of them. It implies the existence, within a certain setting, of qualities like respect, diversity, cohesion, shared goals and meanings and a feeling of belonging to a community (CESI, 2002). Thus the UK Social Exclusion Unit's report on 'tackling social exclusion through new technologies' identifies "building social networks and civic participation" alongside "building personal capacity" as mechanisms through which ICT can and should be deployed to achieve a more inclusive society (SEU, 2005, p.13). Similarly, for Phipps, "social inclusion is about 'bringing in' disadvantaged individuals, groups and communities, and involving them in decision-making, enabling and empowering them to develop and fulfil their potential in the full range of their social, community and work activities." (2000, p.54) Social inclusion policies therefore overlap with 'community engagement/involvement/empowerment' policies, and ICT initiatives which increase community engagement (as eParticipation might) can also increase social inclusion. The degree to which they achieve this is only partially dependent on the inclusiveness of the actual participants (as measured, perhaps, by sample size and statistical representativeness); it is just as dependent on creating conditions for an inclusionary discourse or discursive practice. This is because social inclusion refers to the quality or functionality of social institutions through which the process of inclusion occurs (Berghman, 1995) and to "the community context within which individuals and groups experience disadvantage" (Phipps, 2000, p.61), as much as to the resources (capital) of individuals, groups or places.

Policy-makers have begun to situate digital inclusion within a broader social inclusion perspective: both the Riga Declaration and the i2010 eGovernment Action Plan indicate that EU policy-makers were very conscious of the wider dimensions of an eInclusion agenda, including the role of ICT in the production of public goods and values, the community context of ICT appropriation and the reality and potential of different types of intermediation. The Declaration defines eInclusion as "both inclusive ICT and *the use of ICT to achieve wider inclusion objectives*", whilst eInclusion policy "aims at reducing gaps in ICT usage and *promoting the use of ICT to overcome exclusion*, and improve economic performance, employment opportunities, quality of life, social participation and cohesion" (EU Council of Ministers, 2006, emphasis added). In the domain of eGovernment, the goal is "Designing and delivering key services and public service policies in a user-centric and inclusive way, using channels, incentives and intermediaries that maximise benefits and convenience for all so that no one is left behind." (ibid.)

Rhetorical attention has also begun to turn from the goal of increasing the inclusiveness of the Internet user population in Europe towards goals of encouraging *inclusionary* public discourse and policy-making in online discussion spaces. This links digital inclusion to broader public policy goals such as furthering the integration of immigrants (DG INFSOC, 2007, p.25) or encouraging collective action and self-regulation through ICT to enhance community cohesion. "Fostering pluralism, cultural identity and linguistic diversity in the digital space" is another Riga commitment (EU Council of Ministers, 2006), and intermediation can play a vital role here. An example of an initiative whose goals could be characterised as inclusionary rather than inclusive is a series of pilot schemes in the UK to recruit and deploy 'digital mentors' in deprived neighbourhoods. Their aim is not so much to increase Internet usage or teach basic ICT skills as to support creative and expressive uses of digital media by groups and within communities (Communities and Local Government, 2008, p.44).

Research question 3: *is the discursive practice in the discussion space inclusionary?* Does it reproduce respect, diversity, cohesion, shared goals and meanings and provide enough of a (weak) shared identity to constitute a public sphere?

Research question 4: *how is the eParticipation process linked to broader social, cultural or political processes and institutions?* Does collective action 'spill over' offline through other channels and intermediaries, and how does the discussion influence policies in support of social inclusion within the relevant political community?

The following sections of the chapter offer an exploratory investigation of the four research questions via two case studies from EU countries.

CASE DESCRIPTIONS

A Czech Local Issues Discussion Forum

Local issues discussion forums can be defined as online spaces that attempt to recreate an interactive public sphere and sustain a permanent, deliberative debate that invigorates local democracy from the bottom up. They differ from most online discussion forums because they serve defined territorial communities. They also differ because of the involvement of political representatives and public officials as participants, observers and sponsors of the process. This means that debate is both vertical (between politicians and citizens) and horizontal (between citizens, or indeed between politicians). Inclusion is a fundamental goal for many. For example, politicians and civic activists involved in setting up three pilot local issues discussion forums in England as part of the Local eDemocracy National Project "expressed the hope that a diverse range of local citizens would participate in the local issues forum, which would come to represent a cross-section of the communities" (Coleman, 2005, p.11). Indeed, social inclusion could actually be regarded as a sine qua non for this type of online discussion, if, as one commentator has argued, debate must be inclusive to qualify as (part of) the "local public realm" (Davies, 2004, p.15). 'Inclusive', for Davies, refers to the quality of the discourse. Thus his use of the term inclusive, applied to a local issues discussion forum, does not mean (passively) representative of the relevant population, but (actively) inclusionary. It involves the creation and maintenance of a space where an open public debate and policy critique can occur, together with the likelihood and admissability of confrontation between the voices of sub-groups within the population which may, for the most part, lead parallel lives within enclaves. Such a discourse is inclusionary because it strives for interaction, and ultimately for some level of consensus or reconciliation, between rival perspectives, thus "channelling technology towards the public good" (ibid., p.16).

In a local issues discussion forum serving a medium-sized Czech town, which is hosted by the local authority, a qualitative meta-reading of a sample of threads, grounded in long-term, multi-method ethnographic research by the author in the same locality, revealed the practice of a certain discursive politics. This politics was usually (though not always) inclusionary, allowing confrontation between multiple perspectives on goods socially constructed as public, and enabling the voices of socially excluded groups to be heard, mostly through the intermediation of advocates (for more details see Smith, 2008). This occurred despite the fact that Internet penetration rates are still relatively low in the Czech Republic, with 35% of households having home Internet access in the second quarter of 2007, 19% below the EU average (Eurostat, 2007). It has been argued that this may constitute a barrier to the creation of an inclusive local public sphere (Davies, 2004, p.24).

Advocacy by discussion participants for offline others fell into three categories: the explicit forwarding of letters and messages from others; opening a discussion about a problem faced by known or familiar others (especially neighbours or residents of a particular district); and speaking in defence of other groups out of a general 'social conscience'. Advocacy involved channel integration, as participants routinely drew upon experiences, resources and perspectives from other media and settings. Discussions would actively explore one another's background, so that the dialogue often became one between different social positions rather than individuals. Thus when debate concerned public issues such as transport or urban development (two of the most prominent themes in the forum) spokespeople were readily found for diverse user groups, and special interest groups did not dominate the discussion. Effective moderation and site architecture (structuring the discussion around clearly-defined public policy areas linked to the Council agenda) with links to offline policy-making processes (via the frequent involvement of local authority officers and representatives) have helped maintain a focus on public issues, and the forum has assumed a watchdog function with respect to local policy-making. Direct influence on decision-making was impossible to confirm, but influence on the local political agenda was evident from mass media stories which cited the discussion forum as a source, and from several public responses by the official Council media spokesperson after controversial issues of public concern had been hotly debated in the forum. Under these conditions the tone of discussion does not seem to be distorted by the fact that the forum's user-base is quite small (approximately 2.2% of the total population) and almost certainly socially exclusive in demographic terms (though user records do not enable this to be verified).

In sum, the forum is a text with collective authorship. At its best the discussion presents an inclusionary narrative which expresses a wide diversity of experiences as they coexist and sometimes clash, and which affords legitimate opportunities for working through some of those tensions in a search for social cohesion. Even when lacking much political influence, such forums can contribute to social inclusion, for example if they enable the cultural representation of identities that are largely invisible in other parts of the public sphere. In this sense the goods produced have a value independent of their consumption by specific individuals and groups, and are best thought of as an accumulating textual narrative reflecting on (and sometimes acting on) social experience in a particular place. It is the inclusionary or exclusionary structure of this text and its ability to cross to other media channels with which we should be concerned, rather than the inclusiveness or exclusiveness of the participants as a sample according to socio-economic or demographic criteria.

An English Health Discussion Forum

Online discussion forums about health are among the most common types in existence. Their strength is that they can connect a community of interest across time and space, and thus help people who may have a rare illness to get in touch with others who have the same condition when they might otherwise have few if any chances to meet. The purpose of the discussion could range from various kinds of social support (Nettleton et al, 2002) to campaigning and political organisation in defence of patients' rights, or for better treatment. In a US-centric review article, however, Demiris (2006) maps the diffusion of virtual communities in health care and connects it to a paradigm shift "from institution-centric to patient-centric or consumer-centric systems", underlain by a discourse on patient empowerment that stresses self-awareness and personal responsibility for one's health. This perspective would position discussion-based online health promotion initiatives alongside telecare (alarms, censors and lifestyle monitoring equipment that enable patients to contact others in an emergency, or allow health professionals to monitor vulnerable patients remotely, and thus provide the patient with a greater sense of security) as service innovations whose intended effect is to enhance patients' capacity for 'independent living' by reducing the need for, or frequency of, direct contact with health professionals. An alternative discourse, however, is one that starts from a social ecological model of health promotion and a concern with the social determinants of health and health inequalities. This discourse appears to sit uneasily with eParticipation owing to the existence of digital divides, including the selective nature of recruitment for virtual communities (Ito et al, 2001). It will be argued, however, that the incompatibility may indeed be more apparent than real.

This can be demonstrated by recounting the history of a health discussion forum which aimed to confront social exclusion by targeting a deprived population, deploying a strong incentive for recruitment (the offer of a free home computer and a year's broadband Internet access), and trying to overcome skills and motivational barriers due to unfamiliarity with the medium by combining online discussion with offline group meetings. Recruitment was disappointing and self-selective, but it is argued that the failure to reach most of the priority population is partially offset in the longer term by its potential impact not on individual health behaviours but on community health and health policy.

The forum began as part of a research study examining the value of the Internet in the self-management of heart disease by older people. This involved a website based on Moodle, an open-source educational tool. The website provided participants - older people living in a northern English city - with information and communication resources, using discussion forums, blogs, glossaries and an instant messaging system, but the discussion forums have always been the main hub of activity. During a facilitated first phase lasting six months, moderators from the research team (who were sociologists, not health professionals) steered the discussion, introducing health-related, biographical and general social themes. There then followed a gradual transfer of 'ownership' to participants as a self-sustaining community of practice, until the website as it exists in 2009 can be regarded as a cultural artefact produced and managed collectively by this community, and financed by their own fundraising efforts. It has two principal discussion forums, one for health and the other for general discussion (a space for socialising), as well as two specialised forums, set up at members' suggestion, one on the environment, homes and gardens, the other on sport and entertainment. There is also a forum with restricted access for committee members to plan website development and coordinate activities. Topics for discussion therefore range beyond matters directly related to living with heart disease, and the esteem support and companionship members provide to each other is as important as the health-related informational support (Lindsay et al, 2008).

As ownership of the forum passed to participants, the perspective of the virtual community became more outward-looking. Existing links with other community organisations were strengthened and new ones sought, and the project has assumed a stronger offline dimension, including monthly committee meetings, talks to older people's groups and providing interviews and stories for the local mass media. Although the focus is still on the benefits for individual heart patients, a community health dimension is also emerging and is likely to strengthen, as participants, above all the committee members, start to publicise their own experiences as a means of attracting new users. The online discussion forum has thus become more than a place to spend time 'chatting', it also serves as a 'policy development' tool, a repository for informational resources and ideas which are used to construct a shared narrative capable of being distributed via other channels. For example, these narratives have been re-presented as slides for presentations to community groups, as bite-sized 'real life stories' on promotional leaflets, and even as material for local history projects. When these new outlets emerged, the forum assumed an information-producing as well as an information-consuming significance, and the outputs became more 'public' (in the sense of 'publishing' or 'publicising'). The collective action of a relatively small group of heart patients, collaborating online, is therefore starting to produce public goods whose value is no longer redeemed exclusively through on-site inter-personal relations. It is translatable into community health benefits via the production of offline health promotion material and events, or via the input participants can have, individually or collectively, to health policy at different local scales by taking their knowledge and experience - as 'expert patients' - into other arenas (from formal patient representative bodies to casual conversations with staff at their local surgery).

The health forum can still be read as an inter-personal conversation in which individuals provide and receive advice, company and support. At this level, it is producing essentially private goods, and the best metaphors for its functionality are spatial: it is essentially a meeting-place, of value to those who visit it. At another level, however, it can be read as an evolving narrative account of living in a particular urban environment as an older person managing a chronic health condition. As with the local issues discussion forum, this is a collectively-authored text. Participants are cultural agents for wider constituencies, collaborating in writing the account of an imagined community, and conversely borrowing and adapting parts of that account for recapitulation in other settings.

The Two Forums Compared

Returning to the four research questions, the following summary findings can be offered:

- *what kind of goods are produced by eParticipation: public or private*? The local issues discussion forum is a vehicle for producing public goods, whilst the health forum developed from private to more public appropriations of goods as participants became more involved in project management and promotion.
- *is participation inclusive?* On the 'narrow' measure of digital inclusion, both forums appeared to be highly exclusive affairs.
- *is the discursive practice in the forum inclusionary*? The local issues discussion forum displayed an inclusionary discourse with respect to most issues, such that offline others were represented in the discussion by advocates. Advocacy did not occur in the initial phase of discussion in the health forum, which was conceived as interpersonal, but broader social identities were invoked as community health became an issue for discussion.
- *how is the eParticipation process linked to broader social, cultural or political processes and institutions*? In neither case are such linkages well-established or institutionally-embedded, but in both cases there is evidence of channel integration. In the case of the local issues discussion forum, there were inputs to policy-making and service improvement, as well as to the discourse that occurs in other segments of the public sphere like the mass media. In the case of the health forum, participants had begun to build coalitions with other local organisations which have social inclusion goals such as public Internet centres, and with intermediaries such as health trainers, as well as engaging directly in offline health promotion activities or publicising the project in the mass media.

SOLUTIONS AND RECOMMENDATIONS

Two interconnected recommendations follow from these accounts. The design of an eParticipation initiative - even something as 'simple' as a discussion forum - can exploit the affordances of channel integration and intermediation, and thinking about such issues during the process design is likely to increase its social inclusiveness.

Channel Integration

Flexi-channelling (offering access to a good or service via a choice of channels) can promote wider reach by providing alternative channels for participation, including mobile and offline channels. The eUser study pointed to the potential of flexi-channelling to better meet the needs of disadvantaged groups in eGovernment (Millard, 2006). But arguably it is channel *integration* which has the greatest inclusive potential. This can be a back-office process in the case of services, so that service users who use traditional channels can benefit from the affordances of digitised information flows without necessarily being aware of it. Of more relevance here are situations in which social intermediaries accomplish channel integration in community or domestic settings. Some of the founders of UK local issues discussion forums argued pragmatically that targeting community groups that work with and enjoy the trust of socially excluded populations, might be the most effective means of ensuring diversity and representativeness in the online discussion (Coleman, 2005). This assumes the existence of formal or informal offline channels through which the authority of these groups to speak in the name of a broader constituency is confirmed. Mele (1999) describes an early example of online community activism, based in a US low-income public housing estate, in which the inclusion of disempowered social groups in a planning process was effected by the intermediation of a few members of a residents' organisation, using the Internet very effectively to bridge to external resources, but reproducing their own legitimacy as community advocates via traditional face-to-face channels in a neighbourhood where not even the community ICT resource centre had Internet access at the start of the mobilisation. Both these examples underline the importance of working with rather than displacing other community-based media which often have a long tradition and a proven format (Tacchi, 2006).

If a bridging mechanism is in place between online and offline activity spaces, this can create productive roles in ICT projects even for those who prefer not to use ICT directly. Bridging can occur in both directions: ICT can have "catalytic effects" by bringing together coalitions around projects or creating hubs where people meet for a range of other activities (Warschauer, 2003, p.212). Initiatives that reach people by answering genuine community needs, are more likely to have these spread effects. Conversely, the production of locally-relevant content, often seen as crucial to digital inclusion, is more likely to occur if it becomes a broad-based community endeavour, linking offline and online activities, in which the uploading of material to a community website, or the discussion of local issues in a forum is only one, and perhaps not the most important dimension (see Welsh Assembly Government - Communities Directorate, undated, pp.27-8). It is often "positive community processes that promote use [of ICT]" (Cornford & Klecun-Dabrowska, 2003), but the very notion of use becomes broader when channel integration occurs.

Intermediation

As noted, channel integration is usually enabled by the actions of intermediaries, and 'catalytic effects' are more likely to occur if those intermediaries have the status of 'community networkers' - people who are well-known and respected, and serve as advocates of community interests in a variety of spheres (Coleman, 2005). In Wales, for example, 'community brokers' is a term used for individuals who take charge of asset-mapping activities within their neighbourhood, linking different sections of the community together, and directing inhabitants towards resources made available through community computing initiatives (Welsh Assembly Government - Communities Directorate, undated). In a developing world context, Tacchi has argued (following James) for a paradigm shift towards an intermediary-based model of digital inclusion, on the grounds that intermediaries who are embedded in particular local contexts can be the agents of community-wide benefits by blending new and traditional technologies to distribute information and collate 'digital stories' which give voice to community identities and concerns (Tacchi, 2006; James, 2004). The logic of such a model is equally applicable to deprived areas in developed countries.

The extent to which social intermediation is a routine occurrence in people's online activities is only just starting to be recognised. Proxy use of the Internet (i.e. having a friend or relative search for information or undertake transactions on one's behalf) is an important form of access, albeit that there is still a divide issue present, since Internet users are themselves more likely to be proxy users than non-Internet users: 49% of current Internet users and 29% of non-users or past users made use of a proxy according to a 2003 UK survey (ONS, 2007). The importance of social intermediation as an access channel to eGovernment services has also been recognised: in a cross-European survey 42% of eGovernment users assisted family or friends (an average of 2.6 other people) with access to eGovernment (Millard, 2006), and they often came from relatively disadvantaged backgrounds themselves, acting as disseminators of technology and specific services "at family and community levels" (DG INFSOC, 2007, p.24). In the eHealth sphere too, "serving as an online research assistant" is as common in the USA as seeking health information for oneself - 48% of people who reported searching for health information on the Internet said that their last search related to someone else's health needs rather than their own, with the figure being only slightly lower (44%) for respondents who did not have children at home (Fox, 2006, p.5). Social intermediation is regarded as particularly important for health because health information, as it is typically presented, can be difficult to interpret for people with low formal literacy skills (Milio, 1996, p.224).

There may be a class patterning in the occurrence of intermediation, since Crang et al (2006) found that uses of ICT were collective rather than individual in the case of working class users, and vice versa in middle class neighbourhoods of the same city. In deprived neighbourhoods where everyday urban lives remain reliant on cash economies, face-to-face services and physical travel, ICT use tends to develop as a collective, collaborative activity. Ferlander & Timms (2006), for example, explored the motivations of users of a local IT café in a poor neighbourhood of Stockholm, and found that collective, mutually 'supervised' usage was deemed both safer and more enjoyable than lone usage at home. This is potentially of great significance, since it implies that in certain contexts, and among certain social groups, belonging to a network in which eParticipation occurs might effect social inclusion even if an individual herself does not make use of these channels. There are, of course, limitations to this argument. For one thing, it is true that if there is a lower rate of Internet adoption in deprived neighbourhoods then people living there will have fewer potential mentors and collaborators to choose from (Ferlander & Timms, 2006, p.139). For another, some qualities of the online experience are less transferrable to others via offline channels: of the benefits commonly obtained from participation in an online self-help group, for example, informational support can be transmitted to (and solicited from) offline others via intermediation relatively easily, but companionship and esteem support probably cannot be (Nettleton et al, 2002). These 'conversion problems', however, are less severe when the Internet is being used for content creation - when the intermediary is collating material from offline sources for publication online, or re-publicising collective narratives offline. Thus a 'textual' Internet may be more amenable to intermediation that a 'spatial' Internet.

FUTURE TRENDS

In Riga, at the 2006 EU Ministerial Conference on 'ICT for an Inclusive Society', member states agreed that "To convincingly address e-Inclusion, the differences in Internet usage between current average use by the EU population and use by older people, people with disabilities, women, lower education groups, unemployed and "less-developed" regions should be reduced to a half, from 2005 to 2010" (EU Council of Ministers, 2006, p.2). This goal is frequently cited, and typically expressed simplistically as an aspiration to 'halve the gap' in the digital divide.

Progress on use measures is actually lagging well behind the Riga goals in the case of six out of the seven disadvantaged groups identified (women, the unemployed, rural populations, people with lower secondary education or less, the economically inactive, and people aged over 65; only in the case of people aged 55-64 is the goal of halving disparities on target); although progress has varied between countries, suggesting that they are not unachievable (DG INFSOC, 2007). But more importantly, focusing on a goal reduced to a simple measure of take-up detracts from real progress made in other regards, which may be less easily quantifiable but has more relevance to people's everyday lives and needs. Writing in 2004, Selwyn predicted that "in all likelihood, the flawed and oversimplified notion of a dichotomous digital divide of 'haves' and 'have-nots' will continue in its popularity as a means of framing political discussion of social issues in the information age." (2004, p.357) In line with Selwyn's argument on the need for a more differentiated - staged - understanding of digital divides, the argument here is that changes in usage rates cannot be abstracted from the context of use and equated to changes in the level of digital inclusion if that term is to mean more than the take-up of ICT. So if the political goal is to be "promoting the use of ICT to overcome exclusion" (EU Council of Ministers, 2006), then future research and evaluation of the digital divide, instead of only measuring online presence, needs to develop tools to measure representation, in both the cultural and the political sense of the word, paying attention to the ways in which online and offline activities and networks are integrated.

CONCLUSION

The conclusion to this chapter could have been straightforward: that the digital divide intersects differently with different domains because benefits are distributed and consumed in different ways. In the example of an eHealth discussion forum, the problem of a digital divide found expression as a recruitment issue; eDemocracy, however, intersects with the digital divide as an issue of representation (and there is a potential collective action problem about how the costs of participating are distributed). An eHealth forum is a place, which has to be visited to be appreciated, whereas an eDemocracy forum is a text, which can be re-told, translated or shared, and whose content and discourse inevitably carry power implications (they exclude or include) by acts of naming and defining (as by their gaps and silences). But this contrast held true only up to a certain point, as further exploration revealed how discursive goods are open to reappropriation in the context of the broader social structures and institutions through which social inclusion is materialised. Health, in particular, has an ambivalent character, and must always be conceptualised as both a private and a public good:

Even for those most interested in individual behavioral change, the targeting of higher ecological levels is essential to create the social context supporting healthy behavior. The way that behavior is institutionalized (organizational-level change), normalized (community-level change), and legally bounded (policy-level change) are essential 'social facts', without which individual behavioral *change is not easily sustained. (McLeroy et al, 2003, p.532)*

The institutional re-embedding of the health discussion forum via the agency of its participants themselves produced a re-valuation of the discursive goods that are its outputs: they became open to more public forms of consumption through intermediation and channel integration. They also took on some of the properties of a text, even if the forum still remains first and foremost a meeting-place. This re-positions the digital inclusion challenge from an individual to a community level, and underlines the importance of understanding how technologies for eParticipation are often socially embedded in locally specific and evolving ways.

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KEY TERMS AND DEFINITIONS

Channel Integration: the establishment of connections between different channels for social and political participation, such as Internet-connected PCs, mobile devices, digital TV and face-to-face communication. Here the term is used principally to denote the integration of online and offline channels.

Digital Inclusion (referred to as eInclusion in EU documents): the deployment of information and communications technologies to further social inclusion.

eParticipation: participation using ICT, either as the only channel or alongside non-ICT channels. In this chapter the term refers to social as well as political participation.

Health Discussion Forums: forums that serve as online self-help groups, usually for people with a particular health condition, where mutual support is exchanged among peers.

Intermediary: an individual (or organisation) who assumes the role of an assistant or proxy, using ICT with or on behalf of another individual or group. This can include acting as an advocate for individual or group interests in an online process.

Local Issues Discussion Forums: online spaces that attempt to recreate an interactive public sphere for citizens and their representatives, and to sustain a permanent, deliberative debate that invigorates local democracy from the bottom up.

Public Goods: goods which are non-excludable and non-rivalrous. They can be thought of as goods which are consumed at a society- or community-wide scale in the sense that they are not open to exclusive appropriation by individuals or sub-groups. Publicness often depends as much on context as on the innate character of the goods.

Social Inclusion: 'bringing in' disadvantaged groups to major social institutions for the materialisation of citizenship rights, with the goal of improving both the quality of life of individuals and the equity and cohesion of society. Definitions of social inclusion commonly include concepts like respect, diversity, shared goals and meanings and a feeling of belonging to a community.

Chapter 30

Online Participation and Digital Divide:
An Empirical Evaluation of U.S. Midwestern Municipalities

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ABSTRACT

This chapter examines whether government officials' deployment of resources to broaden Internet access and participation is influenced by officials' communication preferences and socioeconomic factors. The concern that the Internet explosion has alienated and marginalized some citizens from the democratic process and civic life has generated intellectual debate and led governments and other sectors to take measures to bridge the gap created by the digital divide. Although several studies have been conducted on the subject, few are yet to be done on the influence of government officials' communication preferences and socioeconomic factors on resource deployment to broaden access and participation. Drawing on the theories of technological diffusion and determinism, as well as developmental and democratic theories, we argue that officials' communication preferences and socioeconomic factors will be important in broadening Internet access and participation. Survey data, local government Web site contents and census data were analyzed. Results reveal that officials are not eager to commit resources to activities that broaden access and participation because they generally prefer to communicate with citizens via traditional channels. In addition, the sizes of the elderly and Black population, as well as the relative affluence of cities, do influence the presence of deliberative features on city Web sites.

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INTRODUCTION AND BACKGROUND

The purpose of this chapter is to determine whether government officials' deployment of resources to broaden Internet access and online participation are influenced by the officials' communication preferences as well as by socioeconomic factors. Well documented inequalities in access to and use of information technology (IT) such as the computer and the Internet reflect existing patterns of social stratification (Bradbrook & Fisher 2004, Bromley 2004, Steyaert 2002, Foley et al. 2003, Eamon 2004). For example, high-income, Caucasian, married, and well educated individuals have more access to IT compared to low-income, African American and Latino, unmarried, and less-educated individuals (National Telecommunications and Information Administration [NTIA] (2000, 2002).

Some scholars argue although the initial period of Internet adoption temporarily widened social inequality, this gap is narrowed at a rapid pace as the penetration of the Internet becomes saturated in society (Compaine 2001a, 2001b, Powell 2001, Tuomi 2000), and that no government intervention is necessary. Others argue the digital divide exists, cutting across socioeconomic factors, and the gap needs to be addressed to prevent it from widening (e.g. Kastsinas & Moeck 2002, Huang & Russell 2003, Mack 2001, Solomon et al. 2003, Foster 2000), and others suggest with the persistence of a digital divide for some groups in society, there is a need to examine distinctions within the digitally underserved groups, using targeted strategies tailored to the needs of subpopulations, rather than attempting to categorize the digital gap as a single entity (Lorence & Park 2008).

In recent years, several studies have examined IT access and type of use between ethnic groups (Hoffman et al. 2001), income groups (Rice & Haythorntwaite 2006, Lorence & Park 2008), age groups (Loges & Jung 2001) and education groups (PEW Internet American Life Project 2006). Despite these efforts, few studies are yet to examine the extent to which these factors as well as city per capita income, the size of the labor force, and government officials' preference of the Internet as a communication medium do influence their deployment of resources to broaden Internet access and participation for underserved groups. In the following sections, we draw on the literature on the debate over digital divide, theories of technological diffusion and technological determinism, developmental theory, and democratic theory in order to establish a theoretical foundation to explain how government officials' communication preferences and socioeconomic factors could influence their deployment of resources to facilitate Internet access and online participation.

THE DIGITAL DIVIDE DEBATE

As the development of the information society has become an important priority for many governments around the world, issues about the disparity between the "information rich" and "information poor" have attracted much academic attention and research. The importance of this effort lies in the fact that information in today's world is regarded as an important resource for advancing education, culture, science and technology, the absence of which is an epitome for underdevelopment (Kargbo 2002). Some scholars have addressed the specific dimensions of the digital divide from racial (Mack 2001) and global (Norris 2001) to multi-dimensional aspects (Compaine 2001, Mossberger et al. 2003). Others have examined the relationship between information and telecommunication technologies (ICT) and social inclusion (Warschauer 2003), and others have addressed the digital divide as a problem of persistent inequality (Servon 2002).

Some studies suggest that unfortunately, it often seems that the explosive growth of the Internet is exacerbating the existing inequalities (Solomon et al. 2003, Menou 2001, Norris 2001, Parayil 2005, Vehovar 2001) leading some observers to argue the information and telecommunication technologies such as the Internet have led to an increase in the divide between rich and poor with related unequal effects on civic engagement and democracy. The concern that some citizens may become more alienated from the political process and thereby be marginalized from civic life has led several groups of individuals from government, education, social work, and private foundations to take measures to bridge the gap in order to ensure equal playing fields for all citizens (Hick & McNutt 2002, NTIA 2000, Turow & Nir 2000). This situation has, in turn, generated a spirited academic debate about the nature and extent of the digital divide and whether there is the need for government intervention. Emerging from such intellectual debate are two key schools of thought – the '*Stratification School*' and the '*Normalization School*'.

Scholars of the stratification school hold the view that the digital divide does exist and the gaps, which cut across various ethnic, racial, socioeconomic and geographic groups, will widen if the problem is not actively and effectively addressed (e.g. Kastsinas & Moeck 2002, Mack 2001, Solomon et al. 2003, Foster 2000). Indeed, some of these scholars argue inequalities in the access to information and Internet technology, coupled with the resultant digital divide, constitute a 'leading civil rights issue' that requires societal and governmental effort to narrow and bridge the gaps. Parayil (2005) for example, argues 'the digital divide is both a symptom and a cause of broader social and economic inequality.'

Scholars of the normalization school question the existence or at least the severity of the problem (e.g. Compaine 2001a, 2001b, Powell 2001, Tuomi 2000). These scholars believe that the gaps, if still existent, are closing among various ethnic, racial, socioeconomic and geographic groups due to the rapid diffusion of Internet technology resulting from steadily decreasing cost and steadily increasing use (Morrisett 2001). Tuomi (2000) for example, argues 'the discussion on digital divide often takes for granted that future work occurs through the net, that communities and societies will become virtual, and that human potential can be realized using advance information and communication technologies.' Therefore, as 'the digital divide is disappearing on its own' there is no need to 'declare a war already won' in public policy (Compaine 2001b).

The arguments of the normalization school seem to be predicated on the classic theories of technological diffusion developed by the work of Tarde & Sorokin (1941), and advanced by Rogers (1995) and Katz (1999). These theories suggest that the adoption of many successful innovations has commonly followed an 'S' (Sigmoid) shaped pattern (Rogers 1995). New technologies have often experienced a slow rate of initial adoption, followed by a substantial surge that peaks when penetration levels reach saturation point and demand subsequently slows. Thus, the 'normalization' model suggests that the spread of the Internet will follow a normalization pattern as costs fall and the technology becomes simplified. Those who adopt the technological innovations at the early stage will be ahead of the curve, with resources, skills and knowledge to take advantage of digital technologies, but in the long run, penetration will become saturated in these societies (Norris 2001).

Once a high proportion of American households have personal computers and access to the Internet, saturated demand will result in falling prices and attraction of new users, allowing laggards to catch up, and eventually resulting in pervasiveness of the Internet. Therefore, the initial period of Internet adoption could be expected to temporarily widen social inequalities that will eventually close. In contrast, proponents of the 'stratification' model emphasize that their model provides a realistic scenario where groups already well networked via traditional forms of information and communication technologies will maintain their edge in the digital economy (Norris 2001).

Diffusion theory allows us to compare the spread of the Internet with earlier technologies. In the United States, the spread of many previous innovations had usually followed a sigmoid (S-shaped) time path characterized by a slow pace of initial adoption, followed by a significant advance, and then a gradually tapering of demand (Norris 2001). Televisions in America experienced a rapid surge of sales in the 1950s, and VCR sales saw a similar surge in the late 1980s. In contrast, the sale of some other technologies like radio receivers and the telephone took far longer to spread throughout the American population. Available trend data indicates in the United States, Internet access has generally followed an 'S' shaped curve, and with almost 70% penetration (68.6% penetration per 2006 Internet Stats Report), usage continues to increase. However, empirical evidence indicates it is not entirely clear as to whether 'the war on digital divide' has already been won as suggested by the normalization theorists, or can be completely won. Indeed, the review of the data on Internet usage trend as well as evidence from some studies reveal that although progress has been made in bridging the gaps, a persistent digital divide still exists in some groups in society (Lorence & Park 2008) implying the existence of some room for targeted government intervention.

TRENDS IN DIGITAL DIVIDE IN THE UNITED STATES

The first ever American opinion poll on the Internet conducted by Louis Harris Associates found that one third of the public had heard of the Internet in June 1994 but only 7% had ever used it. Pew surveys estimate that the following year, the proportion of users had doubled to about 14% of all Americans, but by mid 2000 54% of Americans used the Internet (Norris 2001). Since 1995, the NTIA and the Economic and Statistics Administration (ESA) have published a series of study reports titled *Falling Through the Net*, which describe the digital divide in America over time and the progress made in narrowing it. The 2000 report found that although rapid uptake of new technologies was occurring among most groups regardless of income, education, race or ethnicity, location, age or gender, large gaps remained regarding Internet penetration rates among households of different races and ethnic origins. Specifically, although the household Internet usage rose from 26.2% in December 1998 to 41.5% in August 2000, Blacks and Hispanics continued to experience the lowest household Internet penetration rates at 23.5% and 23.6% respectively. In addition, only 16.1% of Hispanics and 18.9% of Blacks used the Internet at home, as compared to one third of the US population on average. People age 50 or older, especially those who were not in the labor force were the least likely to be Internet users.

In 2002, NTIA and ESA published another report titled *A Nation Online: How Americans Are Expanding Their Use of the Internet*, based on the September 2001 US Census Bureau survey of 57,000 households and more than 137,000 individuals across the United States. The report found that 143 million Americans were using the Internet, up from 116.5 million in August 2000, and 174 million (66% of the population) used computers. The report also showed children and teenagers use computers and the Internet more than any other group, and that computer availability at schools substantially narrowed the gap in computer usage rates for children from high and low income families (NTIA 2002). Another key revelation of the report was an increasing use of the Internet regardless of income, education, age, race, ethnicity or gender, with faster increases for lowest-income households than for high income households (25% and 11% respectively), and for Blacks(33%) and Hispanics (30%) than for Whites and Asians (20%). Despite these improvements, Blacks and Hispanics continued to lag behind in Internet usage.

