

# Convergence

in Information and  
Communication Technology

STRATEGIC AND REGULATORY  
CONSIDERATIONS

Rajendra Singh and Siddhartha Raja



THE WORLD BANK

# Convergence

in Information and  
Communication Technology



# Convergence

in Information and  
Communication Technology

STRATEGIC AND REGULATORY  
CONSIDERATIONS

Rajendra Singh and Siddhartha Raja



THE WORLD BANK  
Washington, D.C.

© 2010 The International Bank for Reconstruction and Development / The World Bank  
1818 H Street, NW  
Washington, DC 20433  
Telephone: 202-473-1000  
Internet: www.worldbank.org  
E-mail: feedback@worldbank.org

All rights reserved

1 2 3 4 13 12 11 10

This volume is a product of the staff of the International Bank for Reconstruction and Development / The World Bank. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the Executive Directors of The World Bank or the governments they represent.

The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgement on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

#### **Rights and Permissions**

The material in this publication is copyrighted. Copying and/or transmitting portions or all of this work without permission may be a violation of applicable law. The International Bank for Reconstruction and Development / The World Bank encourages dissemination of its work and will normally grant permission to reproduce portions of the work promptly.

For permission to photocopy or reprint any part of this work, please send a request with complete information to the Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; telephone: 978-750-8400; fax: 978-750-4470; Internet: www.copyright.com.

All other queries on rights and licenses, including subsidiary rights, should be addressed to the Office of the Publisher, The World Bank, 1818 H Street, NW, Washington, DC 20433, USA; fax: 202-522-2422; e-mail: pubrights@worldbank.org.

ISBN: 978-0-8213-8169-4  
eISBN: 978-0-8213-8171-7  
DOI: 10.1596/978-0-8213-8169-4

#### **Library of Congress Cataloging-in-Publication Data**

Convergence in information and communication technology : strategic and regulatory considerations/Rajendra Singh and Siddhartha Raja.

p. cm.

Includes bibliographical references and index.

ISBN 978-0-8213-8169-4 — ISBN 978-0-8213-8171-7 (electronic)

1. Information technology. 2. Telecommunication. I. Singh, Rajendra, 1958- II. Raja, Siddhartha, 1980-

HC79.I55C6744 2009

303.48'33—dc22

2009044651

# Contents

Foreword	vii
Acknowledgments	ix
About the Authors	xi
Abbreviations	xiii
<b>1 Introduction</b>	<b>1</b>
Convergence Continues to Gain Momentum Worldwide	1
Responding to Convergence	4
Notes	7
<b>2 Thinking Strategically about ICT Convergence</b>	<b>9</b>
Understanding Convergence	9
Convergence Is Reality	10
Opportunities and Challenges of Convergence for the ICT Sector	14
Options for Policy Responses	20
Nothing Endures but Change	30
Notes	31
<b>3 Emerging Regulatory Responses to Multiple Play</b>	<b>33</b>
Supply of and Demand for Multiple-Play Services Are Growing	34
Multiple-Play Challenges in Legacy Regulatory Frameworks	36
What Role Should Regulatory Frameworks Play?	38
Implementing the Regulatory Response	39
Crucial Principles for an Enabling Regulatory Environment	41
Authorizations	49
Spectrum Management	63
Interconnection and Access	72
Universal Service	85

Regulatory Agencies	93	
Conclusion	98	
Notes	101	
<b>References and Other Resources</b>	<b>105</b>	
<b>Index</b>	<b>117</b>	
<b>Boxes</b>		
2.1	Convergence in Developing Countries: A Few Examples	12
2.2	The Impact of an Enabling Environment for Convergence: Wireline Telephony and Job Creation	26
3.1	Examples of Multiple Play in Developing Countries	35
3.2	Consultations Can Build Support for and Strengthen Regulatory Responses	40
3.3	How Competition in Telecommunications Affects Growth and Consumer Costs: Lessons from India and the United States	45
3.4	The Benefits of an Open Licensing Regime: The Case of VoIP	53
3.5	Malaysia's Simplified Licensing Framework	57
3.6	Japan's Move to an IP-Based Environment	80
3.7	The Potential Gap in Next-Generation Networks	91
<b>Figures</b>		
3.1	Globally, Mobile Telephones Surpassed Fixed Lines in 2002	64
3.2	Many Cellular Operators Derive a Large Share of Revenues from Wireless Data Services	66
<b>Tables</b>		
2.1	Forms of ICT Convergence	11
2.2	Government Responses to Convergence around the World	22
3.1	Some Examples of Regulatory Impediments to Multiple Play	38
3.2	Summary Results of a Survey of Six Countries	42
3.3	Evolving License Types to Authorize Service Providers' Operations	50

# Foreword

The information and communication technology (ICT) sector has experienced explosive growth over the past two decades. There are over 4.5 billion mobile phone subscriptions globally, the Internet has grown to include more than a billion people, and high-speed broadband networks reach more than 400 million subscribers. In short, ICT now permeates every aspect of social, political, and economic relationships. Many of these exciting developments were possible because of policy and regulatory frameworks that spurred investment, liberalization, and competition in ICT. Continuous dynamic market and technology developments have led to a phenomenon called “convergence,” which is the focus of this book. The main finding is that developing countries can benefit tremendously from the forces of convergence provided that policy makers create the same types of favorable conditions that promoted the initial growth of the sector.

The ICT convergence phenomenon entails different aspects. At the technology level, convergence allows delivery of multimedia communications across a range of networks that were traditionally vertically separated. This fundamentally alters the business of ICT: infrastructure, services, companies, content, and devices can now interact and work together in new, unprecedented ways, opening markets, challenging existing structures, and allowing innovative business models. At a different level, we are witnessing cross-sector convergence, whereby many social and business services are being



superimposed and enabled over the rapidly proliferating cellular network platforms, such as mobile banking.

This book proposes that countries have much to gain if they understand and recognize the emerging forces of convergence and if they create the appropriate conditions for it to flourish. Although convergence may increase the complexity of market structures, it will nevertheless help extend access to a broader range of affordable ICT services, support innovation, and open new, unforeseen opportunities. Indeed, some of these benefits are already being realized in the developing world. For example, mobile phones now offer traditionally underserved populations an opportunity to access Internet services, as cable television networks are also generating greater revenues from converged services: voice, Internet, and media. Yet, while the promise of convergence is tremendous, the pace and magnitude of change are challenges for those who are tasked with regulating the ICT sector. The absence of a strategic response can hamper competition and discourage investment. This volume proposes certain policy options and guiding principles that could help governments explore strategic ways to mitigate some of the risks associated with convergence while maximizing the benefits and opportunities that it can offer. It suggests that governments should liberalize their markets further, by promoting competition and allowing technologies to deliver all that they can. At the same time, the book recognizes that there are no universal or global solutions, with convergence occurring across such a wide range of ICT networks and markets. As such, any ICT policy or business solution should be tailored to the local environment and to the peculiarities of the specific situation.

The World Bank Group remains committed to supporting its client countries as they create enabling policy and regulatory frameworks, deepen ICT sector reforms, and promote private participation and investments to ride the next wave of technological advancement.

Mohsen A. Khalil  
Director, Global Information and Communication Technologies  
The World Bank Group

# Acknowledgments

This volume was prepared as part of the analytical work program of the World Bank Global Information and Communication Technologies Department: <http://www.worldbank.org/ict>.

The authors would like to acknowledge the inputs and contributions of a number of reviewers, commentators, and supporters, including the following: from Cisco Systems, Robert Pepper and Enrique Rueda-Sabater; from the International Finance Corporation, Eric Crabtree; from Pennsylvania State University, Robert Frieden; from the Telecom Regulatory Authority of India, Nripendra Misra; from the U.S. Federal Communications Commission, Sherille Ismail and Johathan Levy; and from the World Bank, Jerome Bezzina, Yann Burtin, Philippe Dongier, Boutheina Guermazi, Tim Kelly, Charles Kenny, Mohsen Khalil, Yongsoo Kim, Gareth Locksley, Juan Navas-Sabater, Isabel Neto, Rajesh Pradhan, Christine Qiang, David Satola, Peter Smith, Paul Nounba Um, Eloy Vidal, Bjorn Wellenius, and Mark Williams.

For their help in collecting information and sharing ideas, the authors would like to thank staff from the Organisation for Economic Co-operation and Development, the U.S. Federal Communications Commission, the Australian Communications and Media Authority, the Telecom Regulatory Authority of India, the U.K.'s Office of Communication, the Infocomm Development Authority of Singapore, the Canadian Radio-television and Telecommunications Commission, and Industry Canada.

The authors would also like to thank Alexandra Klopfer, Paul Holtz, Sara Roche, and Lacinda Barrow for their editorial support. Finally, for shepherding this volume from manuscript to published book, the authors would like to thank the World Bank Office of the Publisher—particularly Stephen McGroarty, acquisitions editor; Janet Sasser, production editor; and Denise Bergeron, print coordinator. All errors remain our own.

## About the Authors

**Rajendra Singh** is a senior regulatory specialist in the Policy Division of the Global Information and Communication Technologies (GICT) Department in the World Bank Group, where he advises countries in the South Asia, Middle East and North Africa, and East Asia and Pacific regions on telecommunications policy and regulatory issues. He also leads the analytical work on convergence in the Bank. Before joining the Bank in December 2006, Rajendra worked as secretary of the Telecom Regulatory Authority of India (TRAI). He holds a bachelor's degree and a master's degree in technology from the Indian Institute of Technology (IIT), Roorkee and Delhi, respectively, and a master's in business administration from the University of Delhi. He has published around 50 papers in various international journals and for conferences.

**Siddhartha Raja** is an ICT policy analyst in the Policy Division of the GICT Department in the World Bank Group. His responsibilities span South Asia, the Middle East, and Eastern Europe and include sector strategy development, policy formulation, and regulatory capacity building. He has published journal articles, book chapters, and conference papers on the political economy of telecommunications, the sociology of technology, and the politics of development. Siddhartha has a master's degree in infrastructure policy studies from Stanford University, has studied media law and policy at the University of Oxford, and is currently completing his doctorate in telecommunications policy at the University of Illinois.



# Abbreviations

\$	All dollar amounts are in U.S. dollars unless otherwise indicated
2G	second generation
3G	third generation
BT	formerly British Telecommunications, then British Telecom
CDMA	code division multiple access
CDMA EV-DO	code division multiple access, evolution, data-optimized
CPNP	calling party's network pays
DDSO	digital data service obligation (Australia)
DT	Deutsche Telekom
DVB	digital video broadcasting
EC	European Commission
FCC	Federal Communications Commission (United States)
FDD	frequency division duplexing
GAO	Government Accountability Office (United States)
GHz	gigahertz
GSM	global system for mobile
ICT	information and communication technology
IDA	Infocomm Development Authority of Singapore
IP	Internet protocol
IPTV	Internet protocol television

## ABBREVIATIONS

ISP	Internet service provider
IT	information technology
kbps	kilobits per second
MCMC	Malaysian Communications and Multimedia Commission Act
MDA	Media Development Authority (Singapore)
MHz	megahertz
Ofcom	Office of Communications (United Kingdom)
PSTN	public switched telephone network
RPNP	receiving party's network pays
TDD	time division duplexing
TRAI	Telecom Regulatory Authority of India
UHF	ultrahigh frequency
VHF	very high frequency
VoIP	voice-over-Internet protocol
VDSL	very-high-speed digital subscriber line
WCDMA	wideband code division multiple access

# 1

## Introduction

This book is a compilation of two recently completed works on the convergence of information and communication technology (ICT) (Singh and Raja 2008, 2009). Since then, convergence—the eroding of boundaries among previously separate ICT services, networks, and business practices—has accelerated and deepened.

At the time these reports were written, convergence was already a reality and was picking up pace in low-income countries, as in the rest of the world. Now, as this introduction summarizes, broadband networks are reaching deeper into previously unserved areas. The growing number of people connected to broadband networks are consuming, sharing, and creating new multimedia content and applications. And they are doing this on handheld and portable devices that are less costly and do more than before. All sorts of users—governments, businesses, individuals, and ICT firms—are looking to cut costs while capturing greater value. Taken together, these trends indicate that convergence is set to accelerate even through the ongoing global economic downturn. Countries that enable convergence through appropriate policy and regulatory responses will realize significant benefits in terms of expanded access, lower prices, and greater competition.

### **Convergence Continues to Gain Momentum Worldwide**

Expanding access to broadband, the demand for multimedia and user-created content, the availability of inexpensive multimedia devices, and



the drive to cut costs while increasing value from ICT services are coming together to speed up the pace of convergence.

Broadband network development is picking up pace, extending the infrastructure platform that enables convergence and, more generally, access to an ever-widening range of information and communication services. Indeed, the number of fixed broadband subscribers globally had grown by September 2009 to 465 million, of which 128 million are from the BRIC countries (Brazil, Russia, India, and China). This is up from 286 million in December 2006, when the BRICs had 64 million subscribers (TeleGeography 2009a). A number of countries have also embarked on ambitious plans to support the expansion of broadband access. Some have integrated broadband network deployment into stimulus plans that respond to the economic crisis (see Qiang 2009). Broadband is also finding its way into universal service fund programs. The United Kingdom's June 2009 Digital Britain plan, for example, proposes a £6 annual levy for wireline telephone subscribers. Funds will support the rollout of fiber-optic network infrastructure in commercially unviable areas (Department for Culture, Media, and Sport and Department for Business, Innovation and Skills 2009). Pakistan's Universal Service Fund (2008) is also helping finance the rollout of broadband access networks.

Although core broadband networks primarily use optical fiber cables, much of the growth in broadband access networks is due to wireless technologies. There are now more than 200 commercial broadband wireless networks worldwide, with more than 300 networks in planning, deployment, or trial stages. This is a huge increase from about 20 commercial networks in mid-2006 (TeleGeography 2009b). Third-generation (3G) mobile networks are also spreading; there are now more than 575 million subscribers to 3G services globally (Wireless Intelligence 2009). Mobile networks are already the largest platform by which users connect to the Internet. Going forward, the take-up of broadband is expected to dominate the mobile telecommunications market, especially after the voice market in developed and developing countries alike is saturated. Recently, fourth-generation (4G) mobile systems have moved closer to commercialization, while some countries are seeing the deployment of next-generation networks

that will allow fully converged communications enabling seamless transitions over a variety of technologies, media, and services.

Users are also generating and consuming more and a greater diversity of content online. Twitter, an application that allows users to broadcast short, text-based messages, allows cross-platform communication and has an estimated 6 million users. Only three years old, it is already recognized as a powerful organizing and political tool across the world. The popularity of social networking Web sites, which allow people to publish their own content and communicate with each other, is another testament to the relevance of user-driven innovation. Facebook, which now has more than 350 million active users worldwide, and other Web sites such as YouTube, which contains more than 100 million videos, not only host user-created content, but are also developed by users as distinct from corporations that have long dominated the media market. The financial valuation of Facebook is now higher than that of more well-recognized media companies such as The Washington Post Company or The New York Times Company.<sup>1</sup>

Both ICT users and firms are looking to cut costs while capturing the maximum possible value. The best example of this is the increasing popularity of inexpensive services based on voice-over-Internet protocol (VoIP), which allow free or cheap voice communication. The traffic carried by Internet-based VoIP application Skype now represents 8 percent of all international voice minutes, more than the largest conventional carrier. The use of Skype Out, a service that allows PC-to-telephone international calling, grew 50 percent between 2007 and 2008, carrying almost 8.5 billion minutes (TeleGeography 2009a). Similarly, Jajah, an application that uses the Internet to carry regular telephone calls, connected its billionth call in June 2009—just three years after it was established (Marketwire 2009).

ICT firms are also adopting converged business models and expanding to nontraditional services. These nontraditional services—Internet and telephone services in the case of cable television networks, and video and Internet business for telephone companies—are in many cases growing faster than traditional businesses. As one example, cable

television network VTR in Chile is seeing faster growth in Internet subscriptions than in its cable TV business. In 2008, its Internet subscriber base grew 13 percent, while its cable TV subscription base grew only 3 percent.<sup>2</sup> Firms that move quickly in convergence-friendly markets can similarly benefit by entering new markets and increasing their service profile.

## Responding to Convergence

As broadband networks grow, so will the ability of users to create and share multimedia content. And as their drive to control costs and grow revenues gets stronger, ICT providers and users will look to new technologies and services to help them. Countries with policy and regulatory frameworks that allow converging markets to function well will benefit the most. With the pace of convergence set to increase, many countries are adjusting their policy and regulatory frameworks to facilitate convergence.

Chapter 2 of this book focuses on the strategic implications of convergence and possible policy responses. Three main forms of convergence are identified:

- *Service convergence*, or “multiple play,” allows a firm to use a single network to provide several communication services that traditionally required separate networks. Conversely, any service can be provided over one of several networks.
- *Network convergence* exists where a common standard allows several types of networks to connect with each other. Consequently, a communication service can travel over any combination of networks.
- *Corporate convergence* results from mergers, acquisitions, or collaborations among firms. New business entities are created to offer multiple services (old and new) and address different markets.

Convergence has a significant impact on the ICT sector because it alters market structure and dynamics. On one hand, users are able

to access a wider range of services, choose among more service providers, and produce and distribute content. On the other hand, convergence allows service providers to adopt new business models, offer new services, and enter new markets.

Policy frameworks that restrict competition or prevent convergence from playing out in a market lead to suboptimal outcomes that reduce the development impact of ICT. In the long term, countries that resist change are likely to miss the benefits of improved ICT technologies and services. Countries that take a “wait and watch” approach might benefit if the frameworks in place do not pose major immediate problems, but risks remain because convergence typically does not fit easily into traditional policy frameworks and both technologies and markets are likely to continue changing fast. Evidence suggests that the greatest benefits are derived in markets that seek to facilitate convergence.

Chapter 3 focuses on emerging regulatory practices facilitating multiple play, or the provision of multiple services—such as voice telephony, broadcasting, and Internet access—by one operator over a single communications network, typically telephone or cable television but increasingly mobile and fixed wireless networks. The report describes how regulatory frameworks for networks and services can accommodate and support the introduction and proliferation of multiple-play business models.

Multiple play offers numerous potential benefits to customers, including lower prices, better services, and more choices among service providers. It also enables firms to develop new business models and opportunities for increased competition and reduces their costs. In some cases, however, multiple play increases the risk of renewed monopolization in the telecommunications sector, which has already been brought about by the huge economies of scale and high up-front costs and financing requirements of broadband networks. The benefits of multiple play are enhanced when there is a level competitive playing field for substitute services provided over different networks and effective measures to prevent and address abuses of market power.