Based on data collected to supplement the October 2003 Current Population Survey that included questions about computer and Internet usage, the US Census Bureau (2005) released another report titled *Computer and Internet Use in the United States: 2003*. According to this report, 70 million American households, or 62% of the population, had one or more computers, and 62 million households, or 55% of the population, had Internet access, up from 56% and 50% respectively in 2001. However, computer ownership and home Internet access were not even across various socio-economic groups. For instance, Black or Hispanic households and those with less than a high school education had a lower computer ownership rate of 45% and 28% respectively, and less Internet access of 36% and 20% respectively. The report also indicated low-income households were likely to have less computer or Internet access.

Due to changes in technology, the digital divide is being redefined in terms of broadband access versus telephone access. According to the Consumer Federation of America, the western world is now facing a second generation of digital divide between those who have broadband access and those who have only dial-up access. A 2004 report titled *Exporting the Digital Divide and Falling Behind on Broadband: Why a Telecommunications Policy of Neglect Is Not Benign*, published jointly with the Consumers Union, reveals that half of all households with income above $75,000 have broadband, while half of all households with income below $30,000 have no Internet at home (Cooper 2004). A 2004 NTIA report titled *A National Online: Entering the Broadband Age* shows that although the number of US households with broadband service more than doubled from 9.1% in September 2001 to 19.9% in October 2003, Blacks, Hispanics and people with disabilities lag behind whites in their overall use of the Internet whether it is via dial up or high speed connection, and the same disparities exist for those groups who use broadband technologies (NTIA 2004).

More recently, reports of the PEW Internet American Life Project (2006) suggest that age, educational, and income backgrounds do have considerable influence on citizens' Internet usage. While 88% of 18-29 year olds, and 84% of 30-49 year olds go online, only 32% of 65 years or older go online. In addition, Just 54% of adults living in households with less than $30,000 annual income go online, versus 80% of those whose income is between $30,000-$50,000, and 86% of adults in households with annual income between $50,000 and $75,000. Furthermore, while 40% of adults who have less than a high school education use the Internet, 64% of adults with a high school diploma go online, and 91% of those with at least a college degree go online.

As indicated earlier, more recent data indicate Internet penetration rate of 68.6% in the Untied States. With America being a country with almost 70% Internet penetration rate while certain socioeconomic groups continue to lag behind, the question of interest is whether various governments ought to consider socioeconomic factors in their pursuit of policies regarding Internet access by citizens, and in the design of their websites to facilitate online participation. In this regard, a review of the theoretical perspectives of digital government may help us understand the issues and complexities of differing levels of technological innovations within governmental jurisdictions.

PERSPECTIVES OF DIGITAL GOVERNMENT

There has been a growing attention over the last decade on conceptualization of e-government (Dutton 1996, Bellamy & Taylor 1998, Garson 1999, Heeks 2001, Gronlund 2002, Snellen & van de Donk 1998). Some scholars argue the use of information and communication technologies to democratize government processes may be conceptualized on the basis of the idea that citizens need to be able to access information, to deliberate and discuss political issues, and to vote electronically or exert effective indirect influence on decision-making (Gross 2002, Barber 1984). Others suggest one can apply the kind of conventional e-government development stage approach to the practices of e-democracy (Macintosh et al 2002 p. 235). Within the frame of e-government, the issue of participation and democratic governance have gradually become popular even to the extent that that the focus of the whole idea of e-government has ultimately been perceived by many as the means to improve interaction between government and citizens (Anttroiko 2004, Gronlund 2002).

The above reality implies that for policy makers and government officials to democratize government processes, they need to apply a citizen centered approach to fully utilize the local potential and to maintain their legitimacy in the eyes of the local community (Anttroiko 2004). Empirical evidence suggest that although the Internet has the potential to bring citizens closer to their governments, many governments at all levels have not taken advantage of this interactive potential to enhance the deliberative features of their websites in order to bring citizens closer to their governments (Musso, Hale & Weare 1999, West 2001, 2005, Needham 2004, Global e-Policy and e-Governance Institute 2003, 2005). Understanding why some governmental jurisdictions have moved ahead in e-government adoption while others lag behind raises complex issues, and developmental, technological and democratic theories help to provide alternative frameworks to explain this phenomenon (Norris 2001).

Some developmental theorists argue that long-term secular changes in the economic structure drive social and political change. The rise of the knowledge economy, which is heavily dependent on modern global communications, widespread computer literacy and a large well- educated workforce creates structural changes associated with socioeconomic development which therefore provides the underlying conditions most conducive to widespread access to, and use of, digital information and communication technologies (Bell 1973). In turn, as the general population becomes wired, greater incentives are produced for public sector institutions to invest in forms of service delivery and communications via digital channels. Thus, if socioeconomic development creates the underlying conditions more conducive to the networked world, then according to this theory, we should expect to find governmental institutions in affluent communities with, for example, highly educated citizens, high household income, high per capita income and a strong labor force to invest in website designs that will enable e-government service delivery and interactions with citizens.

As reasonable as they are, developmental explanations fail to account for the strikingly different web presence exhibited by similarly advanced countries such as the United States and Switzerland, as well as the major differences in the spread of digital politics (Norris 2001). Theories of technological determinism are generally based on the assumption that technology shapes society more than vice versa. These theories, which reflect multiple perspectives (e.g. Negroponte 1995), emphasize in varying degrees that technological development directly influences how far political organizations can provide online services and information, and indirectly produces greater incentives for political organizations to do so, as the general public becomes wired. Therefore, modern political and social organizations are responding to adaptations and uses of digital communication and information technologies that are, to some extent, autonomous of socioeconomic development (Dutton 1999). The implication of this theory is that regardless of the level of socio-economic development, there should be positive correlation between technological indicators like distribution of Internet hosts and users, and the proportion of government and civic organizations that have moved online. Therefore, the higher the percentage of a community's citizens that fall within the group of 'technology rich', the more likely we will find governmental investments in digital technology.

Like the developmental theories, the technological explanations regard the virtual political system as the superstructure based upon and driven by more deep-rooted structural phenomenon (Norris 2001), and do not adequately distinguish between the degree of governmental web presence or community activism on the web. Indeed, critics of strong versions of technological determinism argue that social and political choices shape the uses of the Internet for more than the hardware and software (Dutton & Peltu 1996). Theories of democratization suggest that new technologies allow greater transparency in the policy making process, wider public participation in decision-making, and new opportunities for interaction and mobilization in election campaigns. However, critics argue the realization of these potentialities is dependent on how the technology is employed. The argument here is that if the process of democratization plays an important role, then the type of governmental presence on the Internet and the promotion of transparency and interactive communication by the websites can be expected to reflect levels of pluralistic competition, political participation, public deliberation and civil liberties within each political system (Norris 2001). In this regard, the question that needs to be answered is to what extent have governments at all levels utilized the internet for the promotion of transparency and interactive communication with citizens?

INTERNET ACCESS AND CITIZEN ENGAGEMENT

When the Internet came into being, a lot of scholars touted it as a means to foster communication between citizens and public officials, enhance citizen participation and democratic renewal and strengthen the political community (Barber 1984, Beamish 1995, Grossman 1995, Bimber 1996, Ward 1996). Some scholars suggest the Internet can serve multiple functions disseminating information about operations of government, including public services, facilitating feedback mechanisms like email to government agencies, enabling more direct participation in the decision making process, and providing direct support for the democratic process at minimum cost (Klotz 2004, Johnson & Kaye 2003, DiMaggio et al. 2001, Trippi 2004, O'Looney 1995). Others argue the main potential of digital technologies for government lies in strengthening policy effectiveness, political accountability and, to a lesser extent, citizen participation (Bellamy & Taylor 1998).

Theories of mobilization hold that the Internet may serve to inform, organize and engage those that are currently marginalized from the existing political system such as younger generations and traditionally disaffected minority groups to enable them to be gradually drawn into public life and civic communities. The opportunities available on the Internet, coupled with the reduced cost of information and communication, could remove some of the disincentives to participation, make the public more knowledgeable about public affairs and encourage users to become more engaged in civic participation and in the policy process. In contrast, reinforcement theorists argue that online resources will be used primarily for reinforcement by those citizens already active and well connected via traditional channels, such as grassroots activists and party members (Davis & Owen 1998).

If online resources are used to reinforce existing traditional channels by the already well connected members of society, then minorities, low income, less educated and elderly groups will be lagging behind in computer ownership and Internet access. In this regard, institutional environment created by governments could make a difference by allowing those with few personal resources to take advantage of the opportunities offered to broaden access and participation. Therefore, governments that view the Internet as a primary medium of communication and interaction with citizens will have perspectives of information technology that includes access to information and administrative services, citizens' computer literacy and the ability to use information and communication technologies when interacting with government. The governments can then adopt e-government policies that reflect these perspectives. This is important because citizens' motivation to interact with government online is dependent not only on interest but also on the knowledge and confidence that individuals bring to the process.

As explained by development theories, individual and society income, level of education and occupation reflect access to digital technologies. Indeed, some empirical evidence (Verba et at. 1995) suggest that these factors are some of the most important in influencing whether people are active in political engagements. Personal or household income influences the ability to afford home computers as well as the service and telecommunication charges for Internet access (NTIA 1999), and the availability of leisure time and financial resources that facilitate civic engagement. Therefore, governments in high income communities with high Internet accessibility may be more likely to invest in the design of Interactive websites for service delivery and citizen government interaction than those of poor income communities. On the other hand, these affluent governments with larger tax bases, higher per capita income and a stronger labor force may be inclined to adopt policies that enhance Internet access for the ethnic minorities, the elderly and low income members of their communities in order to bridge the digital divide.

High educational background provides the capacity to use digital technology including keyboard skills, as well as basic literacy, numeracy and language skills. Attending school and college provides analytical and cognitive skills that help to make sense of the complexities of the policy process, as well as contributing towards greater confidence, efficacy and awareness (Norris 2001). This implies well educated individuals are more likely not only to be gainfully employed and contribute to stronger labor force, but also likely to go online and navigate government websites with ease than less educate individuals. Numerous pieces of empirical evidence suggest that education is one of the strongest predictors of conventional forms of participation like electoral turnout (Norris 2001). Governments in well-educated communities may therefore be motivated to design websites with more deliberative features to meet the demand and needs of their citizens. On the other hand, since high education is generally related to high income, and therefore high tax revenues for governments, there may be the likelihood of some of these governments spending a bit more resources to design Internet websites that may accommodate all citizens, including the less educated members of their communities.

The Internet is freer from constraints of space and time, as well as the expense of traveling to the meeting hall. Consequently, e-government policies designed to broaden Internet access will mean low income, less educated, elderly and minority participants will not have to expend more resources to travel and assemble in a single space to communicate with each other (Klien 1999). These structural characteristics, which differentiate the Internet from other participation forums such as meeting hall, could serve as a motivating factor for officials of any level of government, who prefer online communication and interaction with citizens, to avail themselves of the opportunities offered by the interactive features of the technology to broaden access and connectivity. However, empirical evidence suggests that some of the promises of bridging the gap among governments and citizens through enhanced interaction between citizens and government, and between citizens themselves are yet to be fulfilled (Chadwick & May 2001, West 2001, Musso, Hale & Weare 1999, Wales, Kerns, Bend & Stern 2002, the Global e-Policy and e-Government Institute and Rutgers University e-Governance Institute 2003, 2005, Jensen & Venkatesh 2007). Although several studies have examined Information technology access and type of use between ethnic groups

(Hoffman et al. 2001), income groups (Rice & Haythorntwaite 2006, Lorence & Park 2008), age groups (Loges & Jung 2001) and education groups (PEW Internet American Life Project 2006), the influence of these socio-economic factors, as well as officials' communication preferences, the level of individual and family poverty, per capita income and the size of labor force on resource deployment to broaden access and online participation remain largely uninvestigated.

Considering the above-mentioned research gap, there are unanswered questions as to whether government officials prefer the Internet over traditional means of communicating and interacting with citizens in the policy process, whether they are willing to deploy resources to enhance access and online participation, and whether their decisions regarding website content designs, and hence the presence of deliberative features on their government websites, are influenced by the above-mentioned factors. Therefore, this study aims at seeking answers to the following questions:

1) To what extent do local government officials prefer the Internet as a medium of communication and interaction with citizens in the policy process?
2) To what extent do local government officials deploy resources to broaden Internet access and online participation?
3) To what extent do local government officials' preferences influence deployment of resources to broaden Internet access and online participation?
4) To what extent do ethnicity, age, income, education, poverty as well as per capita income and labor force influence local government officials' decisions to deploy resources to broaden Internet access and online participation?
5) To what extent do ethnicity, age, income, education, poverty as well as per capita income and labor force influence the presence of deliberative features in local government websites?

METHODOLOGY

This study is in the form of a three-tier cross-sectional, non-experimental research, consisting of survey research, web site content analysis and analysis of census bureau data. The unit of analysis is local government Chief Administrative Officers. Municipalities in five north central states (Iowa, Kansas, Minnesota, Missouri, and Nebraska) with functioning web sites were identified, and a stratified random sample was selected. These municipalities were selected because they have similar geographic and economic environment.

A mail survey was sent in 2004 to 218 city Chief Administrative Officers of the stratified random sample of the cities drawn from the web sites of the five Midwestern states, and 117 returned the survey, representing a 54% response rate. Local government officials are the appropriate subjects for an examination regarding the broadening of Internet access and participation because local government is the tier of public authority to which citizens first look to solve their immediate problems. It is also the level of democracy in which the citizen has the most effective opportunity to actively and directly participate in decisions made for all of society.

The stratification was based on the following category of city population sizes: Less than 5,000, 5,000-24,999, 25,000-49,999, 50,000-74,999, 75,000-99,999 and 100,000 and above. The 2000 U.S. census data was utilized to determine the population sizes of cities in the sample.

The advantage of stratification is that it reduces the probability of a biased sample. In addition, it increases sample representation by ensuring that specific categories of city sizes are represented in proportion to their web sites' appearance in the population within our sample frame (Black 1999, Singleton & Straits 1999). Furthermore, stratifica-

Table 1. Summary of census data analyzed and their comparison with US averages

Census Data Category	Sample Average	United States Average
Percentage of Population Under 18 Years Old	24.78	25.7
18-64 Years Old	60.73	61.9
65 Yeas and Above	14.43	12.4
Percentage White Ethnicity	91.12	75.1
Black or African American	3.35	12.3
Hispanic or Latino	4.20	12.5
Asian	1.74	3.6
Median Household Income	43981	41994
Per Capita Income	21930	21587
Percentage of Families Below Poverty Line	6.27	9.2
Individuals Below Poverty Line	9.05	12.4
Percentage Labor Force (employment population ratio)	67.68	63.9
Percentage With Less Than High School Education	13.34	19.6
High School Graduate	58.20	56.0
Bachelors Degree or Higher	28.34	24.4

Original Source: U.S. Census Bureau Summary Files (SF 1 and SF3)

tion controls for the effect of city population size because of its potential to confound the survey results. For example, cities with large populations may have larger revenue bases that could impact the degree of resource deployment to enhance citizen participation and web site deliberation.

The survey elicited information on various aspects of city officials' preference for communicating and interacting with citizens, officials' deployment of resources to broaden Internet access and participation, and the kinds of facilities provided so that citizens can use the Internet. Survey research is preferred for this part of the study because it facilitates the economical and rapid collection of opinions and the ability to identify attributes of the perceptions that motivate the actions of local government officials, for example, in regard to citizen participation and web site design. The basic rationale for this data collection procedure is cost containment, availability, and convenience. Mail survey is preferred over telephone survey and face-to-face survey because as a self-administered approach, it has the potential for more honest responses. Considerable evidence suggests that people are more likely to give honest answers to self-administered than to interview questionnaires (de Leeuw, 1992; Fowler, Roman & Di 1998, Aquilino 1994).

In addition to the survey data, the year 2000 data from the American Community Survey were obtained from the U.S. Census Bureau website and included in the analysis. The data consisted of citizen's ethnicity, individual and household income, education, age, individuals and families below the poverty line, as well as the municipalities' per capita income and labor force. Year 2000 data were used because the year 2006 estimated data were not available for some of the municipalities in our sample. Table 1 shows the summary profile of the census data analyzed and their comparison with national averages. The data obtained from the census bureau were coded on a 7 point scale to ensure uniformity of all the coded data used in the analysis. The statistics in Table 1 show on the average, the municipalities included in the study sample are predominantly white, better educated and slightly affluent communities, compared to the US averages.

Some scholars have expressed concern about the lack of a more standardized and elaborated operationalization of digital divide measurements (Vehovar et al. 2006), and others have argued measuring digital divide in a simple binary Yes/No questions is inaccurate as it ignores the continuum nature of the issue and fails to value the social resources of diverse groups (Chen & Wellman 2003). DiMaggio & Hargittai (2001) point out that there are at least five dimensions of digital inequality: equipment, autonomy of use, skill, social support and the purpose of using the Internet. Similarly, Mossberger, Tobert & Stansbury (2003) distinguish between an access divide, a skills divide, an economic opportunity divide, and a democratic divide. This implies any variables designed to measure governmental efforts to bridge the digital divide gaps should reflect some of these dimensions.

Resource deployment to support Internet access and online citizen participation was measured by asking respondents to indicate their agreements on a seven point scale regarding their city governments' performance of activities in seven areas. The areas are allocation of funds, assignment of personnel, access provision (e.g. electronic kiosks), Internet usage training, promotion of city web site, and availability of education materials on the Internet. These variables were included in the measure because together, they provide the means for acquisition of the needed technological infrastructure to facilitate access provision, the necessary personnel for support functions, the upgrade of citizen skills needed for access and autonomy of use, and the promotion of access connectivity and online resources availability to disadvantaged groups.

Officials' communication preference was measured by asking respondents to rank order their preference for communication with citizens from six options. These are regular post office mail, telephone, Internet email, electronic bulletin board, face to face communication, as well as other means such as television, newspaper and radio. In addition, respondents were provided options from which they selected their reasons regarding the preference for specific communication methods. The variables in this category were measured because they provide insight and the rational behind the choices made by government officials regarding access provision and Internet-based citizen participation. For the purposes of measuring the facilities provided for Internet access, respondents were asked to select from a list of locations where their local governments provide Internet access to the public. These locations include public library, city hall, independent municipal buildings, public schools and other locations.

Once the questionnaire was returned, a content analysis of the municipality's web site was performed to identify and score those deliberative features that reflect the survey responses. Web site deliberative features are defined in this study as the attributes that serve as democratic outreach by facilitating communication, interaction and discussion between citizens and government. The process consisted of searching for elements of four key categories of deliberative features within each web site that would facilitate citizen participation through the communication and interaction between government and citizens, and among citizens. The categories examined include: online government information and services, online news and bulletin boards, and online feedback and discussion forums, and volunteer registration for participation in civic activities.

The elements reviewed in the respective categories are as follows: information and services category - online contact information, local government minutes and budgets, administrative services provided, and frequently asked questions and answers; news and bulletin board category - online news and events, policies under current debate, newsletter, and webcast; feedback and discussion forum category – online feedback and comment form, chat room, policy discussion forum and customer satisfaction survey; volunteer and voter registration category – online volunteer services information, volunteer registration form, links to community organizations. These categories were selected because together, they strengthen public accountability through communication, interac-

Table 2. Communication preferences with citizens (N = 117)

Respondents' Declared Preferences	Post office Mail	Phone	E-Mail	E-Bulletin Board	Face to Face	Other – (TV, Newspaper, Radio, etc)	Total
Most preferred means of providing information to citizens	26%	7%	115%	2%	18%	32%	100%
Most preferred means of receiving information from citizens	10%	17%	339%	-	30%	4%	100%

tion and feedback between citizens and government, as well as citizen participation in the local governance process. Conceptual analysis was used to examine the presence of sentences, themes and features that relate to these elements and coded for their existence in each web site.

Descriptive statistics were used to analyze city officials' communication preferences, and to analyze officials' deployment of resources to broaden access and participation. Regression analysis was used to determine relationships between communication preference, socioeconomic factors, deployment of resources and the presence of deliberative features on local government websites.

FINDINGS

The Internet as a Preferred Medium for Communication and Interaction

If local government officials are to engage in Internet access enhancement activities and enable online citizen participation in the policy process, one would expect that those officials view the Internet as an important medium to bring citizens closer to their government. The first research question examined the extent to which local government officials prefer the Internet as a medium for communicating and interacting with citizens. Table 2 shows that only 17% of respondents said the Internet is their most preferred means to provide information to citizens (15% email, 2% electronic bulletin board). Similarly, only 39% of officials prefer the Internet medium over other options to receive information from citizens. This means 83% prefer to share information with citizens outside the medium of the Internet and 61% prefer to receive information from citizens in a similar way.

Table 3 and Table 4 show cross tabulations of respondents' communication preferences with citizens and the respective reasons for those preferences. According to the results illustrated in Table 3, 46% of respondents (54 out of 117) prefer regular post office mail, telephone, city newspaper, radio and television over Internet medium of providing information to citizens due to the universality of access to these traditional media. Additionally, 8% cited the influence of human presence regarding telephone and face-to-face communication as their reason, and 15% indicated the ease of follow up and reply when using traditional communication media. Together, these account for 69% of the reasons provided. Table 3 also shows 14% of respondents (16 out of 117) prefer to provide information to citizens via email because of its speed and flexibility. Further analysis using the Pearson Chi Square shows a statistically significant relationship between the most preferred means of providing information to citizens and the reasons for those preferences.

Table 4 shows 35% of officials (41 out of 117) cited the speed and flexibility of email as their reason for preferring Internet medium to receive information from citizens, while 26% cited ease of follow up of non-Internet communication media,

Table 3. Officials' preferences for providing information to citizens and related reasons

Reason for Preference	Most Preferred Means of Providing Information to Citizens						Total
	Post Office Mail	Telephone	E-Mail	E-Bulletin Board	Face to Face	Other (TV, Newspaper Radio, etc)	
Universal Access	21	2	0	0	0	31	54
Influence of Human Presence	0	2	0	0	7	0	9
Speed and Flexibility	2	0	16	2	5	1	26
Ease of Follow Up and Reply	2	5	2	0	8	3	20
Assured Delivery	2	0	0	0	0	0	2
Other	3	0	0	0	1	2	6
Total	30	9	18	2	21	37	117

Pearson Chi Square Value, 146.559; df, 25; Assymp. Sig. (2 Sided) = 0.000

15% mentioned the influence of human presence of telephone and face-to-face communication, and 9% cited universal access of regular post office mail and other traditional media as their reasons. The Pearson Chi Square shows a statistically significant relationship between the reasons cited and the communication preferences.

The implication from these findings is that while most government officials are reluctant to rely on the Internet to communicate with citizens for a variety of reasons, many of them also recognize that the speed and flexibility of the technology could potentially be helpful in their interaction with citizens. The question then becomes given this recognition, are officials willing to deploy adequate resources to broaden and facilitate access in order to enhance Internet-based citizen participation?

Table 4. Officials' preferences for receiving information from citizens and related reasons

Reason for Preference	The Most Preferred Means of Receiving Information From Citizens					
	Post Office Mail	Telephone	E-Mail	Face to Face	Other (TV, Newspaper Radio, etc)	Total
Universal Access	3	3	0	2	2	10
Influence of Human Presence	0	5	0	12	0	17
Speed and Flexibility	1	1	41	3	0	46
Ease of Follow Up and Reply	1	11	3	18	1	34
Assured Delivery	5	0	0	0	0	5
Other	2	0	1	0	2	5
Total	12	20	45	35	5	117

Pearson Chi Square Value, 150.876; df, 20; Assymp. Sig. (2 Sided) = 0.000

Table 5. Officials' agreements regarding their city governments' resource deployment in identified areas to enhance access provision and online citizen participation (highest possible mean score = 7)

Variables Measured	N	Mean	Std. Deviation
Allocates adequate funds	117	4.40	1.359
Assigns adequate personnel	117	4.54	1.336
Provides broad access to Internet connections	117	4.56	1.367
Offers adequate Internet training usage to citizens	117	3.70	1.366
Adequately promotes the use of city website for citizen participation	117	4.72	1.382
Makes adequate education materials available on city web site	117	4.54	1.387
Average Adequacy of Resource Allocation	117	4.41	.974

Resource Deployment for Access Enhancement and Online Deliberation

Resource deployment was measured using the following seven point scale: 7 = Completely Agree, 6 = Strongly Agree, 5 = Somewhat Agree, 4 = Neutral, 3 = Somewhat Disagree, 2 = Strongly Disagree, and 1 = Completely Disagree. Table 5 shows the means and standard deviations for the respondents' agreements, scored as to whether their cities adequately perform the resource deployment activities identified to broaden Internet access and online participation . The table illustrates the mean scores range from the lowest score of 3.70 for "offers adequate Internet usage training to citizens" to the highest of 4.72 for "adequately promotes the use of city web site for citizen participation."

The mean scores suggest that while the city government officials are torn between somewhat disagreement and neutral as to whether their cities provide adequate Internet training to citizens, they almost somewhat agree that their cities adequately promote the use of the city web sites for citizen participation. As illustrated in Table 5, the average mean score for 'Adequacy of Resource Deployment' is 4.41, which is between neutral and somewhat agreement.

These findings appear to suggest that although a sizable number of local government officials (35%) recognize the speed and flexibility of the Internet, officials do not enthusiastically embrace the technology, through resource commitments, to facilitate interactive communication with citizens. However, the fact that more resources are devoted to the promotion of city website for online participation and the provision of broad access to Internet connections (mean scores are 4.72 and 4.56 respectively) may provide some little bit of comfort to scholars in the stratification side of the debate on digital divide. In response to a question that asked them to name the location where their city provides access so that citizens who do not have the personal resources may use the Internet, 45% of respondents said their city provides access at the public library, 35% indicated their city provides access at more than one public location, and 13% said their city provides no public access to the Internet.

Officials' Communication Preferences, Socioeconomic Factors and Resource Deployment

For the purposes of in-depth analysis, a key question that needs to be answered in this section is whether the relationship between city officials' preference for communicating with citizens and

Table 6. Overall model coefficients for impact on communication preference and socioeconomic factors on resource deployment

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	26.808	22.070		1.215	.227
	Under 18 Years Old	.292	1.069	.045	.273	.785
	18 to 64 Years Old	1.587	1.588	.182	.999	.320
	65 Years or Older	.448	.944	.089	.475	.636
	White	-1.002	.917	-.173	-1.093	.277
	Black	-.531	.429	-.182	-1.236	.219
	Hispanic	.282	.387	.087	.729	.468
	Asian	1.075	.497	.303	2.163	.033
	Median Household Income	-.673	.782	-.211	-.861	.391
	Per Capita Income	-.312	.930	-.066	-.335	.738
	Family Below Poverty Line	.093	.749	.027	.125	.901
	Individuals Below Poverty Line	-1.199	.795	-.395	-1.509	.134
	Labor Force	-.719	.700	-.167	-1.028	.306
	Below High School Education	-.509	.888	-.128	-.573	.568
	High School Graduate	.797	1.067	.143	.748	.456
	College Graduate	.436	.795	.157	.548	.585
	Most Preferred Medium of Communication	.418	.206	.201	2.024	.046

a Dependent Variable: Adequacy of Resources Deployment
P>F = 0.165
R Square = 0.181

their resource deployment to broaden Internet access and online participation is statistically significant. Another question of interest is whether socioeconomic factors of ethnicity, age, income, education, poverty, per capita income and size of labor force do influence city government officials' deployment of resources to broaden access and participation. Table 6 shows the overall significance model of these relationships.

Table 6 shows that the dependent variable is a function of local government officials' most preferred medium of communication ($p = 0.046$) and the size of Asian population in our study sample ($p = 0.033$). These findings reflect the importance of officials' communication preference and the size of Asian population in officials' decisions to commit resources to broaden Internet access and online participation. We can therefore conclude that there is a statistically significant relationship between city government officials' most preferred medium of communicating with citizens and their decision to deploy resources to broaden access and participation.

Socioeconomic Factors and Website Deliberative Features

Research question 5 sought to measure the effect of socioeconomic factors on the deliberative features of local government websites. Given the possibility of communication preference and resource deployment to influence website content design and confounding the results of our analysis, they were included as independent extraneous variables. Kelinger (1986) notes that a potential extraneous variable can be controlled by including it as another attribute, an observed variable, in the study. By considering communication preference and resource deployment as variables in their own right, we were able to ascertain how they interact with the independent variables of interest and the extent to which they influence the deliberative features of local government web sites, either individually or in combination with the independent variables of interest.

Table 7 shows that the Presence of Deliberative Features is a function of citizens who are 65 Years and Older ($p = 0.030$), the size of Black population ($p = 0.003$), the Per Capita Income of the municipalities ($p = 0.023$), and the size of the size of the labor force ($p = 0.008$). With an R square value of 0.392, we can conclude that 39.2% of the variation of the presence of deliberative features on local government websites is explained by the variation in these four variables. This implies that the presence of interactive features on local government websites is influenced not only by the elderly and at least one minority group but also by the degree of affluence of the municipalities as well as by the working population. Whereas officials' communication preference influence the extent of resources committed to broaden citizen Internet access and online participation, city government officials' decisions regarding the design of website contents to broaden online participation are not affected by this variable as they are by the affluence of the overall community, the size of the labor force and the plight of some disadvantaged members of the community.

DISCUSSION

The results of this study reveal that although a sizable number of city government officials recognize the speed and flexibility of email as a medium for communicating with citizens, they do not eagerly commit resources to activities that broaden Internet access and interaction with citizens. This is explained by the fact that these officials, for the most part, prefer to communicate and interact with citizens through traditional media such as newspaper, regular post office mail, face-to-face communication and radio. This preference on the part of officials is due to the universality of access to these media.

The results also show that there is a statistically significant relationship between officials' most preferred medium of communication with citizens and their willingness to engage in a combination of funding, Internet access broadening and usage training, promotion of city websites, and placement of education materials on city websites. This implies the more officials prefer traditional medium of communicating with citizens, the less likely they are to engage in these activities to help bridge the gaps regarding digital divide.

The finding regarding government officials' preference of traditional means of communication over Internet communication seems to contradict the theory of strong technological determinism, and appears consistent with democratic theories that suggest social and political choices shape the use of the Internet more than software and hardware. At the same time, the finding also reflects the fact that some of the ideals of democratic and mobilization theories such as the use of the Internet for interaction and wider public participation in decision making are yet to be realized (Wales, Kerns, Bend & Stern 2002, the Global e-Policy and e-Government Institute and Rutgers University e-Governance Institute 2003, 2005, Jensen & Venkatesh 2007), and that the full realization of these potentialities is dependent on how the technology is employed by government officials. For example, the results of the website content analysis revealed that although 100% of the websites reviewed had information about government services provided, only 38% had feedback forms to enable citizens to provide comments to city departments and elected officials.

Table 7. Overall model coefficients for impact on socioeconomic factors, communication preference and resource deployment on website deliberative features

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-26.996	14.449		-1.868	.065
Under 18 Years Old	.546	.695	.112	.786	.434
18 to 64 Years Old	1.975	1.038	.302	1.903	.060
65 Years and Older	1.348	.614	.356	2.196	.030
White	.096	.600	.022	.159	.874
Black	.864	.281	.395	3.074	.003
Hispanic	-.326	.252	-.133	-1.291	.200
Asian	.440	.330	.165	1.331	.186
Median Household Income	.494	.510	.206	.969	.335
Per Capita Income	1.396	.605	.395	2.310	.023
Family Below Poverty Line	.088	.487	.033	.181	.857
Individuals Below Poverty Line	.420	.522	.184	.803	.424
Labor Force	1.230	.457	.380	2.690	.008
Below High School Education	.470	.578	.157	.813	.418
High School Graduates	.019	.695	.004	.027	.979
College Graduates	-.384	.517	-.185	-.742	.460
Most Preferred Citizen Communication	-.130	.137	-.083	-.952	.344
Adequacy of Resource Allocation	.398	.390	.088	1.020	.310

Dependent Variable: Deliberative Features
P>F = 0.000
R Square = 0.392

The research results also reveal that the presence of deliberative features of local government websites is influenced by the size of the elderly population and the Black population of the municipalities. This implies that in general, the less the presence of elderly and Black population in the municipalities, the less interactive the local government websites and vice versa. Perhaps, officials of communities with more elderly and minorities who have less computer and Internet access recognize and accommodate the relatively low keyboard skills of such citizens in their design of government websites. While officials' communication preferences directly impact the level of resources committed to broaden access and online participation, it does not significantly influence the design of the interactive contents of government websites. The reason may be that officials view the opportunity of citizens, including elderly and some minority groups, to use Internet technology to interact with their governments, as more significant than the officials' own communication preferences.

As illustrated in Table 1, the municipalities included in our study sample are predominantly white, better educated and relatively affluent than the US average. Our analysis also shows the presence of deliberative features is significantly influenced by the per capita income and the size of municipality labor force. This means in general, affluent municipalities with larger tax revenues do invest in deliberative Internet websites than less affluent municipalities. Although this appears to be contradictory to the finding that only 38% of the websites reviewed had feedback forms, the key issue to remember is that, as indicated above, numerous studies have consistently shown that the low deliberative features on government websites is a problem that cuts across all levels of governments of which our sample is not an exception. The findings from our analysis therefore seem to confirm the argument of developmental theorists that socioeconomic development such as societal affluence creates the underlying conditions more conducive for government investment in service delivery and communication via digital channels.

This study is somewhat limited in the sense that the socioeconomic and demographic data utilized is a few years old and the numbers may have changed in the interim. In addition, the study did not include a review of gender and disability gaps in online participation and the activities, if any, undertaken by government officials to address any digital divides that may exist in this area. Furthermore, the sample size in this study may limit the generalization of the results on global basis. In spite of these limitations, the findings are useful because the examination of digital divide from the perspective of Internet-based citizen participation and specific governmental actions taken to broaden access and online participation is a relatively young area of study and very little empirical research is available in this area. Further study is required to determine whether newer socioeconomic and demographic data in subsequent years, the inclusion of gender and disability gaps in the study, and the broadening of the research sample to include municipalities in other parts of the United States and around the world will make a difference in the results.

The results of this study have practical implications for information technology and e-government policy formulation and implementation at local government level. Despite its limitations, the Internet still holds great promise to enhance citizen participation and democratic governance by allowing citizens not only to access public information but also to interact with government officials and promote better accountability of officials to citizens. With almost 70% Internet penetration rate in the United States and certain socioeconomic groups continually lagging behind, the opportunity for targeted government intervention through access infrastructure enhancement, training and promotion of free access facilities in certain public areas may be appropriate to help bridge the gaps created by the digital divide. In this regard, it is refreshing to find that the majority of our survey respondents indicated their city governments provide public Internet access (45% in public libraries and 35% in more than one location) so that citizens who do not have the personal resources may still be able use the Internet.

CONCLUSION

Overall, the findings suggest that local government officials' relative perceptions of the Internet as a useful medium for communication influence their decision to commit resources to broaden access and online participation, as well as their use of the technology to interact with citizens. While technological development is important regarding the provision of online services and information by governments, the use of the Internet for such purposes is shaped by the preferences and choices made by government officials. In addition, although the Internet possesses the potential to enhance electronic democracy and online participation, the evidence suggests the realization of such potential depends on how government officials use the technology, and that many local governments have not fully taken advantage of this potential to bring citizens closer to their governments. While some local governments may be investing in website designs to enable some minority groups and the elderly to use the Internet for interaction with government, the degree of investments in such efforts is generally dependent on the relative affluence of local governments. Therefore, there may be the need for some form of assistance to low income communities to help target those socioeconomic groups that have persistently fallen behind in the digital age.

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KEY TERMS AND DEFINITIONS

Communication Preference: The preferred means of providing and/or receiving information. This may include expression of thoughts and ideas. The means for providing and/or receiving information may include face-to-face communication, telephone conversation, regular post office mail, Internet email, electronic bulletin board, radio, newspaper, television, etc.

Digital Divide: The disparity between individuals who have and do not have access to information technology. It is the perceived gap between those who have access to the latest information technologies and those who do not. More specifically, the digital divide is often measured by personal computer ownership and Internet access.

Internet Deliberative Features: Attributes that serve as democratic outreach by facilitating communication, interaction and discussions between citizens and government. These include online discussion forums and feedback forms.

Internet: A global network connecting millions of computers. The Internet is decentralized by design and each computer (host) on the Internet is independent. The World Wide Web (WWW) is a technology that 'sits on top' of the Internet to allow for communication enabled by web browsers such as Internet Explorer, Netscape and Firefox. The Internet generally consists of the WWW, electronic mail (e-mail), file transfer protocol (FTP), Internet Relay Chat (IRC), and USENET.

Online Participation: The use of the Internet to facilitate active citizen involvement in the policy and democratic processes. This includes using government web sites to solicit citizens' opinion on policies and administrative services, to allow citizens to provide online feedback to administrative agencies and the legislature, and to stimulate online public discussions on policy and the political process.

Resource Deployment: The means provided to support a specific project or goal such as provision of Internet access and design of deliberative features for online citizen participation. Such means may include allocation of funds for the technological infrastructure, assignment of support personnel, access provision (e.g. electronic kiosks) and connectivity, Internet usage training, promotion of city web site, and availability of education materials on the Internet.

Social Stratification: The divisions within and across societies. These divisions create individual and structural levels of social exclusion and social inequality. The root cause of such stratification could be disparities in financial, educational, or cultural resources, as well as ethnicity.

Technological Determinism: A concept based on the assumption that technologies shape societies more than vice versa. Various strands of this theoretical concept generally emphasize that technological development directly influences how far political organizations can provide online services and information, and indirectly produces greater incentives for political organizations to do so, as far as the general public is wired.

Technological Diffusion: A concept that suggests that the adoption of many successful innovations have commonly followed an'S' (Sigmund) shaped pattern. According to this theoretical concept, new technologies have often experienced a slow rate of initial adoption, followed by a substantial surge that peaks when penetration levels reach saturation point and demand subsequently slows.

Chapter 31
Bridging the Gap between Citizens and Decision-Makers:
Are ICTs the Appropriate Means for Reconfiguring Traditional Notions of Citizenship and Participation in Public Affairs?

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ABSTRACT

Over the past few years the concepts of government and governance have been dramatically transformed. Not only is this due to increasing pressures and expectations that the way we are governed should reflect modern methods of efficiency and effectiveness, but also that government should be more open to democratic accountability. The following chapter will introduce the social impact dimension of e-democracy while proposing concrete directions and incentives that should be provided for engagement through electronic means. The intention is to highlight the fact that technology is the result of a combination of tools, social practices, social organizations, and cultural meanings. It not only represents social arrangements, but also has the potential to facilitate and / or limit different types of interaction.

INTRODUCTION

Over the past few years the concepts of government and governance have been dramatically transformed. Not only is this due to increasing pressures and expectations that the way we are governed should reflect modern methods of efficiency and effectiveness, but also that government should be more open to democratic accountability.

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Political participation is arguably the main domain where the impact of Web 2.0 is now visible (Kohut, 2008). Information and communication technologies (ICTs) have considerable potential to make government more transparent and to open new channels for participation, but the incorporation of new technology into democratic processes can also be fraught with difficulty and controversy.

However, it is only relatively recently that there has been sufficient practical design and application of ICTs in support of democracy to enable this ‘potential' to be considered within a real-world context (Weber et al, 2003). The term 'eDemocracy' captures both the intent to support democracy and the study of outcomes and context. Hacker and van Dijk (2000), using the term 'digital democracy' as opposed to eDemocracy, discuss the emergence of the concept. They define digital democracy as "a collection of attempts to practice democracy without the limits of time, space and other physical conditions, using ICT or CMC1 instead, as an addition, not a replacement for traditional 'analogue' political practices."

Previous work (Macintosh, 2004) gave a definition of eDemocracy as: "concerned with the use of information and communication technologies to engage citizens, support the democratic decision-making processes and strengthen representative democracy. The principal ICT mechanism is the internet, accessed through an increasing variety of channels including PCs, both in the home and in pubic locations, mobile phones, and interactive digital TV. The democratic decision making processes can be divided into two main categories: one addressing the electoral process, including e-voting, and the other addressing citizen e-participation in democratic decision-making." This chapter builds on these baseline definitions and uses a working definition of eParticipation as the use of ICTs to support information provision and "top-down" engagement, i.e. government-led initiatives, or "ground-up" efforts to empower citizens, civil society organisations and other democratically constituted groups, to gain the support of their elected representatives.

Effective information provision is often seen as a corollary of effective engagement and empowerment as declining political interest presents an increasing erosion of legitimisation for traditional, representative politics. The task of eDemocracy is to empower people with ICTs to be able to act in bottom-up decision processes, to make informed decisions, and to develop social and political responsibility. Therefore, eDemocracy is a means to empower the political, sociotechnological, and cultural capabilities of individuals giving the possibility to individuals to involve and organize themselves in the information society. eDemocracy offers citizens a greater share in political discourse and, in the ability to contribute their own ideas, suggestions, and requests, an as yet unrealised potential that – as far as it is supported and accepted– could modify the understanding of democratic participation.

In a world characterized by a generalized public disengagement from formal political processes, eDemocracy applications are widely recognised as having the potential to support and facilitate participatory and deliberative democracy, enhancing the transparency and accountability of democratic decision-making. However the design and implementation of such e-democracy tools is not at all neutral and involves a series of considerations, many of which have moral/social import. As the knowledge–based economy develops, this increasing use of leading-edge technologies, not only in political but equally in all areas of life, could introduce new threats to sustained growth and social inclusion. Like all technology, ICT comes as a result of a combination of tools, social practices, social organizations and cultural meanings. ICT is shaped by the character of the society that produces them. Social practices, social relationships and social institutions are interrelated with designing, producing, distributing and using technology. Hardware and software applications as well as telecommunication connections could not exist without the variety of social institutions, political and economic arrangements and social bonds, necessary not only for the construction but also for the maintenance of the interne (Goujon et al 2007).

In this context there is a pertinent risk that, despite their many benefits, new technologies could set people apart, create new barriers and increase exclusion. According to 2006 EU eInclusion data, anything from 30-50% of all Europeans are still enjoying few or no ICT-related benefits. The lack of access to equipment or networks, the limited accessibility to user-friendly technologies, price, motivation, limited skills and different generational attitudes to advanced technologies are key constraints in the development of a participatory and equitable information society.

Key demographic variables like income and education drive the policy questions surrounding the Internet and the digital divide. Racial, geographic, and gender variables are important because they are the most likely to differentially impact the consequences of interactive electronic media for different segments in our society.

According to EU data, only 3% of public websites fully comply with web accessibility standards, creating additional hurdles for the 15% of the EU population with disabilities. In this respect, special attention should be paid to vulnerable groups in society, those that are at high risk of being excluded due to a wide variety of reasons, such as age, disability, culture, and literacy.

The following chapter will introduce the social impact dimension of eDemocracy while proposing concrete directions and incentives that should be provided for engagement through electronic means. The intention is to highlight the fact that technology is the result of a combination of tools, social practices, social organizations and cultural meanings. It not only represents social arrangements, but also has the potential to facilitate and / or limit different types of interaction.

RESHAPING POLITICAL PARTICIPATION AND ENHANCING TRANSPERENCY IN POLITICAL MAKING PROCEESES VIA ICT

The decline in citizen engagement in the public sphere has long been one of the main challenges of modern government (Finer, 1997; Dutton & Peltu, 2007). It is often declared in public discourse that people are becoming more and more sceptical about the real value and outcome of traditional democracy enactment and decision-making. Public trust in the political system needs to be restored, and citizens have to be reminded about their obligation to take up their role as active citizens. This raising of awareness is declared necessary in order to rescue the traditional representative democratic system, which is the foundation of our western society.

Barber argued in the 80's (1984) that this was an effect of an excess of neo-liberalism, which had undermined modern democratic institutions and brought about several societal crises, such as reluctance among citizens towards voting and civic engagement. This effect, together with privatisation and outsourcing, coupled with a continuing downsizing of public institutions, created alienation among the public. According to some of its proponents, eParticipation is to be seen as a possible cure to this growing alienation towards formal politics. Macintosh et al. (2002:226) talk about failing political participation and quote Shapiro and Hacker-Gordon (1999), who once pointed out that: "*in reality democracy often disappoints*". Coleman (2005) terms the crisis of modern democracy as a "*widespread distrust of paternalistic representation (manifested by seemingly remote politicians, parties and political institutions); public disenchantment with virtual deliberation (primarily, the political coverage provided by television and the press); and a post-deferential desire by citizens to be heard and respected more.*" (Coleman, 2005)

Democratic political participation must provide the means for citizens and other stakeholders to be informed, the mechanisms to take part in decision-making and the ability to contribute and influence the policy agenda (OECD, 2001). Participation is a multilateral relationship between stakeholders of the political triangle (state, market, civil society), each attempting to influence the political agenda at various stages of the political cycle and at different levels of government.

In order to enhance participation, citizens (as well as governments and political bodies) need increased and improved access to politically relevant information, as well as improved capabilities for managing knowledge. ICT has for some time been considered a strategic tool for reinforcing citizen engagement through eDemocracy and eParticipation initiatives, though it has had mixed success so far (Bryant &Wilcox 2007).

A particular role in eParticipation is played by the policies on transparency. The trend towards enhanced transparency is one of the key changes of future government (Frissen, Millard et al., 2007). Many Web 2.0 initiatives are being set up to enhance the transparency and accountability of public processes. They use, re-aggregate and analyze public data to monitor the behaviour of civil servants and politicians. Often data are publicly available but their potentially disruptive impact results from the re-elaboration of data in a more meaningful and understandable way.

There are relevant examples of applications in other eParticipation activities:

- Politicians using Web 2.0 applications for a more direct contact with the electorate. In many EU countries, politicians have blogs and participate in social networking websites. In the UK, both Tony Blair and David Cameron made extensive usage of video-streaming services such as YouTube; in France, the parties of the presidential candidates Le Pen, Royal and Sarkozy opened headquarters in Second Life;
- Bringing citizens' participation upstream;
- Monitoring public representatives;
- Applications enable citizens to monitor administrative procedures such as planning applications and public funding;
- Opening discussion forums;
- Easy creation of pressure groups for specific causes: where participants can find other people interested in the same causes, and also connect to politicians sharing their views.

Castells (1997- 2000) described the rise of a new political network dynamic, where ICT, and internet in particular, is expected to function as an instrument for furthering democracy, in terms of "*informational politics*" (Castells, 2001). This notion points to the enabling potential of internet to foster new, dynamic forms of democracy and political participation, mainly by functioning as a horizontal communication channel allowing polyphonic discussions as well as one-to one dialogue. eParticipation is also part of these visions of reviving democracy.

Coleman and Gøtze (2001) define deliberative engagement as: "Methods of public engagement can be described as deliberative when they encourage citizens to scrutinize, discuss and weigh up competing values and policy options. Such methods encourage preference formation rather than simple preference assertion". Macintosh analyses the e-engagement of citizens in the policy process through the use of ICTs, suggesting that e-engagement applications can be categorized in three main themes, according to the purpose they serve: the dissemination of information, electronic consultation and active participation.

THE CHALLENGE: USE OF ICT IN ORDER TO RE-ENGAGE CITIZENS IN POLICY DESIGN, IMPLEMENTATION AND EVALUATION

However, everyone can probably agree that government does need to be democratic, transparent, open and accessible, and ICTs can add significant impetus to each of these goals. Engaging citizens through policy design, implementation and evaluation can evolve through the eDemocracy cycle. The OECD's eDemocracy cycle (OECD, 2001) consist of:

- Information (eEnabling) - a one-way relation in which government produces and delivers information for use by citizens. It covers 'passive' access to information on demand by citizens as well as 'active' measures by government to disseminate information to citizens.

- Consultation (eEngaging) - a two-way relationship in which citizens provide feedback to government, based on the prior definition by government of the issue on which citizens' views are being sought. This requires the provision of information as well as feedback mechanisms.
- Active participation (eEmpowerment) - a relation based on partnership with government, in which citizens actively engage in the policy-making process. It acknowledges a role for citizens in proposing policy options and shaping the policy dialogue, although the responsibility for the final decision or policy formulation rests with government. This step of online public engagement in policy deliberation is undoubtedly the most difficult to generate and sustain.

The OECD (2003) has also recently considered the impact of ICTs on efforts to enhance citizen engagement in policy decision-making, and highlights five main challenges for e-democracy

The OECD's five eDemocracy challenges (OECD, 2003)

Challenge of scale: how can technology enable an individual to get heard in public mass debates; how can technology support governments to listen and respond to citizens' comments?

- Building capacity and active citizenship: designing technology to encourage deliberative debates on public issues among citizens.
- Ensuring coherence - allowing a holistic view of policy-making: there is a need to ensure that knowledge that is input at each stage is made available appropriately at other stages of the process so as to enable more informed decision making by governments and citizens.
- Evaluating e-engagement: there is a need to understand how to assess the benefits and impacts of eDemocracy tools on political decision-making.
- Ensuring commitment: governments need to adapt structures and decision-making processes to ensure that the results gathered with eDemocracy tools are analysed, disseminated and used.

The lack of political participation and communication between citizens and decision makers makes public a weakness of representative institutions and generates a functional and structural deficit of the political system. It is suggested that democracy can function again properly by strengthening the communication channels, empowering citizens through ICT and introducing new types of social dialogue and accountability.

The question is not so much whether citizens are involved, they obviously are, but more how and to what extent they are involved regarding their status as citizens. This depends on how far the democratic principles have informed the society that is being created; that is to say, if democracy stands for the right of people to participate in the governance of society, then in turn, those prerogatives should be valid in an information society. (Goujon et al, 2007,Kizza, 2007)

The objective is to find out how, when, where, and at what point individuals should participate, but also which institutions are best at achieving participation, equality, openness and decision making. The complexities of modern life and the increasing interdependence of individuals with nations and across nations make things even more difficult.ICT plays an important role in the intertwining of people across the world. ICT has permeated social structures and has changed social practices in the government, commerce, finance, education and in the health sector. The aim is to reinvent democracy by taking ICT into account. The challenge is for citizens not to be passive receivers but to be included in the process of change.

According to Warschauer (2003)*"ICT, if deployed well, can contribute toward improved education, government, and health care, too, and thus be a multiplying factor for social inclusion"* The obvious difficulty is that education, government, and health care are also the sites of struggle, with *"access policy reflecting broader issues of political, social, and economic power."* (Warschauer, 2003). Nigeria is an indicative example of a country where increasing private sector participation and improved ICT awareness have led to one of the highest per capita access and use of ICT in Africa. Today, more than 70% of the population has access and uses mobile phone, and the growth of Internet Cafes in major metropolitan cities is phenomenal.

DIGITAL INCLUSION: A NEW DIMENSION OF SOCIAL INCLUSION

Digital inclusion is in reality a new dimension of social inclusion rather than a separate part. The digital divide has been described as a new form of social exclusion. The concept of social exclusion was first developed in policy terms in France in the mid 1970s to define social categories of people who were unprotected under the government's social insurance system (de Haan, 2001; de Haan, 1999; Silver, 1994). In the 1980s, the concept was transformed into a new model of anti-exclusion social policies. Since the concept has become enshrined in the UK and the wider European Union (EU) through dedicated policy units; linked different philosophical foundations, objectives, targets and performance measurements.

While different definitions and applications of social exclusion have been developed about what it means to be excluded from society and how different political and social structures should address it in the UK and in other EU countries, two central principles are generally shared. First, social exclusion is defined as being multi-dimensional. That is, social exclusion is understood as something that can happen in the economic, cultural, social and political spheres and people may be excluded from different things at the same time (de Haan 2001). Second, the concept puts a focus on the processes that cause deprivation and exclusion (Jones and Smyth 1999; de Haan 1999). By opening up debate about the many ways in which people are excluded from participation in society, the concept has successfully been used to contribute to context-specific analysis of what Sen (2000) refers to as the 'root causes of deprivation'. The multi-dimensional and historical aspects of the social exclusion framework analysis also support complementary and integrated policies that cut across sectors including health, housing, employment and education (Notley & Foth. 2007). It has been argued that, in a similar way, the concept of digital inclusion can be used to extend the notion of the digital divide away from a singular focus on technology access and towards a focus on the way technology access and use can impact on different forms of deprivation and disadvantage (Warschauer, 2003).In the UK, social inclusion has been used for some years to develop a concept of eInclusion (Notley &Foth, 2007). In 2004, a committee of government, research and non-government agencies argued the need for a governmental 'Digital Inclusion Unit' and outlined the issues and specific sociodemographic categories that would need to be considered in designing a comprehensive national digital inclusion strategy (Bradbrook & Fisher 2004). The UK government subsequently published the report Inclusion through innovation in 2005 and funded a Digital Inclusion Team to implement the report's recommendations. The Digital Inclusion Team defines digital inclusion as: *"The use of technology either directly or indirectly to improve the lives and life chances of disadvantaged people and the places in which they live"* (Digital Inclusion Team, 2007).

The specific form of exclusion is both seen as a result of social exclusion (those who suffer from a lack of financial resources, skills or capabilities will also have trouble accessing ICTs and handling the information that is accessible through ICTs) and a factor that will aggravate the other dimensions of social exclusion (Brants, 2003). The statistics show that digital exclusion is very closely correlated with income, education and to a less extend age, all central categories of social exclusion and marginalization. eInclusion activities cannot work as stand alone projects, but need to be closely aligned and integrated with general social, health and economic policy interventions.

Good eGovernment services can make life easier – from paying council bills via the internet to buying car parking tickets through the use of mobile phones. The possible applications of ICTs in public life are seemingly endless, providing that potential users have the means and ability to access such services. Information and communication technologies (ICTs) are becoming key enablers of modern life. They are used at work, in day-to-day relationships, in dealing with public services as well as in culture, entertainment, leisure and for community and political participation.

In this context, eInclusion is basically about using ICTs to enhance social inclusion in a knowledge society and about barrier-free ICTs that are usable by all. Going beyond access to ICT tools and services and even beyond digital literacy, the eInclusion domain encompasses attention to all groups that may be at risk of exclusion from the Information Society or of not having equal opportunities to benefit from it. Disabled people and older people are therefore encompassed, and so also are many other groups - women, those with low education, the unemployed, ethnic minorities, people living in isolated rural areas and so on. In fact, three distinct yet interlinked perspectives can be discerned:

Inclusive eGov is about using digital technologies to provide public services, which improve people's lives, encourage participation in the local community, strengthen democracy and help those at risk of exclusion from society. According to V.Reading, "In today's society, access to information by all citizens is a right as well as a condition for prosperity. It is neither morally acceptable nor economically sustainable to leave millions of people behind, unable to use Information and Communications Technologies to their advantage". Political participation within an inclusive governance model is possible only if political, economic, technological and social barriers are removed and access to these opportunities is equitably distributed.

Sub Saharan Africa (SSA) nations where fundamental socio-economic and political problems continue to hamper against closing the digital gap is a clear example of the correlation between ICT and social inclusion. Most people in SSA are facing the challenges of perennial poverty, socio-political instability, illiteracy and disease. These problems are multi-factorial brought about by poverty, technology illiteracy or lack of foreign language skills; legacy of traditional beliefs; lack of governmental support; generational gap and general disinterest in change. Amongst all, poverty, lack of governmental support and education is of greatest concern here.

Poverty is a multifactorial phenomenon that undoubtedly manifests in denigration of humanity through lack of access to basic humanistic necessities, leading to despair and stunted socio-political and economic development. The ravages of poverty if we take this example in SSA has hindered sustainable democracy and democratic reforms; safety and security; propelled judicial irregularities and inequities in the distribution of resources. Generally, poverty is more pervasive in rural areas than city centres prompting mass migration to the cities where access to and use of ICT is generally enhanced by better infrastructure and more educated population. It is imperative, therefore, to look at some of all those problems when militating against access to and use of ICT.

SSA to bridge the digital divide clearly needs genuine democratic institutions where national resources and international donations are effectively used to develop infrastructure that would increase access to and use of ICT, and this could only be achieved through accountable and transparent leadership and by allowing the people to "elect" their leaders.

Easy access to ICT is a prerequisite for participation. Facilitating this access entails, inter alia, removing barriers, making ICT tools easier for everyone to use, and encouraging people to use them by raising awareness of their economic and social benefits. Furthermore, eInclusion also refers to the extent to which ICT helps equalise and promote participation in society at all levels (i.e. social relationships, work, culture, political participation, etc.).

SUCCESS FACTORS: CAN REGULATION BE THE SOLUTION?

If the Internet is treated as being a public/social service value, then the human rights standards developed on the basis of the Universal Declaration of Human Rights are globally recognized as a perquisite for the development of an socially inclusive and participative information society.

Specific regulatory measures need to be considered in order for eDemocracy to promote a participatory and deliberative democratic framework that bridges the gap between policy makers and citizens and fosters political accountability. This is important so as to provide the former with support and legitimacy, and the latter with transparent access to information and participation in policymaking processes at all levels of government without physical presence.

The Right to Access Information, Knowledge and Culture

Although potentially Internet offers almost unlimited opportunities to share information and knowledge at the global level and at low cost, this opportunity is limited mainly to privileged groups. The disadvantaged, vulnerable and socially excluded so far have been largely deprived. Furthermore educational, linguistic barriers and technological constraints exist and need to be overcome.

In a study undertaken in Kenya to examine gendered perspectives on the digital divide, motivations for engaging in information technology (IT) education, and expectations regarding IT workforce participation reveales researchers interviewed 32 women and 31 men matriculating in an undergraduate IT-focused program at a Kenyan university. Interviewees reported that IT careers demand technical expertise, and a strong educational background in technology and business. However, their ability to meet these demands was hindered by significant national challenges such as restrictive IT policies, inadequate access to technology and educational resources, and a limited number of local firms that demonstrate the ability to manage advanced technology and IT workers. Women were particularly concerned about gender discrimination in the workplace. These findings imply that IT education and workforce entry require a complex mix of digital technologies, organizational capacity building, gender equity and IT policy remedies (Kvasny et al, 2008).

Freedom of Expression

The liberalization of the creation and dissemination of Internet content and communications challenges the right to freedom of expression in a manner never seen before. By bypassing professional intermediaries, such as editors or journalists, the issue of validation of information (quality, authentication) and the responsibilities for and regulation of communications with particular reference to the legal and harmful characteristics of content and communications is raised.

At the same time existing economic, cultural and political models impose different types of regulation/ censorship models regarding freedom of expression, intellectual property rights and so on. Should information (content and/or software) be regarded as intellectual property? Should the notion of knowledge sharing supersede that of ownership?

Several online-editions of newspapers for example have implemented a service for readers to comment on articles.We have had debates about the use of anonymous comments. Often such (especially anonymous) comments may hurt the people being involved in a specific case. The same thing is applicable to e-democracy applications.

Identity and Social Networks

Internet services and technologies are increasingly enabling users to make easy contact with and develop relations and communities between users from various backgrounds and origins. The emergence of the "Internet of things" also raises an important identity issue regarding the relationship between human beings and machines, with Second Life being a relevant case in point.

With the rise of such social networks, questions of user identity and anonymity in these environments become all the more pertinent. ePetitions constitue an indicative example of the emerging conflict between between authencity and anonymity. Should everone be able to sign a petition even if they are not stakeholders? The Scottish Parliament have no requirement for authencity of the signers. When ePetitions were implementedin Norway, one of the municipalities had a Coca Cola production facility. The municipality was concerned with the possible use of ePetitions by global organizations to raise issues related to the plant.

Rights and Freedoms of Internet Users with Regard to their Actions and Responsibilities

Every individual user should benefit from the same level of protection regarding their rights and freedoms on the Internet, including the right to a private life and to be safe and secure. There is a need to balance the protection of rights and actions of Internet users and their responsibilities; moreover, it is questionable that the State alone can provide effective protection of the rights of cyber-citizens across the world.

The issues of transparency and responsiveness are also directly linked with eDemocracy meaning the right to examine public docs relevant to political decision making process, the right to access statistical information collected by governmental bodies, the right to be aware of decision makers' activities and directly interact with them.At the same time, transparency is in conflict with privacy. If a government implements web based records of incoming and outgoing mail, what kinds of information should be kept undisclosed?

ICT are merely tools, they cannot solve political problems in and of themselves. Facilitating the connection and interaction between representatives and the represented is a cultural function – it is not a product of technology. Issues such as lack of political will to take account of stakeholder views; the lack of responsiveness from politicians and public administrations in interacting with stakeholders; public mistrust in political institutions; and scepticism that citizens' contributions will be taken into consideration are to be considered on a case-by-case basis.

Governmental choices about the development of top-down or bottom-up systems have a direct effect on the type and level of citizen engagement, whether through aggregative applications such as e-voting or focusing on deliberative and sustained dialogues with citizens or by giving citizens the ability to self-organise to pursue particular political preferences or interests. What governments do (and don't do) shapes the space in which citizens and the organisations of civil society can be active. However the key question is who should control the agenda? Through the e-democracy tools government gets some structural power to define what issues should be discussed, and how. Is it better with third party institutions (e.g. media) to run such applications? Which should be the role of international organizations? What measures of regulation are or aren't necessary.

CONCLUSION

Introducing ICT to democracy (however defined) poses profound political, ethical and practical problems, especially in relation to the digital divide, i.e. how can the technology 'have-nots' participate? Just as serious, however, is the danger of trivialization and short-termism which could result if direct voting by Internet were to be widely introduced.

It is questionable whether simply adding ICT to existing governance structures will de facto produce more open and accountable government, even assuming that the digital divide can be overcome. We need to re-examine the whole notion of governance and democracy, both supported by and independent of ICT, and this will take time, especially as the rapid ICT-adoption curve is racing ahead of our ability to cope with and understand the processes unfolding.

Despite these dangers, however, experience has already shown the immense benefits eGovernance can bring in extending participation, widening and enriching the political debate and increasing voter turnout. As in most societal arenas, new technology is a double-edged sword requiring real policy choices and deliberate implementation strategies designed to maximise benefits and minimize negative outcomes. The march of history has been ever thus.

In order to ensure that ICT are applied to governance issues successfully, many countries have adopted an approach based on a strong leadership role for central government, working top-down from an overall vision, with strategies, roadmaps, resources and a specification of standard solutions and frameworks. However, this needs to be proactively complemented by local and regional initiatives, close to their social and business communities, driven forward by local champions who are able to find the appropriate balance between, on the one hand, undermining special vested interests and undemocratic fiefdoms ('breaking down silos'), and, on the other, the need to preserve local autonomy and freedom to act in response to specific local needs.

A difficult balancing act indeed, but an essential one and one that is not confined to eGovernment initiatives alone. Different countries across Europe need to develop their own paths as each has unique identities, cultures, legal systems and institutional structures, but all can learn from the experiences of others.

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KEY TERMS AND DEFINITIONS

Accountability: acknowledgment and assumption of responsibility for actions, decisions, and policies including the administration and the governance.

Digital Divide: the gap between people with effective access to digital and information technology and those with very limited or no access at all.

Digital Inclusion(eInclusion): activities related to bringing the benefit of the Internet into all segments of the population, including people who are disadvantaged due to education age, gender, disabilities, ethnicity, and/or those living in remote regions.

eDemocracy: the use of information and communication technologies to engage citizens, support the democratic decision-making processes and strengthen representative democracy.

eGovernment: the use of information and communication technology to provide and improve government services, transactions and interactions with both citizens and businesses.

eParticipation: the use of information and communication technologies to broaden and deepen political participation by enabling citizens and groups to connect with one another and with their elected representatives.

Regulation: legal restrictions promulgated by a governmental authority.

Social Inclusion: strategy to change the circumstances and habits that lead to (or have led to) social exclusion.

Transparency: visibility related to the behavior of government.

Section 5

Approaches to Study Digital Divides

Chapter 32
From the Digital Divide to Multiple Divides:
Technology, Society, and New Media Skills

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ABSTRACT

It is widely acknowledged that the label "digital divide" can be partially misleading, because it emphasizes a binary dichotomy ("haves vs. have nots") and a mere technological dimension (in terms of physical availability of devices or conduits). Behind the dichotomous model, however, lie different use and adoption strategies. People cannot be described as being either in or out. Evaluating the complex relationships between technological, social, and human factors raises a number of questions, mainly related to the role of technology in social development. Moreover, we should also reconsider what is commonly meant by information and communication technology. In this chapter, I will try to introduce a multilevel model for analyzing the digital divide, focusing on effective access and new media literacy. The focus will be shifted from technology to humans. In every ICT for development project, local context and local needs should be regarded as the key factors.

INTRODUCTION

The purpose of this chapter is to examine the digital divide from a sociological and media studies perspective, referring, for a better understanding of the subject, to the wider literature on the relationship between communication technology and society.

Not only common sense, but also many political and academic definitions of the "digital divide" seem to mainly consider the technological aspects of the question, without paying any attention to the complex human and social phenomena related to technology adoption and diffusion.

As we should have learned from wide international experience in the field of Information and Communication Technology for development (ICT4D), significant problems may occur when projects focus on providing hardware and software, or mere connectivity, without paying sufficient attention to the human and social factors involved.

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Therefore, we should abandon any technological deterministic perspective, without falling into sociological determinism. When considering the global divide, we should not question if the priority is to "provide food, healthcare or a Personal Computer" to developing countries. We should, instead, evaluate which technologies are most suitable to the needs of intended targets, with constant attention to the relevant context.

When considering the intra moenia divide (the "social divide", according to Norris, 2001), we should focus not only on devices or network availability, but also on individual and social use of technology, as research on (Internet) Dropouts has pointed out (Katz & Rice, 2002a).

That's what we define as "enabling technology": access to a set of technologies is not a priority in itself, especially in developing countries; it becomes a priority if it enables a wide range of Information Society services, contributing to addressing the developing countries' basic needs (e.g. eHealth, eLearning, information concerning agriculture or the job market, etc.).

Therefore, we need to widen our perspective on the global digital divide, considering not only access but also effective use of Information and Communication Technology. In this chapter, after having questioned the widespread dichotomous approach to the digital divide, and a limiting conception of technology, I will introduce the "enabling technology" perspective and I will try to propose a multilevel model for analyzing the digital divide, proceeding from mere technology availability to effective use, and focusing on advanced reception practices, technical skills, content production, and networking skills. New media literacy will play a central role in the proposed model.

RETHINKING THE DIGITAL DIVIDE: COMMUNICATION TECHNOLOGY AND SOCIETY

Rethinking the relationship between technological, social and human factors has deep consequences on the definitions and on the theoretical framework we apply to the digital divide.

It is widely acknowledged that the label "digital divide" can be partially misleading, because it mostly emphasizes (1) a binary dichotomy ("haves vs have nots") and (2) a limiting approach to the technological dimension (mainly focusing on physical availability of devices or conduits), and to the relationships between technology and society.

The conceptual framework offered by the digital divide can also be limiting, because it appears to focus on the "gaps" that divide specific populations, i.e. on the needs affecting the so-called "have nots", mostly located in the globalSouth, perpetuating a western-centric perspective on development.

Consequently, a rising number of scholars are questioning the label "digital divide", adding in their books' titles expressions like "rethinking", "redefining", or "beyond" (Warschauer, 2003; Mossberger, Tolbert & Stansbury, 2003, etc.).

Others suggest new definitions, in order to better describe the multidimensional phenomena related to the increasing diffusion of ICTs, such as "digital inequality" (DiMaggio & Hargittai, 2001); or propose a new framework, a "more nuanced" lens, aiming to assume the unconnected's point of view, under the definition of "zones of silence" (Potter, 2006).

Moreover, the term appears to be mobile: it has often been defined as a "moving target", shifting forward every time a newer technology starts its diffusion (from a mere technological point of view, in the western world we have been dealing with first an Internet access divide, followed by a broadband divide, and are now concerned with wireless broadband technologies and Next Generation Access Networks).

But the mobility of the term also refers to the variety of topics addressed. A main distinction has to be drawn between the "global divide", i.e. the difference in ICT access between citizens of the developed and the developing world; and the "social divide" (or "intra moenia" divide), or the difference in access held by early and late adopters in a single area (where income, education, gender and age seem to be the most influencing variables, let alone personal attitude to technology and specific technological literacy). Norris also introduces the "democratic divide" emerging within the online community "between those who do, and those who do not, use the panoply of digital resources to engage, mobilize, and participate in public life" (2001, p. 4).

While the origins of the label "digital divide" are uncertain and still debated, as documented by Gunkel (2003), further distinctions have to be drawn: a dichotomous vision ("haves vs have nots") vs a more nuanced vision; a main focus on ICT availability vs a main focus on human usage and skills; a technological deterministic approach vs an approach considering multiple factors. Even the more specific technological side of the question has to be carefully considered: not only are we dealing with a moving target, as long as newer technologies take place at a growing speed, but there are also "older" technologies to be considered, if we adopt an "enabling technology" perspective.

Nevertheless, even after questioning the label, most of the scholars continue using it, certainly as a tribute to its popularity in the academic world, in order to keep an adequate level of consistency and comparability between different scholarly works. Moreover, the digital divide is also perceived as a shared means of communication with policy makers and activists worldwide.

Such definitional issues should not be regarded as a pure academic concern: they contribute to building the conceptual frameworks that constitute the basis of wider policies, let alone single digital divide projects.