Multiple play presents regulation with complex challenges. Typically, legacy regulatory frameworks developed very differently for each of the different market segments and technologies. These frameworks now have to transition to treating similar services equally without regard to the underlying network, while taking into account the potential impacts of changes—both positive and negative—on different stakeholders. Regulatory frameworks must also mitigate the risks of less effective competition in service and network provision.

The analysis in chapter 3 begins with a discussion of competition and regulatory symmetry as the underlying principles for an enabling environment for multiple play. There is broad consensus that starting with these regulatory principles will promote multiple play and, more broadly, contribute to growth in the ICT sector. Challenges to traditional regulatory frameworks arising from multiple play are then identified, focusing on four areas: authorizations, spectrum management, interconnection and access, and universal service. The organization of regulatory institutions overseeing the ICT sector is also discussed. In each case, the book analyzes how traditional regulatory frameworks might restrict or conflict with evolving technologies and business models. It then identifies emerging trends in regulatory responses.

The book concludes by presenting several best-practice principles for regulatory responses to multiple play and, to some extent, to convergence more generally. It describes experiences and responses from around the world, with the goal of deriving principles for best practice without being prescriptive or offering a universal solution. It is difficult, if not impossible, to offer such a solution to the regulatory and other challenges of multiple play because the issues involved are evolving—as are the technologies and services—and because of every country's unique existing legal and regulatory frameworks, institutional endowments, and political economies.

Still, the report identifies some emerging best-practice principles for regulation that are widely applicable. First, frameworks should promote competition. Though multiple play can increase competition, lower prices, and drive growth, it can only progress in markets with

low entry barriers. Regulatory frameworks that establish level competitive playing fields and easy market entry will provide the greatest benefits for users. Second, policy and regulation should rely more on market forces. Regulation should move toward allowing innovation and competition on a level playing field, abstaining from intervention unless there are market failures. Finally, regulation should allow new technologies to contribute everything they have to offer. Service providers should be allowed to fully use their own networks and those of others and reduce costs—increasing business viability and making markets more efficient.

Together, these principles lead to regulatory frameworks that enable multiple play and, to some extent, convergence. Indeed, the main task for regulators is to remove artificial barriers and restrictions that are remnants of legacy regulation, thus clearing the way for market forces to play out, promoting the public interest, and leading to the realization of a range of benefits for users.

## Notes

1. In June 2009, Facebook was valued at \$6.5 billion, while the market capitalization of The Washington Post Company was \$3.3 billion, and that of The New York Times Company \$730 million (Bloomberg 2009 and Google Finance). Estimates for Twitter, Facebook, and YouTube are based on data collected by the authors.
2. Authors' analysis based on Liberty Global n.d.



# 2

## Thinking Strategically about ICT Convergence

Countries that adopt policy frameworks enabling convergence among telecommunications, media, and computing services will enhance the impact of information and communication technology (ICT) on economic development. Technological innovation and market demand are driving the ICT sector toward convergence. This matters because convergence can lower entry barriers, allow service providers to try out new business models, promote competition, lower costs to service providers and users, and broaden the range of services and technologies available to users. On the other hand, convergence can also lead to market consolidation, reduced competition, and new entry barriers.

This chapter explains ICT convergence and its main forms; shows that convergence is a widespread, market-driven process; discusses some of the main opportunities and challenges convergence poses to businesses, users, and governments; and outlines options for government policy responses, along with potential benefits and risks.<sup>1</sup>

### **Understanding Convergence**

Convergence serves as shorthand for several processes of change taking place in the ICT sector. Broadly speaking, convergence is the erosion of boundaries among previously separate services, networks, and business practices in the ICT sector.



Three main forms of convergence are evident. The first, service convergence, or “multiple play,” allows a firm to use a single network to provide several communication services that traditionally required separate networks. The second form is network convergence, where a common standard allows several types of networks to connect with each other. Consequently, a communication service can travel over any combination of networks. While the first two forms of convergence are technological, the third form, corporate convergence, results from mergers, acquisitions, or collaborations among firms. New business entities are created to offer multiple services, old and new, and address different markets. Table 2.1 summarizes and illustrates these three forms of convergence and associated benefits, risks, and policy implications.

## Convergence Is Reality

A number of factors are pushing ICT service providers toward converged business models. These market drivers are now increasingly common worldwide, including in developing countries.

Convergence is a process driven by technology and demand and resulting from service providers’ adopting new technologies and business practices. Fundamental technology drivers are the digitalization of communication and the falling costs of computing. Both of these drivers, coupled with rapidly growing demand for inexpensive but high-quality ICT, have led to a proliferation of digital devices. Further, digital data processing and increases in computing power have allowed data compression, increasing a network’s carrying capacity even if its bandwidth remains fixed. Cable and wireless network capacities have also been growing steadily. More recently, the widespread and growing use of Internet protocol (IP)-based and packet-switched data transmission has made it possible for different devices and applications to use the same networks. This has sharply reduced costs and significantly eased the design and deployment of access devices. Improved device capability is a significant contributor to convergence.

With related technical and market factors evolving, convergence has now achieved significant traction with service providers seeking

**Table 2.1 Forms of ICT Convergence**

Item	Service convergence	Network convergence	Corporate convergence
Definition	Firms use one network to provide multiple services.	A service travels over any combination of networks.	Firms in one sector acquire, merge, or collaborate with firms in other sectors.
Examples	Communication companies offer telephony, television, and Internet services using telephone, cable, or wireless networks. Examples are found in Chile, the Arab Republic of Egypt, India, Poland, and Ukraine.	Internet telephony services such as Skype and Jajah carry voice telephony using the Internet and traditional networks.	Internet, broadcasting, and telecommunication firms partner, merge, or expand their range of services. Such developments have occurred in Brazil, Nigeria, and Sri Lanka.
Benefits	Service providers enter new sectors, use their networks more efficiently, offer discounts for bundles, and increase access to new ICT services.	Reduced costs lower tariffs. Network integration permits mobility for consumers and expands coverage.	Mergers create opportunities for new services or markets, lower costs and tariffs, and increase the coverage of individual firms.
Risks	Subscribers could be locked into one provider. Smaller firms, especially those without their own broadband networks, might get pushed out of the market.	This could lead to lower investment in networks.	Mergers could lead to less competition, market dominance, and less diversity of media content.
Policy implications	Convergence changes the scope and boundaries of markets and alters entry barriers.	Connecting different networks allows location- and network-independent service provision.	Mergers create new business models and alter the market structure, changing the dynamics of the sector.

Source: Authors.

to increase revenues and cut the costs of service provision. Service providers around the world are embracing convergence through investments in all-IP networks—estimated to reach \$300 billion by 2015—and in converged business models. In an indication of an expanding underlying technological base, one analyst estimates that the global IP switch and router market grew about 10 percent in 2007, to \$11 billion (Marketwire 2008). Cisco Systems, a major IP network equipment manufacturer, has seen sales in emerging markets double since 2005, compared to worldwide sales growth of 40 percent (Cisco Systems 2007). Box 2.1 gives examples of the different forms of convergence from developing countries and transition economies.

### **Box 2.1 Convergence in Developing Countries: A Few Examples**

India's incumbent public telecommunications provider, MTNL, began providing Internet protocol television (IPTV) services in Mumbai in 2006. The service now offers about 150 channels, costs about \$5 a month, and has a reported 6,000 subscribers. A number of private operators have since begun offering IPTV services.

Since 2006, telephone and cable companies have been converging in Brazil. Telemar acquired Way TV, while Telefónica bought a stake in TVA. Convergence is emerging in response to the introduction of triple-play services by NET Serviços, which has an estimated 400,000 subscribers.

Sri Lanka's Dialog Telekom now offers telecommunications and broadcasting services. It has become a quadruple-play operator, offering fixed and mobile voice, television, and Internet service. Its satellite television service reaches more than 60,000 households, while its mobile phone service has 4.3 million subscribers and will soon include 3G (third-generation) services.

In 2007, MTN Nigeria acquired VGC Communications, a fixed and wireless phone provider. This occurred after VGC secured a unified license to offer fixed and wireless telephony,

**Box 2.1 continued**

Internet, and value added services in 2006. The CEO of MTN noted that it made the acquisition with the intention of accessing VGC's infrastructure and labor to achieve convergence.

In the Arab Republic of Egypt, Telecom Egypt has begun upgrading its fixed-line network to an IP-based next-generation network that will allow it to provide voice and IP services. Its Internet service provider subsidiary, TE Data, introduced IPTV services in 2006.

In March 2008, Ukraine's Comstar began offering IPTV services over its fiber-based next-generation network. This offering makes Comstar a triple-play voice, broadcasting, and data operator—the country's first. However, it will soon face competition from Golden Telecom Ukraine and fixed-line operator Ukrtelecom. The IPTV offerings by these companies follow broadcaster Viasat's plans to introduce digital satellite television services later in 2008.

In 2006, Telefónica Chile began offering IPTV and satellite television services to counter a decline in fixed-line revenues and subscriptions. Cable operator VTR saw its triple-play subscriber base double in 2006, and is considering acquiring a 3G license to add mobile voice services to its portfolio.

Argentine cable television operators Multicanal and Cablevision are investing about \$310 million in fiber-optic networks in 2008, with plans to offer triple-play services. This is part of a move to begin services before the government abolishes legislation that prevents telecommunications providers from offering broadcasting services.

*Source:* Authors' analysis.

Another market factor supporting the introduction of convergence is the deployment of broadband networks. Broadband connectivity facilitates convergence because it allows the provision of multimedia content, such as CD-quality audio and streaming video, at reasonable prices. As of 2007, broadband was commercially available in

166 countries, and nearly a quarter of the 300 million subscribers were in middle-income countries.<sup>2</sup>

Demand for converged services is also evident. By late 2007, there were more than 30 million “triple-play” subscribers—typically receiving telephony, video, and Internet services—worldwide. Skype, an Internet telephony service, has more than 400 million registered users in 225 countries and territories (eBay 2009) and carried an estimated 33 billion minutes of international PC-to-PC calls in 2007 (Tele-Geography 2009b).

There has also been consolidation in the development and provision of content and services. Investments, mergers, and cross-holdings in the media and telecommunications industries have increased the number of both content creators and network operators with access to content and delivery mechanisms. The development of online advertising has also allowed many content providers to offer their services for free or well below cost. Such arrangements allow consumers to sample, even if only in a limited manner, the content and find uses for it. As a result, consumers create a demand for that or similar content, which results in higher demand for services to support such content.

## **Opportunities and Challenges of Convergence for the ICT Sector**

Convergence has a significant impact on the ICT sector because it alters the market structure and dynamics. On one hand, users are able to access a wider range of services, choose among more service providers, and produce and distribute content. On the other hand, convergence allows service providers to adopt new business models, offer new services, and enter new markets.

### **Opportunities for Users**

Convergence provides ICT users access to a distinctly expanded variety of services. For example, whereas household telephone or cable

subscribers previously received only one service, they can now receive three—voice, video, and data—over either network. As of 2007, estimates suggest that more than a third of Canadian households now subscribe to triple-play services, and that there are about 23 million subscribers worldwide (Pyramid Research 2007).

Convergence also benefits users because it increases the reach of services. For example, any communications infrastructure now carries telephone service, moving countries closer to universal service. This also improves the utilization of the existing infrastructure, making it more cost efficient. As digital video broadcasting (DVB) and mobile television proliferate and evolve, they will make triple play over wireless networks possible. Similarly, the ability of cable television infrastructure to carry converged services has driven investment in fiber-optic networks by telecommunications operators. Of the 10 countries with the highest broadband penetration, 9 also have strong cable infrastructure (Noam 2007).

Further, many nontraditional types of infrastructure, including cable television and electricity distribution networks, can now carry telephone service, moving countries closer to universal service and improving the utilization of existing infrastructure, allowing them to provide ICT services to communities that earlier had none. Such service provision brings with it the potential for significant social and economic transformation in otherwise underserved areas.

Convergence has another important implication for users: potential reductions in tariffs. The main reason for this reduction is the presence of increased competition in the market as a number of networks provide similar services, which in turn reduces the cost per service. In France, the Internet service provider (ISP) Iliad led significant price reductions in the triple-play market by reducing its bundled tariff; the rest of the market soon followed (*Wall Street Journal* 2006). This would not have been possible without Iliad's converged voice and video networks.

Lower tariffs and a wider range of services also make some services more attractive to users who are price-conscious or unsure of the personal usefulness of new services. In Sweden, for example, one cable

company offering triple-play services gives subscribers the least expensive service free (OECD 2006). Such an arrangement has the possibility to convince otherwise unwilling subscribers to try out a new service.

Convergence drives increased coverage for advanced ICT services over wireless media—a critical consideration for developing countries. “Wireless triple play” can significantly enhance access to services and content for rural or hard-to-reach communities. Mobile phone subscribers in developing countries, for example, are significantly more numerous and far more diffused than the number of personal computer users. As a result, cellular operators that implement service-converged networks, financial services, public services, and entertainment applications can reach a far larger proportion of the population than existing wireline networks.

Similar possibilities arise from the mixed use of cable, wireless broadband, and other ICT networks. Access to high-quality, reliable, and affordable ICT services can have significant impacts that strengthen governance, through e-governance, or provide distance health or distance education opportunities.

Already, the provision of digital video broadcasting over cellular networks has proven potential to increase the number of television viewers in countries such as Kenya and the Philippines. As wireless networks proliferate, use of broadband 3G and digital video broadcasting makes wireless triple play possible.<sup>3</sup> Networks in Afghanistan are using broadband wireless for data connectivity,<sup>4</sup> and new technologies such as WiMax and iBurst and revisions to the Wi-Fi standards are raising expectations. In 2005, for example, Kenya Data Networks began deploying a WiMax system designed to offer converged voice and data services to its customers (All Africa 2005).

Providing new applications for users also creates economic opportunities, while increased demand for content and applications drives significant economic development. Media and entertainment expansion into mobile telephony, for example, is growing rapidly: mobile gaming is a \$4 billion market, and more than 420 million songs were downloaded onto mobile phones around the world in 2005 (SSKI

Research 2007). Creation of these new markets drives employment and investment and acts as a catalyst for network growth.

Moreover, online services such as blogs, video repositories, and social networking tools create opportunities for social development in developing countries. The consequent exchange of ideas, boosts to creativity, and creation of new information and knowledge channels have positive impacts. They also significantly alter the structure of the media sector, where content creation and distribution were traditionally in the hands of either a few firms or the state. One example comes from Myanmar, where pro-democracy demonstrations in 2007 received significant worldwide coverage, largely enabled by the protestors' unprecedented access to digital video communication over the Internet.

## **Opportunities for Service Providers**

Service providers in both the telecommunications and broadcasting sectors have seen convergence as a powerful means to leverage existing infrastructure to provide a wider range of services at lower costs, thus generating higher revenues and reaching new subscribers.

Convergence allows service providers to enter new markets, making it possible for them to compete in a larger market for more subscribers, and grow their businesses beyond their traditional sector or technology domains. The results are even stronger in countries with traditional communications infrastructure with limited reach or take-up. One recent report found that telecommunications firms offering IPTV have succeeded in countries that have relatively low pay television penetration but high broadband penetration (Telecommunications Management Group 2008).

Network convergence also allows entry of new service providers, leading to competition that lowers prices. Some stark examples come from the voice telephony market. Significant discounts are possible, for example, if carriage is over IP networks. One service, Jajah, uses the Internet as a carriage network and offers discounts significant enough



that if half of the international calls from the United States used it instead of traditional carriers, annual savings would top \$1 billion.

Singapore is a useful example of the potential for increased competition. As of late 2007, StarHub was the monopoly cable television provider in Singapore. Now SingTel, the incumbent telecommunications company, has begun to invest in and roll out a new IPTV operation, ushering service convergence into the market. The broadcasting regulator noted that the new service will “inject vibrancy into the Singapore media scene and offer consumers more choices” (*The Business Times* 2006a).

In the United States, cable television companies began to provide Internet and telephone services in the mid- to late 1990s, entering the telecommunications market on the back of quickly maturing voice-over-Internet protocol (VoIP) technology. As of June 2009, cable television provider Comcast, for example, had 7 million telephone subscribers (Comcast 2009), while U.S. telecommunications firm Verizon lost 1.8 million fixed-line subscribers in the first half of 2009 due to increased competition from mobile telephones, broadband, and cable television services (Verizon 2009a, 2009b).

Following the stabilization of IPTV technologies in the mid-2000s, telephone companies are getting into the television broadcasting business. For this, they are deploying new networks to provide triple-play services. Verizon and AT&T, both in the United States, are investing more than \$25 billion combined to upgrade their networks, investments that are giving positive results. For example, Verizon’s recent financial reports show that over the first half of 2009, it added 599,000 new television customers and a net 601,000 new Internet customers on its new fiber network. Simultaneously, it has grown consumer revenues by about 4 percent in legacy telecommunications markets, with video and broadband services driving growth (Verizon 2009a, 2009b).

Following from this, one important implication of convergence for service providers, which has repercussions for the wider market and economy, is that convergence enables greater competition across ICT markets. It reduces barriers to market entry, which has immediate

implications for markets because it disrupts their structure and changes competition levels. In some cases, the reduced barriers to entry represent an opportunity to increase the number of service providers. This can lead to a subsequent reduction in tariffs and increases in service quality and coverage.

Service providers also see convergence as a way to cut costs. They seek to lower operating expenses through consolidation of different sectors or by using standardized IP-based network equipment. For example, BT (formerly British Telecom) expects that its operating expenses will decrease by £1 billion a year because its next-generation, all-IP network will integrate a number of operational and network management systems (BT 2006). Reduced costs for companies translate to lower prices for consumers.

Convergence also alters the impact of the ICT sector on social and economic development—as could be expected given the role of ICT as a critical input to economic and social activity.<sup>5</sup> Increased competition due to convergence leads to reduced tariffs, increases service coverage, and drives economic growth, enhancing the benefits of economic liberalization.

## Potential Challenges

While convergence has the potential to increase competition and reduce tariffs, it can also reduce or undermine competition (Katz and Woroch 1998). When Brazilian telephone company Telemar acquired cable television operator Way TV in 2006, for example, the regulator, Agência Nacional de Telecomunicações (ANATEL), responded to queries about competitive implications by initiating a review. The association of cable television operators opposed the deal, saying that the entry of these larger operators could impede competition—though their view was also seen as a defensive response to the entry of a new player in their market (Global Insight 2007).

Convergence can also reduce competition in other ways. If a subscriber gets all services from one provider, the costs of changing to

alternative providers is likely to increase. In addition, if a backbone or access network is owned by one converged service provider, other service providers may not have access to that network or face high costs for interconnecting, a problem being discussed in growing debates on network neutrality and open network access (Frieden 2006).

Merging of firms in the telecommunications or media sectors might also reduce the diversity of content available to users. In 2003, when the U.S. Federal Communications Commission (FCC) announced a relaxation of restrictions on cross-ownership of media outlets, one of the primary reasons for opposition to the new regulation was that it would allow mergers and acquisitions that could reduce the diversity of new and local content (U.S. Congressional Research Service 2003). In a sign of the social implications of advanced ICT, most of the 3 million responses received were by e-mail.

In sum, convergence entails both opportunities and challenges for service providers and users. These conditions, while specific to the markets in which they play out, are also indicative of the tensions embedded in convergence.

## Options for Policy Responses

The discussion above suggests that convergence is likely to gain further momentum around the world. As demand and supply align, advanced ICT services could develop as quickly in low-income countries as in high-income countries, even with a late start in the former. This will enable the realization of significant benefits and enhance the development impact of ICTs.

For this to happen, however, it is essential that policy and regulatory frameworks allow markets to function. The well-known success of mobile telephony worldwide has as much to do with market liberalization as with high demand and low-cost technologies. Research on the diffusion of advanced telecommunications services in developing countries finds that the rate of adoption depends on the existence of an appropriate business environment, which, in turn,

is directly dependent on the regulatory and policy environment (Antonelli 1992).

If policy frameworks restrict competition, or stop convergence from playing out in a market, they lead to suboptimal outcomes that reduce the development impact of ICT. Consequently, developing countries can increase access to advanced technologies and innovative, high-quality services by opening markets, promoting competition, and removing regulatory barriers to new technologies and business models.

Although convergence is a universal phenomenon, its implications and appropriate policy responses vary by country, depending on the prevailing circumstances and legacy factors. It is possible, though, to create some useful—if broad—categories of policy responses to convergence. Some countries resist the introduction of convergence. Other countries “wait and watch,” embarking on changes only as and when they feel it is necessary. A third response is to create an enabling policy environment for convergence. Table 2.2 presents an overview of these responses.

## **Resistance**

Governments may believe that convergence may undermine social, political, cultural, or economic objectives. In developing countries, VoIP is often perceived as potentially undermining the revenue of incumbent telecommunications firms (and government, where the incumbent is a state enterprise), especially when lack of competition has allowed these firms to draw large monopoly rents. Similarly, the political, cultural, and social importance of broadcasting makes governments wary of new providers.

In response to these concerns, governments may decide to resist convergence and take steps to prevent new services and providers from entering the market. By 2006, 36 of 54 African countries forbade VoIP (Balancing Act n.d.). In some countries, the idea of convergence is broadly accepted, but specific modalities are restricted. In the United

**Table 2.2 Government Responses to Convergence around the World**

<b>Indicator</b>	<b>Policy responses</b>		
	<b>Resist</b>	<b>Wait and watch</b>	<b>Enable</b>
Perceptions	Government believes that convergence may undermine its social, political, cultural, or economic objectives.	Government believes that existing policy accommodates convergence or decides not to act.	Government believes that convergence can benefit the ICT sector and economy at large.
Actions	Government takes steps to prevent new services and providers from entering the market.	No policy changes. Issues are dealt with on a case-by-case basis.	Government updates policy, promotes industry responses, or directly invests.
Outcomes	<ul style="list-style-type: none"> <li>■ New services cannot develop legally, but may still defeat restrictions.</li> <li>■ Users lose potential benefits from innovation and cost reduction.</li> <li>■ Government faces increasing pressure to remove restrictions.</li> </ul>	<ul style="list-style-type: none"> <li>■ Case-by-case decisions allow progress but expose policy inconsistencies.</li> <li>■ Growing uncertainty discourages investors and operators.</li> <li>■ Government faces increasing pressure to revise policy.</li> </ul>	<ul style="list-style-type: none"> <li>■ The market evolves with new services and business models.</li> <li>■ Growth and innovation accelerate.</li> <li>■ Users benefit from increased access and choice and reduced prices.</li> </ul>

Source: Authors.

Arab Emirates, incumbent Etisalat offers a full range of converged telecommunications and video services, but Internet telephony services like Skype were banned in 2006. Concerns involving content regulation have led Bahrain, which has an otherwise liberal telecommunications sector, to restrict private participation in audio-visual services, preventing fully converged services. As of early 2008, India, which has an open and competitive media sector, did not allow private FM radio stations to broadcast news.<sup>6</sup>

Resisting convergence reduces potential benefits, is difficult to enforce, and inevitably leads to pressures for reform. Restrictions cause users to lose potential benefits from innovation and cost reduction. Since Kenya legalized VoIP in 2004, prices for international calls have fallen by up to 80 percent. Legalization of VoIP not only drove the growth of VoIP but also the adoption of broadband and triple play in Kenya, Tanzania, and Uganda. Where VoIP is permitted, small providers can evolve into information technology businesses.

Even where new ICT services cannot develop legally, innovators may still defeat restrictions. The presence of a global gray market for international voice telephony, accounting for between a quarter and a third of international call revenues, attests to the possibility of service provision irrespective of market restrictions.

Resisting convergence may protect short-term interests of governments and particular ICT players. However, the evolution of technology, and the potential for provision in spite of restrictions, will ultimately undermine such a policy. The outcome of resistance will be to delay convergence and its benefits while damaging policy credibility.

## **Wait and Watch**

Governments might believe that their existing policy accommodates convergence or decide not to act on market developments. Countries seeking to maintain a laissez-faire or free market approach to the sector might choose not to regulate for or against convergence. On the other hand, some governments might not have the political capacity

to resist or enable convergence, so wait and watch may be their only practical option.

Under the wait and watch approach, governments do not make changes to their policy frameworks. Instead, they rely on existing policy, legal, and regulatory instruments to deal with issues on a case-by-case basis. In the United States, the FCC and the Department of Justice track mergers and acquisitions in the ICT sector and use general competition law to stop the formation of monopolies or anticompetitive behavior.

Though the wait and watch approach does not necessarily hold back convergence, it can lead to confusion and uncertainty. Because convergence blurs the boundaries among ICT subsectors, case-by-case decisions on structural issues may expose inconsistencies due to the different business and regulatory histories of each subsector (Bar and Sandvig 2000). When rules and policy frameworks overlap or conflict, regulatory risk increases, which can in turn increase the cost of capital by up to 6 percentage points (depending on the country or region), slowing investment in infrastructure and services.<sup>7</sup>

In the United States, the wait and watch response has led to conflicts and concerns. A dispute over the introduction of video over IP services in the state of Connecticut led telecommunications operator AT&T to consider canceling \$336 million in investments and suspending 1,300 jobs (*New Haven Register* 2007). The conflict arose because the state required city-level franchising for cable television operators. AT&T faced delays and increased costs if its video service was to be treated as a cable television service because instead of securing one statewide telecommunications license, it would have had to seek licenses city by city. After 17 months of deliberation, the conflict was resolved in October 2007. During the process, the state cable television regulator reversed decisions and was challenged in the courts twice. Not only did the uncertainty cause significant risk to inward investment and job creation for the state, it also undermined the credibility of regulation.

As conflicts and uncertainty regarding ICT grow, governments face increasing pressure to revise policy. The absence of a response can have a significant negative effect by failing to provide certainty for

investors, as well as not providing a means to overcome inconsistencies in the legacy frameworks. The United States, for example, is now concerned that it is falling behind its European and Asian peers in broadband penetration and reduction of ICT-related tariffs (Windhausen 2008). This led to calls for government intervention and now the development of a national broadband strategy even in a market that has traditionally adopted a laissez-faire approach to the ICT sector. Thus, while a wait and watch response might not prevent convergence, it may lead to outcomes that result in suboptimal benefits.

## **Enable**

Some governments believe that convergence can benefit the ICT sector and the economy at large, and choose to create an environment that actively promotes innovation and competitive service provision. The international experience with the mobile telephone revolution indicates that when service providers have clearance to offer a service, face few government restrictions, and have explicit or implicit government support, the market can develop very quickly. Similar expansion in investments and access to advanced ICT services can result from the creation of an enabling policy environment for convergence.

Enabling policy environments allow markets to evolve with the introduction of new services and business models. Box 2.2 illustrates the importance of allowing firms to overhaul their business models in response to changing technology and market conditions. Policy that promotes convergence will accelerate growth and innovation. This reduces inconsistencies and artificial barriers, cuts risks and entry costs, and creates a better environment for investment. Further, users benefit from increased access and choice and from reduced prices.

Creating an enabling environment can involve different levels of government engagement with the ICT sector. First, governments can amend policy to address convergence and remove barriers and restrictions. At a minimum, a policy response to convergence will resolve some of the conflicting rules among converging sectors and create a level playing field in the market.



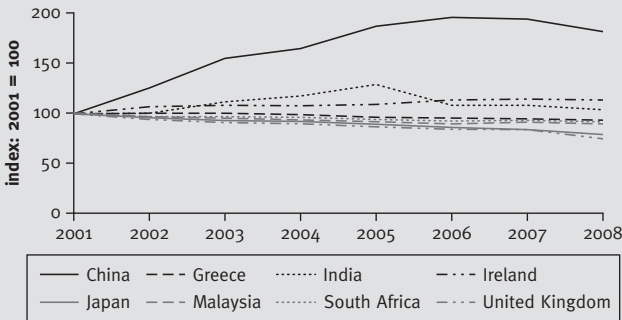
**Box 2.2 The Impact of an Enabling Environment for Convergence: Wireline Telephony and Job Creation**

Worldwide, the wireline telephony business is stagnating or shrinking due to the shift to mobile, cable, and broadband telephony. This transition is threatening wireline telephone companies, raising the possibility of job losses.

In April 2008, U.S. telecommunications firm AT&T announced that it would cut 4,600 jobs in its shrinking wireline business. The firm indicated that it would simultaneously hire about the same number of or more employees to support the rollout and operation of its expanding wireless, television, and broadband services. AT&T's shift into converged and broadband services is allowing it to keep its total headcount about the same. Along similar lines, telecommunications firm Verizon is investing \$18 billion in its fiber rollout for its triple-play business.

Worldwide, however, wireline firms invested more than \$36 billion in equipment over 2007, up more than 10 percent from 2006, with spending increasing on optical transport and routers and VoIP equipment.

**The Subscriber Base for Wireline Services Is Stagnating or Declining around the World**



**Box 2.2 continued**

If AT&T and other similar firms are not allowed to expand into new market segments, they cannot build their businesses, leading to negative outcomes like job losses. Restrictive policy frameworks prevent such new business models and negatively impact the economy. Having an enabling framework will allow an expansion in economic activity and potential job creation.

*Sources:* Dow Jones, Pyramid Research, AT&T, DellOro Research, authors' analysis.

Several countries have reformed their policy and regulatory frameworks to accommodate and enable convergence while simultaneously moving toward a greater focus on market forces. Singapore and Kenya, among others, have moved toward technology-neutral licensing regimes that allow service providers the flexibility to deploy the most efficient networks. Going further, Malaysia, the United Kingdom, and, more recently, the Republic of Korea have restructured their entire legal and regulatory frameworks to align with convergence and allow multiple play without restriction.

Given that the primary implication of convergence is a change in market structure, policy makers have the opportunity to promote competition as they undertake policy reform. Creating a competitive market on a level playing field for different service providers has been recognized as the most effective means to drive growth and encourage efficiency in ICT—leading to reduced prices and improved quality and supporting investment in the sector.

In some countries, a second level of government involvement provides incentives for firms to invest in the deployment of advanced ICT services. The government of Japan, for example, provided interest-free credit, subsidies, preferential tax rates, competition-enhancing rules, and other measures to promote the deployment and use of fiber-optic

broadband networks (Dow Jones International News 2000). Today, Japan leads the world in fiber-optic home subscriptions, with more than 8 million homes connected (*New York Times* 2007).

Finally, some governments directly invest in infrastructure and services. Government investment can provide a significant push during the early stages of convergence and make the government's policy stance clear. One study found that connecting homes with fiber-optic networks is financially feasible in cities only if take-up is more than 25 percent of homes, mainly due to the high costs of deployment (Sigurdsson 2007). Passive infrastructure accounts for up to 80 percent of these costs (Gauthey 2006). Hence, governments that reduce the cost of rollout by sharing costs or providing right-of-way can jumpstart development.

As part of their investment, governments can lead development of advanced networks or create an open-access infrastructure that can attract private investment. By 2008, 65 percent of households in France had broadband service (Paul Budde Communication 2009) and multiple service providers had benefited from the unbundling of incumbent France Telecom's network. Now, the national and local governments are investing in the rollout of open-access fiber networks that private service providers will pay to use. Included in this plan are opening sewers and conduits to allow competitive service providers to lay their fiber-optic cables. According to one estimate, this will reduce costs of network deployment by up to 60 percent (Paul Budde Communication 2008).

Direct government investment in ICT carries risks and challenges, however. First, the government's preferential treatment of some service providers may distort the market. In Germany, for example, the incumbent Deutsche Telekom (DT) invested €3 billion to build a hybrid fiber very-high-speed digital subscriber line (VDSL) network. The government gave DT permission to keep its network closed to competitors, in opposition to European Commission (EC) guidelines. While DT claimed that opening its network would diminish its returns on investment, the EC saw this as anticompetitive—benefiting DT but cutting off potential benefits from increased competition from other service providers.

A second risk is that public funding of broadband networks can distort the market. To address this issue, the EC verifies that interventions are in line with state aid rules.<sup>8</sup> These rules require justification for state intervention and an analysis of the impact of the aid on competition in the market. In areas where competing private operators are present, the EC can prohibit state investment if “intervention may crowd out existing and future investments by market players” (Papadias, Riedl, and Westerhof 2006, p. 13). This also implies that governments need to demarcate their role as an investor from possible roles as a service provider. Put another way, public investments should not serve as a way for governments to reenter service provision, effectively rolling back the sector reforms of the past two decades.

Finally, governments risk investing in technologies or services that may never find a mass market, may quickly become obsolete, or may slow down further innovation. France’s recent success in the broadband market came after much criticism of its deployment of the pre-Internet data service Minitel. The government invested \$11 billion in the system over 20 years, with service beginning in 1981 (*International Herald Tribune* 1996). At that time, Minitel was an advanced data service serving a pioneer market. But with the rapid development of the Internet in the 1990s, Minitel remained a policy and business priority well beyond its useful life.

The three levels of government involvement outlined above can be cumulative. Creating a framework that promotes competition and innovation may need these stages in sequence. Experience suggests that the priority has been to first remove policy and regulatory restrictions, then create new frameworks to address convergence and promote competition and innovation, and finally move toward encouraging or investing in these technologies and services. These might be considered as stages in the creation of a policy framework that enables convergence.

The United Kingdom began with creating an enabling policy and regulatory framework in 2003, when it promulgated the Communications Act and created a converged regulator, the Office of

Communications. In 2004, however, the government and regulator began to push incumbent BT to reorganize. The impetus was to lead BT toward opening its local access networks to competitors, as the government believed this would promote competition and drive the penetration of broadband services. In 2007, the government began discussions about investing £10 billion in its own national fiber-optic network. The reason for this move was to catch up with other countries that were investing in fiber-based infrastructure “delivering considerably higher bandwidth than is available in the UK” (BBC News 2007). Over time, the United Kingdom has moved from a policy response to working with firms and, most recently, to planning direct investment in the ICT sector. Further, the government formed a “convergence think tank” to suggest means to improve the policy framework given further technological and market developments since the last major revision in 2003 (U.K. Department for Culture, Media and Sport 2006). This think tank was merged into the Digital Britain review that was launched in October 2008 (U.K. Department for Culture, Media and Sport 2009).

## Nothing Endures but Change

Around the world, ICT service providers embrace convergence to enter new markets, drive growth, and improve their business prospects. Users are also responding, with a significant number of people subscribing to innovative services at lower prices. Undoubtedly, the market is driving convergence forward, leading to significant potential benefits.

As such, a policy maker’s role is to respond to these changes. In this, different countries have followed very different paths in response to convergence. With a variety of options available to policy makers on how to respond, it is essential that they have a firm understanding of the implications of convergence and their decisions.

In the long term, countries that resist are likely to lose out on the benefits of improved ICT technologies and services. Countries that wait and watch might benefit if they have appropriate policy frameworks already in place, but risks remain because convergence typically does

not fit easily into traditional policy frameworks. Evidence suggests that the greatest benefits are derived in markets that enable convergence.

If a country decides to create an enabling policy environment, it will have to implement specific regulations supporting this decision. Moving toward an enabling environment will at least require a review of policy and regulatory frameworks. Indeed, translating a broad vision and policy for convergence into a set of specific regulations is likely the more difficult task.

The next part of this combined report addresses some of the regulatory challenges and emerging responses to service convergence or multiple play. Emerging trends suggest best practice principles as promoting competition, creating a level playing field, and reviewing the authorizations regime and spectrum management frameworks. These lead to regulatory frameworks that enable multiple play and, more broadly, convergence.

Policy makers seeking to respond to convergence and enable it will find that this move to promote competition and support innovation in services will benefit the ICT sector. As a market phenomenon that can reduce prices, spur growth in coverage, and drive investments, convergence will enhance the effects of earlier liberalization. And as countries begin these second-generation reforms in the ICT sector, they will find themselves and their economies the better for it.

## Notes

1. For conciseness, this chapter focuses on the supply of information and communication services rather than on their demand and use, including content and applications. The chapter presents a selection of the different views on convergence found in current practice, bearing in mind the interests of ICT policy makers and businesses in the developing world.
2. Estimated from Internet World Stats (2007) and ITU (2006).
3. Many countries have also begun to consider digitizing terrestrial broadcasting. Such developments alter the scope of services that can be carried over the

broadcast spectrum, because it reduces the amount of spectrum needed to carry television signals. The freed excess spectrum—the “digital dividend”—can be used for broadband and other new wireless services and networks, introducing convergence among wireless technologies. It can also significantly increase coverage, especially since the bands used for broadcasting have wider reach.