We will try to focus on some of those topics in the following pages, fully aware that "Perhaps the greatest gap is the wisdom gap – the gap between the information revolution's inherent complexity and our capacity to comprehend it. We need a multidisciplinary and comprehensive framework for analyzing the information revolution" (Wilson, 2004, p. 36).

Beyond Dichotomies: From "Haves" and "Have Nots" towards a More Complex Model

One of the most widespread digital divide *myths* is that it can be addressed using simple, dichotomous categories, such as "(information) haves" vs "have nots". Behind this widely used dichotomy, introduced by the much quoted National Telecommunications and Information Administration "Falling Through The Net" (NTIA, 1995), lies a simplifying framework, assuming (1) that the digital divide is a mere question of technology availability or access, without any concern for effective use; (2) that, compared to the technological *optimum*, one can only suit or not suit to the model, without any gradation ; (3) that those populations that don't suit to the (young, western, urban) proposed model are necessarily in need, without taking in any account people's motivations.

In western countries, where the Internet has become a widespread medium, influencing people's everyday life (Wellman & Haythornthwhaite, 2002), there seem to be fewer barriers to mere technology access: a vast majority of the population can have material access, if not at home then at work, at school, at someone else's house, or in public places (such as public institutions or commercial outlets). What becomes therefore crucial are the differences between people with formal access: how often they use technology, for what purposes, showing which level of new media literacy, etc. (see DiMaggio & Hargittai, 2001).

In addition, the framework offered by a binary divide "can be patronizing because it fails to value the social resources that diverse groups bring to the table" (Warschauer, 2003, p. 7).

With special regard to the western world, the "have nots" model, claiming technology deprivation, should be integrated with the so-called "want nots" category (van Dijk, 2005). Although deprivation and lack of motivation are difficult to separate (lack of motivation could be used by the people to rationalize their deprivation status), there is empirical evidence that "motivational access" plays a central role in technology adoption.

Behind the dichotomous model, moreover, lies an articulated variety of use and adoption strategies. People cannot be described as being either in or out: some nonusers were previously connected, others can have formal access to technology without using it, some people assumed to be users can in fact be very random users (some global digital divide work, for instance, defines as user everybody having used the Internet in the past six months). The most appropriate way to describe use and adoption strategies is to draw "a *spectrum of access*, ranging from those with full access using the best available technology in a mass market in the developed countries (broadband, these days) to the truly unconnected" (van Dijk, 2005, p. 32). According to van Dijk (2005), present or potential nonusers can be divided into at least four categories: (1) intermittent users, (2) dropouts, (3) net evaders, (4) the truly unconnected.

Intermittent users are people that have gone offline for long periods of time in the past (but are actual users again), mainly due to technical problems, house moving or losing access to the place they used to connect from (job, school, etc.).

Dropouts are people who have used the Internet, typically for a short period of time, but no longer do so. They have had access to technology, and may still be owners of the device, but stopped using it. They would therefore be mentioned on the "haves" side, if considering mere technology adoption, but are to be defined as nonusers. According Katz & Rice (2002a), the number of American dropouts is large: about 10% of Internet users. More than intermittent users (who went back to usage, and whose intermittency depends mainly on material conditions), the dropout phenomenon reveals the importance of motivation. While the loss of material access is listed by respondents as the most important cause of disconnection, other relevant causes are "cost", "too hard or complex", "not interesting", "too much time". Not surprisingly, "access" was the main motivation in the first surveys (1995 and 1997), afterwards losing its influence in favor of "too hard or complex" (Katz & Rice, 2002a, pp. 75-78). Thus, while the Internet is increasingly penetrating in western societies[1], material access appears to be less influencing (because affordable for a vast majority of the population, even if not necessarily at home), while more immaterial variables, mainly skills and motivation, gain growing importance.

The so-called Net evaders confirm this trend: they normally belong to the "haves", living in households with Internet connection, and are nonusers as a "distinct lifestyle choice" (Lenhart et al., 2003, p. 20). They might be parents who leave the use of the Internet to the children, or top managers having their subordinates use it.

Only the fourth proposed category describes the Truly unconnected, people with no Internet access that show a "difficult-to-unravel mixture of have-not and want-not causes", distinguished by "the lack of social networks that would encourage them to go online" (van Dijk, 2005, p. 35).

Horrigan (2007) proposes an updated typology of ICT users: Omnivores, Connectors, Lackluster Veterans, Productivity Enhancers, Mobile Centrics, Connected but Hassled, Inexperienced Experimenters, Light but Satisfied, Indifferent, Off the Network.

Access can be explained relying on specific resources. Material resources appear as prerequisites, while (lack of) time is a generally underrated factor, often mentioned as a reason by many nonusers. Social resources also appear to be crucial, as long as "people become aware of the importance and applications of the new media via social contacts with family, friends, colleagues, teachers, neighbors and acquaintances" (van Dijk, 2005, p. 37). Mental resources, both cognitive and emotional, also play a role in determining access behavior: while cognitive resources refer to knowledge and skills, emotional resources can explain people's attitude towards technology.

Motivation, more than mere material constraints, appears therefore a key factor in explaining new media access: evidently, a strong motivation can lead people to find opportunities to access technology, even outside their households, while the lack of motivation is possibly leading to what has been called Net evasion. This shifts the focus from technology to humans.

The people with a lack of motivation to gain access to computers and networks should not be accused of being backward. Instead, the finger should be pointed at the current flaws of the technology concerned: lack of user friendliness, usefulness, attractiveness, affordability, and safety (van Dijk, 2005, p. 43).

Most of the digital divide work, and particularly quantitative reports by international agencies, defines the digital divide as a mere matter of technology access, measuring it by the number of devices (PCs, mobile phones, etc.) or conduits (Internet connection, broadband, etc.). Thus, shifting the attention to humans, to their motivations and their knowledge, draws a more complex and nuanced picture, as I try to show in the following pages.

The fundamental digital divide is not measured by the number of connections to the Internet, but by the consequences of both connection and lack of connection. Because the Internet (…) is not just a technology. It is the technological tool and organizational form that distributes information power, knowledge generation, and networking capacity in all realms of activity (Castells, 2001, p. 269).

Digital Divide: Technology and Society

When questioning the digital divide, evaluating the complex relationships between the technological, the social, and the human factors raises a number of questions, mainly related to the role of technology in social development.

According to Warschauer (2003), many failures in technology projects worldwide depend on their focus: they focus on the physical infrastructure (hardware, software, connectivity), without paying sufficient attention to the social and human systems involved. "The digital divide framework (…) overemphasizes the importance of the physical presence of computers and connectivity, to the exclusion of other factors that allow people to use ICT for meaningful ends" (Warschauer, 2003, p. 7).

Technology-driven policies, ignoring any social or human consideration, follow a widespread conceptual framework, often becoming a *myth*, that considers technology as a sort of *magical tool*, fostering development and well-being for humankind. Such a utopian point of view has a long history, having been particularly popular during the French Revolution, when the connection between distance communication tools (Chappe's Optical Telegraph, at the time), social development, democracy, and universal peace was explicitly stated by Philosophers and Politicians[2].

More recently, the use of mass media in developing countries has raised expectations among the international community, as exemplified by the United Nations Educational, Scientific and Cultural Organization New World Information and Communication Order (UNESCO NWICO), but ended up not achieving the expected results.

ICTs seem to be even more powerful. According to Lyut (2004)

At the highest levels of government and intergovernmental organizations, this newest form of information technology is viewed as a ticket to *everlasting peace, progress, and prosperity. Despite the faltering of the "tech" bubble in 2000, hopes remain that the application of information technology will solve many of the problems now confronting the planet.*

As Warschauer (2003) points out, "the notion of a digital divide – even in its broadest sense – implies a chain of causality: the lack of access (however defined) to computers and the Internet harms life chances" (p. 7). As reductionistic as it may appear, the conceptual framework based on such direct causality is widespread, both on the negative side (the lack of access harms life) and on the positive side (the diffusion of technology will solve major problems).

From a broader perspective, the question is whether – and to what extent – ICT is having effects on the social and human environment. The debate on the effects of communication technology has a long history. Communication scholars have long been studying the effect on everyday life of broadcast media (radio, tv, etc) and of interpersonal communication media. Early research was mainly focused on short-term effects, proposing the idea that the mass media are so powerful that they can inject their messages into an undifferentiated audience (the so-called "hypodermic needle"). Subsequent empirical work has shown this early phase to be nothing more than "folk belief": a large amount of empirical data has led to the assumption that personal and social variables can strongly influence the way people use the media, and dramatically reduce their power and the strength of their effects. Recent research is now focusing on long term, cultural effects, on active audiences and on the complex way they negotiate meanings. Instead of studying mass media "effects", researchers are now turning to the way in which audience members generate their own meanings starting from media consumption (see McQuail, 2000[4]; DeFleur & Ball-Rockeach, 1989).

Recently, social scientists have added pc, mobile phones, and the Internet to the mix of technologies whose effects they are studying. According to Kraut & Brynin (2006), there are four main approaches to identify "what researchers mean by the phrase social impact of Information Technology": Technology as a tool, Technology that shifts goals, Personal welfare outcomes, Social impact (pp. 5-6). As highlighted in relation to mass media effects, "people shape the impact technology has to their lives by choosing which technology to use and how to use it" (Kraut & Brynin, 2006, p. 8) and appropriate it to serve their needs.

The effect of technology on the social sphere can be described in terms of *technological determinism*, meaning that technology is designed as the condition (hard determinism) or as a factor that may facilitate social change (soft determinism). Despite the critiques, technological determinism still plays an important role in the rhetoric of computers and the Internet, with special regard to ICT for development related topics. "The reports, texts, and discussions of the digital divide do not question this prevailing technological determinism, but exploit it" (Gunkel, 2003, p. 12).

Instead of a unidimensional causal chain, where technology has the power to foster social change, we need a more complex model, helping to consider adaptive behavior and domestication processes (Silverstone & Hirsch, 1992). Adopting this framework means agreeing that the acceptance of new technologies into everyday life is evolutionary, and can be defined as an active and creative process. In the case of individual appropriation of technology, social and cultural dimensions are involved: both technologies and cultures change in the process.

To draw such a multidimensional picture, many disciplinary approaches are needed, and a new research perspective has to be introduced. According to Raiti (2006), *There are several epistemological shortcomings within information communication technologies for development (ICT4D) literature. The literature is overly optimistic, highly western, multidisciplinary, and atheoretical. It fails to draw extensively on a breadth of research in other fields such as media and communications studies (p. 1).*

BEYOND THE DONATION RHETORIC: ENABLING TECHNOLOGIES

For a better understanding of the multiple divides we are dealing with, we should also refuse to embrace the idea that we can define the universally optimal technology equipment, to which every other situation has to be compared, independently of the context people live in and of the purposes they are willing to pursue through Information and Communication Technology. Moreover, many discussions assume that providing ICTs to larger parts of the population is good in itself. If simply focusing on providing technology to a target population, ICT for development projects run into difficulties that have been well documented (see Warschauer, 2003): most of the technology provided appears to be unable to meet the population's needs; sometimes, people don't even use it.

One of the most debated issues in ICT for development research is how investment in ICT can be justified when millions of people lack food, essential healthcare, etc. Many argue that, when resources are limited, they should be allocated to meet more basic needs, without investing in ICTs, often perceived to be just glamorous gadgets compared to food, healthcare, education.

The conflict between investing in ICTs and investing in meeting basic needs can only be solved by refusing the assumption that providing technology is a goal in itself, and focusing on how essential human needs can be better addressed using technology. In fact, there is no necessary contradiction between meeting basic human needs and investing in ICTs, as long as ICTs are seen as means to achieve important human goals.

If ICTs are useful at all, it is as a potential instrument in meeting other human, social, cultural, economic, or political purposes (…) Information technologies should be introduced when (and only when) they constitute the most effective available way of meeting basic human needs and fulfilling fundamental human rights. Information and communication technologies can have a positive role in development. But ICTs are neither a panacea nor necessarily the first line of attack in combating poverty, misery, injustice (Keniston, 2004, pp. 21-22).

That's what we define as "enabling technology": following Silverstone (1999), "Technologies, it must be said, are enabling (and disabling), rather than determining" (p. 21). Consequently, access to a set of technologies is not a priority in itself; it becomes a priority if (and only if) it enables a wide range of Information Society services, contributing to addressing people's basic needs, as information really can turn into a strategic asset worldwide. Most effective ICT for development projects, in fact, focus on healthcare, education, agriculture, electronic governance (for a project review, see Keniston & Kumar, 2004; Wilson, 2004).

Not Only Personal Computers: Redefining ICT for Development

Adopting an "enabling technology" perspective also leads to reconsider what is commonly meant by ICT, when reflecting on its application to development.

Social science research and policy-making, let alone common sense, sometimes adopt too narrow a definition of ICT, exclusively focusing on Personal Computers and Internet (wired) connection. Much of the digital divide empirically-gathered data, at a micro (the family, the individual) as well at a macro level (international comparisons), mainly describe the digital divide in terms of PCs and Internet availability, measuring the number of PCs, Internet hosts, or connections available in single households or in a geographical area.

Alternatively, commentators use too broad a definition, treating ICT as a homogeneous concept, used as an umbrella term for a wide variety of technological applications.

Even when they are not treating ICT as a homogeneous concept, many politicians and other commentators have been extremely limited in their definition of terms – content to define ICT vaguely in terms of computer hardware and software or, latterly, exclusively in terms of access to the Internet (e.g. Norris, 2001). However, we know that people's use of technology extends far beyond the realm of the computer through technologies such as digital television, mobile telephony and games consoles (Selwyn, 2004, p. 346).

Adopting an enabling technology perspective, however, leads us to consider a huge variety of technologies. If we shift the focus from technology itself to social use of technology (i.e. on what people can achieve through technology), we should broaden the spectrum of technologies to be involved in ICT for development projects, at least in the following three directions:

- Not only PCs: towards ubiquitous computing and "newer" technologies
- "Older" technologies
- Ad hoc technologies

The narrow definition, identifying ICT with PCs and Internet (wired) connection, is widely utilized in new media literature, much beyond the ICT for development debate. It derives from what Marinelli (2004), defines, in von Foerster's terms, a *blind spot* ("what we do not see that we do not see"): too often have we mistaken the precondition (digital convergence), for the evolution's goal. New media evolution will not lead to a single, strongly multitasking device. New media, instead, are differentiating and evolving in complex ways: the variety of devices, connection types, and interfaces we deal with in our everyday life will be multiplying rather than reducing.

We live in the age of Ubiquitous computing, where a growing variety of devices is processing information and where information itself is available throughout our world. In Weiser's (1993) definition:

Long-term the PC and workstation will wither because computing access will be everywhere: in the walls, on wrists, and in "scrap computers" (like scrap paper) lying about to be grabbed as needed. This is called "ubiquitous computing", or "ubicomp" (…) unlike virtual reality, ubiquitous computing endeavors to integrate information displays into the everyday physical world (…) ubiquitous computing envisions a world of fully connected devices, with cheap wireless networks everywhere.

Furthermore, the digital divide appears to be a moving target, and technological innovation constantly provides newer technologies to deal with. On the other hand, however, these rapidly evolving processes also provide new answers to older questions: technological *leapfrogging*, for instance, has taken place when mobile telephony has overcome the worldwide diffusion of wireline telephony[3]. Similarly, wireless Internet access appears to offer a practicable alternative to wired connections in many disconnected or poorly connected areas (both in western and in developing countries). Cheaper and more powerful devices are emerging from Ubiquitous computing research.

On the other hand, crucial information can be provided to specific populations by older media, such as radio and television. Not focusing on technology itself, but on people's need, also means that we don't have to assume that ICT are necessarily the best way to provide the information needed. Traditional broadcast media have been successfully employed in many developing contexts, providing healthcare information, education programs, information on agriculture and trade[4].

In some western countries, policy makers have believed that digitalization of broadcast media could be a powerful means of *digital inclusion* for those who are not already reached by PCs and the Internet. This is the case, for instance, of early digital terrestrial television introduction in Italy, where the Government financially supported its diffusion, aiming to guarantee a wider inclusion in the Information Society. Elderly people, as well as individuals with low incomes and low education, were supposed to take advantage of the interactivity and the information services (the so-called T-Government) provided by digital television[5].

Finally, a more creative use of ICTs can lead to "ad hoc" technologies: technologies, or applications, specifically designed to better meet local needs. Instead of simply providing western technology worldwide, "putting a PC in every village", technologies, user interfaces and applications can be designed starting from the specific purposes of intended beneficiaries, considering their social and cultural backgrounds.

Technology in Context: Towards a Better Understanding of Local Needs

Introducing ad hoc technologies leads to a deeper consideration of local context. Instead of adopting homogeneous definitions of ICT, and of human needs that can be addressed through it, ICT for development projects should attentively focus on the specific contexts they are addressing.

Furthermore, even context cannot be considered as a homogeneous concept: geopolitical, social, economical, cultural contexts have to be examined; in addition, infrastructure availability (electricity, wireline telephony, internet connection) varies enormously depending on the context.

The notion of "developing countries" itself has to be considered a mere *synthetic device,* as a variety of different conditions has to be found among them. "The term does not imply homogeneity in any other respect or that other economies have reached a preferred or final stage in development" (Wilson, 2004, p. 10).

Successful ICT projects worldwide show that technologies have to be chosen not because of their sophistication or cutting edge quality, but because of their practical utility in meeting the needs of local people. Information and communication technology projects must build on an assessment of local needs, as locally defined by local people. (Keniston, 2004, p. 23)

Consequently, local language and local content are crucial. The dominance of the English language, or at least of very few languages worldwide, emerges not only in web site content, but also in software. Copyrighted software, indeed, doesn't allow any local adaptation by users, while Open Source or Free Software can be tailored to local languages and specific local needs. Furthermore, having access to source codes represents a powerful way for local programmers to improve their programming skills, through so-called "reverse engineering". Local content is the only way to really improve local people's lives. For grassroots content to be produced, and for software to be locally adapted, specific skills and a broader meaning of new media literacy are essential factors.

According to some research, moreover, intended users show doubtful attitudes towards technology: some of them don't believe "the ability of a cold piece of technology to deliver the information they were interested in" (Medhi, Sagar & Toyama, 2007, p. 48) while others "don't trust the phone; it always lies" (Molony, 2006, p. 67). Social capital and education appear to be key factors in fostering trust towards technology, as well as locally relevant content and an effective user centered interface and application design.

User Interfaces in Local Contexts

An important, but often overlooked, consideration refers to the social and cultural variability related to User Interfaces. In the western world, user-friendly Graphical User Interfaces (GUI) have played a major role in mass adoption of Personal Computers, as graphical browsers did in relation to the world wide web. Standard GUI offer windows, graphical icons, menus and pointers; the actions are normally performed through so-called *direct manipulation*. Moreover, GUI free the user from learning and retaining complex command languages and are considered to be intuitive, mainly because they are based on visual metaphors such as desktops, folders, etc.

Nevertheless, what is perceived as fully intuitive in a specific culture can be far less intuitive in different cultures. For instance, the desktop metaphor mainly works for people who are familiar with real world desktops. More sophisticatedly, cultural difference also affects the way in which people organize time and space[6]: spatial and visual metaphors appear, therefore, to be culturally variable. Writing direction, for example, appears to influence the way we perceive directionality. Using left directed arrows to mean "back", which is fully intuitive for western cultures, could appear less evident to other cultures.

In addition to cultural variability, illiteracy (referring to the skills of reading and writing) can constitute a major barrier to computer and Internet use, due to the heavy presence of text, both in user interfaces and in document content. The well-known Simputer[7], as well as other applications, try to give the illiterates access to computing devices and to the Internet, often offering at the same time reading and writing training.

According to Medhi, Sagar and Toyama (2007), a text-free user interface is defined by "liberal use of graphics and photographs for visual information, and voice for providing information normally provided via text" (p. 37). In their research, they adopt an "Ethnographic Design" approach, working extensively with members of the project's target community. As a result, they reach a UI that is fully understandable for illiterate users. In fact, there are no universal rules to reach such a result, as user response to graphical details "may depend on psychological, cultural, or religious biases" (Medhi et al., 2007, p. 40). Again, local context and local needs have to come first.

TOWARDS A MULTILEVEL MODEL FOR ANALYZING THE DIGITAL DIVIDE[8]

The enabling technology perspective, as well as the multiple divides approach, offer complex theoretical frameworks for understanding the technological, social, and human factors that have to be considered when questioning ICT for development. In order to operationalize such theoretical frameworks, I will try to introduce a multilevel model to analyze digital divides, focusing on five main steps:

- Technology availability (or formal access)
- Real access
- Reception practices
- Technical skills and content production
- Networking skills

Technology availability (or formal access) refers to the opportunity, at a micro or a macro level, to materially access technology at reasonable prices, whether at home, at work, at school or in public places (such as public institutions or commercial outlets). It represents a prerequisite for the further steps. Evidently, without the chance of accessing technology, there is no point questioning effective use, reception practices, and technical skills.

It is important to draw a distinction between mere availability and real access, often confused by commentators: availability means that people have the opportunity to access technology (whether owning it, or through public facilities); whether they effectively use it or not depends on many factors, starting from motivation and perceived utility.

The most popular understanding of technological availability is certainly what Warschauer (2003) defines as the *device* model: ICT access can be considered in terms of ownership of a device. It is a very appealing model to policy makers and international agencies, because the diffusion of devices is relatively easy to measure. Access to a *conduit* can be added as a second element, showing slower diffusion models, "either because a delivery infrastructure must be established first (…), or because of the cost of a regular monthly fee is a disincentive to access" (Warschauer, 2003, p. 33).

With the exception of a small minority of excluded people, standard technology availability does not represent a big issue in western countries: even if technology penetration is far from being universal, a large majority of the population has the opportunity to access the Internet at reasonable prices (at work, at school, in public places, etc.). Standard connectivity to the Internet can therefore be taken for granted in western countries. Nevertheless, access to newer and more powerful technologies, e.g. broadband, not to mention Next Generation Access Networks, can have severe limitations (mainly following spatial patterns: urban vs rural areas, mountains vs lowlands, etc.; and depending on specific policies and commercial strategies)[9]. On the contrary, technology availability still constitutes a crucial issue for a wide majority of the population in the global South, where the opportunity to use *devices* or *conduits* is far to be widespread.

Once technology availability is granted, real access designates an individual's or a population's actual use of technology. Having formal access to ICT does not necessarily lead to using it, as scholarly work on nonusers in the western world has pointed out: intermittent users, dropouts and Net evaders are people having (had) at least formal access to technology, but who have stopped using it (see van Dijk, 2005). Similarly, ICT for development projects exclusively focusing on providing technologies have shown their low effectiveness: without enough motivation, an adequate consideration of local needs, and at least a basic new media literacy, it is highly unlikely that the intended beneficiaries will become effective users of technologies[10].

What really matters, for people to improve their lives, is effective and meaningful access to technology; the theoretical opportunity to access it is not enough, neither is using it without a sufficient degree of control and competence. The third level of the proposed model focuses on the skills implied in reception practices.

What seems to make the difference towards an advanced use of technology, once formal access has been granted, are people's motivations and skills. In fact, as argued by van Dijk (2005), motivations themselves are related to the perceived utility of technology use and to people's skills. To effectively use new media, indeed, a large variety of competences are involved, such as dealing with multimedia, with hypertextual reading, information processing, etc.

Like education in general, it is not enough to give people a book, we also have to teach them how to read in order to make it useful. Similarly, it is not enough to wire all communities and declare that everyone now has equal access to the Internet. People may have technical access, but they may still continue to lack effective access in that they may not know how to extract information for their needs from the Web (Hargittai, 2002).

The fourth step also deals with new media literacy, focusing on the skills involved in production, both referring to technical skills and to content production skills. Technical skills refer to ICT professionals and to the broader community having an advanced technical background (as, for instance, the Open Source community). While technical skills are often mentioned as a strategic asset in Information Society, content related skills are seldom considered. Indeed, liberty of expression, grassroots information, and independent content generation would remain rhetoric, or managed only by a limited elite, if content related skills were not broadly spread. In the last few years, the growing importance of User Generated Content (UGC) is showing to what extent content related skills are becoming crucial[11].

"Networking skills" constitute the fifth level. As Rheingold (2002) says, "A new kind of digital divide ten years from now will separate those who know how to use new media to band together from those who don't" (p. xix). Networking skills refer to the vast field of Computer Mediated Communication, where interaction not only occurs "With the Net", but also between people, "Through the Net". The recent popularity of Social Network Sites such as My Space, Facebook, Linkedin, etc., shows that there is a growing interest in articulating, making visible, and managing personal or professional relationships through technology enabled environments[12].

Furthermore, *social capital* appears:

as an important element of individuals' and organizations' ability to access and effectively engage with ICT (…), with the size and nature of an individual's network of technological connection and relevant social contacts developing and sustaining an individual's use of ICT (Selwyn, 2004, p. 345).

"Social isolation" was also mentioned as one of the main reasons for not being connected in van Dijk's (2005) analysis. Technology, therefore, can be used to manage, and even strengthen, individuals' social networks, while, specularly, social capital appears to be an important factor in gaining access to technology and in improving personal skills towards effective use. Finally, networking skills appear to be crucial in knowledge creation and dissemination, as well as in maintaining distance ties, particularly among diasporic communities.

From Computer Skills to New Media Literacy

As the three final levels of the proposed model deal with different aspects of new media literacy, it is worth focusing on it, for a better understanding of the model's implications.

Literacy (in its very traditional meaning: the skills of reading and writing) still constitutes a critical topic for many developing countries. Nevertheless, as ICTs become central to modern societies, new literacy issues are emerging, extending the previous meaning to include audiovisual media and, more recently, new media. Moreover, it is widely acknowledged that, from the perspective of the global South, a multiplicity of literacies, instead of a monolithic literacy, has to be considered (Dunn & Johnson-Brown, 2007).

Warschauer (2003) composed a complete picture of the skills needed to work with computers and the Internet: computer literacy, information literacy, multimedia literacy, computer-mediated communication literacy[13]. While the term computer literacy appears to be simplifying and is discredited among commentators, information literacy covers a broader set of skills and competences in manipulating information, involving both technology-specific skills and broader resources. Information literacy refers to the wide variety of abilities people need to retrieve, access, critically evaluate and effectively use information, in a their various contexts and for different purposes (Dunn & Johnson-Brown, 2007).

Following Livingstone (2003), media literacy can be defined as "the ability to access, analyse, evaluate and create messages across a variety of contexts" (p. 3). (New) media literacy, like traditional literacy, does not only involve receiving information (which refers to the third level of the model), but also producing it (which refers to the fourth level of the model): first of all, people achieve a better understanding of a medium through direct experience of content production and second

the internet par excellence is a medium which offers hitherto unimagined opportunities for ordinary people to create online content. To exclude this from a definition of media literacy would be to greatly under-utilise the potential of the internet for the public (Livingstone, 2003, p. 3).

As many commentators argue, the literacy needed in new media use has still to be established, and appears to be partially co-evolving with technological and social innovation, in a constant co-production between technology and the user.

Hargittai (2002) has conducted extensive studies on how people search the Internet, finding a "great deal of variance in abilities to locate content online", not only related to critical evaluation of sources, but sometimes also due to spelling errors. Therefore, she introduces the idea that a "second-level digital divide exists relative to specific abilities to effectively use the medium".

Multimedia literacy goes beyond traditional written text-based literacy, including a variety of languages and media (both on the reception and on the production side). Computer-mediated communication literacy, involved in the fifth level of the model, has hitherto received less attention, but will acquire a growing relevance the more ICTs are used as a means of interpersonal communication and as a tool to manage social networks, both in professional and in personal contexts.

FUTURE TRENDS

In our rapidly changing world, new gaps and new opportunities are constantly emerging from technological, economic and social evolution. The main challenge we will have to face is building a more equitable Network Society, reducing the number of excluded people, and guaranteeing social inclusion to the broadest part of the world's population.

Digital technology can play a major role in this direction, if we seriously focus on specific local needs, and if every effort is made to effectively reach the intended beneficiaries of ICT for development projects. Therefore, we should abandon every techno-centric vision, to focus on human needs; and we should also refuse a western-centric perspective on development. Local context and actual human needs should be regarded as the key factors. Therefore, further research needs to be done to better analyze the complex dynamics between local contexts and a globalized world..

Only a widespread new media literacy will effectively lead individuals and communities into the Network Society. Education (both formal and informal) appears as one of the most valuable resources for individuals and communities. Therefore, new media literacy should be better defined, in order to provide specific policy models and to design appropriate learning tools.

Finally, ICT for development projects should be more systematically analyzed, producing worldwide benchmarking and outlining best practices, on the basis of their actual results. We need a more precise insight into what actually works, under precise conditions and in specific contexts, in order to plan policies that will effectively improve people's lives.

CONCLUSION

Rethinking the relationship between technological, social and human factors has deep consequences on the definitions we apply to the digital divide. Therefore, redefining the digital divide should not be regarded as a pure theoretical concern: it directly contributes to building the conceptual frameworks for ICT for development projects. A deeper consideration of the technology involved, moreover, helps to draw a more complex picture, moving towards Ubiquitous computing and ad hoc technologies.

The enabling technology perspective, as well as the proposed multilevel model, can have relevant policy implications. From this point of view, shifting the emphasis from technology itself to social use of technology means to design policy instruments that focus on human needs rather than on technologies. There are no universal policy measures, to be applied worldwide, in any context and for every type of purpose. We need *user-centered* policies, able to effectively meet their beneficiaries' actual needs. Moreover, policies, as well as specific technologies, should be designed involving the intended target communities; possibly, they should be designed and managed *by* target communities themselves.

Critics may point out that it is too complex a model to be practically implemented in real world projects. In fact, the proposed multilevel model tries to operationalize those theoretical frameworks, offering a practical support for policy making and project developing. More specifically, the first level (technology availability) can be addressed by the most traditional digital divide policies, providing device and conduit access at sustainable prices to growing parts of the target populations (fostering the diffusion of community technologies, as well as supporting infrastructural modernization, and sustaining the digitalization of single households).

The second level (real access) can be addressed by focusing on users' motivations: the diffusion of valuable content, specifically produced to meet people's (local) needs, and a growing attention to usability and interaction design, could increase the perceived surplus value of ICT for everyday purposes and, therefore, strengthen the users' motivation. A key element would be producing specific services and applications for underserved groups, both in industrialized countries and in the global South. Single ICT for development project, moreover, should involve specific actions aiming to motivate intended users.

To address the following levels of the proposed model, educational policies (both formal and informal) have to be implemented, both at a macro and at a micro level. New media literacy offers a complex framework: in the proposed model, it includes reception practices, active production skills and networking skills. Similarly, educational policies should try to address the wide variety of skills needed for a full participation in the Network Society. Schools and Universities should be connected, as a necessary prerequisite for young people to learn how to use ICT, while overall educational systems should adapt their curricula, rapidly integrating information literacy and new media literacy. Adults, on the other hand, should not be left behind: continuous education and training programs should be granted. At a micro level, every ICT for development project should deal with its intended users' skills, providing the needed support to individuals and communities.

The effectiveness of projects involving ICT in bridging the digital divide depends on multiple factors. Their intended beneficiaries can actually be reached only putting local contexts and local needs first. Applying the proposed model, adapting it to each project's specific context and purpose, can help reaching this goal.

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KEY TERMS AND DEFINITIONS

Ad Hoc Technologies: technologies, user interfaces or applications that are specifically designed to better meet local needs, starting from the specific purposes of intended beneficiaries and considering their social and cultural backgrounds.

Enabling Technologies: technologies that enable a wide range of Information Society services, contributing to address people's (basic) needs.

Networking Skills: the skills involved in so-called computer mediated communication, like using technology for interpersonal communication, and to articulate and manage social networks.

New Media Literacy: the ability to use new media, both on the reception and on the active production sides.

Real Access: once technology availability is granted, real access designates an individual's or a population's actual use of technology.

Technology Availability: the opportunity, at a micro or a macro level, to materially access technology at reasonable prices, whether at home, at work, at school or in public places (such as public institutions or commercial outlets).

Technology in Context: the adoption of definitions of ICT, and of human needs that can be addressed through it, that focus on the specific contexts they are addressing. Geopolitical, social, economical and cultural contexts, as long as infrastructure availability, have to be considered.

ENDNOTES

1 The surveys summarized by Katz & Rice (2002a) only refer to the US, but further studies confirm similar trends in other western countries. Internet Benchmark Italia Reports (and particularly the fourth and fifth Report, 2001 and 2002), for instance, were among the first to highlight the dropout phenomenon in the Italian context.

2 See Flichy (1991), Mattelart (2000).

3 For a critical approach to the role of mobile telephony in developing countries, see Castells Fernández-Ardèvol, Linchuan Qiu, & Sey, 2007. After reviewing some case studies, focusing on the emerging trends in mobile telephony, The authors underline that their "observations document the excessive optimism that surrounds this new magic bullet of development (…) Wireless communication is no panacea for development. But developmental projects from all corners of the planet, are embracing the potential of new technology and are using it for their own purposes according to what they are able to achieve" (p. 243)

4 Mass media can be seen as powerful modernization tools (see Morcellini, 2005, pp. 15-41).

5 Hitherto, the goal has not been achieved, mainly because the described strategy was based on a simplifying, device-centric model. The implicit assumption was that the mere introduction of a digital tool (namely, a digital decoder) could foster digital inclusion. Currently, on the contrary, the access rates to interactive tv services, let alone T-Government services, are very low, and digital terrestrial television is mainly used

as a more powerful version of traditional analog television.

6 For early research on this topic, see Hall 1959.

7 For further information, see http://www.simputer.org

8 For an early version of the proposed model, see Anzera & Comunello (2005).

9 For a recent research on challenges and opportunities of Next Generation Access Networks, see Caio (2008).

10 One of the most cited examples of problematic ICT for development projects is “The hole in the wall”, a community technology project realized by the Government of New Delhi, aiming to provide computer access to street children. As Warschauer (2002; 2003) points out, the project succeeded in providing pc access, but didn’t focus on people’s skills, showing little effectiveness on community life. An interesting review of effective projects, addressing cultural and social implications of ICT, can be found at http://www.stockholmchallenge.se

11 According to Tancer (2007), currently, the percentage of *participatory visits* (i.e. video or photo uploads) in web 2.0 sites like You Tube and Flickr, are respectively about 0.18% and 0.12%, while participatory visits in Wikipedia (editing an entry) are 4.18% out of all website visits.

12 Boyd & Ellison (2007) define social network sites as “web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site”.

13 Another useful categorization describes operational skills, information skills, and strategic skills (van Dijk, 2005, pp. 75-93).