4. Afghan Telecom’s high-speed wireless dial-up Internet service uses cellular networks to carry data and voice services.
5. There is a significant amount of literature dedicated to the analysis of the development impact of ICT. See, for example, Grace, Kenny, and Qiang (2004) and Wang (1999).
6. A recent recommendation from the sector regulator allows these FM stations to broadcast news. The recommendation, however, must still be accepted by the Ministry of Information and Broadcasting (Telecom Regulatory Authority of India).
7. See Estache and Pinglo (2004); Jamison, Holt, and Berg (2005); Kirkpatrick, Parker, and Zhang (2006); and Smith (2000) for further details.
8. The Commission’s Director General for Competition (DG Competition) “monitors state aid to the ICT sector and contributes to the development of State aid policy in this field. State aid is defined as an advantage in any form conferred on a selective basis to undertakings by national public authorities. In view of this definition, a number of measures such as research and development aid or regional aid to ICT companies have to be monitored by DG Competition in order to avoid market distortions. DG Competition also clears aid that is beneficial to consumers, by providing new research grants and encouraging the development of new products, such as open source” (European Commission n.d.).

# 3

## Emerging Regulatory Responses to Multiple Play

In the information and communication technology (ICT) sector, “multiple play” refers to situations in which a service provider uses a single communications network—typically a telephone or cable television network—to provide a combination of services such as telephony, media, and Internet access. Around the world, providers of communications services are adopting business models based on multiple play. In doing so, they are using their existing infrastructure to expand coverage, increase subscriber bases and revenues, and reduce costs.<sup>1</sup>

Multiple play is actually a subset of a much broader trend in the ICT sector toward convergence, which involves reducing distinctions between previously separate market segments, services, and technologies. The trend results in substitute (or “converged”) services, both within the telecommunications sector and among telephony, broadcasting, and computing—without regard to the underlying technology.

Almost every current form of content can be carried over high-speed Internet networks, including stored sound (such as MP3 music files), interactive sound (such as Internet telephony), streamed sound (which emulates broadcast radio), text (e-mails, instant messages, newspapers, and books), images (digital photos), video (such as WMV [Windows Media Video] files), and mass audience streamed video (such as Internet protocol television, or IPTV).



Multiple play significantly changes the modes of service providers' operations and brings together two traditionally very differently regulated markets, telecommunications and media. These changes require that regulation adapt to new business models and the evolving ICT sector.

## **Supply of and Demand for Multiple-Play Services Are Growing**

Delivering multiple services to consumers requires broadband connectivity—a precondition increasingly in place around the world. In 2007, fixed broadband was commercially available in 166 countries, with nearly a quarter of the 300 million fixed subscribers in middle-income countries (estimated from Internet World Stats 2007 and ITU 2006).

Moreover, there is strong demand for multiple play and its related services. Skype, an Internet telephony service, has more than 400 million subscribers in 225 countries and territories (eBay 2009), and in 2007 carried 4 percent of international telephone traffic (Tele-Geography 2007). By late 2007, there were more than 30 million “triple-play” subscribers worldwide—typically receiving telephony, broadcasting, and Internet services. With the increasing availability of broadband and growing user awareness of and interest in related services, multiple play will likely become increasingly popular.

Service providers see multiple play as a way to enter new markets and break down traditional boundaries between telecommunications (telephony and Internet communications) and media services. Operating beyond their long-standing models of cable television or telephone services, for example, companies are now offering all types of communication services over their networks. In the United States, Comcast (2009) has 24 million cable television, 13 million broadband Internet, and 5 million digital telephone customers. In May 2008, it joined a consortium that plans to deploy wireless broadband services as well. Similarly, France Telecom is the world's largest broadband

television provider, with 1.1 million subscribers, followed by Verizon in the United States (Telecommunications Management Group 2008). Service providers in developing countries are beginning to invest in similar business models (box 3.1).

### **Box 3.1 Examples of Multiple Play in Developing Countries**

Telephone and cable companies in Brazil recently began converging. Telemar acquired Way TV, while Telefónica bought a stake in television company TVA. These moves came in response to the introduction of triple-play services by cable operator NET Serviços, which has an estimated 400,000 triple-play subscribers.

In the Arab Republic of Egypt, Telecom Egypt has begun upgrading its fixed-line network to an Internet-based next-generation network, allowing it to provide both telephone and Internet services. Its Internet service provider subsidiary, TE Data, introduced IPTV services in October 2006.

In 2006, Telefónica Chile began offering IPTV and satellite television services to counter the decline in fixed-line tariffs and subscriptions. Cable operator VTR has seen its triple-play subscriber base double since 2006, and is considering acquiring a high-speed third-generation (3G) telephone license to add mobile telephone services to its portfolio.

India's public sector incumbent telecommunications operator, Mahanagar Telephone Nigam Limited, introduced IPTV services in Mumbai in 2006. The service offers about 150 channels for about \$5 a month, and has 6,000 subscribers. A number of private operators have since begun providing IPTV services.

Sri Lanka's Dialog Telekom offers telecommunications and broadcasting services. It has become a quadruple-play operator—offering fixed and mobile telephone, television, and

*(continued)*

**Box 3.1 continued**

Internet services. Its satellite television service reaches more than 60,000 households, and its mobile service has 4.3 million subscribers and will soon include 3G services.

In March 2008, Ukraine's Comstar began offering IPTV services over its fiber-based next-generation network, making it the country's first provider of triple-play telephone, broadcasting, and Internet services. Comstar will soon face competition from Golden Telecom Ukraine and fixed-line operator Ukrtelecom. The IPTV offerings follow broadcaster Viasat's plans to introduce digital satellite television services later in 2008.

*Source:* Authors' analysis.

## Multiple-Play Challenges in Legacy Regulatory Frameworks

Legacy regulatory frameworks may impede implementation of multiple-play services in two main ways: first, frameworks can impede new service providers from entering markets; and second, different legacy rules may apply to different operators providing different services—creating a situation in which the playing field is not level.

Obstacles to entry of new firms within a legacy regulatory framework can include the possibility of not allowing existing service providers to expand the range of services they offer—that is, failing to authorize network owners to provide services that their networks are capable of delivering. Many countries' regulatory frameworks permit only specific services on a network. Cable television companies and Internet service providers are often not permitted to provide interconnected voice telephony, while telephone companies are often barred from offering broadcasting services. In some cases, though there is not

complete restriction on market entry, service providers face high entry barriers or delays in acquiring licenses or resources, such as telephone numbers or spectrum.

Such impediments to market entry prevent competition in service provision and diminish the performance of not just the ICT sector, but an entire economy. Disallowing the full use of networks also reduces their financial viability. Delays in permitting expanded or better service choices to customers slow innovation and make network investments less attractive.

In terms of competitive playing fields, adhering to legacy frameworks might create situations where operators provide the same or similar services but are regulated differently because they operate under different rules. These differences arise from the separate development of the regulatory frameworks that have traditionally governed telecommunications, broadcasting, and Internet services.<sup>2</sup> Now, as service providers enter new markets, fairness and efficiency require that similar rules apply to similar services to safeguard competition regardless of the underlying network.

Telephone service providers traditionally have had to follow local loop unbundling regulations, pay into universal service funds, or follow price controls. These rules might not apply to cable television operators even if they provide the same or similar services as telephone service providers, allowing the cable television operators to benefit from lower costs or higher efficiencies. Such differences in the regulatory environment are based purely on legacy frameworks and undermine competition.

Efforts to overcome the nonlevel playing field give rise to a number of questions: Should broadband-based providers of telephone services pay the same contributions to universal service funds as do traditional telephone service providers? Should they be subject to the same price controls? And how do traditional price controls work when services are bundled? Table 3.1 presents some examples of how traditional regulatory frameworks can impede multiple play and have negative implications for the ICT sector.

**Table 3.1 Some Examples of Regulatory Impediments to Multiple Play**

<b>Impediment: restrictions on new entry</b>	<b>Implication</b>
An Internet service provider with its own network is authorized to provide Internet service but prohibited from providing voice-over-Internet protocol (VoIP) service.	The regulatory environment prevents networks from delivering all their capability to customers. The financial viability of network investment is damaged and deployment of services restricted.
An incumbent telephone company invests in a high-speed broadband network but faces delays in obtaining authorization to provide video content services such as cable television or IPTV.	The regulatory environment delays implementation of expanded service or service choice to customers and damages the attractiveness of network investment.
An incumbent telephone company has regulatory obligations—such as local loop unbundling, payment to universal service funds, or price control—that do not apply to cable television operators or resellers providing the same or similar services.	The regulatory environment is not providing a technology-neutral level playing field. As a result, customer choices are distorted and there is a loss of economic efficiency.
An incumbent telephone company has better access to public rights of way than cable television operators.	The regulatory environment is not providing a technology-neutral level playing field.
Radio spectrum is available at a nominal price to some users (such as broadcasters) but is available to others only at commercial prices that reflect scarcity value (such as cellular mobile or broadband wireless access operators).	As convergence progresses, with more video content distributed over mobile or broadband wireless access networks, the need to progress all commercial users toward a common system of economic pricing for spectrum becomes more important.

Source: Authors.

## What Role Should Regulatory Frameworks Play?

Regulatory frameworks have an important role in the era of multiple play. First, they have to remove such impediments to the full play of market forces and technological innovation. Second, they can

facilitate the realization of benefits from innovation and competition, and reduce the risk of creating dominant market power. Consequently, they must adapt to multiple play.

For regulatory frameworks to create an enabling environment, they have to remove artificial restrictions and promote competition on a level playing field. Ensuring an enabling regulatory framework will require that the tools and approaches used for authorizations, spectrum management, interconnection and access, and universal service facilitate the free play of market forces and the deployment of new technologies. If regulatory frameworks allow the market to function without impediments to innovation and competition, they will support the introduction of advanced technologies, encourage new investments, and enable growth.

Legal responses, broadly construed, usually lag technical developments. Only in some cases do governments make strategic and policy decisions ahead of time to champion multiple play that regulators then implement. Typically, regulators will be confronted with and need to make decisions about multiple play after it has already been introduced by innovative service providers.

In either case, regulators respond to market developments within an existing framework, or to changes in the policy and legal environment. The way that regulatory reform occurs can play an important role in creating positive perceptions and stable regulatory regimes. The speed, transparency, and strategy behind a regulatory response will greatly determine how the market perceives the environment. Further, experience suggests that when regulatory decisions are made through open and transparent consultations with stakeholders, it builds the regulator's credibility in the market and better informs decision makers (box 3.2).

## **Implementing the Regulatory Response**

Given the growth in broadband-capable infrastructure and proliferation of Internet protocol (IP)-based networks, it is hard

### **Box 3.2 Consultations Can Build Support for and Strengthen Regulatory Responses**

Regulatory reform is often difficult and complex. It typically proceeds in a piecemeal fashion, overcoming specific resistance at different stages of the process. Hence, careful and strategic planning, along with consultations and transparent discussions, enables a smoother transition—even if it takes more time to build momentum. This approach enables reformers to build support and have an open, transparent reform process.

Consultations are also important because investors will lose confidence if the government is seen as taking unilateral steps—even if such steps might have positive outcomes. If government initiatives are seen as damaging, they might undermine efforts to develop an enabling regulatory regime that supports investment and growth.

Consultations and discussions are also proven mechanisms for regulators and ministries to understand the varying potential challenges and opportunities that are part of the reform process. Opening discussions to all stakeholders and maintaining ongoing, clear communication make the process more effective. Transparency also ensures that regulatory reforms consider and satisfy public interests and that the process occurs without bias to any one segment of the market. Moreover, exchanging ideas in an open, transparent setting helps regulators develop effective relationships with stakeholders and increases their capacity and knowledge, making it easier to counter potential resistance.

*Source:* Authors.

to justify any regulatory delay in responding to multiple play. Yet it is rarely possible to implement radical reforms in one quick step. Reform often takes time and can be slowed by political obstacles. Still, in some cases, there may be windows of opportunity to initiate reform.

When such opportunities present themselves, governments should be able to identify reforms that will do the most to achieve their goals. As such, there will be a gradation of responses—from “greatest impact” to “important” to “desirable but not essential.” Thus, even with limited political capital and technical capacity, regulatory reform can have a significant impact if it is prioritized.

Given its primacy in allowing service providers to offer multiple play, the authorizations regime may be a good starting point for such reform. Acting within the existing policy and legal framework, the authorizations regime can be amended to accommodate new business models and operators immediately. Such a move initiates regulatory reform and allows market forces to operate, even if partially.

By contrast, another common approach—often overemphasized—is creating new agencies or modifying laws to accommodate multiple play. Doing so takes significant time and political capital that may deflate willingness to implement further reforms in the sector. Though having a “converged” institutional framework is typically perceived as being desirable and has potential efficiency benefits (García-Murillo 2005), it is not essential. Some countries create converged institutions simply by combining their telecommunications and broadcasting services. But success in moving toward multiple play depends more on coordination between agencies and their ability to function in a way that enables new business models and operations.

## **Crucial Principles for an Enabling Regulatory Environment**

An in-depth survey of regulatory responses to multiple play in six countries formed the starting point of this report’s conclusions (see summary in table 3.2). Two regulatory principles are discernible from the range of responses. First, regulatory frameworks are looking to promote competition. The ways in which authorizations are allocated and spectrum is assigned, for example, clearly indicate a trend toward openness, flexibility, and market mechanisms. This enables easier market entry by nontraditional service providers.



**Table 3.2 Summary Results of a Survey of Six Countries**

<b>Country</b>	<b>Authorizations</b>	<b>Spectrum</b>	<b>Interconnection and access</b>	<b>Universal service</b>
Australia	Converged licenses for telecommunications facilities and services; broadcasting separately licensed	Trading is allowed; market mechanisms for assignment	Opposition from incumbent to open access; government is currently building national network	A minimum data service is guaranteed and subsidized
Canada	General authorization, with a technology-neutral regime for telecommunications, on a notification basis unless spectrum is needed	First-come-first-served for bands in low demand, auctions for bands in high demand; technology neutral, flexible use in some cases	Ex post regulatory involvement; unbundling only for essential facilities	Wireless services have no obligation; universal service for fixed telephony; cable television to reach all residences
India	Technology-neutral licensing for telecommunications; specific IPTV conditions	Technology-specific, service-specific licensing; spectrum is included in the service license	Service-specific interconnection	Broadband and mobile telephony have been added to the program

Singapore	Converged carriage licensing regime; but needs specific licenses for IPTV and mobile television	Broadband wireless access spectrum can be used for voice telephony	Currently tendering an "open access" fiber-optic network	None
United Kingdom	Technology-neutral and flexible use; general authorizations for telecommunications	License auctions and trading are common; digital dividend will be available for mixed use	Incumbent undertook functional separation; local loop unbundled	A proposal describes a "next-generation fund" supported by payments from fixed copper line subscribers
United States	Multiple levels of licensing; federal authorizations; more specific licenses at state and city levels	Spectrum freed by the move to digital television allocated on a service and technology-neutral basis	Rural telephone operators have to connect with "interconnected VoIP" providers	VoIP providers are required to contribute

Source: Authors' analysis.

Second, regulatory frameworks are being set up to ensure that markets, not regulations, pick winners. This requires regulatory symmetry—the application of similar rules to service providers offering similar services—to create competitively level playing fields. Use of similar rules will encourage interconnection, universal service, and spectrum assignment, for instance, to become competitively neutral.<sup>3</sup>

The general trend in authorizations, spectrum management, interconnection and access, and universal service is to have a framework that supports competitive service provision and applies similar rules to similar services regardless of technology (in other words, is technology neutral). A pro-competition regulatory framework supports service growth and user benefits, while symmetry creates a level playing field. Together, these underlying principles inform much of the analysis in the rest of this report.

## **Promoting Competition Is an Essential Part of Multiple Play**

There is a strong connection between multiple play and competition. Multiple play will emerge only when regulations allow easy market entry by service providers. Thus, the extent to which multiple play enters and affects a market greatly depends on the overarching competition policy. Cable television companies have entered the Internet or telephone services market because governments have liberalized them.

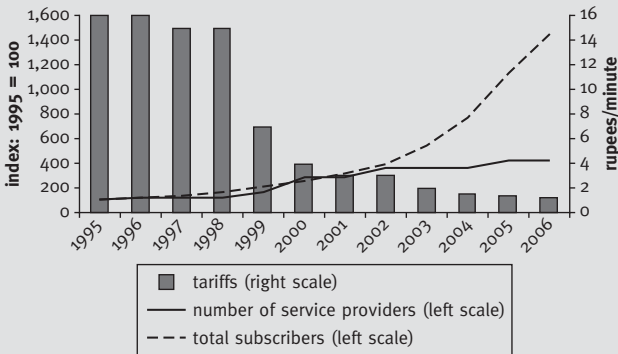
Similarly, telecommunications companies can add video services to their offerings only if a country's competition policy allows entry into cable television or general broadcasting and media markets. Such a move promotes competition and results in reduced tariffs, increased coverage, and better quality of service (box 3.3). It also allows firms to operate without restriction and use their networks more efficiently.

While multiple play might lower entry barriers, there is also a risk that it could lead to monopolistic market conditions, through several means. First, multiple play might reduce competition because only those service providers that can invest in multiple service

### Box 3.3 How Competition in Telecommunications Affects Growth and Consumer Costs: Lessons from India and the United States

Over the past two decades, liberalization of telecommunications has shown that competition is the most effective mechanism for spurring sector growth. For example, India's growing number of mobile telephone service providers has driven growth in subscribers and pushed down calling costs (see the figure). India is now the world's fastest-growing mobile telephone market—and, like many other countries before, it is benefiting from increased competition due to an enabling regulatory environment.

#### Competition in the Indian Mobile Telecommunications Market Has Driven Growth



Similarly, a 2004 report by the U.S. Government Accountability Office (GAO) of 12 domestic markets found that market entry by competing broadband service providers offering combinations of telephone, cable television, and Internet services induced incumbent cable television companies to provide more and better services, lower rates, and offer promotional deals.

*(continued)*

**Box 3.3 continued**

Incumbent telephone providers did not show a similar response, but indicated to the GAO that incumbent cable television companies were their main competitors in the high-speed Internet market.

The GAO survey found that expanded basic cable television rates were 15–41 percent lower in five of the six markets with competing broadband providers than in similar markets without such competition. Almost all the incumbent cable television operators said that they lowered their cable and high-speed Internet prices to compete. Consequently, the report concludes that competition results in substantially lower prices for consumers.

*Source:* TRAI (Telecom Regulatory Authority of India) data; GAO (2004).

provision can successfully compete in the market. Second, if a service provider is able to achieve increased efficiencies, it might become a dominant player in the converged market by leveraging its position in one of these markets. Third, multiple play may significantly weaken incentives for investing in new facilities, as a single service provider might now serve areas that previously did not have any infrastructure in place. Hence, an enabling environment for multiple play requires a pro-competition regulatory framework that allows entry into new markets and guards against the creation of harmful monopolies.

Regulators will also have to rethink their approaches to regulating competition in light of multiple play: with the boundaries between cable television and telephone companies breaking down, regulators will need to ensure that the ICT market as a whole remains competitive. Consequently, definitions of “market power,” for example, which typically focus on the subscriber base or revenues of only telephone

or cable television companies, might have to expand their focus to include all the relevant firms.<sup>4</sup>

It is important that the drive to prevent monopolies does not compromise innovation, good business models, or organic growth. As a result, regulators are now moving from *ex ante* to *ex post* competition regulation. Before intervening, regulators look for evidence of anti-competitive behavior. This is a significant change from before-the-fact restrictions on what constitutes anticompetitive behavior, such as limits on ownership or market share. This more flexible approach allows innovation and new business models while keeping their impact on market efficiency in check (ICT Regulation Toolkit 2008).

### **Regulatory Symmetry Is Important—but Has Exceptions**

Legacy regulatory frameworks have different rules for cable television, radio, fixed telephony, and so on. These differences lead to asymmetric regulations across communications sectors. When multiple play brings together these sectors, it is no longer possible to distinguish between them—exposing the asymmetries in legacy regulatory frameworks and creating uneven playing fields.

Regulatory asymmetry is harmful when it creates confusion and distorts markets. Asymmetries can lead to overlaps and conflicts that increase regulatory risks and raise the cost of capital by up to 6 percentage points (see Estache and Pinglo 2004; Jamison, Holt, and Berg 2005; Kirkpatrick, Parker, and Zhang 2006; and Smith 2000 for details). This slows investment and blocks full competition in infrastructure and services. Asymmetries can also enable regulated firms to use regulatory processes to secure artificial competitive advantages. Thus, in some cases, regulation may not be picking winners as much as firms skilled in exploiting regulatory processes.<sup>5</sup>

If multiple play allows competition between service providers that did not previously compete and have been subject to different regulatory regimes, “the various regulatory regimes will have to be reformed and harmonized or else run the risk of creating distortions”

(Katz 2000, pp. 29–30). Regulatory symmetry can rectify and prevent such outcomes.

Symmetry is a simple notion: fungible services should be regulated under the same terms and conditions. In addition to appealing to notions of fairness, symmetric treatment promotes efficiency. If substitutable services are treated the same, service providers with better-quality services and business models will prevail in the market.

This report considers regulatory symmetry to be synonymous with technology neutrality, where regulations do not concern themselves with the technologies used to provide a given service.<sup>6</sup> Many countries, including India, Kenya, Singapore, and Uganda, have adopted technology-neutral licensing regimes, allowing licensees to deploy any technology as long as they follow technical guidelines. This approach allows service providers to choose the most efficient technology for their purposes, clearing the way for deployment of advanced communications systems and enabling future technological evolutions to enter the market with the fewest regulatory restrictions.

At the same time, in some cases, clearly defined and predictable asymmetries can ensure competition and foster growth in new technologies. Regulators often apply stricter or more rules to dominant service providers to ensure that they do not abuse their market power. For instance, these rules often require providers to unbundle their local loops and interconnect with competing service providers. Sometimes, regulations mandate incumbent mobile telephone service providers to offer national roaming facilities to new entrants for a limited time so that the new entrant can compete effectively even as they deploy their networks.

Thus, the regulatory principle is to ensure symmetry unless there are justifiable reasons not to do so. Supporting or creating opportunities for firms to game the regulatory framework will slow investment, destabilize the regulatory regime, and impede multiple play. Any intentional asymmetries should be transparently applied, and regulation of dominant operators should not focus on specific companies but follow predefined criteria.

## Authorizations

In some markets, authorizations—the legal instruments, such as licenses or concession agreements, that allow service providers to enter markets and define the rights and obligations of authorized parties (ICT Regulation Toolkit 2008b)—have been the result of regulatory responses to multiple play, while in others they existed before multiple play.<sup>7</sup> But in all markets, the authorization regime is a top priority in creating an enabling regulatory environment that facilitates a market-driven transition to multiple play. Service providers can lawfully provide only those services that fall within the scope of their authorizations. As a result, even though technology permits multiple play and service providers' business models could benefit from it, authorizations may hold them back. Mechanisms for awarding authorizations also have significant implications for the market effects of multiple play. Regimes that allow easy entry by new service providers or permit older service providers to enter new market segments will facilitate the introduction of multiple play.

Recent trends have been for regimes to move from technology (or service-specific) authorizations to open and flexible regimes, as in Kenya and Uganda (table 3.3). Some countries, such as Malaysia and Singapore, have moved to class licensing for some services. There is also an emerging trend requiring only simple notification for some services (as in Finland, Japan, and Moldova) or, in the future, toward de-licensing.

### How Do Authorizations Affect Multiple Play?

Governments typically authorize telecommunications and media service providers before allowing them to begin delivering services. These authorizations typically specify who can build communications infrastructure or offer communications services. They also define the scope of services that licensees are allowed to offer.

Traditionally, authorizations have specified the types of technologies and services that licensees can provide. The separate histories of



**Table 3.3 Evolving License Types to Authorize Service Providers' Operations**

<b>License type</b>	<b>Description</b>	<b>Example</b>
Specific licenses	Licenses are developed and awarded to individual service providers. Licenses have specific terms and conditions.	Many of the initial fixed-line and mobile phone licenses followed this approach.
Uniform licenses	All similar service providers have the same license and terms and conditions.	Many current telephony regimes follow this approach.
Class licenses	Technology-neutral licenses that combine converged services or broaden the types of services that fall within a single license ("class licenses").	In Malaysia, the framework consists of 4 general and technology-neutral licenses, down from 31 in the former framework.
Unified licenses	Licenses are amalgamated into a single license covering a wide range of services, effectively technology and service neutral.	Kenya's latest licensing regime uses a unified and technology-neutral licensing framework that allows any form of communications infrastructure to be used for any type of communications service (compared to 46 types of licenses in the previous regime).
Notification	Operators are free to provide services subject to regulatory obligations and only have to notify the regulator before, or shortly after, initiating service.	European Union countries are moving to an authorization regime using minimal regulatory intervention and requiring individual licenses only where strictly necessary (for example, for the use of scarce resources such as radio frequencies and numbering).
De-licensing	No license is needed to provide communications services.	In some countries, value-added or Internet services are provided in this manner.

Source: ICT Regulation Toolkit 2008d.

telecommunications and media have led to very different terms and conditions for service providers.<sup>8</sup> For example, governments have licensed telephone companies to offer voice telephony using specific technologies, beginning with wireline and moving to cellular and wireless local loop systems. Licenses for media service providers have focused on the provision of radio and television services over terrestrial and cable networks using specific technologies for, say, radio broadcasting or cable television.

But beyond the content of authorizations, the licensing process also controls market entry, allowing government to manage which service providers can enter and operate in which market segment. Regulatory frameworks create other entry barriers, such as requiring telecommunications providers to pay significant entry fees and ongoing taxes. Similarly, cable television networks or terrestrial broadcasters have to meet social and cultural obligations related to content and service. Such requirements determined entry barriers for and profiles of service providers. The mechanism for allocating authorizations thus strongly influences market structures and competition levels.

The mechanism and scope of authorizations have perhaps the greatest impact on multiple play. A restrictive mechanism for or scope of authorizations severely restricts market entry and the ability of service providers to offer combinations of services. At the same time, multiple play has a significant impact on the authorization regime—challenging the traditional separation between telecommunications and media providers and putting pressure on systems with different allocation mechanisms and scopes of service.

Multiple play poses two main challenges to authorization regimes. First, it makes it possible for service providers to expand their scope of operations. While allowing existing service providers to operate in new markets, it challenges traditional restrictions on market entry. Second, with different service providers operating in the same markets, it is difficult and likely counterproductive to maintain asymmetric operating conditions. For instance, not requiring telecommunications firms to adhere to content regulations common to those for

media licenses or not requiring broadcasters to follow service quality guidelines common to those for telephone and Internet service providers will lead to confusion among consumers and unequal regulatory burdens. Regulators have reduced market entry barriers, increased the scope of operations, and mitigated unequal operating conditions in an effort to minimize the potential downsides of multiple play.

### **Restrictive Authorization Regimes Slow the Introduction of Multiple Play**

Multiple play disrupts carefully planned controls on market entry. By upgrading their network infrastructure, telecommunications and broadcasting firms can enter each other's markets with relative ease. Since the introduction of VoIP services, for example, many policy makers and regulators have grappled with how to respond to this new means of providing telephone services. Although new entrants increase competition, they can also reduce the revenues of incumbent providers.

Countries that believe restricting VoIP will prevent loss of revenues for incumbents should bear in mind that illegal gray market traffic also causes losses. For example, Nigeria's Nitel estimates that before it lowered the costs of international calls in 2004, 90 percent of such calls went through the parallel or gray market that used VoIP (ITU 2006). Policy makers and regulators need to understand that it is unproductive to restrain market forces and technological developments using regulation. In trying to do so, they also risk restricting potential benefits for consumers and the economy (box 3.4).

Accordingly, many countries are simplifying mechanisms for market entry. Instead of seeking high license fees, they are moving to simple authorizations with low fees. Some countries have started to adopt open and flexible licensing regimes, allowing service providers to use any technology to offer a wide range of services.

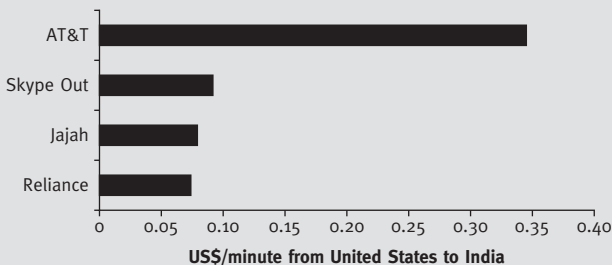
Some countries, especially those in Europe, are eliminating licenses in favor of automatic authorizations for operators that do not

### Box 3.4 The Benefits of an Open Licensing Regime: The Case of VoIP

VoIP-based Internet telephony services such as Skype Out make it possible to have long-distance telephone conversations that are much cheaper than traditional long distance services. Lower costs are also possible with telephone-based services conducted over Internet networks—such as Jajah, which uses the Internet to carry phone-to-phone conversations. If all the international calls made to just the top 10 destinations from the United States used Jajah, the savings would top \$2.5 billion.

If a country's licensing regime prevents the entry of VoIP-based providers or restricts the type of technology they can use, the benefits of convergence for consumers are reduced. Moreover, countries that have banned these technologies have also undermined their technological competitiveness. Failure to legalize VoIP prevents entrepreneurs from developing into a core of fast-growing information technology (IT) startups, the latter of which tends to happen in countries where VoIP is legal.

#### VoIP Service Providers Offer Significantly Lower Costs Than Conventional Carrier AT&T



*Source:* Authors' estimates based on tariff data from service provider Web sites; TeleGeography traffic estimates; Economist Intelligence Unit 2007.

require spectrum or telephone numbers. For example, the European Commission's 2002 Authorization Directive states:

The least onerous authorization system possible should be used to allow the provision of electronic communications networks and services in order to stimulate the development of new electronic communications services and pan-European communications networks and services and to allow service providers and consumers to benefit from the economies of scale of the single market. . . . Those aims can be best achieved by general authorization of all electronic communications networks and services without requiring any explicit decision or administrative act by the national regulatory authority and by limiting any procedural requirements to notification only. (European Commission 2002)

The underlying goal of such authorization regimes is to enable competition through easy market entry. Thus, service providers should be subject to the fewest burdens when entering markets. Enabling competitive entry introduces new business models, investment, network deployments, and services into markets. Service providers can then enter nontraditional sectors and offer service bundles—reflecting the possibilities of multiple play.

### **The Scope of Authorizations Determines the Extent of Multiple Play**

Another aspect of the authorization regime is the scope of the license involved—what it allows a service provider to do. This is probably the most important aspect of regulation for multiple play. If a licensing regime is too restrictive, it will prevent service providers from offering multiple services, automatically restricting multiple play. If networks are capable of providing multiple services on one platform, and service providers are seeking to implement such models, an authorization regime that restricts these possibilities will impose artificial constraints on the market, resulting in underuse of existing infrastructure, lower investment, and reduced economic growth and benefits.

In Singapore, SingTel's efforts to move into IPTV services and offer triple-play services were slowed by its need to seek authorization from the broadcasting regulator, the Media Development Authority (MDA). Seeking to expand its businesses and shore up revenue, SingTel planned to invest \$40 million in an IPTV operation as early as October 2005 (*The Business Times* 2006b; *Straits Times* 2005b, 2006). The MDA offered SingTel a trial IPTV license in November 2006, then created a new IPTV licensing regime in January 2007. Thus, about 14 months passed between SingTel's initial approach to the MDA and the approval, during which cable operator and competitor StarHub increased its subscriber base and saw its profits jump by more than 60 percent (AFX Asia 2007). Even though the MDA saw IPTV as a way to boost competition in the pay television market, its introduction was delayed by the need to pass through the bureaucratic motions of creating a new license.

In another case in Singapore, when third-generation (3G) cellular operators wanted to broadcast television content over their networks in 2007, the MDA proposed that cellular mobile television service providers obtain media service licenses before transmitting television services to their customers. The operators countered this proposal, stating that their 3G licenses included the right to offer broadcasting services. They claimed that after spending significant sums acquiring 3G licenses, they should not be subject to additional licensing.

Companies in countries with regulatory regimes that are less forward-looking and responsive, however, face much higher hurdles. For example, India has 70 million households with cable television, making it one of the world's largest markets for subscription television services (Deutsche Bank 2007). Rules governing cable television operators are separate from telecommunications and Internet licenses and legislation. Licenses for cable television and Internet providers are effectively free and unlimited—a strategy adopted to encourage their growth. But national telecommunications licenses cost about \$400 million. As a result, while many cable television companies are Internet providers, none offers competitive telephone services. Enabling them to do so affordably could double the number of fixed telephone

subscribers and spur growth in broadband subscriptions as a result of bundling and lower costs.

Most countries do not have a completely converged authorizations framework that includes both telecommunications and media services, and even countries that are advanced in adapting to multiple play make distinctions among services. Australia and Singapore, for example, have regimes that support multiple play. For telecommunications, there are two sets of technology-neutral licenses—one for infrastructure providers and one for service providers. But both countries have a different licensing regime for media services. Now that mobile television is entering these markets, both governments are considering the technology's regulatory status.

The emerging trend is for flexibility in authorizations to allow a range of services, opening as many as possible to competition. Many countries have started to respond to multiple play and convergence in their authorization regimes. In the United States, the Federal Communications Commission (FCC) recognizes the need for flexibility in allowing firms under its jurisdiction to provide any combination of voice, broadcasting, and Internet services. Economies such as Hong Kong, China, and India have also implemented unified licensing, allowing service providers to offer any service using any technology.

Still, it is not necessary for countries to offer unified licenses. Different types of licenses might be required as long as entry conditions—that is, acquisition of new and different types of licenses—are not restrictive. As in Malaysia, a country might have multiple types of licenses that still represent a simplified regime (box 3.5). But to make this system work effectively, it is essential to have low barriers to entry in terms of process or pricing, as in Singapore.<sup>9</sup>

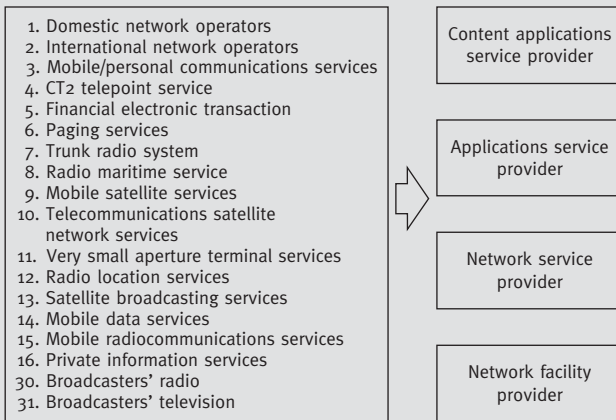
The 2002 European Commission Authorization Directive addresses the use of conditions and explains:

Convergence between different electronic communications networks and services and their technologies requires the

### Box 3.5 Malaysia's Simplified Licensing Framework

Malaysia adopted a new licensing framework in 1998, reducing the number of licenses involved from 31 to 4. This move has made licensing more efficient and reduced possibilities for conflict and overlap in the regulatory framework, significantly improving market efficiency and performance by reducing arbitrage opportunities among service providers.

#### Malaysia Dramatically Reduced the Number of Licenses Required for ICT in 1998



Source: World Bank staff.

establishment of an authorization system covering all comparable services in a similar way regardless of the technologies used. (European Commission 2002)

In short, the directive suggests that member countries should have a technology-neutral authorizations regime and treat all comparable



services similarly. Such a regime would enable market forces to determine the best technology to use for a given purpose and avoid the creation of sector-specific, asymmetric rules and conditions that might hinder competition.

Indeed, technology neutrality has become a common theme of authorizations regimes in many countries. As noted, India, Kenya, Singapore, and Uganda, among others, have implemented licensing regimes that focus on the services being offered—not the technology used to offer them. In 2006, Nigeria introduced a unified access service license that allows telecommunications firms to

construct, maintain, operate and use an international gateway and a network consisting of a cellular communication system, a fixed wireless access telecommunications system, fixed wireline telecommunications system or a combination of any of these systems comprising radio, cable or satellite or their combination, in the designated license area, deployed for the purpose of providing point to point or switched/unswitched point to multipoint communications for the conveyance of voice, data, video or any kind of message. (Nigerian Communications Commission 2003)

As technology neutrality and authorization flexibility become more common, regulators can consider further simplifying their regimes. In March 2008, for example, Moldova promulgated a new ICT law that envisages a simplified authorization regime requiring only notification. The law replaces three licenses required for mobile, fixed, and Internet communication services. Only when spectrum is needed does the law require specific licenses. Similar notification schemes, where the service provider only has to inform the regulator and then assume license conditions, are in effect in Finland and Japan. In fact, Finland allows for notification through a Web site. Japan, on the other hand, limits the size of networks allowed to use simple notification. Beyond that, service providers must seek licenses. More liberal regimes might require only that service providers follow a set of rules; there is no need even for notification.