Chapter 33
A Human Factors View of the Digital Divide

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ABSTRACT

This chapter addresses a problem that centers on the persistent disparities in computer use and access among citizens of varying cultural backgrounds. The chapter begins with discussion about the digital divide among ethnic minorities, particularly African-Americans and Hispanic-Americans (Latinos), in the United States. This chapter defines "access" as having a computer interface that facilitates user learning. One proposed human factors intervention for this problem of access is in recognizing and accounting for culture's influence on cognition. This discussion is grounded in the development and employment of computer interface metaphor designs that are culturally valid for target user groups. We also provide examples of challenges that users may encounter when inappropriate interface metaphor are built into a computer interface design. Finally, the chapter highlights various human factors interventions and considerations that will provide a pathway to achieving greater levels of e-inclusivity and for providing citizens with equitable access to information.

INTRODUCTION

Our global society is becoming increasingly reliant upon electronic access to information. It is vital to provide the masses with access to computer and Internet technologies. In the mid-nineties the issue of the digital divide surfaced, as the Internet became a major communication medium in the United States. National investigations were conducted to assess the breadth of this divide. One of the more recent investigations identifies two groups, African-Americans and Hispanic-Americans (Latinos), as lacking access to the Internet (Lenhart, 2003). Lenhart reports that even when income is held constant, African-Americans still access the Internet less than Whites. These reports provide clear examples of cultural groups within the United States that have experienced a reduction in access to

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knowledge that is made readily available to other portions of the information society.

The term "access" maintains a dual meaning. The most common use of the word "access" concerns the availability of computer hardware and Internet connectivity. Smith-Jackson and Williges (2001) define "access" as having a computer interface that effectively facilitates user learning. It is the latter definition of "access" that has been adopted for the purpose of this chapter's discussion, because it is aligned with the discipline of human factors. Human Factors integrates engineering and psychology to design and evaluate systems that are compatible with users' capabilities. A human factors view of the digital divide perceives access as a successful interaction between humans and machines such that humans receive the intended benefits of the system. Poor design or design biases can lead to access inequity. Access inequity is viewed as a failure in design if the intended users are diverse.

Despite the aforementioned inequities in access, our society is becoming progressively more information driven. Individuals who lack access because of design biases will continue to be disenfranchised and will ultimately suffer losses in various aspects of quality-of-life. For example, those who lack access will not garner equitable opportunities for jobs, internet-based economic empowerment, civic engagement, healthcare, web-based education and simple day-to-day activities. A lack of access to computer interface designs that facilitate user learning, for this discussion, is central to the human factors perspective presented here. Thus, the barrier that must be overcome to achieve greater rates of access among ethnic minorities and other groups is to use inclusive design to avoid marginalizing user groups through the computer interface design process.

One intervention to address this barrier to access, from a human factors perspective, is to recognize and account for the influence of culture on cognition. Chapanis states, "Human factors discovers and applies information about human behavior, abilities, limitations, and other characteristics to the design of tools, machines, systems, tasks, jobs, and environments for productive, safe, comfortable, and effective human use" (1985, p. 2). Cognitive activities, as well as the physical activities are evaluated to determine compatibility with users needs and capabilities. The human factors approach to product assessment would also describe the influence of culture on an individual's cognitive processing and decision-making while interacting with the product. Product assessment occurs during the product development cycle and after the product is completed.

In this chapter, it is proposed that ethnic minorities in the United States choose to use computers and connect to the Internet at lower rates because the interfaces that are available in the form of computer software and the Internet do not appeal to their design needs and preferences. The focal point of this chapter is to addresses the issue of the enduring inequity in computer and Internet access among ethnic minorities, particularly those who are economically underserved, and mainstream Americans. While the catalyst for this discussion is a problem defined within the United States, the design implications that emerge for development of culturally and socially valid computer interfaces will facilitate global design efforts as well.

We will focus on five main areas to demonstrate how human factors can be applied to the digital divide to increase the rate of access by ethnic minorities. The areas of focus are:

(a) To examine the intersection between digital divide phenomena and interface design,
(b) To discuss known psychological theories relevant to cultural groups and the implications of these theories as they relate to the digital divide,
(c) To examine how culture and human cognition interact to influence computer interface use,

(d) To discuss user challenges resulting from culturally and socially invalid interface designs, and
(e) To present effective design considerations.

This chapter will further illuminate the implications for the digital divide for currently marginalized groups in the United States. We will conclude with 21st century strategies that will move the discipline of human factors towards designing, developing and implementing more "e-inclusive" computer interface designs.

BACKGROUND

Digital Divide Statistics in the United States

The National Telecommunications and Information Administration (NTIA), while serving as advisors to the President of the United States on telecommunications policy, began to assess personal computer and modem usage among Americans (NTIA, 1995). At that time the administration realized that the personal computer and modem were quickly becoming means to attain the riches of our "Information Age." Internet usage was increasing and individual subscribers were taking advantage of online services. Recognizing the power of this growing set of technologies for all Americans, research endeavors began in efforts to explore the characteristics of those individuals that were not "connected" and thereby considered as the "information-disadvantaged." Their studies revealed essential information about the technology "have-nots," who were residents of rural areas and central cities in the United States. The schism between the technology "haves" and the technology "have-nots" became know as the digital divide; this schism also became a critical topic of inquiry for the NTIA.

NTIA (1995) released their report, "Falling Through the Net: A Survey of the 'Have Nots' in Rural and Urban America." Profiles of those who were deemed as the "have-nots" were the poor who resided in rural areas and central cities; profiles by race included minority groups in the United States (i.e., Native Americans, Asians/Pacific Islanders, Hispanics, and African-Americans) as having the least personal computer and modem penetration in households. These profiles also noted that the information-disadvantaged groups are the most likely group to need online services to seek employment, access government documentation, and take educational classes (NTIA, 1995). Policymakers were then charged with instituting support for the information disadvantaged, and established a strategy for computer access that would in theory empower the information disadvantaged groups with computer access in public schools, libraries and other community access centers.

Several years later a second report was published entitled, "Falling Through the Net II: New Data on the Digital Divide" (NTIA, 1998). Relevant statistics revealed that even though overall computer ownership and usage improved significantly, there remained a persisting digital divide. Furthermore, the data showed that the African-Americans and Hispanics trailed Whites at a greater rate in their personal computer ownership and online access. At that time White households were twice as likely (40.8%) to own a personal computer than African-American (19.3%) and Hispanic (19.4%) households; this divide was consistent across all income levels. In addition, it was determined that White households rates of online access were nearly three times the rates for African-Americans and Hispanics. The policy implications for supporting the information disadvantaged remained constant.

NTIA released a third and fourth report, entitled "Falling Through the Net: Defining the Digital Divide" (NTIA, 1999) and "Falling Through the Net: Towards Digital Inclusion" (NTIA, 2000), respectively. The report concerned with defining the digital divide acknowledges the digital divide as one of America's leading economic and civil rights issues (NTIA, 1999). Additionally, this national report examines in detail household access to telephones, personal computers and the Internet, the what and how of Internet usage among individuals, the challenges associated with dismantling the digital divide and the importance of critical policies promoting equitable access. The latter of the reports discussed in detail topical points such as: household access to computers and the Internet, use of the Internet by individuals, and Internet access and computer use among people with disabilities. Each of the aforementioned topics was discussed in relation to income, ethnicity, age, employment status, and gender.

While these two documents assert that the digital divide was still a viable issue, they are, nevertheless, examples of attempts to move forward in the agenda of addressing the issue of the digital divide and promoting digital inclusion within the American population. On the contrary, further reporting beginning in 2002 and extending through to 2008 have been focused on understanding how Americans are extending the use of the Internet into their lives, the development of affordable broadband services, and creating broadband technology strategies. There appears to have been a shift in national priorities concerning research areas specific to the persisting digital divide in the United States. Yes, broadband technologies are growing at an exponential rate and should be studied; however, the economic and civil rights issue of the digital divide still require an equal amount of attention in efforts to continue narrowing this technological divide.

As late as 2003, Pew Internet Research affirmed that there were still disparities in Internet access among ethnic-minority groups in the United States (Lenhart, 2003). Two such groups included African-Americans and Hispanic-Americans. (Note: Hispanic-American is used in this chapter for the sake of continuity with the Pew Internet research; however, some members of this specified group may be characterized by and prefer the use of the term Latinos.) Lenhart reports that even when income is held constant, African-Americans still access the Internet less than Whites. Among those whose income is less than \$20, 000 per year, 24% of African-Americans and 28% of English-speaking Hispanics are online, as compared to 32% of Whites. In homes where income level is \$50, 000 per year or more, there are 65% of African-Americans online as opposed to 82% of Whites (Lenhart, 2003). Interestingly enough, African-Americans and Latinos who have higher acculturation toward mainstream American values tend to also have higher incomes (Snowden & Hines, 1999). This idea may in fact be a reason for greater computer access among ethnic minorities who rank higher on the socio-economic scale.

These are simply a few of the recent statistics on the persisting digital divide in the United States. From these statistics it is apparent that the African-Americans and Hispanic-Americans have a lower penetration rate (access) for computer use, thereby, providing some justification for targeting the Hispanic-American and African-American cultural groups for this research.

The Digital Divide Phenomena and Computer Interface Design

One potential extension of the "access" crisis is the lack of attention given to diversity among cultural groups during the computer interface development process. Hofstede (1997) describes culture as being "software of the mind"(p. 4). He states that an individual's mental programs are a result of the social environment where one grew up and gathered one's life experiences. For the purposes of this discussion, we adopted the American Psychological Association's (APA, 2008) conceptualization of culture as part of the policy guide for the application of multicultural research or practice. Culture is a belief system that consists of values that, in turn, influence socialization practices, psychological processes, and organizations. According the APA, culture is also a worldview or a cognitive metaschema, influencing how a person interacts with the world, including people and technologies.

There are a myriad of cultures in the United States. These cultures may be characterized by: ethnicity, class, economic status, geography, religion, gender, age, profession, and proclivity towards technology use. Ethnicity is considered a major component of culture, and is based on groupings by regions, nationalities, and physical features. Race is no longer used in psychological research, because the term is controversial and confusing from a biological perspective (APA, 2008). Thus, the intentional use of culture in human factors usually refers to an ethnically-distinguishable group who share a worldview that influences how they interact with systems. One additional caveat that applies to our use of culture is that one cannot assume that a person who is assumed to be in a specific ethnic culture has the attributes of their ethnic group (such as collectivism, discussed later). Culture is a description of an aggregation, not of individuals. So, per research and theory, it is accurate to describe an ethnic group as sharing certain beliefs and worldviews as a whole. But no individual part of the group or person can be assumed to be an exact match to the whole or aggregate. This understanding is similar to the central limit theorem that is the basis of statistical analyses for normal distributions. For example, the mean of a distribution is the central tendency of the entire distribution, but data points will deviate from the mean by some number of standard deviations. However, collectively, each individual metric contributes to the size of the mean. So, one cannot assume that a single data point is exactly equal to the mean; it may be close to the mean or deviate widely.

Two specific cultural groups who have experienced problems with access (i.e., the most traditional definition of access) in the United States are African-Americans and Hispanic-Americans (Lenhart, 2003). African-Americans and Hispanic-Americans are classified as minority groups in the United States and are historically noted as marginalized groups, both politically and economically. When giving consideration to the disparity in cultural values and norms among groups of people, one may hypothesize that the lack of access among minority groups could be due, in part, to insufficient design attention given to cultural differences among users. Ignoring relevant cultural differences within the design process comprises various minority groups' satisfaction and performance with the interface design.

Traditionally, the computer interface design process has not included the perspectives of a broad array of cultural worldviews. The interface design process has focused on particular groups, e.g., identified by their socio-economic status or professional cultures. These specified groups would be queried concerning their requirements and preferences for the computer interfaces that they would need for work or recreation. Companies developing computer interface products for sale to the public, most often give attention to the sectors of the market that will produce the greatest financial return. In these instances the larger, broader population is only presented with the option of using computer interfaces that were designed with the perspectives of a much narrower segment of the overall population. In effect, the requirements and preferences (representative of relevant values and norms) of a smaller segment of the population are imposed upon the remaining cultural groups by way of the computer interfaces that are available for commercial or personal use.

While there are some individual members of the African-American and Hispanic-American ethnic minorities who maintain high levels of acculturation toward the dominant American culture, there still remains a considerable portion of ethnic minorities that have not fully assimilated into the dominant culture. The process of acculturation is supposed to concern the mutual exchange of characteristics and attributes of two distinctive cultural systems. However, often the outcome of acculturation is the loss of original cultural values and the adoption of new cultural values (Berry, 1980). Berry suggests that, although cultural attributes will be exchanged between different ethnic groups, the non-dominant or minority groups are more likely to lose more of their own ethnic culture, while taking on more of the features of the dominant culture. This non-reciprocal exchange has, historically, described the institutionalized disparities in the United States. And, this pattern is similar to the dominance of Western cultural views in other geographic regions that were colonized (i.e., India, West Africa, and Australia). Either through cooperation or coercion, minority groups have learned to outwardly adopt certain attributes of the ethnic majority, while struggling to hold on to the unique attributes of their own ethnic cultures. In summary, the population of the United States represents a multitude of cultures, which have all reached various levels of acculturation into the mainstream Western culture.

There are many cultural elements that uniformly characterize African-Americans and Hispanic-Americans. However, a question still remains: what cultural elements (i.e., values, cognitions, and norms) might affect an individual's performance and satisfaction with a given computer interface design? Certainly, a comprehensive discussion exceeds the scope of this work, however, highlighting a few examples may be the foundation for further extrapolation towards the affects of culture on computer interface designs.

There are two specific African-American cultural values that are examples of elements that could be embodied within a more inclusive interface design. These cultural values include sharing one's life with family and close relationships (Hecht et al., 2003), and African-American preferred learning styles (Belgrave and Allison, 2006). As a culture, sociologists and cultural psychologists have found that African-Americans are inclined towards collectivism (Hofstede, 1997) in their behavior and communication styles. Hecht et al. (2003) reports that African-Americans develop closer and deeper relationship with friends and family compared to European Americans. Interconnectedness, interrelatedness, sharing and interdependence characterize the depth of those relationships. These relationships often demonstrate a greater level of intimate communication across all areas of life. These cultural values could be successfully integrated into the functions and features that require an aspect of communication (e.g., a "Help" or "E-mail" function). Integrating this idea would provide a reflection of their value of sharing and interdependence within the interface design.

A second cultural element is a preferred learning style for African-Americans. African-Americans are biased toward relational learning styles, while European Americans are more analytical in their learning approach (Belgrave and Allison, 2006). An analytical learning style is associated with an elemental way of organizing information, and defines the learner as being stimulus centered, field independent and reflective in his or her information processing. Conversely, relational learners are holistic in their information processing. This holistic learning comprises three information-processing constructs: self-centeredness, field dependence, and spontaneity. In self-centeredness, learners process information by orienting towards social and personal cues present in the learning environment. These learners are inclined to focus on the personal aspects of the learning environment, rather than on the objects in that environment. Field dependence refers to the inclination to perceive and process components of information holistically. From a design perspective, the application of field dependence to interface design would involve the use of features that afford a grouping of functions on an interface in a manner that matches how the functions would be used to relate to others. One example is to arrange word processing functions around a relational activity such as writing and sending letters or working on a team with colleagues to produce a document. Providing a supporting function to allow users to personalize their interface with items and ideas that are typical of their daily lives at home, work, or play would also facilitate relational learning.

Similar to African-Americans, Latinos are family-centered and value personal interaction with others. Chong and Baez (2005) also describe Latinos as valuing collectivism and "simpatía". Latinos are considered collectivists because they value the personal satisfaction and self-assurance garnered by being in the company of other people. Simpatía does not exactly translate into an English word, but is the catalyst for relationship development among family and friends and represents the qualities a person uses to foster pleasant social interactions. In Latino families, relationships gain strength through simpatía, and aunts and uncles often become confidants, mentors and advisors as children mature into adulthood. Incorporating common values into the interface design will increase learnability with the design among its users, thereby, enhancing performance and satisfaction. For example, an interface design that might appeal to users with Latino worldviews may include function groupings that focus on how to connect to others.

CULTURE AND COMPUTER INTERFACE DESIGN

Culture and Cognition

Addressing the issue of computer access may take root in a multiplicity of theoretical and practical perspectives. As previously stated, this chapter conceptualizes computer "access" as having a computer interface that effectively facilitates user learning. One intervention for this problem of access, from a human factors perspective, is in recognizing and accounting for culture's influence on one's cognition.

To apply Hofstede's (1997) definition of culture to this discussion would provide that culture is "software of the mind". This analogy likens an individual's pattern of thinking, feeling, and acting to a computer program. These mental programs result from the social environment where a person was socialized. More specifically, those mental programs are collected within families, neighborhoods, at school, among youth groups, at work, and in living communities. Culture "is always a collective phenomenon, because it is at least partly shared with people who live or lived within the same social environment, which is where it is learned (Hofstede, 1997, p.5)". This definition of culture includes education, literature, and art, but also includes more ordinary things like: eating, greeting, and showing feelings or not showing feelings; all of which are based in reasoning and decision-making.

Nesbitt and Norenzayan (2002) highlight the intersection between culture and cognition. They established four basic cognitive commonalities that exist among all people regardless of the cultural experience: (1) in the absence of cognitive disabilities, all individuals have a universal set of cognitive processes including attention, memory, learning and inferential procedures, (2) those universal cognitive processes operate in the same manner regardless of the content that is manipulated, (3) basic learning and inferential processes give developing children all they need to learn about the world, and (4) since individuals are influenced by different political, social, and economic worlds, the content of the human mind (i.e., beliefs, values, and theories) is potentially different.

Furthermore, Nesbitt and Norenzayan (2002) posit that cultural practices and cognitive processes are tied together; cultural practices guide certain kinds of cognitive processes. More specifically, culture greatly influences the content of the mind by way of knowledge structures. This knowledge of structure, better known as schema, drives an individual's thoughts by selective attention, retention, and use of information concerning specific aspects of the world. Construction of a schema provides information about how the various parts of the schema fit together and relate to the whole (Nesbitt and Norenzayan, 2002). Schema, which can include interconnected behaviors, may be about objects, people, events, situations, and sequences of events. Drawing from the discovery of the schema concept, cognitive anthropologist Roy D' Andrade developed the idea of cultural schemata. Cultural schemata are patterns of schemas that create a meaning system for a particular cultural group. Those shared cultural schemata within a group are called cultural models. Cultural models drive the interpretation of a user's experiences and govern their actions. Scripts (Schank & Abelson, 1977) are a special type of cultural model, which are event schema that appropriately connect people with events, the social roles that they play, the objects they use, and the order of actions that they take. These scripts are the tools that individuals in cultural groups use to moderate how they function, perform rituals, and play games. In parallel, individuals within cultural groups develop abilities that may directly or indirectly impact their performance when interacting with technologies such as computers.

The interdependence of culture and cognition is an important consideration for designing interfaces that are equitable in terms of access. If meanings, schemata, and mental models are based in culture, an interface design that rests on only one cultural model will not be usable by those who do not conform to the targeted cultural model.

Computer Interface Metaphor

"People from different cultures are different in their appearances, perceptions, cognitions, and thinking. They may hold different cultural assumptions and values, they may view the world differently, and they may have very different customs, all of which make them culturally unique" (Choong & Salvendy, 1999, p.30). One would presume that differences in culture would be essential to effective computer interface design. Interface design rationales and development have historically rested in the hands of the interface developer(s). In many cases interface designers have taken the liberty of implementing interface metaphors that have little-to-no value to the broad group of end-users (Duncker, 2002).

One method to address the problem of access inequality among cultural groups is to select meaningful computer interface metaphors. Interface metaphors provide the benefit of user familiarity (Neale & Carroll, 1997). These metaphors assist users in their expectations and predictions of the computer system behavior or functionality. The most common example of an interface metaphor is the "desktop" metaphor, which is the primary interface model for desktop/personal computing.

Metaphors are also a facilitator of learning (Neale & Carroll, 1997). They permit users to rely on their mental models (previously developed knowledge about experiences and interactions in the world) to make sense of new situations that they encounter. Interface metaphors can be employed to aid users' comprehension in a variety of contexts. For example, Table 1 presents an extended version of Neale and Carroll's (1997) four contexts for metaphor use. Table 1 also summarizes an in depth view of the types of interface components that interface metaphors can support and the knowledge bases that they draw upon (Neale and Carroll, 1997), as well as a number of additions to the "source domain" and "exploits knowledge of" examples (Johnson, 2008).

Designers have used a number of metaphors for computer interfaces. Several examples of interface metaphors are presented in Figure 1, which is actually a composite metaphor—a conglomeration of different metaphors. The primary functional metaphor represented is the "File System." Here the file metaphor is used to provide the user with some indication of how files can be stored, organized and retrieved. There are objects such as the "back" arrow and the "search" magnifying glass that are used to metaphorically represent the program's functionality. In addition there is the general "window" metaphor, which drives all

Table 1. Examples of user interface metaphors (adpated from Neale and Carroll, 1997; Johnson, 2008)

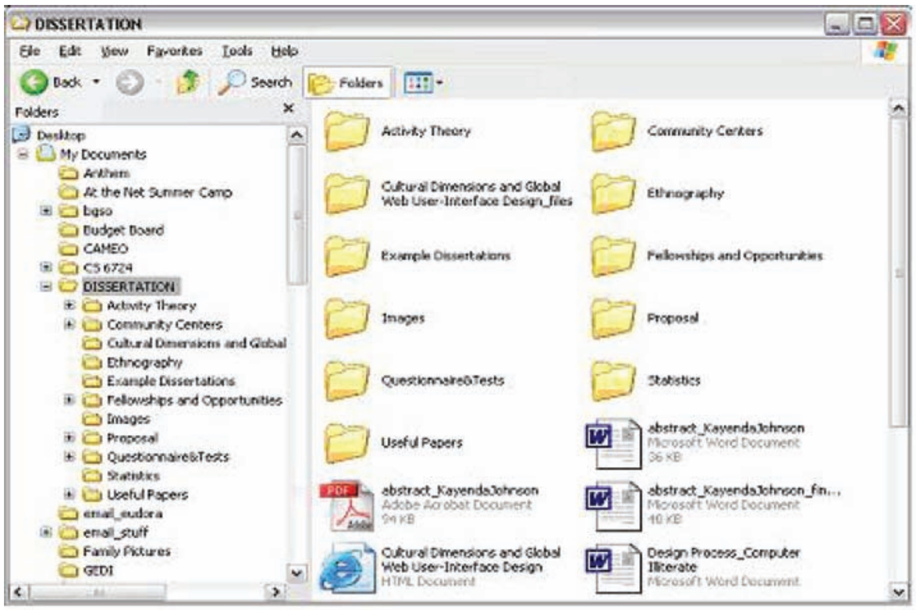
Context of Metaphor	Target Domain	Source Domain (Metaphor)	Exploits Knowledge of
Information Structures	Information browsing and searching	Storehouse / House / Room	stores, rooms, malls, shelves, **bed-rooms**, **dining rooms**
		Library	library catalogues, books, page turning, shelves, indexes
		Landscape	roads, junctions, signs, maps, mountains, lakes
		Space, conference, rooms, auditoriums, lobbies	navigation: shortcut, go to, travel between sites, links, movement
		Travel / Tourist activities	exploring, guided tours, maps, indexes, asking questions
		Book / Dictionary	pages, bookmarks, tabs, indexes
		Personal Assistant: A person to give suggestions and help with computer user completing the task.	person-to-person Interaction
		Pressable Buttons	**Any objects with pressable buttons:** keyboards, telephones, cell phones, VCRs, DVD players, ATM machines, etc.
		Table	**Tables**
	Organizing task tools	**Container**	**containers: cans, boxes, bottles**
	Organizing documents	Piles	physical piles of paper, categories
	Organizing and viewing information	Bags and Reviews (filters)	bags for hold items, viewers with different filtering capabilities, **envelop for holding paper/documents**
Multimedia	Presenting multimedia	Television, compact disks, photographs, film, **radio**	albums, photo holders, TV programs & channels, VCRs, CD tracks, **radio stations**
	Working with large video sources	Magnifying lens	lens, changing resolution, changing viewin area, filters

of the Windows® operating system applications (except the MS DOS® mode). Those representative object metaphors potentially provide some indication as to what functions are available at that time. Meanwhile, the "windows" metaphor is used to help the user understand how to change the physical dimensions (in terms of appearance to the user), change the current information displayed (using the scroll bars), and close the active computer application.

Metaphor usage can potentially accelerate the learning process because the mind is reasoning about new situations by borrowing from the user's current knowledge stores (Streitz, 1986). While metaphors can be a source of benefit for learners, they can be an impediment for learning and usability if the metaphors are inappropriate (Erickson, 1990). For this reason, it is pertinent that care is taken to provide appropriate interface metaphors for different user classes. This is especially important for novice computer users who are just learning how to operate a computer application.

The problem of "access" from a human factors perspective is related to the overall design and

Figure 1. Example of the "file system" metaphor used by the Windows®XP operating system. Microsoft product screen shot reprinted with permission from Microsoft Corporation.



application of metaphors within interface designs. More specifically, the problem of access may be addressed by examining the cultural relevance of interface metaphors. Interface metaphors provide the benefit of user familiarity (Neale & Carroll, 1997), and allow the user to exploit their current knowledge when learning how to use a new computer system (Preece, 1993). Authors Holyaock and Thagard according to (Neale & Carroll, 1997) contend that metaphors permit the transference of knowledge from a source domain (familiar area of knowledge) to a target domain (unfamiliar area or situation), thereby allowing humans to use specific prior experience and knowledge for understanding and behaving in situations that are new or unfamiliar.

Problems with Inappropriate Metaphors

Study of appropriate metaphors for various cultural groups is a growing area of work and research (Duncker, 2002; Johnson, 2003). From a conceptual perspective, an appropriate metaphor is one that is matched to a user's current knowledge. Interface metaphors are an essential component of graphical user interfaces, and mapping matches between interface metaphor source domain and the target domain are the strength of computer interface metaphors. In metaphor mappings, the source domain refers to the familiar area of knowledge for the user; the target domain refers to the situation or area that is unfamiliar to the user. The function of a metaphor is to act as a bridge from the source domain to the target domain. Similarities between the source and target domains characterize a match; dissimilarities between the two domains typify metaphor mismatches (Neale & Carroll, 1997).

Identifiable dissimilarities between the source domain and the target domain generate confusion for interface users as they endeavor to conceptualize what actions they can perform and how they can perform those actions on a given interface. This confusion is typically the beginning of a frustrating user experience. These kinds of user experiences may have a number of specific catalysts that affect an individual's cognition in relationship to a computer interface: (a) mental models, (b) schemata and (c) values and norms.

Mental Models

Johnson (2008) designed a study to assess the usability of MSWord® 2003 interface metaphors for a group of economically underserved African-Americans who resided in a central city. The study focused the compatibility of mental models. Mental models refer to the "organization of data, functions, tasks, roles and people in groups at work or play" (as stated in Young Seok Lee, 2006, p. 308). The participants had the most trouble when the terminology, with its accompanying metaphors, was ambiguous. In these instances, the participants' mental models of how to perform a given task were not applicable to the interface design. When inappropriate mental models are applied to the execution of a task, a user's efforts to complete the task(s) encompasses numerous errors. This study demonstrated the importance of designing systems and instructional materials that facilitate users' construction of coherent and usable mental models as a duty for designers (Norman, 1983).

The results of Johnson's (2008) study substantiate the claim that all groups (cultural groups of every type) may perceive terminologies and metaphors incorrectly when applying their personal cultural lens to a given task. Culturally inappropriate interface metaphors add a burden to a user's performance. Interface designs must be considered in relationship to the cognitive load that they invoke upon the users. As users work toward achieving their goals, they utilize mental models (schemata within long-term memory) to help them navigate through a novel design (Neale and Carroll, 1997). When the design does not match the users' expectation, he or she will have to perform more cognitive processes with limited long-term memory data, which will then lead to high mental workload (high demands on working memory). This combination of limited long-term memory data is due to a different worldview, and high mental workload will increase the extraneous cognitive load. Here the extraneous cognitive load is potentially a cause for user error during performance by impeding learnability and increasing error rates and user frustration. A good design would promote germane cognitive load, which directs the individual to schema development (i.e., learning) (Sweller et al., 1998).

Cultural Schemata

As previously defined, cultural schemata are patterns of schemata that create a meaning system for a particular cultural group. Groups of people, regardless of the defining characteristics of the group, have socially acceptable behaviors that become common practice within their groups. For instance, consider the American schema for riding an elevator. Generally, an individual will get

on the elevator, select the floor that they are going get off, and wait patiently quietly until it is time for them to get off; in some cases the individual may even politely greet other passengers on the elevator. If an individual gets on the elevator with friends or acquaintances, they may talk to each other in a polite manner. Conversely, it would be out of the ordinary for a person to walk around or sing a song on the elevator, particularly if the individual does not know the other passengers. In the American schema for riding an elevator, it is understood that passengers wait quietly and should be respectful of the other passengers as they wait to get off.

This elevator schema is a simple example of a knowledge structure in relation to an activity in a specific context. Cultural schemata govern the way people perceive how they should perform various activities. This remains true when considering how an individual will interact with a computer interface. Some computer interface metaphors are ineffective for groups of users because they con-

Table 2. Examples of user interface metaphors continued (adapted from Neale and Carroll, 1997; Johnson, 2008)

Context of Metaphor	Target Domain	Source Domain (Metaphor)	Exploits Knowledge of
Group Work	Shared work spaces, video conferencing, distance learning	Rooms, TVs, slides whiteboard, phone video	group interaction, meeting tools, chalkboard, phones, TV
Virtual Reality	Navigating	Flying hand / Floating guide / Lean-based	physical/spatial world, flying, moving objects
		Eyeball & Scene in hand / Flying vehicle control / Push-pull	Attributes in and movement of physical space, camera control, flying, moving objects

flict with high level and overarching knowledge structures for a given cultural group.

Values and Norms

Metaphors are only valuable when they exploit the users' current knowledge about a task, process or social norm. Cultural differences unaccounted for in the design may result in implementation of inappropriate metaphors. For example, Aaron Marcus suggests that cultures with high uncertainty avoidance would be most comfortable or reassured with an interface that uses simple and easily discernable metaphors (Marcus, 2000). Uncertainty avoidance is one of five cultural dimensions that Hofstede (1997) uncovered during an anthropological study of a global business organization. Uncertainty avoidance is defined as the degree to which individuals feel threatened in the midst of unknown or uncertain situations.

While there are some obvious cultural issues that designers will have to consider (e.g., differences in spoken language or dialect), there are some that are not so obvious. For example, in some countries and ethnic groups, the social norm is for both men and women to be tender, modest, and concerned with quality of life (Hoftstede, 1997). So for these cultures, it would be less appropriate to use metaphoric terminology such as "Abort" or "Kill" (Shneiderman, 1992) to describe exiting a function or ending a program. This example could serve for images and symbols as well. Users will try to make sense of information by making associations with what they already know about their task, and determine how it fits into the larger scheme of their desired goals or interests. If a particular aspect of an individual's overall value system or belief structure is compromised by verbal or pictorial metaphors, a user will be less inclined to trust the contents of the interface and may then abandon the idea of accessing the interface in its entirety.

Case Study: Usability Problems with Interface Metaphor Mismatches

Metaphor mismatches are the nemesis to good interface design, and can be the very agent that disenfranchises users of various cultural groups. Duncker (2002) performed a cross-cultural usability study of the "library" interface metaphor with white New Zealanders of European decent and the Maori people who are indigenous to New Zealand. To understand the cultural schemas, the researcher studied different aspects of Maori culture. The study of the Maori uncovered information about their history, values, customs (including the way they pass on knowledge from generation to generation), and perceptions about the Westernized library system that is used in New Zealand. When the Maori, who have distinct perspectives about the purpose of and service in a physical library, were asked to perform a number of tasks using a library interface metaphor, various issues arose. Those issues later became usability problems for the Maori students when executing tasks using the digital library designed according to Westernized standards.

Among Duncker's (2002) list of general Maori character traits (where some are general and others are specific to digital libraries) is their inclination for:

- Being oriented towards collectivism and tribal unity,
- Holding their genealogy, sacred objects (of their culture), tribal privacy, and property rights in great esteem,
- Being oriented towards the past (They view the past as the forward direction and pay no attention to the future. They see time progressing towards the past and those of an Westernized culture view time as progressing towards the future),
- Believing that representations of people (whether in text, pictures, or carvings) are very sacred and should only be used in their sacred tribal environments,
- Being partial to face-to-face communication,
- Disagreeing with the openness of the Web (concerning Maori content or information),
- Feeling unwelcome in the library, even when the library staff is friendly by western standards,
- Disagreeing with the use of the English classification systems for Maori content (they are not familiar with the Western formats), and
- Being unfamiliar with publication formats: journals, series, and proceedings.

The use of Westernized libraries, including digital libraries, appeared to be a difficult undertaking for the Maori college students. The cultural characteristics described above are in most cases the root of the Maori's usability problems with the digital libraries. The Duncker (2002) study was actually performed in New Zealand using a local college's digital library. Libraries in New Zealand are often a repository for Maori artifacts – artifacts that include Maori genealogies and other aspects of their history. Furthermore, as a general note, the Maori sometimes feel that the history of their people does not receive the respect that it deserves and should not be available for viewing by the general public.

The usability problems that surfaced from Duncker's study were understood to have the following foundations:

- Libraries emphasize individualism and the Maori Culture is characterized as being collectivist in nature,
- Maori are partial to face-to-face communication, which is not generally supported in Western libraries,
- Maori value their sacred objects, tribal privacy, and property rights; library policies generally do not reflect those values,
- Maori do not agree with the openness of the Web,
- Maori do not feel welcome in the library, even when the library staff is friendly by western standards,
- English classification systems are not appropriate for Maori historical content (they are not familiar with the Western/Anglo-American formats and categorization), and
- Maori have trouble with publications formats: journals, series, proceedings (they do not generally know what these are).

Duncker (2002) found that the Maori are able to work with digital libraries, but certain aspects of the library metaphor break down. These breakdowns make working with digital libraries arduous for the Maori and fraught with negative critical incidents. Below is a negative critical incident, which occurred during a usability session with a Maori student that demonstrates usability problem # 7.

Participant stops working. Silence.

Researcher: "What is the matter?"

Participant: " I don't know."

Researcher: "What are you doing?"

Participant: "I am not sure. Maybe go there?" (Points at the link 'Journal and Proceedings')

Participant: "Perhaps?" (Looks at the researcher)

Researcher: "It depends on what you want to do."

Participant is silent and looks at the screen.

Researcher: "Do you know what journals and proceedings are?"

Participant: "No."

Researcher explains what journals and proceedings are.

Participant carries on (Duncker, 2002, p.228).

Desktop Metaphor

The most ubiquitous computer interface metaphor is the desktop metaphor. Smith and colleagues (as reported in Neale & Carroll, 1997) state that the desktop metaphor depicts the computer's operating system as analogous to the objects, tasks and behaviors of an office environment. These office workers are more than likely proficient in their knowledge of documents, files, file folders, windows, wastebaskets and so forth. Therefore, the argument is made that the desktop metaphor is relevant and will potentially facilitate user learning of computerized office tasks and equipment, at least in Americanized office environments.

Some believe in the desktop metaphor's potential for universal relevance for office working environments. Others contend that the desktop metaphor, which is influenced by mainstream American culture, is not fully applicable outside the borders of the United States. For example, Duncker (2002) discusses computing metaphors and emphasizes that while the general concept of a desktop metaphor transfers across cultures, the components of the metaphor do not transfer. In American culture, folders are made from firm pieces of paper and have a tab for labeling. These folders are stored horizontally in filling cabinets and or drawers. In other cultures like Japanese and European countries, folders are handled and stored differently. For instance, Japanese and European cultures store their files in lever arch files, which look like cardboard box containers. File users punch two holes in the sheets of paper and place them into rings connected to the lever arch file. These lever arch files are stored in an upright manner on shelves and pulled off the shelves using a small hole in the vertical backside of the folder; the vertical backside of the folder is also used for labeling (this labeling system has a larger surface area than American folders) the file. Furthermore, the labels in the lever arch files are always visible, while American file labels are obscured by drawers or filing cabinets (Duncker, 2002). With respect to these subtle differences, one could imagine how the desktop metaphor developed in the United States would not provide visual cues that are readily recognizable in other countries.

From these examples, it is evident that the globalization and localization of computer interface metaphors cannot be attained by simply translating idiomatic expressions and icons from one cultural situation to another (Duncker, 2002). These cultural differences in metaphor comprehension must be equated to more than the superficial meanings of color and shapes of icons. Rather, cultural differences or meanings among groups of people are rooted in their history. Conflicts in metaphor meaning from group to group result from having and employing different cognitive, emotional, behavioral, and social structures and processes. Therefore, it is essential to use metaphors that maintain relevance when the users consider the related physical object or source domain (Duncker, 2002).

Human Factors Interventions for Effective Interface Design across Cultures

There are a number of human factors tools that can facilitate the development of culturally valid or socially equitable computer interface designs. To achieve more culturally inclusive interface designs, designers must be able to identify and apply interface metaphors to effectively illuminate the design functionality within the cultural context that it would be used. Culturally informed metaphors use will help users apply appropriate schemata and mental models to novel computer applications.

Cognitive Load Theory Application

Accurately applying schemata from long-term memory will provide a reduction in overall cognitive load and reduce the possibility for user error (Sweller et al., 1998). Don Norman's (1983) assertion of the importance of designing systems and instructional materials that facilitate users' construction of coherent and usable mental models as a duty for designers works in tandem with the philosophy of Cognitive Load Theory (Sweller, 1988). Traditionally, Cognitive Load Theory (CLT) has been applied specifically to the design of instruction. Three primary components comprise the core of CLT: intrinsic cognitive load, extraneous cognitive load and germane cognitive load. Intrinsic cognitive load is the load on working memory that results from the inherent nature of the material to be learned; the intrinsic cognitive load cannot be altered with instructional interventions. Extraneous cognitive load is the unnecessary use of working memory capacity that results from the poorly designed instructional materials; instructional interventions can alter extraneous cognitive load. Germane cognitive load refers to the productive use of working memory capacity, which leads to the construction of schemas (Sweller et al., 1998). Moreover, the goal of CLT is to design instructional materials that reduce extraneous cognitive load and increase germane cognitive load. Considering the similar ideals of good usability in interface design and instructional design, the most rudimentary components of CLT can be applied to computer interface metaphor design as well. In order to achieve good usability, extraneous load would be reduced by designing-in culturally appropriate interface metaphor into the interface. In turn, germane cognitive load would increase and result in schema construction, also known as learning.

Socio-Technical Systems Theory: A Macroergonomic Approach

From the American statistics concerning the digital divide, it is apparent that African-Americans and Hispanic-Americans have a lower penetration rate (access) for computer use. There are a variety of potential reasons for the persistent lack of access for these minority groups. Moreover, since the problem of access is influenced by factors internal and external to the user and the interface designer, a socio-technical systems view is necessary to understand the interactions between culture, interface design, and processes.

Socio-technical systems theory (Trist & Bamforth, 1951) posits that there must be congruence between people (personnel subsystem), work systems, and technology (technological subsystem) to achieve optimal effectiveness of work systems within an organization (Hendrick & Kleiner, 2001). Each of the elements of socio-technical systems theory (i.e., personnel subsystem, work system and technological subsystem) is subject to an external environment. The personnel subsystem considers issues such as cultural and psychosocial characteristics. The technological subsystem refers to how the work or task(s) is performed, and also considers the methodologies and tools used to perform the work (Bancroft, 1992; Cummings, 1978). The work system refers to the manner in which people are organized in order to perform their work and their related processes (Hendrick & Kleiner, 2001).

Macroergonomics, which is a area of study within Human Factors, offers a model of socio-technical systems theory states that there are three major constructs associated with socio-technical systems theory: joint causation, joint optimization, and joint work design. Joint causation, in concept, suggests that both the technological and personnel subsystems are affected by causal events in the external environment (e.g., competition and new government regulations). Joint optimization suggests that both the technological and personnel subsystems should be jointly optimized in order to effectively respond to causal events in the external environment. Joint design is the idea that both subsystems should be designed together to produce the most optimal fit (Hendrick & Kleiner, 2001). Hendrick and Kleiner also discuss the mutual interdependence of the four socio-technical elements: personnel subsystem, work systems, technological subsystem and the external environment. If any aspect of one element is modified, there will be subsequent effects on each of the remaining elements. It is essential to recognize and plan for the interdependencies of the system; it is likely that ignoring the interdependence of the subsystems will have a sub-optimal result on the system as a whole. Consequently, it is necessary to jointly consider the personnel subsystem, technological subsystem, the work system and the external environment. Figure 2 is a conceptual model of how the discussion of interface metaphor fits into a macroergonomics framework.

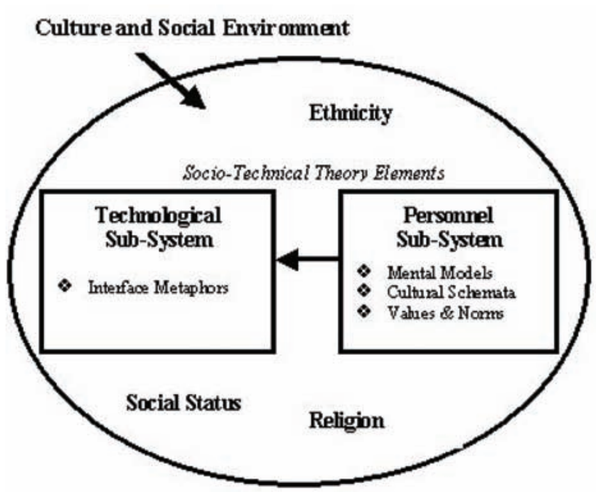
While the impetus for this discussion is developing a strategy that will facilitate increasing computer access to varying cultural groups (by way of including their needs, thoughts and ideas into the interface design), there is a system of factors that influence a design's effectiveness for a given population(s) of interface users. Consideration must be given to the fact that the individuals are situated within a culture and its associated social environment. Furthermore, an individual's culture becomes the cognitive framework through which he/she views and conceptualizes the world and the technologies in the world. Using a macroergonomics approach is an effective tool for conceptualizing the notion of designing technologies that will thrive with specific, and on occasion unique, groups of individuals within a predefined socio-cultural environment. Identifying the detailed attributes and roles of the technology, the individuals and the environment will serve as a sound starting point for developing culturally valid interface metaphors.

Designing in Support of Culturally Valid Computer Interfaces

There is no exact recipe to design culturally valid interfaces, but there are heuristics or rules of thumb that can be used across different computer applications and interfaces. These heuristics are also referred to as usability attributes. Commonly assessed usability attributes include: learnability, efficiency, memorability, errors, and satisfaction (Nielsen, 1993). Nielsen describes these usability attributes as:

- Learnability: The system should be easy to learn so that the user can rapidly start getting some work done with the system,
- Efficiency: The system should be efficient to use, so that once the user has learned

Figure 2. Socio-technical systems theory applied to interface design



the system, a high level of productivity is possible,

- Memorability: The system should be easy to remember, so that the causal user is able to return to the system after some period of not having used it, without having to learn everything all over again,
- Errors: The system should have a low error rate, so that users make few errors during the use of the system; if they do make errors, they should be able to easily recover from them. Further, catastrophic errors must not occur, and
- Satisfaction: The system should be pleasant to use, so that users are subjectively satisfied when using it; they like it.

The issues of learnability and errors would be most effective in assessing the strength of interface metaphors for a specified cultural group, because metaphors are used to assist with comprehension of the design and task performance.

In the lead author's (Johnson, 2008) research work, several aspects of design were uncovered. This research indicated that culturally valid computer interfaces can be supported with relevant and appropriate use of terminology and interface metaphor. According to these studies, the first thing to do to augment learnability among the novice African-American users in her study, is to consider the culture of the user group at a relatively low level. More specifically, the research advocates allowing the users' common language and perceptions about the way they do their work drive the interface's design. This is particularly related to the formation and implementation of metaphors used in efforts to provide a mechanism for understanding. This usability consideration is not notably novel; however, the nuance is the notion of "relatively low-level" cultural considerations driving the implementation of (a) terminologies and (b) relevant verbal and pictorial metaphors.

The aforementioned design consideration resulted from a review of African-American participants' comments concerning the ease and difficulty of the various computer benchmark tasks. During post-task interviews, the African-American participants had an opportunity to rate each task on a scale of one (easy) to ten (hard). These participants characterized the "easy" tasks with a number of descriptors. The attribute that was most salient among the "easy" tasks concerned the use of labels. When asked the question "Was there anything about this computer [interface] design that helped you to complete this task?" the response was often that the label titles were clear. Participants commented on the simplicity of the terminology used on the buttons or menu selections. For instance, the participant may comment on the label "Format" in MSWord® 2003 or the "Make Corrections" button in a novel interface design inspired by a group of young the African-Americans. The novel interface was titled the African-American Inspired Interface (AAII).

There were some cases where the participants recognized the deeper meaning of the labels that were represented metaphorically. For example, some participants understood that "Final Draft" in the AAII was used to convey that it was the option where they could finalize their work and print or email the letter. A few others recognized that a "File" in MSWord® would be something that they could save and keep until later. Even when the terminology used on the labels was somewhat ambiguous, the participants still mentioned that the labels were the cue they used to complete the benchmark tasks. Moreover, participants' comments indicated that the labels were key in making the task easy. The participants almost always made reference to the verbal labels on the menu selections or on the buttons.

The attribute that was most salient among the "hard" tasks concerned options being hidden. A popular phrase for the "hard" tasks was "I couldn't figure out where to go to…" Further discussion with the participant would often reveal that some option(s) appeared to be hidden. The root of the problem of hidden options was consistently related to the use of unclear or ambiguous terminology. One very common example of the use of ambiguous terminology is the use of "Font" in MSWord® 2003. Participants could generally recognize that they needed to go to the "Format" to change the color or size of a letter or a word in their document; however, the participants would get stuck after selecting "Format." The next step would be to select "Font", but many of the participants did not understand what "font" meant. A second problem with the use of terminology is rooted in the misinterpretation of metaphors. For example, there were occasions where the participant stated that certain function should have been located under different menu titles. For example, a participant trying to correct his or her spelling and grammar may look under the "Edit" menu in MSWord® 2003. However, the participant may be frustrated when they go to the "Edit" function (with a mental model that leads them to think that "Edit" would be the place to make any corrections in their document) and can not find a "Spelling and Grammar" option.

Implications for the Digital Divide

Culturally and socially valid interface designs are and will continue to be an essential requirement for products and services, as the United States and other countries endeavor to increase productivity and enrich quality of life for its citizen by exploiting broadband technology. Leadership in the United States has recognized the transformative power that broadband technologies are having on the lives of American citizens and on the American economy and culture (NTIA, 2008). NTIA's report "Networked Nation: Broadband in America, 2007" asserts,

By making it possible to access, use and share information, news, and entertainment with ever increasing speed, broadband knits geographically-distant individuals and businesses more closely together, increases our productivity, and enriches our quality of life. In so doing, it fuels economic growth and job creation that, in turn, provide unparalleled new opportunities for our nation's citizens (NTIA, 2008, p.i).

American government has acknowledged the strength in the electronic exchange of information and seeks to dismantle the barriers of broadband access to its citizens through technology, regulatory and fiscal policies.

While the focus in America has shifted from discussions about bridging the digital divide to developing strategies for expanding broadband technologies, the issue of culturally valid computer interface designs still remains. Yes, broadband technologies are powering the computer technologies and applications that people to which people tend to gravitate. However, if we endeavor to increase the quality of life for a more inclusive aspect of the American population, we must give credence to the role that culture plays in the usability of computer interfaces. If we fail to take culture into account, we will maintain and possibly extend, the number of citizens that are already excluded from the benefits of broadband (and Internet) technologies.

If one looks closely, interface metaphors can be found in all types of computing devices and applications. For example, verbal and pictorial metaphors are pervasive in products such as: cell phones, gaming devices, digital cameras, audio listening/recording devices, etc. Modern examples of both verbal and pictorial metaphors embedded within a technology are cell phones such as the Apple® iPhone and the Samsung Instinct™. In both types of examples the user's experience is driven by pictorial metaphors. These phones have a cadre of features and computing applications. On the main menu of the Samsung Instinct™ the most salient aspects of the interface are pictorial metaphors that are developed to denote functions including email, messaging, voicemail, navigation, calculator, notes, calendar, clock settings, and the web. Considering what we know about culture's affect on cognition, transferring metaphor (pictorial) into other cultural domains is a questionable activity. The images and words represented can potentially take on variant meanings, thereby invoking erroneous user actions. The use of pictures and images that are not applied in a culturally informed manner may be ambiguous or even offensive to different cultural groups. Ambiguity and offense are causes of poor and dissatisfying user experiences.

While hand-held mobile devices such as smartphones are one example of augmented methods for information acquisition, more prolific use of E-business, computer-supported collaborative work, E-Government, E-Democracy, E-Health, E-Training, and E-Education are still on the horizon. Presently, a myriad of businesses are taking advantage of the Internet and provide various components, if not all, of their business online. With the proliferation of broadband technologies, business owners are seamlessly expanding into global markets; they are able to sell their products and offer their services to people and other businesses worldwide. Thereby, national and international citizens have the opportunity to acquire products and services that assist them with everyday living. This burgeoning phenomenon also taking place within the spheres of computer-supported cooperative work (CSCW), E-Training, E-Education and E-Health, will only benefit people or business entities that are able to make meaningful sense of the computer interface designs. A relatively recent example of the growth of CSCW is the Google™ application named Google™ Docs. This application provides groups of individuals an occasion to edit and share documents in real time no matter how geographically dispersed the group members are. The gains in productivity and knowledge sharing are quite apparent for application users in such an example.

What will be the cost to citizens and or business entities that cannot benefit from this proliferation of resources because the front-end access points, i.e., the computer interface design does not offer a culturally valid presentation of information? What will happen to groups of individuals who are not able to get health services, which are available to others, simply because they could not navigate successfully through the computer interfaces? What will happen to the individual who desires to take advantage of online certification programs or other E-Education and E-Training services, but struggles to get registered for the program because the terminologies present on the website are unclear? What is the consequence for citizens of a nation who can not access E-Government services, such as motor vehicle, Social Security Administration, public works, public transportation, and job employment because essential culturally considerations are not integrated into the interface designs? The answer to these questions is that individuals, groups and business entities will be or continue to be marginalized and will miss the benefits of potentially life enhancing opportunities, products and services.

FUTURE TRENDS

There is a natural phenomenon associated with technology adoption (Rogers, 2003). There are different classes of technology adopters and these classes of adopters have a propensity for coming on board with technologies at different rates. Some researchers may even propose that this fact is the reason for the persisting digital divide. Nonetheless, it appears that there are other factors that have continued to fuel the digital divide. Poor interface designs that are incompatible with the values and social norms of a given cultural group, are potentially contributing factors in the pervasiveness of the digital divide among various ethnic/cultural groups within the United States and across the world.

There are widespread implications for the role of culture in computer interface metaphor design. The implications are almost boundless when considering the rapid penetration of computing broadband technologies into the everyday lives of local and global citizens. There are numerous directions for further research that are associated with this discussion. Presently, there is little empirical research that explores and applies interface metaphor design in the context of culture. Future research should address the development and design of interface metaphors from the perspective of users' cultural views and socio-cognitive attributes. Some topics for study might include: (1) methods for designing culturally appropriate interface designs for E-government and E-Health applications, (2) comparisons of cultural appropriateness between the older, but widely used MSWord® products and the newly released MSWord® 2007, (3) culturally informed icon-driven interface designs for mobile computing devices and (4) educational computer interfaces for children and adults. There is also a strong need to develop valid ways to measure the cultural competence of interface designs. Just as software exists to score the accessibility of a website, similar measurement tools are needed to quantify the cultural competence of interface designs.

CONCLUSION

This chapter addresses a problem that centers on the persistent digital divide among ethnic minorities, particularly African-Americans and Hispanic-Americans (Latinos), and persons of low socio-economic status in the United States. The digital divide research from the United States reports that there is a schism in computer and Internet access between the technology "haves" and the technology "have-nots." Much of the literature pertaining to the digital divide defines "access" as referring to having a computer and software available for use. However, this chapter conceptualizes "access" as having an interface that facilitates user learning, and provides greater insight into the problem of access from a human factors perspective. The human factors intervention for this problem of access is in recognizing and accounting for culture's influence on cognition and the affect of culturally valid and invalid computer interface metaphor designs for various user groups.

Most nations have economically and educationally underserved citizens who tend to be removed from the symbols and opportunities of affluence that contribute to quality of life. For these marginalized citizens, information may be hidden behind computer interfaces that do not employ meaningful computer interface metaphors. Information pertaining to critical aspects of life such as political involvement, health, economic empowerment, and even recreation may be completely or partially invisible to various members of society. Our society is driven by a knowledge-based economy that is fueled by various information technologies such as computers, the Internet and static or interactive computer interfaces. Culturally valid interface designs that employ meaningful interface metaphors will support the development of a more e-inclusive society, whether it is national, regional or local. Deployment of culturally valid interface metaphor designs will unlock important information for citizens of nations and the world.

As we move forward in the 21st century, the human factors profession, along with other disciplines, must develop new methods for acquiring user interface requirements from typically marginalized populations. In tandem with new methodologies should be innovative methods for measuring and assessing computer interface usability for less typical groups. In human factors, our professional goal is to design processes, products, and services that will maximize human capabilities in safe and effective ways. Therefore, we must venture out and discover the intelligences and complexities of many cultures, and design so that people of all groups can maximize the benefits obtained from technologies. Upon developing culturally informed designs, we will decrease the digital divides, achieve greater levels of e-inclusivity, and provide larger segments of our local and global society with equitable access to information.

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KEY TERMS AND DEFINITIONS

Access: (*Related to good interface design*)**:** Access means having a computer interface that effectively facilitates user learning (Smith-Jackson & Williges, 2001).

Access: (*Common definition*)**:** The availability of a personal computer (i.e, computer hardware) and Internet connectivity.

Computer Interface Metaphor: Computer interface metaphors provide the benefit of user familiarity (Neale & Carroll, 1997), and allow the user to exploit their current knowledge when learning how to use a new computer system (Preece, 1993).

Culture: Culture is software of the mind (Hofstede, 1997, p. 4). An individual's mental programs are a result of the social environment where one grew up and gathered one's life experiences. According the American Psychological Association (2008) Culture is a belief system that consists of values that, in turn, influence socialization practices, psychological processes, and organizations. Culture is also a worldview or a cognitive metaschema, influencing how a person interacts with the world, including people and technologies.

Cultural Schemas: Cultural schemas are patterns of schemas that create a meaning system for a particular cultural group (as stated in Nesbitt & Norenzayan, 2002).

Culturally (and Socially) Valid Interface Designs: Interface designs that employ metaphors that are meaningful and relevant within the cultural and social context of target groups of users. These metaphors are identifiable and familiar concepts for the target user groups.

Digital Divide: (*In the United States*)**:** The Digital Divide is the schism between those with access to new technologies and those without (NTIA, 1999).

Human Factors: Human factors discovers and applies information about human behavior, abilities, limitations, and other characteristics to the design of tools, machines, systems, tasks, jobs, and environments for productive, safe, comfortable, and effective human use (Chapanis, 1985, p. 2)

Mental Model: Organization of data, functions, tasks, roles and people in groups at work or play (as stated in Lee, Y.S. et al, 2006, p. 308).

Chapter 34
Conceptualizing a Contextual Measurement for Digital Divide/s:
Using an Integrated Narrative

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ABSTRACT

Measurements for the digital divide/s have often engaged in simplified, single factor measurements that present partial and static conceptualization and, therefore, measurements of the digital divide/s. The following chapter encourages policy makers to choose appropriate tools and programs to measure digital divide/s according to three dimensions: (1) the purpose of the tool; (2) levels of observation; and (3) methods of approaching the data. Then it describes an integrated contextual iterative (ICI) approach suggested by the authors as an effective way to assess digital divide/s including perspectives of different stakeholders. The approach is illustrated with examples from a research project studying public access venues in 25 countries around the world.

INTRODUCTION

The digital divide is a concept that has broadly come to signify a range of phenomena referring to disparities of access, use, skill, background and environment in the context of information and communication technologies (ICTs). The issue of digital inequalities was already addressed and studied at the beginning of the 90s. However, the concept of the digital divide, which was first introduced by the Clinton-Gore administration in 1996, quickly gained popular acceptance as a concept that highlighted the importance of access to ICT in society among different populations and countries. The

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digital divide, it was feared, would exacerbate the gap between rich and poor communities as well as nations (United States, 1999). Early interventions aiming to narrow the gap between the digital haves and have-nots focused on access to computers and technologies, in the hope that such access would bring about more equitable distribution of resources, knowledge and solutions to people's problems.

This simplistic approach has long been criticized, with growing voices insisting that access alone is not enough to promote social inclusion or bridge the digital divide (Barzilai-Nahon, 2006; Potter, 2006; DiMaggio, Hargittai, Celeste, & Shafer, 2004; Fink & Kenny, 2003; Gomez & Ospina, 2001; Norris, 2001; Warschauer, 2003; Wilson, 2004). These voices are aimed towards broadening the conceptualization of the digital divide and overcoming the dichotomous interpretation the nomenclature 'divide' might entail. Barzilai-Nahon (2006) suggests that the digital divide is multifaceted and offers the label digital divide/s as a way to highlight the multiple dimensions included in it. Digital divide/s, she argues, should be understood as a concept that reflects inequalities derived from the digital environment, and at the same time be studied in a continuum with other socio-economic inequities.

This chapter briefly introduces the concept of the digital divide/s. Next, it provides a roadmap for policy makers which helps them assess how appropriate each methodology is to their particular decision making scenarios by suggesting three stages of evaluation that can be applied to each such methodology: first, the purpose of the tool or method; second, the level of observation implicit in this tool; and third, the method of approaching the data. We then propose a framework for assessment and measurement of the digital divide/s that is contextual, integrated and iterative - the Integrated Contextual Iterative Approach (henceforth, ICI). By proposing the ICI we provide decision makers with a tool to arrive at comprehensive and contextual measures of the digital divide/s. We then discuss the pros and cons of this approach and illustrate the use of ICI by referring to an ongoing research project that is being carried out in 25 countries across the world.

BACKGROUND

The definition of the digital divide/s and the empirical analysis of its components have been much debated in existing literature on the subject (Dewan & Riggins, 2005; Hargittai, 2003; James, 2008; Warschauer, 2003). Traditional thinking in disciplines like communications, sociology, information systems and science on the issue of digital divide/s revolved around the issue of access. Policy makers attached overriding importance to the physical availability of infrastructure and connectivity – a function, perhaps, of the reality of resource allocation to address the digital divide/s in the 90s. However, as Warschauer (2003) argues,

a digital divide is marked not only by physical access to computers and connectivity, but also by access to the additional resources that allow people to use technology well. However, the original sense of the digital divide term - which attached overriding importance to the physical availability of computers and connectivity, rather than to issues of content, language, education, literacy, or community and social resources - is difficult to overcome in people's minds.

In recent years, this traditional access-oriented thinking moved beyond technology to focus on people and communities to understand – for example, the influence of skills, usage patterns and influence of the environment such as political and economic development (Bridges.org, 2005a; Wilson III, 2006). The focus of funding and the resulting practical implications also exemplify this shift of focus from issues of access to other factors (Alampay, 2006; Colle & Roman, 2001;

Dagron, 2001; Gomez & Ospina, 2001; Gomez & Reilly, 2002; Parkinson, 2005; Proenza, 2001; Simpson et al., 2004; United Nations, 2007).

Within the field of the digital divide/s then, attention has shifted from first degree questions such as "*what is the digital divide*" to more contextual, second-degree questions such as "*what components should we add to measure/conceptualize a more refined understanding of the digital divide in a certain context?*" While this shift has occurred, research and practices are still characterized by single-factor, monotopical relations as explicating digital divide/s (Barzilai-Nahon, 2006). Such monotopical measurements examine how certain factors have an impact on a certain aspect of the digital divide – for example, how does low income affect the use of technologies? This chapter does not address the debate of whether such monotopical indices actually measure digital divide/s (James, 2008). Instead, it focuses on the ICI approach as a means to reach robust, comprehensive and comparable data that illustrate the contextual nature of data gathered to measure the concept of digital divide/s.

A THREE-STEP ROADMAP FOR POLICYMAKERS FOR ASSESSING DIGITAL DIVIDE/S

In addressing issues surrounding digital divide/s, various methods, tools and programs are used. It can be difficult for policy makers and other stakeholders to understand and analyze what tool is appropriate in what circumstances. To help them assess the appropriateness of such methods and tools, Barzilai-Nahon (2006) recommends looking into the following important steps in any tool/program/method that measures digital divide/s:

- **Purpose of the tool**: determining the characteristics of the tool according to its goals. The goals are reflected through four dimensions:
    - Monotopical vs. integrated measures
    - Fixed vs. contextual or mixed factors
    - Fixed vs. contextual or mixed weights
    - Fixed vs. iterative process of measurement

Essentially, we argue that it is most important to utilize tools that apply best to the goals of the policy makers. In this article, we focus specifically on one type of tool which applies an integrated, contextual and iterative look at problems around the digital divide/s.

- **Level of observation**: identifying the appropriate level of study/focus of the tool. Measurement of digital divide/s can occur on international, national, community and sector levels. The level of observation impacts directly the method of approaching the data. A detailed zooming-in at the level of observations (e.g., examining a particular community) will in most cases involve mixed method research combining qualitative and quantitative and therefore methods which fit such analysis.
- **The method of approaching the data**: this includes the use of methods such as 'ready-to-use' indices/questionnaires, case studies, third party surveys etc. and determining which method of data collection is appropriate.

This chapter focuses on a particular approach under the three-step roadmap for policy makers: an Integrated Contextual Iterative (ICI) approach originally discussed on a theoretical level (Barzilai-Nahon, 2006) and as part of a global study on public access to ICTs (Coward, Gomez & Ambikar, 2008). We recommend that the measurement of the digital divide/s consider integrated factors along with their varying levels of importance (formalized in our framework through the assignment of weights) in varying situations, and the use of tools that are contextual and integrated. To ensure a complex understanding of the measurement, we propose an iterative method that revisits the measurements over set periods of time to document the changing factors and their weights in the ways that they affect the digital divide/s.

To illustrate this approach, we cite our experiences at a national level of observation using mixed methods of approaching the data. However, the ICI framework can be applied to different levels of observations and methods of approaching the data. Let us consider each step in the assessment of digital divide/s measurements in turn.

Purpose of the Tool

When analyzing policy decisions that were made in the last decade, one can observe that policy makers have a tendency to address digital divide/s issues through monotopical or single-factor indicators of the digital divide/s. Often decision-makers consider ‘access’ as the most important factors to measure digital divide/s. Following this, they implement policies that increase access of people to information and communication technologies. This facilitates measurement and enables them to point at visible outcomes in a rather short amount of time - an effective tool to sway public opinion. Furthermore, decisions based on monotopical measurements may address some components of the digital divide/s successfully, but fail to address the complexity of the multiple levels reflected and contributing to digital divide/s. For example, if a certain government agency wants to implement a program of ICT proliferation aimed at increasing use of ICT by youth, then usage is the only indicator that needs to be considered and monotopical measurement would be the appropriate method. But if what is needed is to understand the situation of digital divide/s in general, then the integrated approach would be the one that fit best.

The second and third dimensions, while considering the purpose of the tool, take into consideration whether to use fixed, contextual or mixed factors and their weights. We undertake understanding of the relative importance of each factor by assigning it an appropriate weight in the methodology. This is an important step in understanding the context in which the measurement is applied. Most comparative international indices tend loosing the contextual dimension in favor of the comparison. This happens both in terms of which factors to use and what weight to assign to these factors. Sometimes, this strategy leads to absurd situations, such as, when looking at usage of ICT in a country where connectivity is almost non-existent or analyzing the affordability of ICT usage where access to ICT is free. While usage and affordability are important factors to consider when addressing digital divide/s, they are meaningless without the context in which they are factored.

Finally, a contextual approach to measuring the digital divide/s suggests deciding upon the relevant factors and weight according to the particular context. An iterative approach promotes repeating this process time and again for refinement and to understand the changing relationship of each of the factors that are used to measure the digital divide/s. The iterative component entails two questions:

- should the same list of factors in every measurement of research project/policy decision be used?
- should each of the chosen factors in this list carry the same particular decided upon weight for each iteration of measurement?

This chapter promotes a contextual approach. While a fixed factor list addressing key areas of social, economic, cultural and political life that affect digital divide/s in any context is important, it may not be common in all contexts, and it may distort the actual state of affairs in the eyes of decision makers. For example, while religion may be an important aspect to be studied in a country with a fundamentalist government, it may not be important in a situation where religion is not a significant part of the country's culture. Instead of having a fixed list of factors for each case, this chapter endorses developing unique factors which will be utilized as applicable in the individual case.

Similarly, using a list of factors with a same fixed weight in each decision may not provide the most comprehensive picture of the digital divide/s. It is necessary to assign weights for each of the factors used for analysis in a contextual manner. For example, education and literacy might be a factor that is commonly considered across nations. However, it may be most significant in a country where the level of literacy of the general population is extremely low, and therefore assigning a strong weight for such a factor will be crucial to understand the situation. Finally, if policy makers would like to be able to respond to changes occurring over time, it is important to repeat the process of refining the index in an iterative manner.

Level of Observation

Most existing indices measure digital divide/s at the international and national level. Nevertheless, digital inequalities exist in variety of other levels: sector, community, and individual levels (Dewan & Riggins, 2005). The current focus on these higher levels of analysis shortchanges detailed and vitally important data collection and analysis at more micro levels. For example, many communities within nation-states are far removed from the rest of the country with regard to information and communications technology (ICT) access and use. Such communities reshape ICT to their culture and norms. Barzilai-Nahon and Barzilai refer to it as *Cultured Technology* (Barzilai-Nahon & Barzilai, 2005). We cannot disregard the discrepancies at local levels and the variance in digital use in access, even if such variance is below the nation-state threshold, since in many cases this level of resolution is more meaningful than the national and international levels that tend to be more popular.

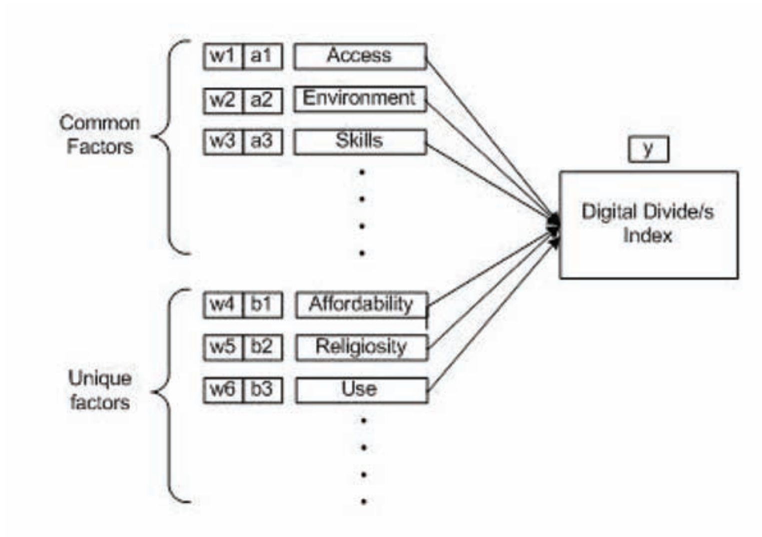
The claim forwarded in this chapter is not to include all possible levels in one index, but rather to use a similar contextual index design for all levels while the importance/weights of the different factors are altered according to the specific context. This would allow maximum flexibility in the level of measurement, whether it is at sector, communal, national or international level and at the same time maintain homogeneity inside the unit of analysis that is examined. For example, an index measuring digital divide/s in an immigrant community will emphasize weights that reflect language factors over other factors in the index.

Method of Approaching the Data

Integrated approaches are proposed and implemented by various institutions and scholars. Nevertheless, not many ready-to-use integrated indices, or even reviews of assessment tools, exist, yet these integrated indices are widely used (Bridges.org, 2005a; Grigorovici, Schement, & Taylor, 2002). Prominent among the integrated indices are Statistical Indicators Benchmarking of the Information Society (SIBIS), DIDIX (Digital Divide Index) (Dolnicar, Vehovar, & Sicherl, 2003; Husing & Selhofer, 2004), NRI (Network Readiness Index) (Dutta & Jain, 2004), The Digital Index, and other more traditional inequalities measures such the Gini Coefficient (Riccardini & Fazio, 2002). Bridges.com (2005a) offers a comparison of the various assessment tools to determine e-readiness while looking at

- Ready-to-use questionnaires (e.g. CID [Center for International Development]).
- Case studies (e.g. USAID [US Agency for International Development])
- Third party surveys and reports (e.g., KAM [Knowledge Assessment Methodology]).

(Figure 1. Integrated contextual iterative approach of a digital divide/s index. © 2009 Karine Barzilai-Nahon. Used with permission.)