## **Symmetric Licensing Terms Support an Enabling Regulatory Environment**

The approaches used to allow entry into new markets by nontraditional service providers point to the significance of asymmetries in licensing conditions. For example, cable television companies are typically not bound to connect with emergency services, offer number portability, or contribute to universal service funds. If they begin to offer telephone services, they can escape these and other regulatory burdens—unlike traditional telephone service providers. Similarly, telecommunications companies that enter the media market can often skirt content codes or be subject to different (and typically higher) limits on foreign investment than are cable television or other broadcasting service providers. These differences create arbitrage opportunities that bias the market and undermine a level playing field. To encourage competition, regulators should ensure a level playing field in licensing terms and conditions.

Even a liberal market such as that in the United States has not been free of the problems that multiple play creates for the authorizations regime. U.S. telephone services are traditionally licensed at the state or national level. Now that telecommunications companies are entering the media market, they are subject to licensing regimes at the city level, a disparity that creates opportunities for firms to exploit different rules if they find themselves in a conflict between regulations and agencies.

One example comes from the U.S. state of Connecticut, where telecommunications operator AT&T had plans to invest \$336 million and employ 1,300 workers to operate its IPTV service, U-verse (Associated Press 2007). In May 2006, AT&T secured a statewide franchise on the basis that its service was not cable television and thus not subject to city-level franchising. But the cable television industry and the state sued AT&T, alleging that this tactic was illegal and that the firm was trying to avoid coverage obligations and content codes (such as those required to carry local and public service channels). A July 2007 court ruling ordered AT&T to seek cable television

licenses, saying that IPTV was not significantly different from traditional cable television. After a long court battle, in November 2007 AT&T secured the right to statewide franchising. Along the way, the company almost canceled its investment and employment plans, threatening significant lost economic opportunities for the state.

Another example from the United States involves telephone services. IP-based services grew throughout the 1990s, with the FCC holding back from regulating them. As a result, traditional telephone companies had a number of obligations that VoIP operators did not. Today, cable television operators and stand-alone VoIP operators account for about 13 million telephone subscribers, or 10 percent of U.S. households (TeleGeography 2007). The FCC has begun to require that VoIP operators that interconnect with traditional telephone services ensure connectivity to emergency services, provide consumers with number portability and access for subscribers with disabilities, and contribute to universal service funds. Such requirements have a significant impact on operators' business.

Different types of licenses also have significant differences in their entry fees, annual license fees, rollout obligations, universal service obligations, interconnection, and other conditions. Some of these conditions are common across license types, while others are specific to certain kinds. For example, while rules on foreign ownership may be the same, rules on interconnection or license fees may differ. (Some of these aspects of ICT regulation are discussed below.) Yet, as a general principle, following from the idea of symmetry, it is important for regulators to ensure a level playing field for all operators offering similar services.

## **Two Basic Options for Reform**

Reform of authorizations regimes occurs in two basic forms. First, reform can proceed in a piecemeal way—fixing current problems without significantly altering authorizations regimes. Otherwise, reform can launch directly into new regimes that fix current problems and prepare the sector for the future.

The problem with a piecemeal approach is that it does not address larger problems, making authorizations susceptible to challenges from a market that is rapidly innovating and moving toward multiple play and new services. The communications industry is already experiencing intense innovation and convergence between services and technologies. It will become increasingly difficult to discriminate among these converging networks and services.

Further, when rules or regulatory frameworks overlap or conflict, regulatory risk increases and the cost of capital rises. These obstacles slow investment and impede competition in infrastructure and services. Regulators thus need to move toward a stable, predictable licensing regime—yet one that has the flexibility needed to accommodate new technologies and business ideas. Regulatory frameworks that move the ICT sector to a new authorizations regime also need to account for current challenges and address future concerns. Moving to a liberal, flexible regime that accommodates future technological developments and is market friendly will drive growth, lower regulatory costs, and reduce burdens for operators.

Restrictions in a licensing regime might keep service providers from extending their services, making investments, or providing services of the desired quality. While it is difficult to determine the exact costs imposed by restrictive regimes, international experiences have shown that less restrictive licensing often drives growth and investment. India, for example, implemented unified access service licensing in 2003 and 2004. The license was technology neutral and allowed flexibility in services. The introduction of this regime ended a number of disputes between operators about different license terms and conditions. Investments and growth increased after this reform, with the subscriber base increasing exponentially—from 10.6 million in 2002 to 76 million in 2005 (Wireless Intelligence 2008).

## **Designs of Authorizations Regimes Are Changing**

Emerging trends indicate a preference for simpler, more flexible authorizations regimes that are technology neutral and accommodate

the provision of multiple services and easy market entry. Many countries are adopting unified regimes, class licenses, or even de-licensing (see again table 3.3). The only exception typically is when service providers require the right to use finitely available resources such as radio frequency.

Reform also involves many other considerations, including the following:

- *Migration.* Although flexible or open licensing might be desirable, introducing a new licensing regime requires careful planning to be successful. Service providers are often resistant to changes that might affect their interests. Hence, it is useful for regulators to engage with stakeholders to ensure transparency, understand the issues and concerns involved, and reach consensus. Still, regulation should aim to achieve flexible or open regimes—resistance from incumbents should not result in more restrictions or maintain the status quo.
- *Licensing fees.* Some licensees may have paid large sums for their licenses, while others have paid little or nothing. In many cases the differences are significant even within the same market.
- *Spectrum charges.* To maintain a level playing field, the method of assigning spectrum must be the same for different licensees (see the section on spectrum management below). Given the possibility that a licensee can use any spectrum for multiple services, pricing can depend on the spectrum assigned, not the technology used or service offered.
- *Other license terms and conditions.* A number of other license terms and conditions require attention for licensees to face equal regulatory burdens and costs. Universal service fund collections and disbursements, rollout obligations, and telephone numbering plans, for example, can be undertaken in a technology-neutral fashion. It might also be necessary to change any technology-specific service quality conditions to a service orientation. Some of these changes need not be linked to licensing reform (such as numbering plans),

but will create a clearer framework and might be easier to achieve as part of the larger process than in a piecemeal fashion.

- *Validity of new licenses.* Regulators will also have to decide how long new licenses are valid. The basic choice is between whether a new license continues for the period of the older one or is renewed for a full term.

## Spectrum Management

Appropriate radio spectrum management can facilitate wireless multiple play. Around the world, spectrum management is moving away from traditional administration, which involved allocating spectrum to specific uses, toward more flexible, open spectrum management regimes.

To optimize the performance of markets and establish a level playing field for spectrum in a multiple-play environment, spectrum management needs to increase the role of market forces in allocating spectrum among uses, assigning it to users, and pricing its use. That may involve a number of arrangements. Some economies use auctions as a market mechanism to assign spectrum—for example, Germany; Hong Kong, China; Singapore; the United Kingdom; and the United States. At the same time, countries such as Australia and New Zealand are developing markets for tradable spectrum rights. Several countries are also opening parts of the spectrum to unlicensed use, an approach that has encouraged the growth of Wi-Fi networking worldwide.

## Wireless Networks Can Advance Multiple Play

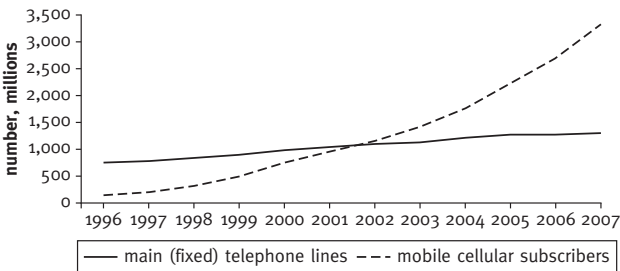
Just as multiple play is possible over cable television or telephone networks, it can also be provided over broadband wireless access networks. The proliferation of broadband access is one of the driving forces behind multiple play, and the same is true for wireless multiple play. But the latter will be possible only if spectrum management frameworks support wireless broadband.

As the technical barriers to multiple play decline, service providers are using their spectrum to carry more than just its originally intended use. In addition, a number of countries are looking to use their “digital dividend”—that is, freed spectrum from the transition to digital broadcasting—to offer telecommunications services. Yet many countries’ spectrum management regimes do not allow flexible use of spectrum. Such limitations prevent service providers from implementing advanced services and hold back the evolution of technical capabilities and, more important, most people’s ability to benefit from multiple play.

For these technical possibilities to emerge, traditional methods of managing spectrum will need to be reviewed. The discussion below outlines possible ways for regulators to increase access to wireless broadband and so increase the penetration of wireless multiple play.

**Wireless communications offer enormous potential.** The global telecommunications industry has undergone a dramatic shift from wireline to wireless in the past decade. Worldwide, mobile telephones became more common than fixed lines in 2002, and their usage has increased exponentially in the years since then (figure 3.1).

**Figure 3.1 Globally, Mobile Telephones Surpassed Fixed Lines in 2002**



Source: Author estimates based on ITU and Wireless Intelligence (2008) data.

By late 2007, there were 660 million wireless telephone subscribers in the 50 least developed countries, accounting for a fifth of the global total and a third of adults (15–64 years old) in these countries (author estimates based on the Infocomm Development Authority of Singapore [IDA], World Bank, and Wireless Intelligence data). The reach of wireless communications today means that mobile phones are likely to be the first mode of access to advanced communication services for much of the world. Hence, ensuring access to spectrum will be critical to supporting the spread of multiple play in the developing world.

**Broadband wireless enables a multiple-play environment.** Providing multiple services over wireless networks requires broadband capability. As the number of broadband wireless networks amenable to providing multiple-play services is rapidly increasing worldwide, there is growing interest in using VoIP over wireless local access networks. When Singapore, for example, allocated spectrum to broadband wireless service providers, it also allowed this spectrum to be used to provide telephone services. Similarly, a number of 3G operators have begun to offer their subscribers video on demand.

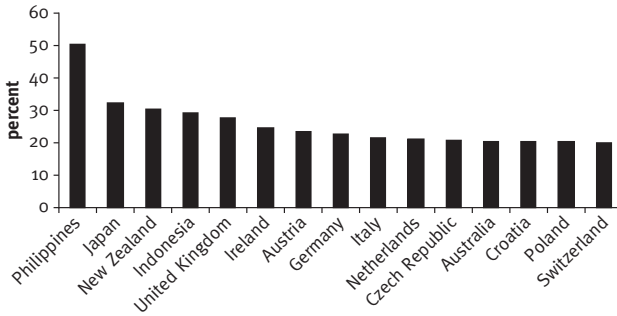
There are also indications that demand is growing for nonvoice (data) services over wireless networks. In 2007, cellular operators in at least 15 countries—including Indonesia and the Philippines—derived a fifth or more of service revenues from data services (figure 3.2).

The market for content and services provided over mobile telephones is also growing. For instance, revenues from games played on mobile phones are already more than \$4 billion and by 2010 are expected to reach \$17 billion. Similar growth is expected in multimedia distributed over cellular telephone networks (SSKI Research 2007).

Markets are also beginning to see the effects of multiple play on the spectrum originally reserved only for broadcasting. This effect manifests in two ways: growth in digital television and the resulting spectrum dividend, and growth in mobile television services. Countries around the world have begun to move toward digital audio



**Figure 3.2 Many Cellular Operators Derive a Large Share of Revenues from Wireless Data Services**



Source: Wireless Intelligence 2008.

Note: Data are for 2007.

and video broadcasting. Some have already begun the switch, while others—such as Chile, Hungary, Slovenia, and República Bolivariana de Venezuela—are planning to move toward digital television.

More efficient digital broadcasting techniques free up valuable spectrum in the very high frequency (VHF) and ultrahigh frequency (UHF) bands. The U.K. Office of Communications (Ofcom 2006) estimates that its digital switchover program will free about 112 megahertz (MHz) in the UHF band. Similarly, the clearing of the 700 MHz band in the United States was partly made possible by the transition of incumbent television broadcasters to digital systems, which freed up 108 MHz of spectrum (FCC 2008b). An opportunity is missed if the service authorization does not allow multiple play. Hence, to be meaningful, spectrum management regimes and service authorizations must be aligned.

Another trend arising from the digitalization of broadcasting is the evolution of mobile television services. A number of countries have seen a significant uptake of mobile television—as in the Republic of Korea, which has more than 2 million subscribers and investments of more than \$500 million (*The Economist* 2007). Countries including France;

Germany; Hong Kong, China; India; Kenya; and Nigeria have mobile television services in testing or ready for commercialization.

## **Expanding the Scope of Spectrum Licenses Enables Multiple Play**

Earlier spectrum allocation defined one set of frequencies for one service (voice, data [including broadband], and broadcasting). Now, however, new technologies enable multiple services on one network, and the wireless version of multiple play broadens potential uses of spectrum—changing the value of the resource and challenging assumptions about allocating spectrum for specific uses.

Wireless multiple play goes against the traditional classification of spectrum, which divides the entire range of commercial spectrum into bands meant for specific services. Such conditions are often embedded in a service provider's license. For example, in 2004, the European television broadcasting spectrum had about 450 MHz, while cellular telephony had 365 MHz (Burns et al. 2004).

Traditional classifications allowed regulators to levy different fees, use different assignment mechanisms, and impose different conditions on different types of spectrum licenses. Most countries have assigned broadcasting spectrum for free through administrative licensing, for example, and since the 1990s have assigned telecommunications spectrum through market mechanisms. If there is no longer any difference between these types of spectrum, such asymmetries cannot stand.<sup>10</sup> Instead, spectrum assignments will need to be—and are increasingly becoming—flexible.

Governments around the world adhere to general guidelines set out in the radio spectrum management frameworks such as those of the International Telecommunication Union. These guidelines provide member countries with some flexibility in allocating spectrum bands for one or more uses. Now, with multiple play possible over wireless networks, it might be necessary for a review of these guidelines to align them with emerging technological and market developments.

Such a review will ensure the continued benefits of global spectrum coordination and harmonization, while allowing greater flexibility and more efficient utilization.

**Technology neutrality.** Even as some countries have moved toward technology-neutral spectrum management, others continue to define which technologies service providers should use in a given band. In India, cellular networks must use either the global system for mobile (GSM) or the code division multiple access (CDMA) standard. Now, with advanced wireless systems such as 3G networks and broadband wireless, countries are defining specific broadband wireless or 3G technologies for use in specific bands, such as the 2.5 gigahertz (GHz) band, where both of these technology families lay claim.

Changes in technology are also important to consider when allocating spectrum. One of the starkest examples is of developments in 3G technology. Because 3G cellular systems appeared some years after second-generation (2G) systems, many countries gave them new bands in which to operate. The most common was the 2.1 GHz band. Many service providers spent a lot of money to acquire this spectrum. But 3G technologies are now available for commercial deployment in the bands used by 2G systems. This development is creating debates about fairness in these countries. Service providers that paid large sums to acquire spectrum in the 2.1 GHz band for 3G services now have to devalue their spectrum holdings and face higher capital costs because lower 2G frequencies have better propagation characteristics. For instance, one Australian 2G operator estimates that it would cut its capital costs by 40 percent using the lower frequencies.<sup>11</sup>

The change in the valuation of 2.1 GHz spectrum is an important example of changes in the market and technology and their implications. The International Telecommunication Union's 1992 World Radiocommunications Conference defined the 2.1 GHz band for 3G services. Eight years later, at the conference in 2000, the 800, 900, and 1,800 MHz bands were defined for 3G services, and by 2006 manufacturers were beginning to develop wideband code division multiple access (WCDMA) and code division multiple access, evolution, data-optimized (CDMA EV-DO) technology in these

bands. Similarly, the 2.5 GHz band was originally marked for technologies including 3G and beyond. But the 2007 World Radiocommunications Conference added WiMax to the list of 3G international mobile telecommunications-2000 (IMT-2000) technologies, thus allowing regulators to attempt to avoid tying spectrum bands to specific technologies.

Regulatory symmetry requires that spectrum assignments be technology neutral to promote investment and growth. Otherwise, countries might lose investments and lag behind in growth simply because of their spectrum regimes. For example, 3G services have yet to take off in China, partly because the country delayed spectrum assignment until its indigenous time division synchronous code division multiple access (TD-SDCMA) standard was finalized and ready for deployment (RealMoney.com 2007).

**Service neutrality.** Flexibility in spectrum use is becoming increasingly common, particularly in the context of discussions about the digital dividend and the growing use of mobile television. Many countries are pursuing service-neutral spectrum allocations.<sup>12</sup> For example, the U.S. FCC has allowed service providers to use the 700 MHz spectrum for

flexible fixed, mobile, and broadcast uses, including fixed and mobile wireless commercial services (including FDD- and TDD-based services);<sup>13</sup> fixed and mobile wireless uses for private, internal radio needs; and mobile and other digital new broadcast operations. These uses may include two-way interactive, cellular, and mobile television broadcasting services. (FCC 2008b)

In the United Kingdom, Ofcom's 2007 statement on the digital dividend outlined how the agency decided that it would give "users the freedom to decide how spectrum is used and clear incentives to use it efficiently." It envisions the uses of this spectrum to be wireless broadband, mobile television, digital terrestrial television, and local television, but does not limit its applications. Ofcom expects that this approach will enable the introduction of innovative technologies and

services, increase competition, and provide “a significant contribution to the United Kingdom, as the overall benefit from the use of the digital dividend is estimated to be £5bn to £10bn (\$9.8 to \$19.6 billion equivalent) of added benefit to the economy over 20 years” (Ofcom 2007).

One concern about opening all spectrum to any use involves the balance between flexible new assignments and existing assignments to incumbents. For example, if a new mobile wireless broadband provider offers voice telephone services, it changes the business models and position of existing 3G-only operators, many of which have paid significant sums—sometimes hundreds of millions of dollars—for spectrum usage rights. Regulators need to consider not only how to manage the growing range of uses of previously allocated spectrum, but also the balance between new spectrum allocations and incumbents’ interests.<sup>14</sup>

**Spectrum management is moving to open, flexible models.** The ideal situation for spectrum management would likely be one where regulators do not specify which services are offered over a specific band of spectrum or which technology is used to offer them. Instead, regulators would focus on promoting competition and ensuring that spectrum users are following certain guidelines—such as noninterference in each others’ operations.

A few regulators are actively organizing the spectrum as a “commons,” expanding on the idea and success of unlicensed spectrum. Supporters argue that a commons regime creates incentives to innovate and develop spectrally efficient technologies such as smart radios, which automatically detect and use vacant spectrum. Further, these efficient technologies reduce spectrum scarcity by creating more efficient systems such as mesh networks. Commons regimes do not place restrictions on the network bandwidth assigned to specific networks—allowing networks based on new ultra-wideband technologies, for instance, to provide high-speed connections not otherwise possible.

Indeed, a similar mechanism has already worked in many countries with unlicensed bands in the 2.4 GHz and 5 GHz spectrums. Aside from simple rules limiting the maximum transmitter power or defining

the rights and responsibilities of spectrum users in terms of interference, there are no technology or service limitations.<sup>15</sup> This open band has been credited with spawning WiFi technology. WiFi was among the earliest wireless technologies supporting wireless triple play. Similar outcomes are possible in an open and flexible environment for spectrum use.

Moving to these new spectrum allocation regimes will enable multiple play by supporting the development of new technologies, the entry of smaller or new service providers, and more efficient spectrum use. Efforts to link revisions to the spectrum management regime thus can be linked to moves toward a converged regulatory regime.

### **Separating Spectrum Licenses from Service Authorizations Enables Growth**

Most countries have traditionally bundled spectrum and service licenses. As a result, spectrum management is often tied to authorizations. For instance, concerns about how spectrum is used—whether for broadcasting or telecommunications—might depend on the authorization that allows the operation of that service as well as use of associated spectrum. Hence, many of the problems discussed in this section might be relevant to discussions of authorizations.

Ultimately, restrictions on services translate into rigidities in the use of the spectrum assigned to them. Decoupling or unbundling these two authorizations enables the spectrum authority to remove technological and service limits on the use of assigned frequencies. Decoupling also reduces demand for spectrum because not all operators (such as cable television or Internet service providers) want spectrum.

### **Moving to Market Mechanisms Also Supports Multiple Play**

The move to market mechanisms has manifested as two important trends: assigning spectrum to operators using some sort of competitive means, and charging market-based prices for acquiring or using

spectrum. Having a competitive, transparent means of assignment also gives service providers greater access to spectrum. In conjunction with a regime that allows flexible use of spectrum, such competitive assignment enables new models of service provision.

Spectrum trading is another important development. Implemented in countries such as Australia and New Zealand, this approach allows later entrants to a market to access spectrum by paying a market price for it. Thus, new service providers are not constrained by the timing of their market entry. Instead, they can acquire spectrum from other users. In the absence of market mechanisms for spectrum assignment, new service providers would have to wait for government-administrated assignment—slowing the rollout of new services, reducing the potential for competitive service provision, and lowering investments.

Despite the important advantages of moving toward more flexible arrangements for spectrum assignment and a greater role for market forces, there are also risks that in a poorly regulated environment, some firms could establish or reinforce market power by controlling key high-value spectrum bands. Thus, it is critical to ensure that the outcome of moving toward market mechanisms is an increase in market competition, supporting the introduction of new services and providers. Moving toward market-based assignment, pricing, and use will allow new service providers to access spectrum competitively, allowing them to provide innovative services over wireless networks.<sup>16</sup>

## **Interconnection and Access**

Ensuring interconnection and access to essential facilities is crucial to competition. Multiple play and the shift toward IP-based networking make obsolete the paradigm of technology-specific, switch-based interconnection based on per-minute costs. Instead, the costs and mechanisms of IP networks require reviewing existing interconnection regulation. The shift toward capacity-based, technology-neutral charging mechanisms is now visible in Mexico, Thailand, and the United States, among other countries.

Access to essential facilities can enhance competition, allowing new service providers to offer their services without the high entry barrier of investing in entirely new facilities. For example, regulators in France; Hong Kong, China; Singapore; and the United Kingdom have implemented rules on unbundling local loops, allowing competitive service providers to enter the market.

## **Broadening the Meaning of Interconnection**

In the traditional sense, interconnection in the telecommunications sector has implied “linking with suppliers providing public telecommunications transport networks or services in order to allow the users of one supplier to communicate with users of another supplier and to access services provided by another supplier” (World Trade Organization 1996).

Traditionally, the complete separation of media and telecommunications networks allowed them to develop their own types of interconnection. Media interconnection focused on sharing revenue between content producers and distributors. Terrestrial broadcasting was vertically integrated from content production to distribution, and so needed few interconnection arrangements. The development of cable television required arrangements between content producers, multisystem operators, and local cable operators. In competitive media markets, access to infrastructure was also often important. For instance, competing broadcasters often sought access to towers and collocation to interconnect with cable networks. Yet traffic management was not a major concern, nor was transmission—the number of television stations has been relatively stable, and satellite broadcasting allowed wide coverage with no loading effects, or the reduction in the strength of the transmitted signal that occurs as the number of users increases.

On the other hand, interconnection in telecommunications networks is more complex due to variability in traffic, the growing number of service providers in the postliberalized market, and rapidly increasing volume. Multiple play brings even more competition, and methods of interconnection will need to ensure that all service providers and



networks compete fairly. Further, the primacy of wireline media in the transmission and carriage of bulk traffic has meant that the locations of interconnection points are of great concern. Cost sharing between the originators and receivers of telecommunications traffic has also been a major topic of discussion.<sup>17</sup>

Now, with multiple play, there might also be agreements between telecommunications and media firms to share content and services as well as costs and revenues. Indeed, the European Commission's Access and Interconnection Directive alludes to such possibilities, covering "electronic communications networks and services," including "telecommunications networks, cable television networks, networks used for terrestrial broadcasting, satellite networks and Internet networks, whether used for voice, fax, data or images." However, the directive does not cover "sound or television broadcasting content" (European Commission 2002b).<sup>18</sup>

## **How Does Interconnection Function in the Era of Multiple Play?**

Multiple play creates challenges for traditional interconnection models—mainly because of technological developments, but also because of changes in the scope of markets where regulators intervene to ensure interconnection. The technical challenges result from a shift from switch-based to IP-based networking in telecommunications networks. The definition of a market also might change because interconnection now also occurs between telecommunications and media networks. The interconnection regime often determines the success of competitive service providers. These shifts require regulators to reconsider past assumptions while trying to maintain the basic goal of interconnection regulation—enabling competition between service providers.

Multiple play has three significant implications for interconnection. First, service providers traditionally provided interconnection or access to others that resembled them in operations and technologies. That is no longer the case. For example, telephone companies

based on public switched telephone networks (PSTNs) now have to interconnect with broadband telephone networks that use VoIP. Similarly, cable television companies must now interconnect with telephone networks to distribute video content. These developments raise questions about the interoperability and security of networks and, consequently, whether regulators should be involved in regulating the nature of these interfaces.

Second, cost structures that formerly were well understood for telephone and broadcasting networks no longer apply. Telephone interconnection costs depended on circuit-switching costs associated with a hierarchy of switches and transmission systems—not the case for IP packet-based networks. Because the use of IP technologies significantly reduces costs, the level of prices paid by networks and consumers should be called into question, as prices should reflect costs. But the more complex issue is that IP networks are not based on physical location, so it is difficult to position network users—making it difficult to differentiate between local, domestic, and international VoIP calls for billing purposes. In addition, attributing costs to specific services is difficult because one converged network is used for multiple services, making it no longer possible to identify which packet carries which type of service, or what part of the cost of an IP router, for instance, is used for telephone traffic as opposed to video distribution. Traditional time-based interconnection regimes are also meaningless in packet-based, always-on broadband networks. As a result, new models of interconnection and pricing will have to replace current arrangements.

Third, interconnection and access regulation often depends on definitions of market power. For example, dominant telecommunications service providers are typically subject to additional regulation that requires them to publish reference interconnect offers. The introduction of multiple play expands the relevant market, possibly recategorizing previously dominant service providers and excluding them from such requirements. Further, if cable operators, for instance, are not included in the scope of interconnection regulation, it might be possible for telephone companies to reject interconnection or access requests. The consequences of multiple play for market structure

and, by extension, identification of dominance and significant market power are not yet known. Some analysts believe that IP networking will eliminate the need to consider market power; others take an opposing view, while still others are not sure (Scott and Elixmann 2007; Waverman 2006).

The enabling regulatory environment for multiple play, which requires a move toward increased competition, thus must include a review of the interconnection regime. A simple, effective, pro-competition interconnection regime will support the entry of competitive service providers and the provision of multiple-play services. Regulators will have to define relevant markets and measure and monitor for evidence of dominance, then apply remedies.<sup>19</sup>

### **Interconnection Regulation Is Becoming Technology Neutral**

One of the most relevant areas of the debate on interconnection and multiple play focuses on efforts by alternative telephone service providers to interconnect with traditional telephone networks as they begin offering VoIP services. For instance, in 2007, Time Warner Cable in the United States petitioned the FCC to allow its VoIP service to interconnect with PSTNs. The FCC allowed this petition, with the chairman noting that the decision increased competition for telephone services and encouraged deployment of broadband facilities and so lowered prices and expanded customer choice (FCC 2007e). In March 2007, the FCC also announced that rural telecommunications companies must interconnect with cable television companies (FCC 2007a).

As these different types of networks begin to seek interconnection with each another, questions are being raised about the extent of regulation and the ways that nontraditional operators share costs. In Thailand, for example, a telephone network has asked the regulator to impose network interconnection regulations on VoIP providers, saying that it was gaining nothing from carrying these firms' traffic. The problem was that while the telephone companies have to share

revenues with each other, VoIP providers, who hold a different type of license and are not subject to these regulations, benefit from this imbalance (*The Nation* 2008).

Similarly, but with the opposite effect, Mexico's Federal Commission of Telecommunications (better known as COFETEL) recently ruled that a cable television provider is not entitled to special interconnection fees when handling telephone traffic from the country's largest fixed-line operator, Telmex. The main sticking point was the "bill and keep" rule, established in October 2006, which abolished interconnection fees. The cable television operator had argued that its relatively small subscriber base would not generate as much traffic as Telmex's, and that the interconnection regulation would unfairly burden it with higher costs.

In June 2005, Singapore's IDA announced a new VoIP licensing and numbering policy. The intention was to enable competition, possible because of the low costs of VoIP. Eight telecommunications firms acquired numbers for this service, but by 2007 none of them had begun providing commercial services. Reports suggest that the delay was due to disagreements in commercial negotiations on interconnection between the firms (*The Business Times* 2006a).

Given these complexities, some analysts are suggesting that regulators adopt a technology-neutral approach to interconnection. Regulators would then focus on whether service providers follow broad competition-enabling rules and allow nondiscriminatory interconnection (Bezzina 2005). Thus, interoperability is ensured by enforcing competition rules—meaning that no network can refuse interconnection as long as both parties use the same standards and technologies for the interface.<sup>20</sup>

Multiple play does not necessarily mean that the nature of services is changing. In many cases, the telephone, media, and Internet services that consumers are using will continue. Delivery platforms, though, are changing, as is the roster of service providers. Still, discussions about interconnection and interoperability need not deviate entirely from their current form. Rather, they can take into account the presence of

new service providers and ensure that interconnection terms are fair and nondiscriminatory.

## **New Models Are Emerging for Allocating Costs and Ensuring Competition**

If technology-specific regulation is undesirable in the context of interconnection in a converged era, two significant issues remain. The first relates to cost- and revenue-sharing arrangements between interconnecting operators. And the second relates to which service providers and networks are subject to regulation, which depends on the definition of the relevant market and the expansion of interconnection regulation across traditionally unregulated sectors. Thus, there is a need to reconsider interconnection in terms of the sharing of costs and revenues and the protection of competition.

**Cost- and revenue-sharing arrangements.** Three basic models of cost and revenue sharing emerge at the wholesale level. The first is the calling party's network pays (CPNP), the traditional model of interconnection, in which the calling party's network pays the terminating network a per-minute charge based on the cost of terminating the connection. The second model is the receiving party's network pays (RPNP). Here, the receiving network pays for incoming traffic. These regimes face the challenges in a converged era discussed earlier: the allocation of costs, determination of origination, and nature of traffic have changed.

The third model is the bill-and-keep model, used extensively in the interconnection arrangements underlying the Internet. In this model, the traffic-originating party pays the originating network for data transport and that network keeps the payment. There is no payment from the originating network to the terminating network, allowing simple allocation of costs. The concern for service providers with the bill-and-keep model is that if they do not receive Internet traffic, they will not be able to recover all their costs. Consequently, variations on the bill-and-keep model, such as allowing local networks to recover the costs of local facilities from receiving consumers, have increasingly been

adopted. Although the payment was traditionally only for transporting data (not services), there have been discussions about service-based payments as well. In this scheme, users would pay more for different levels of service quality or content.<sup>21</sup>

All three of these models are currently in use around the world—and in some cases multiple models are used in the same country. For example, the United States uses CPNP for calls to incumbent wireline telephone operators, and bill and keep for mobile-to-mobile calls and calls from one nonincumbent fixed provider to another (or to a mobile operator). Singapore uses a system similar to that in the United States, with CPNP for calls terminating on the fixed network and bill and keep for calls terminating on the mobile network. There are also a number of arrangements in the Internet hierarchy. While tier 1 backbone operators tend to use bill and keep among themselves, their arrangements with tier 2 operators<sup>22</sup> tend to be RPNP (Gilbert + Tobin and CRA International 2007).

Another shift occurring in interconnection regimes involves a move from per-minute to capacity-based models. The FCC, for example, is considering moving from a time- and circuit-based interconnection regime to a capacity-based regime. This follows the realization that always-on broadband connections—which will likely be the dominant type of end-user connection in the future—are difficult to model on a time basis.

Internet bandwidth is already provided at the wholesale level on a flat-rate basis, with fixed monthly fees and capacity-based rather than usage-based charges. A number of countries are seeing interconnection charges fall significantly due to regulatory decisions to move to new mechanisms of interconnection and revenue sharing. Regulators in Poland and Portugal, for example, have required incumbents to introduce capacity-based interconnection. Spain was an early adopter of this model, and more than half of its fixed-access and termination interconnection are now capacity based.

In general, a shift in the mode of allocating and recovering the costs associated with providing networks and services to retail consumers

is under way. Moreover, regulators are beginning to move to interconnection regulation that seeks to enforce competitive safeguards rather than technical or operating conditions. Japan is one such example (box 3.6).

**Targets for regulation.** Interconnection regulation typically requires that operators with significant market power provide interconnection to all competitive networks on a nondiscriminatory basis. In the

### Box 3.6 Japan's Move to an IP-Based Environment

In October 2005, Japan's Ministry of Internal Affairs and Communications created a study group on a Framework for Competition Rules to Address the Transition to IP-Based Networks. The group developed a framework for interconnection and tariff policies and issued a final report in September 2006. The report mainly addressed the changes in the competitive environment required to transition to IP-based networks and the need to revise competition rules. The report noted that "market integration in the transition to IP-based networks has been eroding the traditional distinction among service categories." The ministry formulated the following basic principles for competition policy in the transition to IP-based networks:

- Ensuring fair competition in telecommunications (comprising the physical network and telecommunications services);
- Ensuring fair competition, with a focus on a vertically integrated business model;
- Ensuring competitive and technological neutrality;
- Protecting consumer interests;
- Ensuring that competition rules are flexible, transparent, and consistent.

*Source:* Scott and Elixmann (2007).

United Kingdom, this principle has been termed “equivalence.” For BT (formerly British Telecom), it has meant that the regulator has required the functional separation of its wholesale and retail businesses. As such, BT Openreach now owns all the subscriber access networks, BT Wholesale controls the wholesale connectivity networks, and BT Retail buys capacity and access from both companies—which treat it like any other customer. Though full separation might not be necessary or possible, separating the accounts of different business lines (at a minimum) is useful because it makes the allocation of costs and revenues explicit, thus allowing fair interconnection.

Another consideration is minimizing opportunities for arbitrage. In a capacity-based, technology-neutral interconnection regime, a service provider offering telephone services pays the same rate regardless of whether it uses VoIP, cellular, or PSTN technology. This approach follows the law of one price: that similar goods or services should cost the same. Given the shift to lower-cost operating networks and growing traffic volumes, these rates might be reduced—thus lowering tariffs and increasing usage.

The regulatory questions posed by multiple play include whether interconnection can be mandated and ceilings on wholesale and retail tariffs can be imposed. The answers to these questions depend on the political economy environment in the country in question and the country’s experiences with its incumbent network operators and their competitors. But the trend emerging from many countries is for regulators to clearly indicate their power to set such requirements, if justified. This approach falls within the broad rubric of *ex post* regulation—that is, regulation that responds to market failures.

Careful thought will need to be given to which service providers are included in such an approach. In a technology-neutral environment, regulators might not care whether the telephone service provider asked to honor interconnection agreements is a cable television company or a traditional telephone company. Still, regulators will likely have to reconsider definitions of significant market power and dominance given the growing field of participants, and apply interventions accordingly.



## **Access to Facilities Supports Competition, Innovation, and Multiple Play**

Access is the use by one service provider of certain capabilities of another service provider as a component of its own services, in support of its own subscribers. Many countries will see benefits in allowing new entrants to access existing facilities, as these companies would otherwise face significant and probably insurmountable entry costs to providing services. In a converged market, provision of wholesale access to facilities in the last-mile segment of networks plays an important role in a converged market. Pro-competition access policy significantly reduces the costs of service provision for new entrants and spurs deployment of converged services.

Access regulation allows new entrants to climb up a “ladder of investment” (Cave 2005), beginning by using incumbents’ facilities and reselling services. New entrants are then able to scale up their services, finally investing in their own facilities. A powerful example of this effect comes from France, where the unbundling of France Telecom’s local loop—the network that connects subscribers to the telephone exchange—enabled growth of new service providers. By 2006, 40 percent of French households had broadband service, and multiple-service providers have benefited from unbundling (Hazlett and Bittlingmayer 2003). Multiple-service providers now have begun to invest in their own facilities.

One of the most common ways to enable access is to unbundle the local loop. In this scenario, incumbents have a dominant position due to their ownership of the local loop, while competitors might find it economically unfeasible to construct new ones. Regulators in many countries have therefore moved to require that incumbents unbundle, or allow competing service providers to use different elements of the incumbent’s local loop.