Ready-to-use questionnaires, such as the CID, while providing a uniform standard for measurements, do not allow for flexibility and easy transition from one context to another. On the other hand, case studies present interesting, detailed context of digital divide/s in various situations, but findings from these are not easily scalable. Third party surveys and reports such as the KAM have taken great strides in creating a framework for contextual measurements that offer some level of flexibility that allows for its use in various contexts.

INTEGRATED CONTEXTUAL ITERATIVE APPROACH FOR ASSESSMENT: HOW DOES IT WORK?

The main purpose of this chapter is to elaborate and explain in depth how an integrated contextual iterative methodology (the ICI) should be approached. For understanding the concept of digital divide/s and measuring it, we propose a comprehensive and contextual approach over one that compares different elements of digital divide/s. The main idea behind a comprehensive contextual approach is that the comparison is not between the elements which comprise digital divide/s (e.g., comparing access in one country vs. access in another country), but between the dependent variable which represents the whole, that is the digital divide/s index. This approach does not preclude the study of particular elements (e.g. affordability) which might be important in understanding digital divide/s. This approach is important when one would like to learn about this particular factor (e.g., affordability), rather than the comprehensive concept of digital divide/s.

Figure 1 exemplifies the proposed methodology. So for example, if a country is establishing a digital divide/s index, it should choose first the basic common factors that they would like to compare on a regular basis with other countries (see in figure 1 factors a1-a3 for example). The next phase would be to choose the factors that are unique to their particular national context and choosing a common way to measure it would distort the profile of the country. Finally, weights should be assigned according to the relevance of these factors in the national context. Next, we will explain how integrated, contextual factors and weights, and iterative aspects are reflected in that model (see figure 1).

- **Integrated** – We argue that measurements for the digital divide should consider an integrated approach to measurement; i.e. considering the whole (y in figure 1) for comparison purposes. Most methodologies compare the components (a, b in figure 1) rather than the whole (y in figure 1). For example ***access*** in Guatemala will be compared to ***access*** in Portugal, and ***affordability*** in Peru will be compared to ***affordability*** in Philippines. Some indices such as the KAM do compare the whole, and provide an ability to compare between components. However, even in these cases the whole is reflected by a number which is sometimes meaningless to the policy maker who is expected to interpret these results. It is clear that one number, bereft of its context does not provide the policy maker clear guidance as to where the challenges are, and where the next investments would accrue the maximum benefit for bridging the digital divide. Here the ICI proposes an integrated narrative as the variable that is compared, providing the policy makers with not only numbers that are easily understood and compared, but also with local contexts within which these numbers are situated. Undertaking analysis and comparison using the integrated narrative as a unit of analysis provides a richer, more complex picture for policy makers where differential weights and levels of analysis can be transparently applied to measurements - allowing them to strategize in more meaningful ways.
- **Contextual factors** – each index should comprise common factors (a1-a3 for example in figure 1), basic factors which may be similar in other contexts, unique factors (b1-b3 for example in figure 1), and factors that are unique to the particular context. Contextual factors may differ not only on the existence or non-existence of factors, but on the contextualized ways to measure a factor. For example, the study of race, gender, class, and education can be recommended for the study of digital divide/s across the board (the various factors that constitute a2 in figure 1). At the same time, unique factors such as war affected regions or regions affected by recent natural disasters (b1-b3 in figure 1) would be unique factors to be considered in the case of particular situations. It is clear that unless one engages the context within the measurements, it may not prove to be accurate. To take a hypothetical case, if a country with high literacy rate is measured soon after its schools are severely impacted by a large scale earthquake, it might register a low literacy rate while disaster affected. To ensure comparability, our framework proposes a comparison at a higher level. To elaborate on the example above, comparison would be conducted at the level of socio-cultural factors (as a single category) to encompass both the common and unique factors which are included in this category.
- **Contextual weights -** within a given set of factors (common and unique) the proposed weights should be contextual to the particular case (w1-w6 in figure 1). For example, a common factor such as religion may receive a higher weight in a country which is known to be fundamentalist. As in the example above, we would assign differential weight to factors according to their relative importance in each context and engage in comparison at a higher level, i.e. at the level of socio-cultural factors to be able to explore the differential weights of each criterion included in this category.

- **Iterative** – when repeating the process of measuring digital divide/s, refinement of the contextual factors and weights should be undertaken. An iterative process of research design, implementation and analysis that regularly revisits the research questions, findings and other insights to identify trends and patterns as they emerge in the research process is always crucial in indices like that. Such iterative design allows for the changing co-relation between different factors and weights. To revisit the example of the earthquake affected country with a dysfunctional schooling system in the wake of the disaster, there may be a marked rise in attendance and literacy as the schools regroup in the course of the future.

Our next section gives examples of the application of the ICI drawn from a research project that is currently underway at the Center for Information & Society at the University of Washington. This methodology was adopted for a research project conducted for the Center for Information & Society at the University of Washington in order to map public access to ICT in 25 countries within developing economies around the world. As part of the research process, an evaluation of digital divide/s in these countries concentrating on public access as the most important factor highlighted in the study was conducted.

A STUDY OF 25 COUNTRIES: IMPLEMENTING THE ICI APPROACH

To illustrate the Integrated Contextual and Iterative approach we discuss a study that is currently underway at the Center for Information & Society, which was formulated and is being conducted using the ICI approach. The project focuses on venues providing public access to information and particularly information through the use of digital ICT. We looked at venues such as public libraries, telecentres and cybercafés that provided public access to information and ICT to understand the information needs of people and to explore the barriers to increased access; i.e. factors that affected the digital divide/s in these 25 countries (see Figure 2).

This research study was designed as an iterative process in which different levels of participation were sought from multiple stakeholders. We committed to approaching the process of research design and implementation in multiple steps, with input from different stakeholders to ensure that all key categories and dimensions of analysis were addressed and to make sure that the most meaningful questions were asked in the most meaningful way during the research. Our aim through this process has been to arrive at findings that are useful, credible, dependable and trustworthy.

We formalized our approach to research in the ICI: Integrated, Contextual and Iterative approach. The ICI emphasizes a multi-disciplinary approach to any research study and presents two important guidelines to ensure that the research is meaningful and useful:

- An integrated approach where each stakeholder is represented and
- An iterative process of research design, implementation and analysis that regularly revisits the research questions, findings and other insights to identify, probe and validate trends and patterns as they emerge in the research process (Denzin & Lincoln, 2005).

The selection of our sample countries embodied the first iterative step in this research. We developed a framework of information needs and information readiness to select our sample countries. The research design introduced two pre-selection criteria of countries – population between 1 million and 1 billion and the existence of public library systems in the country. Next, we applied three indicators of information needs -- inequality, ICT usage and ICT cost--and three indicators of information readiness -- politics, skills and ICT infrastructure. The final selection of 25 countries was based on four additional criteria:regional representation, number of public libraries per country, availability of qualified local research partners and tipping factors such as movements to increase public access, known plans for future infrastructure development. Our next step was to recruit expert local research partners in all our sample countries and to undertake a series of research planning workshops (For details see Coward et.al., 2008).

To organize our research design we chose the Real Access/ Real Impact (RA/RI) framework. Developed by Bridges.org in South Africa, this framework proposes a list of twelve social, economic, political, educational, cultural and environmental factors that influence public access. While the RA/RI framework provided a large list of factors influencing access and use of ICT, we critiqued the static nature of this list. Through the ICI approach we determined that a more dynamic approach was needed to measure these factors – examining historical factors as well as future implications of public access to ICT. To organize our research design in a way that allowed for the richness of the data to emerge, we grouped the criteria suggested by the RA/RI framework into three main categories viz. Access, Capacity and Environment.

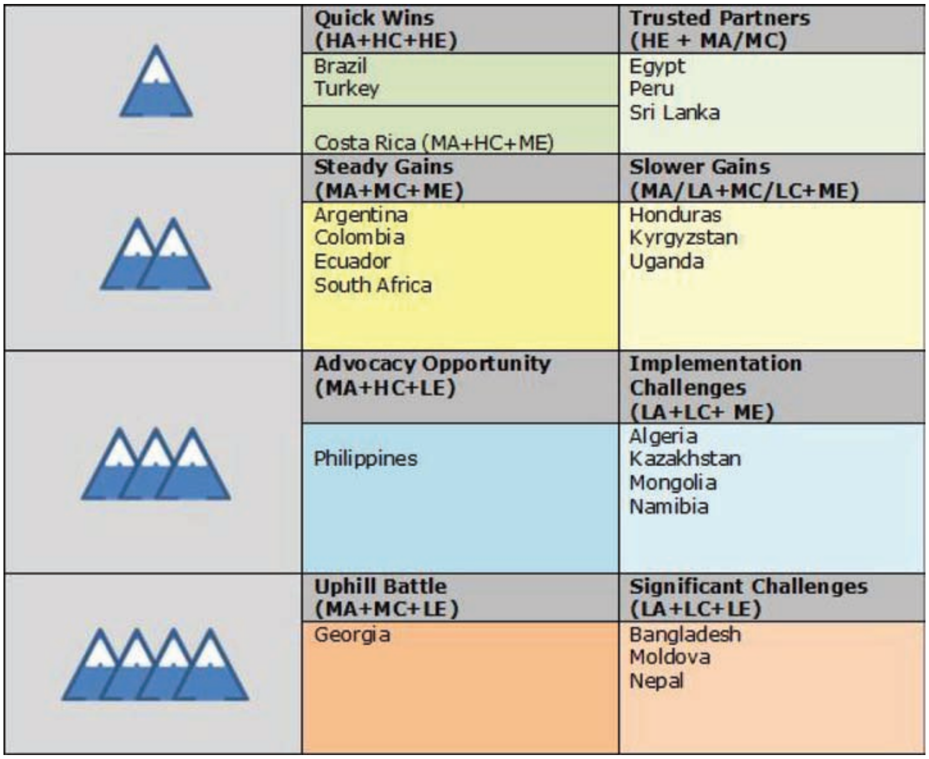
Another important point of consideration was also the uni-directional approach to information and communication within the RA/RI framework. In our study, we wished to examine not only what was provided by different venues in terms of ICT, but also the use and appropriation of technologies by the people which reflected their particular information and communication needs. With an intention of mapping unintended uses of technology, we added the category of social appropriation of technology to our list of factors influencing public access and use of ICT. The regional and international environment as an influencing factor was added to our list based on the advice of our research partners.

These fourteen factors formed the basis of a research design that was adapted to local contexts. Each of these fourteen factors was assessed with the help of several variables. For example, to study physical access, we explore the rural and urban distribution of venues, the ease with which a user could travel to the venue, availability of public transport to the venue, provision for handicapped access, the hours of operation of the venue and the ease with which the technology itself could be accessed at the venue. Field research was divided into two phases of research, to allow for preliminary results and analysis to inform the next phase of research. Each of these factors was studied in each country in our sample to build the aggregate category of physical access, which we then compared across countries.

The ICI approach exemplifies our recommendations to utilize a contextual and comprehensive framework to assess digital divide/s. Our commitment to work in an integrated framework was operationalized through collaboration with local researchers in our sample countries. We encouraged them to use the three broad categories of Access, Capacity and Environment, which included our 14 factors of analysis, and adapt them to local contexts. Our aim in encouraging local adaptation of the research design, was to arrive at contextual measurements of the factors that affected the digital divide/s in those countries. By conducting comparison across venues and across countries at the level of Access, Capacity and Environment, we were able to ensure the equivalency of criteria used in comparison at the same time as we allowed for local contexts to inform these measurements. This gave us a common basis for comparison.

The ICI framework also allows for differential weights to be accorded to different criteria given each factor's particular importance in local contexts. For example, while socio-cultural factors

Figure 2. Factors used for the 25 countries study © 2009 Ricardo Gomez. Used with permission.



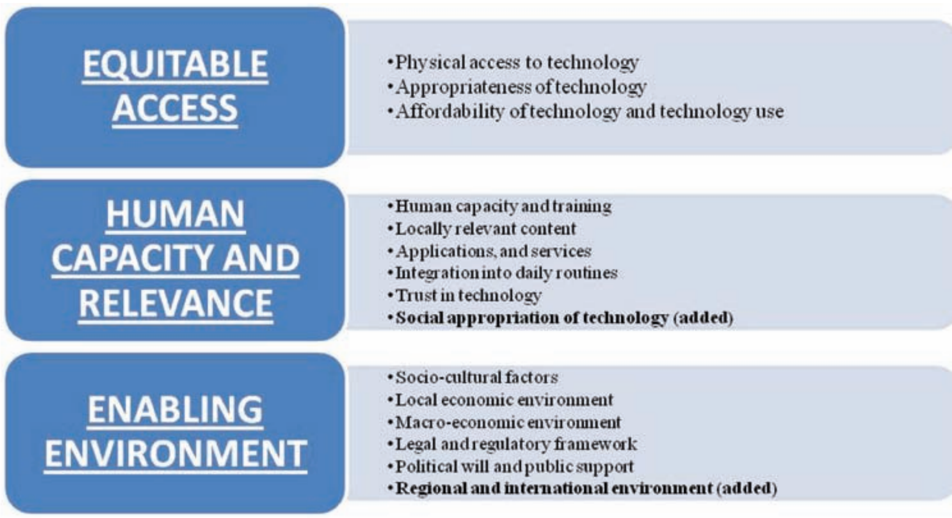
were considered important in all countries, Sri Lanka added also another factor, the tsunami. The tsunami is an important factor in understanding inequality and access issues in this country. This reduced the relative weight of each of the other criteria studied under socio-cultural factors, but ensured that the category of socio-cultural importance which was used for comparison across all 25 countries was enriched by the local context. To take another such example, gender was studied as part of the social and cultural factors in each country. In countries like Egypt or Algeria, however, gender received additional weight since the cultural environment of these countries prohibited the free movement of women outside the home, and therefore affected also their usage and access patterns of ICT.

Taking local contexts into account, each country developed a narrative, integrated index which was meaningful to external audience. In this way, we were successful in allowing the richness of the local contexts to emerge while keeping uniform criteria across countries and venues to ensure methodologically sound comparative analysis. By framing our research design in such a way, we could be mindful of new and emergent findings that did not form from the basic research design but were nevertheless important factors to consider in the digital divide/s of particular countries.

Figure 3 illustrates our comparative analysis across the ranking of Access, Capacity and Environment and offers a quick insight into barriers to information access and use. In this case the stronger the barriers, the greater the digital divide/s.

Through such a contextual and comprehensive framework, our aim has been to develop a unique narrative about public access in each country and to engage in a comparative analysis based on this narrative as a whole. For example, instead of comparing monotopical indicators such as Physical

Figure 3. Access, capacity and environment rankings © 2009 Ricardo Gomez. Used with permission. [L: Low; M: Medium; H: High. A: Access; C: Capacity; E: Environment]



access of the ICT, we consider the whole narrative. By being contextual and comparative at the same time, this methodology has some advantages that may help overcoming some shortcomings of existing methodologies. It allows one to compare different entities (for example – a country) while protecting the independent ability of that country to tell its unique story. Furthermore, it enables policy makers to understand what issues need to be addressed. Here are some examples of the advantages of the ICI approach:

- **Highlighting the importance of unique factors** which may be ignored or underestimated under fixed factor index. For example, in each country we considered the issue of regional and international policy regarding ICT. However, the issue of leadership was not explicitly addressed. In Egypt, however, we found that much of the increase in ICT can be credited to the championship of one single person – the First Lady of Egypt. By allowing unique factors from each country to emerge in the framework of measurement, we were able to highlight this important factor that is instrumental in bridging the digital divide/s in Egypt.
- **Highlighting the importance of a factor over others through assigning weights** differently in one context, may reduce distortions in the state of affairs. Most indices use fixed weights which can cause a distortion in the situation reflected to the decision maker and therefore mislead policy makers as to where to focus on and what challenges to address. An example of this would be the Philippines, where political environment becomes the single most important factor holding back increase in access to ICTs. While people use existing technologies engage in innovation and locally relevant content is present, the country does not have universal access to ICT because the political environment does not support a systematic proliferation of ICTs.

Using a fixed weight for the political environment factor like any other country while comparing will distort the impact this factor has.

- **Common Factors**: For all the 25 countries in the sample for this study, we studied the fourteen factors outlined in the access, capacity and environment categories above. Undertaking this in the first iteration of study allowed us to develop a common ground for comparison and also allowed for the relative difference in the weights of each factors to emerge in their unique contexts. For the next iteration of study then, we were able to anticipate the different weight of factors in each context.

The study is in its last stages as of the writing of this chapter. The second phase of research is underway and we are currently conducting the second round of comparative analysis. As such, all results should be considered preliminary. CIS will be publishing further reports to assess the final success of the ICI methodology and to elaborate on the factors of the digital divide/s in these 25 countries.

CHALLENGES TO UTILIZING THE ICI

The ICI presents a complex narrative of the digital divide/s in each unit of analysis (country, city, region etc). However, it presents certain challenges that may prove to be a drawback in particular situations as well:

- **Time consuming**: The ICI approach can be a time-consuming process by the very nature of its formulation. The approach does not provide a ready-made list of questions that are applicable in each and every situation. Utilizing this approach requires the development of unique factors and weighting such factors every time this approach is deployed. Despite this, as the 25 country research has demonstrated, it is possible to do solid research in relatively short periods of time if research is well organized and research teams make the right choices and are effective researchers.
- **Costly**: Along with being time consuming, conducting field research based on at least fourteen variables can be a costly process; special care needs to be given to make sure the available resources are used in the most efficient way.
- **Messy, bottom-up processes**: A significant part of the CIS approach is a bottom-up, participatory process for both the development of the research design and for the analysis of the data collected. While such an endeavor provides the most robust results, it necessitates a solid commitment to the process on behalf of the involved stakeholders.
- **No shortcuts**: To get to a comprehensive picture, the researchers undertake a rigorous process that does not provide robust results if any of the suggested steps are omitted.

FUTURE TRENDS

In the beginning of the chapter we discussed how many digital divide/s measures have been simplistic, focused on access alone, and relying on single factors to describe complex phenomena. The good news is that this is changing and in some cases changing dramatically. More sophisticated approaches, tools and methods are being designed and implemented in the field, and valuable new insight is emerging from them to provide a better understanding of the complexities of digital divide/s than we have ever had before. The ICI approach suggested here is a valuable step in that direction, and other initiatives are under way to make further progress in that direction. An exhaustive literature review on methods, impacts and ICT (CIS, 2008) confirms this trend; there is more sophistication in the research, and more depth in the analysis than 10 years ago. Nonetheless, there is no silver bullet, no magic solution to the complex issues of digital divide/s and social inequalities: hard work is still required to better understand the role of ICTs in social and economic development.

The digital divide as a concept must be understood to be a part of the continuum of socio-economic inequities: not simply as a discrete phenomenon restricted solely to issues of access, use and benefit derived from ICT.

CONCLUSION

The digital divide/s that exists around the world has long been an issue of concern for policy makers, governments and proponents of development around the world. We have seen various tools and methods of measurement that present interesting insight into the phenomenon of the digital divide/s. In many cases, however, this measurement is partial and does not present a complex view of the socio-economic realities in which such digital divide/s are situated. To address some of these lacunae, we present a framework within which policy makers can assess the relevance of tools and methods used to measure the digital divide/s. We propose three levels of consideration that evaluate the purpose of the tool, the level of observation and the method of approaching the data. We then propose the Integrated Contextual Iterative Approach (ICI) to measuring digital divide/s in order to present a complex understanding of the contexts in which such digital divide/s occur. We exemplify the use of ICI framework through a study that assesses public access venues and factors affecting their access and use. Through a prioritization of an integrated approach to research and conducting the research in multiple steps that are iterative, we were able to implement the ICI approach and arrive at rich and contextual results.

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KEY TERMS AND DEFINITIONS

Access: Inequality which is reflected in terms of the physical infrastructure and availability of technology.

Accessibility: refers to technology and behavior characteristics that help people with disabilities to use and access computers.

Affordability: a measure of a financial ability to pay for infrastructure, service and content of technology.

Contextual Factors: factors which reflect a particular context, characteristics unique to a particular group, community, society and individual.

Cultured Technology: ways in which communities and societies reshape technology and make it as part of their culture, while on the other hand allowing this technology to make certain changes in their customary way of life.

Digital Divide/s: a general term which reflects inequalities and disparities among countries, groups, communities and individuals in regard to awareness and behavior activities that relates to information and technology.

Monotopical Factors: Monotopical measures of digital divide typically identify one or a few variables that influence a dependent variable, which, in turn, reflects one aspect of the divide such as awareness, access, attitudes, or application.

Usage: a measure which reflects the frequency, number and type and other characteristics of using technology.

ENDNOTES

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Chapter 35
The Empirics of the Digital Divide: Can Duration Analysis Help?

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ABSTRACT

Accurate measurement of digital divides is important for policy purposes. Empirical studies of broadband subscription gaps have largely used cross-sectional data, which cannot speak to the timing of technological adoption. Yet, the dynamics of a digital divide are important and deserve study. With the goal of improving our understanding of appropriate techniques for analyzing digital divides, we review econometric methodology and propose the use of duration analysis. We compare the performance of alternative estimation methods using a large dataset on DSL subscription in the U.S., paying particular attention to whether women, blacks, and Hispanics catch up to others in the broadband adoption race. We conclude that duration analysis best captures the dynamics of the broadband gaps and is a useful addition to the analytic tool box of digital divide researchers. Our results support the official collection of broadband statistics in panel form, where the same households are followed over time.

INTRODUCTION

Digital divides are among the most pressing concerns in telecommunications policy. Researchers have used a variety of methods to study the determinants and consequences of digital divides. In an overview of current research on broadband digital divides, Dwivedi and Papazafeiropoulou (2008) discuss studies using methodology from sociology, economics, strategic management, and organizational development, including case study analysis, focus group and survey methods, system dynamics and causal loop analysis, cluster analysis, and econometrics. These authors identify dozens of factors that may hinder a consumer from adopting advanced technology, from obvious candidates such as prices and income to more subtle (and less quantifiable) influences such as attitudes toward technology.

As informative as qualitative studies may be, if attention paid to the divides is to generate light—

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and not just heat—then policy-makers require accurate measurement of the gaps in question. In this chapter, we assess some of the statistical tools that empirical researchers use to measure digital divides. Our focus is on econometric regression studies using data from many individuals, households, or geographic areas. Many empirical studies of the digital divide analyze a cross-section of data[1] on the extent of digital deployment or use. Studies of broadband Internet access are a leading example (refer to the next section for citations). In these studies, researchers regress broadband subscription on characteristics of the household or the area, depending on the nature of the available data. Methods used for the binary access decision range from OLS regression, probit, and logit to more complicated estimators tailored to unique features of the data at hand (Flamm & Chaudhuri, 2007; Prieger & Hu, 2008). Researchers and policy-makers often use the results to identify subpopulations that are prone to end up on the wrong side of the digital divide.

What is missing from most of these approaches is the ability to say much about the *timing* of technological adoption. In this chapter we investigate the catch up hypothesis, which posits that socio-demographic groups lagging in broadband adoption eventually reach the same subscription rates as other groups. For example, take one of the results from Prieger & Hu (2008): blacks in the U.S. subscribe to broadband Digital Subscriber Line (DSL) service at a lower rate than do whites. Unanswered are the questions of whether this divide is only temporary, as predicted by the catch up hypothesis, and how rapidly the gap will close if so. These questions are close to the heart of public policy toward digital divides. If gaps exist but close quickly without intervention, policymakers may better direct public resources elsewhere. Persistent gaps, on the other hand, may warrant further study and action.

We aim to improve our understanding of appropriate techniques used to analyze the digital divide and policies aimed at reducing it. We use data on DSL adoption in the U.S. to compare the policy implications deriving from traditional cross-sectional analysis with that from duration analysis, an appropriate but under-used statistical technique in digital divide research. Our work contributes to the policy literature on the digital divide in three ways. We begin by clarifying the potential limitations of cross-sectional analysis. We also propose and explore the performance of duration analysis applied to broadband take-up data. Often data are available (or could be gathered) on how long a household has subscribed to broadband, even in cross-sectional datasets. Appropriately conducted duration analysis can then clarify the temporal dimension of the digital divide. Finally, we compare duration analysis to other methods used to examine the temporal dimension of the gap. Previous studies such as Whitacre (2007) and Flamm & Chaudhuri (2007) have analyzed data collected from different time periods. We explore whether duration analysis yields different conclusions than does panel data[2] analysis and whether results are more easily interpretable for policy makers.

In our empirical section, we examine the demand for DSL broadband in five U.S. states. To compare traditional cross-sectional analysis with duration analysis and panel data methods, we focus attention on groups prone to the digital divide: racial minorities and women. We assess the gaps three ways. Ordinary least squares and probit regressions using the cross-sectional data, which come closest to what is done in most studies, establish a baseline for our results. We next use duration (also known as survival) analysis to speak to the pace at which gaps can be expected to close. Finally, we use the cross-sectional data, coupled with information on when households subscribed, to create a synthetic panel dataset on subscription stretching from the date of the cross-section back to when DSL was first deployed in the neighborhood. These are the data that would have been available had subscription been surveyed periodically to create a panel dataset, for example.

The latter two methods address the temporal dimension of the broadband gap for these groups. Although there is no direct policy variable in the models, the techniques we use also apply to policy analysis. We conclude that duration analysis best captures the dynamics of the broadband gaps and can be a useful addition to the analytic tool box of digital divide researchers.

We describe the statistical models without assuming that the reader is familiar with advanced econometric techniques. The chapter thus serves as both a reference for practitioners and as a blueprint for future research.

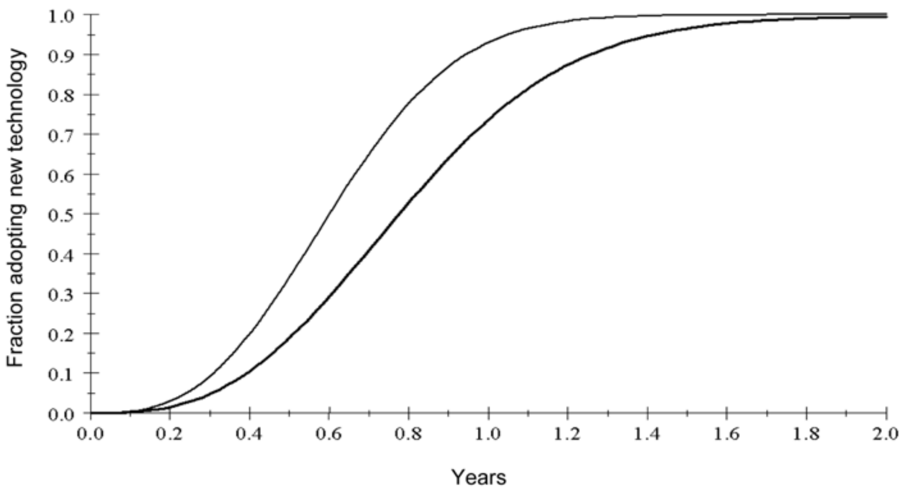
BACKGROUND

Literature

Over the past several years, broadband adoption has been widely studied. Main examples of the previous research are presented in this section, with emphasis on the methodology and nature of the data used in the studies. Most authors use cross-sectional data, although a few take advantage of repeated cross-sectional data. We pass over the earlier generation of studies looking at pre-broadband digital divides (e.g., Fairlie, 2004), as well as studies not using individuals or households for the unit of analysis (e.g., Prieger, 2003). Among cross-sectional studies, the logit model for binary household choices is the most common methodology employed (Duffy-Deno, 2000; Kridel, Rappoport, and Taylor, 2001; Rappoport *et al.*, 2003; Stanton, 2004). Crandall, Sidak, & Singer (2002) use nested logit, an extension of the logit model, to estimate broadband demand. None of these examine the impact of gender or race on demand, two variables we pay particular attention to here. The probit model (Leigh, 2003; Savage & Waldman, 2005) is less commonly employed. Leigh (2003) includes variables for race, but failed to find significant differences in adoption (but also could not control for broadband availability). Prieger & Hu (2008) use a probit model adapted to aggregations of household data to find that women, blacks, and Hispanics have lower demand for DSL. A smaller set of studies uses more than one cross section, collected at different times. Chaudhuri, Flamm & Horrigan (2005) analyze data from the Pew Internet and American Life Project with a logit model and another of its extensions, the ordered logit model, and find that women and blacks are less likely to subscribe to broadband.[3] Flamm & Chaudhuri (2007) come to the same conclusion with later data from the same source examined with another ordered logit model. Finally, Whitacre (2007) uses the logit model to uncover shifts in the influence of household characteristics and telecommunications infrastructure on residential broadband adoption decisions. We did not find studies of broadband adoption that use panel data methods or that employ duration analysis. We show below that duration analysis is a useful tool to address the evolution of digital divides. The catch up hypothesis

The temporal dimension of a digital divide is paramount when mapping statistics to the realm of policy. Persistent digital divides are cause for concern, while evanescent gaps are of little consequence. Central to our analysis is the notion of the adoption curve: the fraction of potential broadband adopters who have already adopted, plotted over time (Figure 1). The theory of technological diffusion (see Whitacre (2007) for a summary specific to broadband) explains the commonly observed ogive (S-shaped) adoption curve by learning. When few have adopted a new technology, few other will learn about it (or be convinced they should adopt) and the adoption curve rises slowly. Howell & Oren (2002) also highlight the roles of informational barriers and learning effects in DSL adoption. As time passes and more are exposed to the innovation, the adoption curve increases more rapidly. Eventually, the pace of adoption slackens when most have adopted and the remaining holdouts adopt slowly.

Figure 1. S-shaped adoption curves



Textbook diffusion theory thus posits the catch-up hypothesis. Even if a group has a lower adoption rate than the rest of the population, as depicted by the heavy adoption curve in Figure 1, both curves converge at full adoption eventually. While full convergence undoubtedly exists only in the realm of abstract modeling, the catch-up hypothesis usefully highlights three points. First, adoption gaps today may disappear tomorrow. Second, even when ultimately converging, the adoption rates may diverge among groups initially. In such cases, cross-sectional analysis will uncover these gaps. Temporary gaps are not necessarily without policy concern. Given evidence that the way adopters use the Internet changes as they gain experience online (e.g., Weiser, 2000), differences in the timing of adoption may lead to differences in Internet usage among groups even after most have adopted. Third, a key question is not merely *if* divides will disappear but *when*.

COMPARISON OF METHODS

Theory

We compare several econometric methods in our exploration. Readers with econometric experience can skip to the next section to see the empirical results. For those wishing a brief review, this section sets out the basics of linear and probit cross-sectional regression models for binary dependent variables, duration analysis, and panel data methods.

Cross-Sectional Methods

Least satisfactory for purposes of investigating the catch-up hypothesis are cross-sectional methods, which attempt to uncover the determinants of adoption with data reflecting only one point in time. In terms of Figure 1, cross-sectional data is taken from households (or other units of observation) all at one point on the time axis. Cross-sectional studies can uncover disparities in adoption among subsets of the population, but generally cannot address how quickly the gaps developed or might close.

The cross-sectional studies reviewed in the literature section above model the mean adoption rate for a household as a function of (a linear combination of) explanatory variables (the *regressors*):

$$E(y_i|x_i) = f(x_i'\beta) \tag{1}$$

where y_i is a binary variable taking values 1 if household *i* has adopted, and 0 otherwise, x_i is a vector of regressors, and β is a vector of coefficients to be estimated. In the case of ordinary least squares (OLS) regression, termed the *linear probability model* when applied to binary dependent variables, the function *f* is the identity function. We assume readers are familiar with OLS methods.

In probit (or logit) models, *f* is the cumulative density function of the Normal (or logistic) distribution. Probit models have an advantage over the linear probability model, which is not commonly used in the broadband adoption literature. Unlike the linear probability model, the predicted probability of adoption from the probit model is bounded between zero and one, as a probability should be. While the probit model is no more difficult to implement with modern statistical software than is OLS, the interpretation of the coefficients is less obvious. In OLS, β_j (the coefficient for the *j*th regressor) is also the *marginal effect*, the effect on $E(y_i|x_i)$ of a unit increase in regressor *j*. In the probit model, the coefficient gives the sign of the marginal effect but not its level, which is $\beta_j\phi(x_i'\beta)$, the derivative of the conditional mean (1) with respect to regressor *j*.[4] Since the marginal effects depend on the data (i.e., x_i appears in the expression), they are typically computed at either the mean of the regressors or by averaging the marginal effect for each observation over the sample. We do the former below.

Cross-sectional methods, lacking a temporal dimension, cannot speak to the catch-up hypothesis and are of important but limited use for policy purposes. Nevertheless, these methods can document and partly explain the determinants of digital divides at any point in time, which is not without value. Furthermore, many times, only cross-sectional data are available, particularly when new technology is first available.

Duration Analysis

When the purpose of the analysis is to estimate adoption curves, a natural method to use is duration analysis. Given its long association with biostatistics, duration analysis is also commonly known as survival analysis. There are many excellent textbook treatments of duration analysis (e.g., Kalbfleisch & Prentice, 2002), and here we present only the basics needed to understand our estimations. In our context, the duration of interest is the time from the availability of broadband until a household adopts the technology. The fundamental notion in duration analysis is the *hazard rate*, $h(t)$, the rate at which adoption occurs given that it did not occur before time *t*. In exponential duration models, the hazard rate for household *i* is modeled as a function of explanatory variables (often called *covariates* instead of regressors in duration analysis):

$$h(t_i) = \exp(x_i'\beta) \tag{2}$$

Exponentiating $x_i'\beta$ ensures that the hazard rate is non-negative. If no functions of time are included among the covariates, the hazard rate in the exponential model is constant. The inverse of the hazard rate is the mean duration for the exponential model.[5] The interpretation of coefficients in specification (2) is thus as follows: a positive β_j implies that increases in the associated covariate increase the hazard and decrease the expected time until adoption. Coefficients can also be interpreted as in a log-linear regression model: a one unit increase in x_j increases the hazard by approximately $\beta_j \times 100$ percentage points. The exponential model is the simplest of the *proportional hazard* models, so-named because covariates have a proportional effect on the hazard rate.

The exponential model in its simple form, with its constant hazard rate, is not flexible enough to investigate the catch-up hypothesis. However, by splitting each duration into month-long intervals and adding dummy variables for the month, the baseline hazard rate can be modeled nonparametrically. Let $D_m(t)$ be a dummy variable for month m with coefficient α_m. More precisely, D_m is a step function that is zero outside month m (timed from the start of the duration, not the calendar) and one within. Collect these into vectors $D(t)$ and α. Then our semiparametric[6] exponential model has hazard rate for t_i in month $m = 1,\ldots,M$ of

$$h(t_i) = \exp(D(t)'\alpha)\exp(x_i'\beta) = h_0(t)\exp(x_i'\beta) \quad (3)$$

The baseline hazard h_0 is piecewise constant and can take any shape, nonparametrically accounting for the basic duration properties of the data. We constrain h_0 to be constant within a month only because DSL adoption in our data is observed at the monthly level and any additional α's that further partition time would be unidentified.[7] Since the α's vary during the time until adoption for any duration lasting longer than one month, we now have *time-varying covariates* (TVCs). Explicit treatment of TVCs complicates notation, and we ignore the issue here (except when presenting the formula for the adoption curve in equation (4) below). For the practitioner, the pressing question is how to set up the data for estimation when there are TVCs, and the answer depends on which software package is used.[8]

While the addition of h_0 makes the baseline hazard flexible, specification (3) (as well as other common semiparametric hazard models such as the Cox model) still imposes proportionality on the impact of the covariates. If a coefficient for Hispanics is −0.1, for example, then their hazard rate is constrained to be (about) 10% lower than non-Hispanics in all months. To relax proportionality, we interact the covariates of interest (in our case, the variables *Female*, *Hispanic*, and *Black*) with the monthly constants. With a new set of covariates $D_1(t)x,\ldots, D_M(t)x$ (where x stands for the female, Hispanic, and black variables), the impact of these variables on the baseline hazard can vary freely among months. While greatly increasing the number of coefficients to be estimated, the added flexibility is essential to investigate the catch-up hypothesis. Our enormous number of observations makes estimating the additional coefficients no problem. In smaller datasets the degrees of freedom may be used up rapidly, since interacting a variable adds *M-1* coefficients to be estimated.

With an estimate of the (time-varying) hazard rate, calculation of the adoption curve is straightforward. The adoption curve is formally the cumulative density function of the durations given the observed covariates. Standard results from survival analysis (Kalbfleisch & Prentice, 2002) show that for our model, the adoption curve F is found from the hazard rate as

$$F(t \mid x_i) = 1 - \exp\left(-\int_0^t h(s)ds\right)$$

$$= 1 - \exp\left(-\exp(z_i'\beta)\sum_{m=1}^{M}\exp(\alpha_m + \gamma_m w_{im})\Delta t_m\right) \quad (4)$$

where x_i is partitioned into TVCs w_{im} and other covariates z_i, M is the number of months spanned by t, and Δt_m is the amount of time spent in month m. With estimates of α, β, and γ in hand, predicted adoption curves can be generated for any subgroup of the population by setting the covariates to the appropriate values.

Repeated Cross Section and Panel Data

A few papers in the literature (e.g., Flamm & Chaudhuri, 2007; Whitacre, 2007) use repeated cross sections to address the digital divide. Repeated cross sections are cross sectional data gathered at multiple times, where the individuals or households differ each time. Repeated observations on the same units of analysis, known as panel data, enable more sophisticated modeling than do single or repeated cross-sections; see Hsiao (2002) for an excellent treatment of methods suitable for panel data. We are not aware of previous panel studies of broadband demand using individual- or household-level data. The greatest advantage of panel data is the ability to control for unobserved factors specific to the unit of observation (e.g., households) that may render cross-sectional estimation results invalid through the use of random or fixed effects. Perhaps more important for present purposes, panel data can shed light on the dynamics of a divide since households are followed over time. Panel methods are available for linear, probit, and logit models. The interested reader is referred to Hsaio (2002) for descriptions of these and other panel models.

An Empirical Application of the Methods

The data we analyze is from 1998-2000, the early years of DSL adoption. The vintage of the data limit the applicability of our results to present digital divides. However, the dataset has other advantages that make it suitable to demonstrate the candidate methods.[9] The data cover households in over 50,000 Census blocks in four Midwestern U.S. states. For each Census block, the dependent variable is whether at least one household subscribes to the incumbent phone company's DSL service. Only blocks where DSL is available are in the data. Since it is unlikely that DSL from any other provider would have been offered without the incumbent's service available, the data give a good measure of DSL adoption. Cable modem subscription and other forms of broadband Internet access are not covered in the data, however. While the data are not at the household level, the geographic fineness of the data[10] and the large number of observations make these data unique. Prieger & Hu (2008) describe the construction of the dataset more fully, and analyze it using a cross-sectional method.

Census variables measuring the number of households in the block, the racial and ethnic composition, the fraction of women, and income are joined to the dataset. Income is aggregated in the Census data to the block group level, and so in all estimates we cluster the observations at that level when calculating the standard errors of the estimates.[11] Each Census block is also matched to the phone company's local service area into which it falls.

For the cross-sectional analysis, we use the snapshot of DSL adoption as of March 2000 provided in the data, at which time 85% of blocks had a household subscribing to DSL. For the duration analysis, we create observations on the time until initial adoption by a household in the block.[12] Time elapsed is measured from to the initial availability of DSL in the block, and so durations for blocks in different local service areas are not necessarily occurring at the same calendar time. Blocks that never subscribed are durations for which the ending time is not known, and are marked as right-censored observations.[13] For the panel analysis, we create monthly panel data from the March 2000 data and the information on when first adoption occurs in each block. A block that could have subscribed to DSL a year before any household actually did, for example, will have zeroes for the adoption variable for 12 months before it changes to one upon adoption and thereafter. The data are equivalent to a monthly adoption survey of areas where DSL is enabled.

Results from Cross-Sectional Models

To establish a baseline for DSL adoption, in this section we present the linear probability model (OLS) and probit regression results from the cross sectional data from March 2000. Results are presented in Estimations 1 (OLS) and 2 (probit) in Table 1. Our main independent variables of interest in our estimations are the fraction within each Census block that is female, identify with a racial minority, or claim Hispanic ethnicity. In estimation 1, aside from race, ethnicity, and gender we control for the log of income (in levels and squares to test for non-linearities), average household size, the number of households within the census block, and a set of indicator variables for the local telephone service (central office) areas. The role of the central office indicators is to hold constant all unobserved factors common to all households in the area. Such factors include how long DSL has been available in the central office, the availability of competitors also offering DSL in the area, and the average value of all other unobserved factors that vary among households.

The coefficients from OLS, reported in Table 1, are similar to the marginal effects from the probit estimation, and we discuss the latter. In comparison to whites, the excluded category, only Asians and other races have significantly lower probability (13.1% and 6.6% respectively) of DSL adoption. That adoption is lower for Asians is the opposite of national statistics (Prieger & Hu, 2008). We have few Asians and "other races" in our Midwestern sample (3.7% and 7.7% of people, respectively), and our results may not be representative. The negative coefficients for women and blacks reveal adoption gaps, but are insignificant. Surprisingly, the coefficient for Hispanics is positive (but not significant). Blocks with more and larger households are more likely to contain a household adopting DSL, as expected. Income has no significant effect, probably because the central office fixed effects remove the variation in average income among local service areas.

The cross-sectional estimations yield a few results of note. First, as one commonly finds with binary dependent variable models, it matters little whether one uses probit or the linear probability model.[14] More interesting is that the analysis does not uncover digital divides where other studies lead us to look for them, except for the "other race" category. It may be that broadband diffusion was fairly even among the population in the states represented in the data. However, our analysis in the next section leads us to conclude instead that the cross-sectional analysis fails to find broadband gaps that do exist for women, blacks, and Hispanics. Finally, there is no way to speak to the catch-up hypothesis with these results, because there is no temporal dimension in the data.

Results from Duration Analysis

We now consider whether duration analysis sheds additional light on the adoption experience of women and minorities. Two specifications of the duration model are compared in Table 2: one in which the variables for blacks, Hispanics, and females are constrained to affect the hazard rate proportionally (Estimation 3), and another in which they are not (Est. 4). The coefficients on the monthly dummy variables are largest in month one (showing that many households adopt DSL immediately upon availability) and overall create a rough U-shaped hazard rate.[15] In both estimations, the hypothesis that the coefficients on the monthly dummy variables are equal to each other is rejected. Thus the baseline hazard rate of adopting DSL is not constant (or even monotonic) in these data, which makes our semiparametric approach an appropriate choice.

Estimation 3 shows that women, blacks, Hispanics, and Asians have significantly lower hazard rates for DSL adoption. Thus, in contrast to the suggestions of the cross-sectional results, these groups take longer on average to adopt after DSL becomes available to them. The coefficient for other races is not significant. The coefficients for log income imply that as income increases the time to adoption decreases (for all but the bottom 0.7% of incomes). Larger households also decrease the time to adoption.

Estimation 3 constrains the female, black, and Hispanic variables to affect the hazard propor-

Table 1. DSL adoption: cross-sectional estimation results

	Estimation 1: OLS		Estimation 2: Probit	
	coefficient	s.e.	marginal effect	s.e.
Female	-0.026	0.022	-0.026	0.020
Black	-0.033	0.022	-0.030	0.020
Hispanic	0.045	0.029	0.039	0.027
Asian	-0.147***	0.035	-0.131***	0.027
Other race	-0.075***	0.028	-0.066***	0.024
Income (log)	0.232	0.228	0.243	0.219
Income (log) squared	-0.012	0.011	-0.013	0.010
Household size	0.011***	0.004	0.012***	0.003
Number of Household	4.13E-4***	3.71E-5	0.001***	7.09E-5
R^2 (OLS)/Pseudo-R^2 (probit)	0.0657		0.0658	
N	51,796		51,796	

* = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level. Notes: both estimations include local telephone service area fixed effects, not shown in the table. Standard errors are robust to heteroskedasticity and clustering at the block group level.

tionally regardless of elapsed time. We relax this assumption to investigate the catch-up hypothesis in Estimation 4, in which we allow the impact of these three variables to differ in each month elapsed after DSL is available. A hypothesis test for the three variables that the coefficients in the expanded set are equal in all months, which tests the assumption of proportionality, is soundly rejected for each variable. The impact and significance of the other variables is similar to that in Estimation 3.

Catch-up is most easily investigated via the adoption curves implied by the coefficients. The adoption rates for women, blacks, Hispanics, and others are graphed in Figure 2. We limit the graphs to the first nine months after DSL becomes available because no further adoption is observed until month 22. The adoption curves are thus flat until month 22, and then the coefficients are either insignificant (*black*M22*) or large and negative (*Female*M22 and Hispanic*M22*), so that the adoption curves remain nearly flat.[16] Two curves are calculated in each graph to compare the group of interest with everyone else.[17] In the top panel of the figure, the adoption rate for women starts at 2.1% after the first month of availability and rises to 3.3% after nine months. Men start out with a 10.3% adoption rate, and the absolute difference between men and women stays relatively constant across the graph. Thus, there is no evidence of women catching up to men during the first year of availability.

The adoption curve for blacks in the middle panel shows a different story. The adoption rate for blacks starts at 3.7% after the first month of availability, compared to 4.8% for non-blacks. The adoption rate for blacks rises to 4.3% after nine months, but the gap between blacks and others doubles over time, from 1.1 percentage points after one month to 2.2 points after nine months. Not only do blacks fail to catch up during this period of initial DSL availability, they fall further behind.

Hispanics fare differently than women and blacks concerning adoption. Hispanics have an adoption rate of 4.1% initially, compared to 10.7%

Table 2. DSL adoption: duration analysis results

	Estimation 3		Estimation 4	
Variable	coefficient	s.e.	coefficient	s.e.
Female	-1.353***	0.232		
Female*M1			-1.633***	0.253
Female*M2			0.349	0.865
Female*M3			-0.184	0.949
Female*M4			-1.557*	0.867
Female*M5			1.364	1.062
Female*M6			0.365	0.637
Female*M9			0.754	0.936
Female*M22			-3.343**	1.526
Black	-0.333***	0.101		
Black*M1			-0.268**	0.109
Black*M2			-10.417**	4.250
Black*M3			-3.041***	0.548
Black*M4			0.266	0.238
Black*M5			-0.504	0.395
Black*M6			-0.685***	0.217
Black*M9			-10.431	7.284
Black*M22			0.306	0.377
Hispanic	-0.674***	0.184		
Hispanic*M1			-0.982***	0.209
Hispanic*M2			-0.995	0.776
Hispanic*M3			1.536***	0.308
Hispanic*M4			-1.498***	0.550
Hispanic*M5			-4.326***	1.147
Hispanic*M6			1.582***	0.428
Hispanic*M9			-0.778	0.630
Hispanic*M22			-1.568**	0.625
Asian	-2.801***	0.381	-2.765***	0.380
Other race	0.189	0.246	0.309	0.245
Income (log)	-2.510***	0.266	-2.650***	0.261
Income (log) squared	0.136***	0.014	0.142***	0.013
Household size	0.433***	0.028	0.422***	0.028
Month 1	8.847***	1.340	9.819***	1.334
Month 2	4.786***	1.333	5.108***	1.360
Month 3	5.071***	1.351	5.258***	1.434
Month 4	5.762***	1.349	6.543***	1.401
Month 5	5.057***	1.363	4.718***	1.492
Month 6	6.782***	1.342	6.529***	1.367

Table 2. continued

Month 9	6.433***	1.350	6.431***	1.431
Month 22	5.845***	1.357	7.576***	1.543
χ^2 stat (*p*-value)	4,855.3	(0.000)	5,562.3	(0.000)
Pseudo-likelihood	-253,041.8		-252,085.9	
N	1,917,724		1,917,724	

* = significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level

Notes: both estimations include state and calendar year fixed effects, not shown in the table. Standard errors are robust to heteroskedasticity and clustering at the block group level.

for non-Hispanics. Hispanic household adoption rises to 6.2% after nine months. After a slow start, their gains in adoption are greater than that for non-Hispanics, and their adoption gap narrows by 18% (from 6.6 to 5.4 percentage points) during the time. Hispanics do begin to catch up even during our relatively brief period.

Results from Panel Data Models

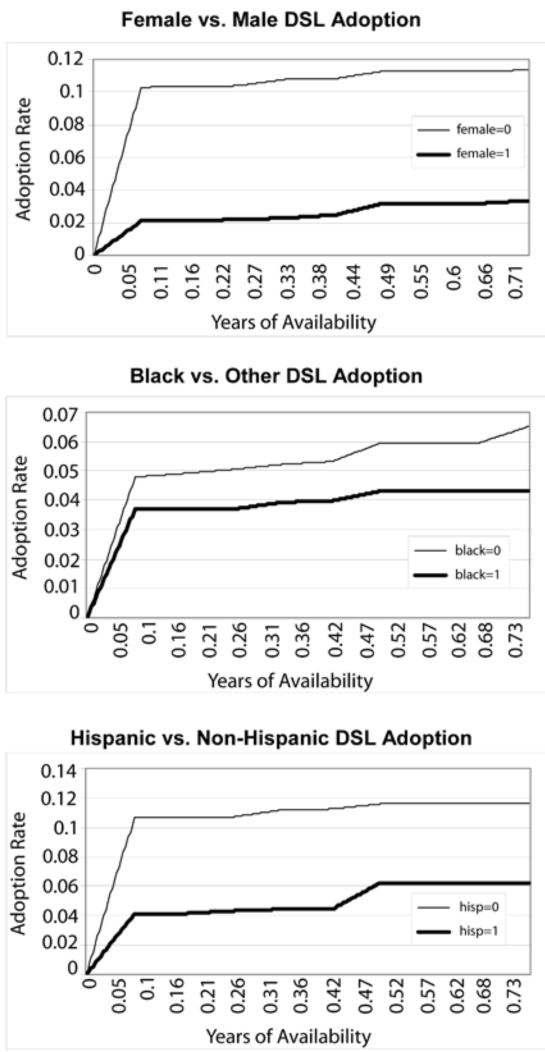
In this section we repeat the OLS and probit regressions using panel data to compare the duration analysis with another way of studying digital divide dynamics. In addition to the set of regressors we use in the cross-sectional estimations, we include dummies for each calendar month in the estimation. We again include indicators for the local service areas to control for unobserved, time-invariant factors specific to the central office area.[18] Since, as before, the coefficients from OLS estimation for DSL adoption are similar to the marginal effects from the probit estimation we present and discuss only the latter. Two specifications are compared in Table 3. In Estimation 5, the adoption gap between women and men is constrained to be constant over time, and same for the gaps between the minority groups and their non-minority counterparts. In Estimation 6, the adoption gaps for women, blacks, and Hispanics are allowed to vary as time progresses.

In both estimations, the coefficients for the monthly indicator variables are positive, significant, and generally increasing over time. The month coefficients by themselves represent the baseline adoption trend for all groups in Estimation 5 and for non-black, non-Hispanic males in Estimation 6. The data thus show that over the period December 1998-March 2000, demand for DSL services progressed in the region. Recall that since only Census blocks where DSL is available at the household are included in each month's data, the results do not merely pick up that DSL becomes more widely available.

In Estimation 5, the signs and significance of the coefficients for income, number of households, and household size are the same as in the corresponding cross-sectional estimation (Estimation 2), and we focus on the variables of interest instead. The marginal effects show that Asians and those in the "other race" category have significantly lower (the latter only at the 10% level) adoption rates than the whites. Women also have lower adoption rates (10% significance level) than men. The gaps are sizeable: 17.2% for Asians, 6.6% for women, and 11.0% for other races. There are small, insignificant adoption gaps between blacks and whites and between Hispanics and non-Hispanics.

Compared to the results from the cross-sectional estimation, the estimated adoption gaps are larger for all groups of interest, except for blacks.

Figure 2. Estimated DSL adoption curves from the duration model



The larger number of observations also leads to statistical significance (albeit only at the 10% level) for the gaps for women and other races. In addition, using the panel data removes the anomalous positive coefficient for the Hispanic group. Since these results are more in line with results found in the literature, the case is strong for using panel data over a cross-section, even before moving to the augmented set of variables in Estimation 6. We compare the panel data results to the results of the duration analysis below.

In Estimation 6, we interact the month indicators with the variables for women, blacks, and Hispanics to evaluate how their adoption gaps evolve. The marginal effect for, e.g., blacks in month 5 is the difference in the level of broadband adoption between blacks and whites in the same month. If the marginal effect is negative, there is a broadband gap that month for the group in question. The gaps in DSL adoption are depicted in Figure 3.[19]

The estimation indicates that, as with the duration estimations, there are significant differences in the evolution of the broadband gaps for women, blacks, and Hispanics. In month one, only the gap for women is significant. However,

Table 3. DSL adoption: panel probit estimation results

	Estimation 5		Estimation 6	
Variable	marginal effect	s.e.	marginal effect	s.e.
Female	-0.066*	0.035		
Female*M1			-0.111***	0.028
Female*M2			-0.107***	0.029
Female*M3			-0.118***	0.030
Female*M4			-0.099***	0.033
Female*M5			-0.079**	0.037
Female*M6			-0.052	0.046
Female*M7			-0.072	0.049
Female*M8			-0.049	0.051
Female*M9			0.086	0.062
Female*M10			0.002	0.071
Female*M11			0.096	0.076
Female*M12			0.125	0.084
Female*M13-M18			-0.021	0.079
Female*M19-M22			-0.045	0.079
Female*M23			-0.261**	0.123
Female*M24			-0.070	0.160
Female*M25-M26			-0.033	0.174
Female*M27			0.243	0.218
Black	-0.023	0.038		
Black*M1			0.056	0.037
Black*M2			0.018	0.037
Black*M3			0.004	0.038
Black*M4			-0.030	0.039
Black*M5			0.124***	0.042
Black*M6			-0.064	0.044
Black*M7			0.040	0.051
Black*M8			-0.084*	0.046
Black*M9			-0.180***	0.048
Black*M10			-0.189***	0.052
Black*M11			-0.216***	0.053
Black*M12			-0.256***	0.054
Black*M13-M18			-0.083	0.054
Black*M19-M22			-0.031	0.053
Black*M23			0.136	0.076
Black*M24			-0.327	0.094
Black*M25-M26			-0.466***	0.095
Black*M27			-0.711***	0.101

Table 3. continued

Hispanic	-0.005	0.060		
Hispanic*M1				
Hispanic*M2			-0.009	0.051
Hispanic*M3			-0.012	0.052
Hispanic*M4			-0.029	0.052
Hispanic*M5			0.104	0.059
Hispanic*M6			-0.084	0.054
Hispanic*M7			0.232***	0.078
Hispanic*M8			0.176**	0.079
Hispanic*M9			0.296***	0.087
Hispanic*M10			0.086	0.097
Continued from previous page	**Estimation 5**		**Estimation 6**	
Variable	marginal effect	s.e.	marginal effect	s.e.
Hispanic*M11			-0.131	0.096
Hispanic*M12			-0.184*	0.101
Hispanic*M13-M18			-0.090	0.126
Hispanic*M19-M22			-0.021	0.127
Hispanic*M23			-0.219	0.135
Hispanic*M24			-0.781***	0.153
Hispanic*M25-M26			-0.966***	0.156
Hispanic*M27			-1.259***	0.169
Asian	-0.172***	0.047	-0.174***	0.048
Other race	-0.110*	0.060	-0.115*	0.060
Income (log)	0.218	0.472	0.202	0.476
Income (log)	-0.013	0.022	-0.012	0.022
squared				
Household size	0.004	0.006	0.002	0.006
Number of households	0.001***	0.835E-5	0.001***	0.850E-5
Month 2	0.027***	0.003	0.032***	0.007
Month 3	0.037***	0.004	0.051***	0.010
Month 4	0.084***	0.006	0.084***	0.013
Month 5	0.116***	0.006	0.100***	0.015
Month 6	0.174***	0.007	0.155***	0.017
Month 7	0.202***	0.007	0.187***	0.017
Month 8	0.198***	0.007	0.180***	0.017
Month 9	0.215***	0.007	0.178***	0.020
Month 10	0.216***	0.007	0.214***	0.019
Month 11	0.222***	0.007	0.203***	0.022
Month 12	0.249***	0.006	0.220***	0.021
Months 13-18	0.180***	0.007	0.171***	0.027

Table 3. continued

Months 19-22	0.164***	0.005	0.150***	0.029
Month 23	0.242***	0.008	0.260***	0.018
Month 24	0.283***	0.006	0.295***	0.007
Months 25-26	0.287***	0.006	0.297***	0.007
Month 27	0.287***	0.006	0.296***	0.007
Pseudo-R^2	0.3224		0.3296	
N	411,477		411,477	

= significant at the 10% level; ** = significant at the 5% level; *** = significant at the 1% level.

Notes: both estimations include local telephone service area fixed effects, not shown in the table. Standard errors are robust to heteroskedasticity and clustering at the block group level.

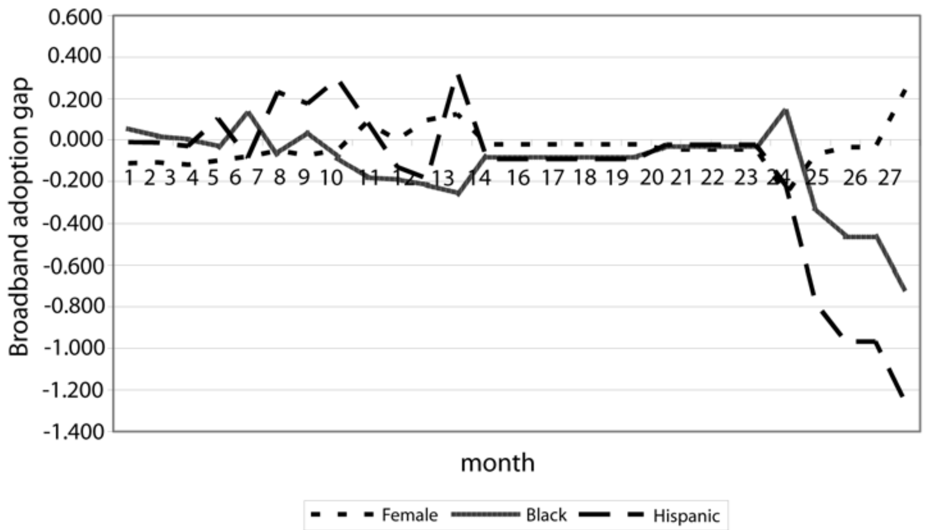
as time passes the gaps reverse. For women, the gap narrows significantly after eight months, with a few months of reversal mixed in, until the final month, which shows women strongly ahead of men. Hispanics start with essentially no gap, show stronger adoption than non-Hispanics through the first year, and then begin to lag sharply in the last few months. The pattern for blacks is similar to that of Hispanics, except that they have only one month of significantly more adoption than whites. The pattern of catch up overall, therefore, is present for the women but absent for blacks and Hispanics. The impacts of the other variables are generally similar to those in Estimation 5.

To compare with the results of the duration analysis, consider the message Figure 1 suggests if it is truncated at nine months. One would conclude that female broadband adoption not only catches up to the baseline, but surpasses it. Blacks apparently start out ahead of others but slowly lose their advantage and maybe fall behind. Hispanics also start out ahead and increase their broadband lead over others during the next eight months. These conclusions differ starkly with the patterns revealed by the duration analysis. The previous section showed that women exhibit no evidence of catching up to men, that adoption by blacks was never ahead of others, and that Hispanics narrow their broadband gap but do not erase it. Furthermore, the panel results do not seem plausible in their own right, given other estimates of broadband demand (Prieger & Hu, 2008; Flamm & Chaudhuri, 2007; Stanton, 2004).

Why do the panel results mischaracterize the dynamics of the broadband adoption gaps? The comparison to the results from the duration model is not exact, since the estimates in the previous section are at the household level and those here are at the level of the Census block. However, aggregation alone should not create such widely differing results. To test this, we aggregated the data to the block group level, and re-ran Estimation 6. Although the levels of the broadband gaps for women, blacks, and Hispanics differed somewhat from Figure 3, the general shape of the curves was the same.

A more likely reason that the panel data—and also the cross-sectional data—do not properly capture the dynamics of the adoption gaps is that DSL becomes available at different times in different areas. Time in the duration model is time elapsed since availability, whereas in the panel data it is calendar time. The panel estimations thus suffer from composition effects, since in any calendar month there are new areas added to the sample as DSL becomes available. Furthermore, in any

Figure 3. Estimated DSL adoption gaps from the panel data model



cross-section of the panel, some areas will have had access to DSL for months, while it will be newly introduced in other areas. Of course, the panel data can be re-organized to have the same timing convention as do the duration models. However, probit estimation of monthly observations on time to adoption is merely a duration model itself. However, discrete duration models estimated by probit are neither as easy to interpret nor as naturally linked to the underlying duration process as is our duration model.[20]

CONCLUSION

Duration analysis can be a useful analytic implement in the tool box of digital divide researchers. Cross-sectional studies may highlight the existence of divides at a point in time (although they did not here), and indeed may be all that is possible in the initial stages of monitoring adoption of a new technology. However, with our DSL adoption data, duration analysis gives a more complete picture. In particular, duration analysis sheds light on how groups progress along their adoption curves. Policymakers can use the information to identify groups for which the adoption gap is widening rather than closing. In application of the method to our data, we found that women do not catch up to men in adoption through the first year of broadband availability, that the adoption gap of blacks widens during that time, and that Hispanics narrow their gap but do not erase it. While some of the inner workings of duration analysis may appear arcane to policymakers without substantial econometric foundations, the results can be presented in adoption curves, which are easy for anyone who can read a graph to interpret and understand.

Although we have concerned ourselves in this chapter primarily with methodological issues, our work suggests one policy recommendation. For duration analysis to be performed, longitudinal data must be available on households. To the extent that duration analysis proves useful for analyzing digital divides, it follows that priority in data collection should go to following the same people or households over time, rather than merely surveying differing cross-sections. Thus, official broadband statistics collected in panel form should be supported and expanded. The U.S. Congress recently directed the Census Bureau to modify the American Community Survey (ACS) questionnaire to gather information about broadband subscription in households.[21] However, given that the ACS does not resample the same households, perhaps official support would be better directed to panels such as the Current Population Survey from the U.S. Bureau of Labor Statistics, a longitudinal survey which has asked questions relating to broadband in the past. The U.S. Federal Communications Commission will also soon begin to conduct consumer broadband surveys,[22] and should design its sampling procedures to collect longitudinal data.

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KEY TERMS AND DEFINITIONS

Adoption Curve: the fraction of potential adopters who have already adopted a new technology, expressed as a function of time.

Catch Up Hypothesis: the notion that the adoption rate of a new technology by a subgroup of the population that initially lags will eventually converge with the adoption rate of the rest of the population.

Census Block: the smallest geographic unit used by the U.S. Census Bureau for tabulation of data collected from households.

Cross-Sectional Data: a type of one-dimensional dataset in which the units of observation (e.g., individuals or households) are observed at the same point in time.

Duration Analysis: the branch of statistics dealing with the modeling on durations, such as life spans or time to electronic component failure. In the context of modeling technological adoption curves, duration analysis models how much time passes before a household adopts a particular technology such as broadband. Also known as survival or failure analysis.

Hazard Rate (at time *t*): the rate at which adoption occurs given that it did not occur before a certain time *t*.

Panel Data: a collection of cross sections of data gathered at multiple times, where the same units of observation (e.g., individuals or households) are represented in each cross section. Also known as longitudinal data.

Time-Varying Covariates: covariates (i.e., explanatory variables) in duration analysis that change values over the course of a duration.

ENDNOTES

[*] This chapter was written while the second author was visiting the Federal Communications Commission. The views expressed in this chapter are those of the authors and do not necessarily reflect the views of the FCC or any of its Commissioners or other staff.

[1] With cross-sectional data, observations are taken from a single period, and the sample

comprises different individuals, households, or geographic areas. Cross-sectional data thus provides a point-in-time snapshot of the phenomenon under study.

2 Panel data consist of repeated observations on the same units of analysis in the cross-section.

3 The authors use the ordered logit model to look at the hierarchical choice of no Internet access vs. dial-up access vs. broadband access.

4 In this notation, ϕ is the Normal density function. Modern statistical software packages can calculate marginal effects automatically for probit and logit models.

5 This simple relationship between the hazard rate and the mean holds only when the former is constant.

6 The term *semiparametric* has different meanings in the statistics literature. Here we mean that the baseline hazard is modeled effectively nonparametrically and the effect of the covariates on the hazard rate is modeled parametrically.

7 The nature of our data also lends itself to a discrete-time hazard model (see Kalbfleisch & Prentice, 2002), but the results would differ little.

8 The authors have found both S-Plus and Stata to be particularly easy to use in this regard. We use the latter for this article.

9 Chief among the advantages of the data are the large number of observations, the accurate information on the availability of DSL, and the fine geographic detail. See Prieger & Hu (2008) for a discussion of the strengths and weaknesses of these data.

10 Census blocks are the smallest unit of Census geography, and there are only 23 households in the median block in our data.

11 When estimating the effect of aggregated variables on a dependent variable at a lower level of aggregation, standard errors can be artificially small unless corrected by clustering methods. See Moulton (1990) for an illustration of the principles involved.

12 Initial availability is determined by the first date any household in the local service area subscribes. Initial adoption in the block is available in the data.

13 See Kalbfleisch & Prentice (2002) for a complete discussion of censoring in duration models. For the practitioner, the statistical software takes care of the details.

14 The difference between the two models is likely to be more pronounced when the mean of the dependent variable is near zero or one.

15 Only those months for which adoption is observed are represented with dummy variables in the specification. With no adoption observed in month 8, for example, the maximum likelihood estimate of the coefficient on the month dummy is negative infinity, and the hazard rate is zero for the month.

16 The adoptions after 22 month all come from a single area in Detroit, the only area with DSL available for more than two years. Thus the results after nine months are likely to be unrepresentative anyway.

17 The curves are calculated at the mean values of the other variables, which are month-specific in the case of the interacted variables.

18 We cannot estimate a panel fixed effects model by adding a dummy variable for each Census block, because only the dependent variable varies over time, and none of the coefficients on the regressors would be identified. We can, in theory, estimate a panel random effects model (in which the intercept for each block is treated as a random variable to capture unobserved heterogeneity). However, our large sample size and number of regressors precluded estimation of a panel probit random effects model. In a half-sample version we did estimate, the results for the gender, race, and ethnicity coefficients were

similar to that of Estimation 5 below.

[19] In the figure, the gap for women is with reference to men, the gap for Hispanics is with reference to non-Hispanics, and the gap for blacks is with reference to whites.

[20] The probit discrete duration model implies a lognormal, rather than constant, hazard rate within each period and has covariate effects that are far from proportional. Given that within-period hazard rates cannot be identified nonparametrically and that assumptions on their shape cannot be tested with discrete data, we assume the simplest possible form: constant (Sueyoshi, 1995).

[21] This section of the Broadband Data Improvement Act is codified at 47 USC § 1303(d).

[22] See 47 USC § 1303(c).

APPENDIX

This technical section deals with adapting the Census block-level observations to a household-level analysis for maximum likelihood estimation (MLE). The issues discussed here are unique to our dataset and can be ignored if household observations are available.

Let the number of households in a Census block be N. Define (compound) event A as the first household adoption of DSL not occurring until time interval $[t,t+\Delta)$, event B as the first adoption occurring before t, and event C as the first adoption not occurring until after $t+\Delta$. Since events A, B, and C are mutually exclusive and exhaustive, we have:

$$\Pr(A) + \Pr(B) + \Pr(C) = 1 \tag{A1}$$

Since the complement of B is that all adopt after t, which has probability $S(t)^N$, we have $\Pr(B) = 1 - S(t)^N$. Similarly, $\Pr(C) = S(t+\Delta)^N$. Combining these facts with (A1) implies

$$\Pr(A) = S(t)^N - S(t+\Delta)^N \tag{A2}$$

Taking a second-order Taylor's expansion shows that

$$S(t+\Delta)^N = S(t)^N + \Delta N S(t)^{N-1} S'(t) + o(\Delta^2) \tag{A3}$$

where $o(x)$ means "terms of order x". Expressing the right side of (A2) as a rate, applying (A3), and noting that $S(t) = -f(t)$ (the p.d.f.) gives

$$\frac{S(t)^N - S(t+\Delta)^N}{\Delta} = NS(t)^{N-1} f(t) + o(\Delta) \tag{A4}$$

Taking the limit of (A4) as $\Delta \to 0$ and explicitly noting the dependence of S and f on coefficients β gives the likelihood for an observation:

$$L_i(\beta) = N_i S(t_i;\beta)^{N_i - 1} f(t_i;\beta) \tag{A5}$$

where the subscript denotes quantities and functions pertaining to observation i. Since $L_i(\beta)$ is proportional to N_i, that term can be ignored when maximizing the log likelihood. Dropping N_i, the rest of (A5) is equivalent to the likelihood of observing one household adopting at t_i and the other $N_i - 1$ households adopting after t_i. We can thus expand each Census block observation into separate, identical observations for each household, mark all but one of them as censored, and perform MLE on the expanded dataset. The block characteristics are assigned to each household for their covariates. To account for the fact that only one observation per Census block is available, the standard errors must account for clustering at (at least) the Census block level. In fact, we cluster at a higher level of observation in the text.

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