Access is provided in wireline networks, such as BT’s Openreach, as well as wireless networks, where a virtual network operator leases capacity from 2G or 3G cellular network operators and provides services. Cable television and telecommunications networks can

also be unbundled. An extensive literature on unbundling and its outcomes exists.<sup>23</sup>

In Hong Kong, China, the Office of the Telecommunications Authority defines two types of interconnection. Type 1 refers to interconnection between networks and services so that users connected to one network may communicate with or gain access to other users or services connected to other networks. Type 2—what this book refers to as “access”—refers to interconnection by one operator to the customer access networks (such as local loops) of another, enabling it to reach its customers. Hong Kong, China, did not unbundle network elements other than local loops, expecting that new entrants would build their own backhauls, switches, and trunks, and that Type 2 interconnection would facilitate the emergence of facilities-based competition. Further, the Type 2 interconnection rules applied only to local loops constructed by the incumbent during its period of monopoly, and have not been extended to optical fiber or wireless access networks. This type of interconnection opened up the narrowband fixed network market to competition; by 2005, about 11 percent of local telephone line users were served by new entrants through Type 2 interconnection (Au 2006).

Multiple play raises important questions about access regulation. Because it is now possible for any infrastructure to be used for any service, a number of alternative last-mile facilities might exist. In the past, “a copper wire pair to the home was in some sense an ‘essential facility’ as it could not be easily replicated by entrants. Today, most businesses and homes have alternative paths—cable, cellular phones, fixed wireless and, potentially, satellite and power lines” (Waverman 2006, p. 159). These developments have challenged the basic rationale for regulating last-mile facilities—monopoly status.

The twin issues of access and unbundling must be addressed early and clearly. Investments in facilities are significant: estimates suggest that investments in next-generation networks will exceed \$300 billion over the next decade and, as with all investments, are made assuming certain rates of return that in turn depend on tariffs. Investors might seek

out regulatory holidays or exemptions, claiming that their business models will suffer if they are forced to open up their networks at low fees.

In Germany, for example, Deutsche Telekom challenged a move by the European Commission to require it to open its last-mile facilities, claiming that the €3 billion (\$4.64 billion) it had invested would not be recovered under a regulated tariff or access scheme (BNET 2006). Similarly, Australia's Telstra tried to negotiate with the regulator on access rules so that its new network would not be subject to the unbundling regulations imposed on its legacy network. The company's plan to build a \$2.3 billion fiber-optic network for high-speed broadband services was abandoned in 2006 when it could not agree on access rules with the regulator (Global Insight 2006a). Then the Australian government announced a tender to build a \$4.4 billion network that will have open access (allowing regulated and nondiscriminatory access) (Global Insight 2008b). When even this program failed, the government announced an \$A 43 billion plan in April 2009 to build a superfast broadband network that would connect 90 percent of Australian homes, schools, and businesses within eight years with speeds of 100 megabits per second. The government plans to set up a state-controlled company with an initial investment of \$A 4.7 billion. Once this network is operational, the government will sell its stake (*Times Online* 2009).

The experience of Singapore shows that when governments implement clear access rules for networks, operators that might previously have been reticent quickly seek to participate. This is because there is strong business potential in selling access. In April 2008, Singapore's regulator, IDA, announced that it wanted to tender two companies, for up to \$700 million, to operate the network's active and passive infrastructure. One major qualification, however, was that the selected operator company had to be operationally separate from service providers. This well-designed program was well received: 21 bidders expressed interest in the different functions, including incumbents such as British Telecom, Japan's NTT, and Deutsche Telekom (Global Insight 2008a). A consortium led by SingTel won the contract. It will invest about \$1.4 billion to build the network, supported by a government grant of \$525 million (AseanAffairs 2008). In May 2009,

work formally began on the network, and Nucleus Connect was signed on to operate it (IDA 2009).

Access rules also find their way to cable television networks. In 2007, the U.S. FCC initiated discussions on regulating access to cable television channels. It proposed a rule, currently under discussion, that would require cable television companies to lower the prices they charge television content producers to lease access to cable channels (FCC 2008a).

Another aspect of access to facilities is related to the sharing of passive infrastructure. Instead of investing in building towers for mobile telephone services, or trenches and ducts for cable television, many countries are looking to regulate access to such infrastructure. Given that a significant portion of network deployment costs comes from the building of passive infrastructure, such sharing can cut costs and increase the viability of network deployment.

In conclusion, for countries with limited facilities, it is useful to consider using access regulation to enhance competition and begin new entrants on the ladder of investment. But such moves need to be considered in the context of countries' network infrastructure, the possibility of using multiple access platforms to reach subscribers, and the need to balance investor concerns with increased competition. As with interconnection, the most important decision for regulators is how they plan to enforce specific rules for dominant service providers. Any move to an asymmetric regime, making specific rules for a subset of the market, should be clearly defined in advance.

## **Universal Service**

Many socially desirable goals cannot be achieved by relying solely on markets. Hence, governments often introduce universal service programs to attain goals such as increased coverage, access for poor or socially vulnerable groups, and provision of cultural and educational content and services.

Universal service programs provide support, either through financial means or through an improved regulatory environment, for the development and deployment of ICT networks in areas and to

groups that they otherwise might not reach. With the spread of broadband, regulators will have to reconsider the goals of these programs and ensure that obligations and support apply equally across technologies. They can also add new services as targets for support, such as data services—as Australia has done.

A well-designed universal service program that reconsiders its goals and targeted services will advance deployment of multiple play. The United States now requires that interconnected VoIP service providers pay into the universal service fund. Further, there is a trend toward supporting the deployment of passive infrastructure, with a recent auction in India proving very successful. Funds are also increasingly being allocated using competitive approaches, with a number of countries now holding competitive subsidy auctions for universal service provision.

## **Universal Service Programs Are Changing**

Universal service programs exist in both the telecommunications and broadcasting sectors, though with different meanings and mechanisms. In telecommunications, the traditional model of universal service developed around the telephone. Large incumbents subsidized telephone services in high-cost areas or for low-revenue subscribers by overcharging urban, high-revenue, or long-distance callers. With the liberalization of telecommunications, this implicit—and typically nontransparent—mechanism gave way to the explicit universal service funds that are now commonplace. Further, the focus of many programs has begun to shift from telephone to broadband services and, beyond that, to building the backbone or passive infrastructure that supports these networks and services.<sup>24</sup>

In broadcasting, universal service programs have aligned, but with different goals than in telecommunications. Many countries see the need for universal access to news and information, and mandate a publicly funded or operated broadcaster for this purpose. These public service broadcasters provide socioculturally or educationally valuable content and aim to reach the widest possible audience. Even private broadcasters have universal service requirements. For example,

cable television operators are often required to follow must-serve guidelines, providing services in all neighborhoods and preventing them from serving only high-income areas. Many countries have rules requiring television to be accessible to people with hearing disabilities, and numerous regulations govern access to local content—so-called “must-carry” guidelines.<sup>25</sup> Indeed, broadcasting spectrum was often assigned for free to entities that followed these guidelines.

In light of multiple play, governments might want to review their telecommunications and broadcasting sectors to ensure that they maintain their relevance. Multiple play presents two direct challenges to traditional universal service programs, and provides an opportunity to review a third, indirect question. First, new platforms can offer the services targeted in universal service programs. Thus, regulation will have to ensure that universal service programs are competitive and technology neutral.

Second, multiple play allows multiple services to be provided on a single platform, raising new possibilities for these programs. Whereas the traditional target service used to be wireline telephony, governments are moving toward funding mobile telephony and even broadband services. Thus, regulators will need to reconsider the design of universal service programs for telecommunications to accommodate new technologies and service providers.

A third, indirectly related issue involves funding for universal service programs. The issue for regulators is whether they want to continue with older mechanisms of managing universal service programs or move to new mechanisms. This move could support the rollout of passive infrastructure and provide fiscal incentives to meet service provision goals, supporting the rollout of broadband and other advanced services and indirectly supporting the spread of multiple play.

## **The Goals of Universal Service Programs Could Change**

Realigning universal service programs to address these challenges will require attention to two issues. The first is recognizing that

new platforms are providing the services covered by universal service programs. Thus, regulations will have to apply equally to different platforms to eliminate arbitrage opportunities. For example, telecommunications networks now carry media services that might not be covered by existing content and service requirements. If IPTV-based video provision is regulated as a telecommunications service, it might be excluded from content guidelines, must-carry, or must-serve requirements. Similarly, symmetry in the media sector dictates that must-carry and must-serve rules should apply equally to different broadcasters, regardless of the technology they use.

But, as a recent Organisation for Economic Co-operation and Development (OECD) report finds, “Most . . . member countries impose must-carry regulations on cable television operators but these have not been extended to telecommunication firms” (OECD 2006). In the United States, a significant debate arose about the entry of telephone companies into video services. Cable television companies alleged that telephone companies were not subject to the same must-serve requirements as they were, and so would be free to “cherry pick” neighborhoods—serving only high-income areas (TelecomWeb News Break 2007). Remedying such asymmetries will be important to ensure that socially desirable coverage goals are met for both infrastructure and content. Otherwise, such discrepancies could distort competition and undermine the level playing field.

Second, multiple play creates the need to reconsider the goals of universal service programs in light of new possibilities for delivering services. The extension of coverage is possible because any communications infrastructure can carry any service. For example, while wireline telephone service might not reach everyone, the rate of subscription to wireless services might reduce the need for a universal service program focused on voice communications; it is more likely that access to the Internet or broadband data services is a concern. Moreover, if cable television is widely subscribed to, it might be useful to include the provision of telephone or Internet services over those networks in considering goals and outcomes. Moreover, providing multiple services over a single platform leads to lower costs and higher revenues—both of

which improve coverage and access. This is another reason to review the goals and rationale for universal service programs.

All of this means that regulators, policy makers, and governments can reconsider the definition and scope of universal service programs. They can identify what gaps remain in the provision of ICT to their populations, taking into account the complete range of available services and infrastructure. They will also have to review the goals of their programs to address gaps, leveraging the possibility of increased coverage, lower prices, and a wider range of services due to multiple play.

### **Options Are Emerging for Redesigning Programs**

While voice telephony is on its way to becoming ubiquitous around the world, broadband and Internet services are less diffused. Multiple play allows multiple platforms to offer consumers the same or similar services. Thus, the provision of one service to rural and remote subscribers offers the possibility of providing other services over that same infrastructure, while universal service programs can support services beyond voice telephony—especially Internet—by making expanded use of existing infrastructure.

Initially, one goal of most universal service programs was to encourage deployment of network facilities to support telecommunications services (typically voice). With the advent of multiple play, this outcome is only part of the possible new picture. The scope of universal service programs might have to go beyond supporting only telecommunications firms to include media networks. In India, cable television is available to just 10 percent of rural households. Converged services such as cable Internet or VoIP could increase the penetration of wireline telephony, currently at 6 percent, and Internet, at less than 0.5 percent, in rural households. Electricity networks could also be used to deliver broadband, as 20 percent more households have access to grid-based electricity than cable television or telephones.<sup>26</sup> Hence, rather than relying on greenfield investments by providers, regulators can look to enabling innovation, supporting upgrades, and generating demand by subsidizing services. Developing countries have an option



to consider multiple facility-service combinations and optimize support to achieve universal service faster.

A number of countries have included data services in their universal service programs. Since 1999, every household in Australia has had access, on request, to a data service with 64 kilobit-per-second (kbps) digital data capacity. This is known as the digital data service obligation (DDSO). For those who cannot access wireline data services, a special DDSO includes an industry-funded rebate that offsets the costs of satellite equipment and installation. The European Union, for its part, has specified that member countries define a minimum bandwidth for Internet services as a way to ensure connectivity. In its Digital France 2012 plan, the French government sets a target of connecting 4 million households through fiber-optic networks by 2012 (MuniWireless 2008).

In 2006, the U.K. agency Ofcom began discussing a proposal to make broadband Internet access available to every household in the country. The country's current universal service obligation covers only fixed-line telephony. However, Ofcom found that nearly all U.K. households were within reach of broadband networks, and that 39 percent had broadband access (Global Insight 2006b).

More recently, the U.S. Federal-State Joint Board on Universal Service said that broadband and wireless services should be part of its efforts, marking the first time the board has said that the program should cover broadband (FCC 2007b). Similarly, in 2007, India announced a new stream of universal service funding to provide broadband connectivity in rural areas. The government has also begun discussing support for the rollout of wireless broadband networks.

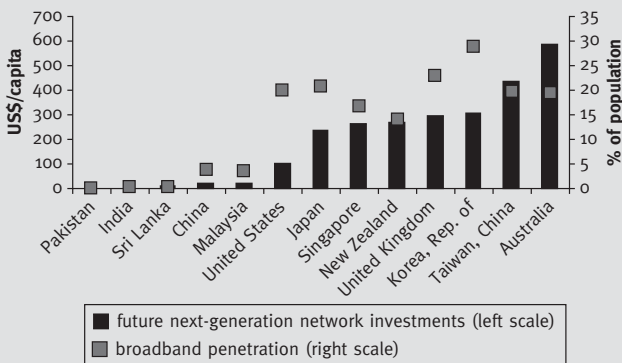
Countries with the highest levels of broadband penetration are the same ones with the greatest amount of investment in next-generation, all-IP, high-speed networks. Countries with low broadband penetration would be wise to consider investing in or subsidizing the construction of backbone networks to avoid falling into a next-generation network gap, which would simply be the next stage of the digital divide (box 3.7).

### Box 3.7 The Potential Gap in Next-Generation Networks

Investments in next-generation networks—that is, all-IP, high-speed networks—are not equally distributed worldwide. Service providers, governments, and equipment manufacturers in countries such as Japan, the Republic of Korea, the United Kingdom, and the United States are making significant investments in the fiber-optic networks and broadband technologies that constitute next-generation networks. However, countries that do not have significant broadband penetration are not yet investing in its rollout (see figure below).

Rather than investing more in their broadband and converged networks, countries with lower penetration tend to spend less, while countries with high broadband penetration are investing heavily. Such a trend points to the creation of a new digital divide, this time based on access to advanced all-IP networks. A review of universal service programs and their goals can help developing countries avoid such a divide.

#### Expected Investments in Next-Generation Networks and Current Broadband Penetration in Various Countries



Source: International Telecommunication Union data and analyst reports.

## **Funding Mechanisms Can Draw On and Support Multiple Play**

One of most common points within the debate on changes to universal service programs due to multiple play focuses on how to respond to the entry of nontraditional service providers in the voice telephone sector and the impact on funding. This is especially relevant in countries that have traditionally collected contributions to universal service funds only from PSTN-based wireline telephone companies. More recently, the growth of wireless telephony led governments to collect funds from these service providers as well. Now, with the growth of VoIP services, regulators are considering adding them to the list of providers required to pay into universal service funds.

For example, in a review of its rules for universal service fund contributions several years ago, the U.S. FCC (2006) noted that the revenues of traditional wireline telephone contributors had fallen by 6 percent even as their disbursements had grown 29 percent over 2003–05. Yet wireless and VoIP services grew enormously during this period, with VoIP subscribers growing by 28 times (FCC 2005a). The FCC concluded that excluding these providers from universal service contribution requirements was inappropriate, especially given that they were competing directly with traditional contributors. It thus added all “interconnected” telephone providers to the list of contributors, including VoIP providers. The FCC is currently seeking to develop a contribution methodology, based on end-user telecommunications revenues, that is competitively neutral. This approach would avoid distorting how carriers choose to structure their businesses or the types of services that they provide.

Reviews of universal service programs can enable countries to reconsider their goals and identify ways to use funds to expand broadband and other high-speed networks. This brings up the issue of what expenses such programs can support. While traditional programs aimed at greenfield operations, cable television operators might already have built their infrastructure and need support only for the incremental investment required to enable VoIP services. Further, some countries are supporting the construction of passive infrastructure such

as ducts, cellular phone towers, and dark fiber. The regulatory question is then how to use available funds to support not just the active or complete infrastructure, but also the passive infrastructure that will enable broadly based sector development.

In addition to specific programs, regulators should note that the creation of an enabling regulatory environment often spurs network growth without other interventions. Enabling multiple play can advance the market frontier, leaving less of the population to cover with traditional universal service programs.<sup>27</sup> A shift toward technology-neutral, flexible, broad, and efficient universal service programs will at least support—if not directly increase—access to ICT and multiple-play service delivery.

## Regulatory Agencies

The establishment and mandates of regulatory agencies are policy issues. But given the importance of regulatory agencies in the ICT sector, it is relevant to consider the impact of multiple play and the different organizational models in use. Every country has its own organizational structure for the ICT sector. Typically, there are line ministries, regulators, and affiliated authorities or bodies that directly oversee the sector.

Many countries have reorganized their regulatory agencies in response to convergence. Under the traditional model, telecommunications and broadcasting each have their own regulators—while the converged model combines oversight for both in one agency. But the analysis finds no direct link between organizational structure and regulatory effectiveness. Rather, instead of a converged regulator, it is more important for relevant government agencies to have a collaborative mind-set.

## Regulatory Structures Vary

Traditionally, most countries have had multiple institutions overseeing the telecommunications and media sectors. According to the

International Telecommunication Union, as of 2006, 149 countries had separate regulatory authorities for the communications sector—covering telecommunications, radio communications, media, and in some cases postal services (ITU 2008).

More recently, there has been a growing trend toward creating converged regulators. This can be done either by creating converged regulators for telecommunications and broadcasting infrastructure and content (as in the United Kingdom and the United States) or by creating converged infrastructure regulators (as in Estonia and Singapore).

In the United Kingdom, Ofcom replaced five offices exercising regulatory responsibilities in the communications sector.<sup>28</sup> A converged institutional design puts all communications services under one agency. And like a single-sector telecommunications regulator, a converged communications regulator tends to be strong in specialized engineering skills in the communications sector—an important core expertise when dealing with complex network issues.

The main rationale for regulatory convergence is that as services converge, it is increasingly difficult to identify which regulator has the competency to deal with them. If a cable television operator starts offering VoIP services, the telecommunications regulator might not have the authority to regulate the cable operator directly. However, a more common problem is overlapping authorities—for example, the telecommunications and broadcasting regulators might assert that their rule overwhelms the other's. In such a scenario, the possibilities for forum shopping, where a party can choose between different agencies with overlapping jurisdictions or competencies, increases substantially, both of which make regulation less efficient and impose burdens and costs on service providers.

Further, it is possible that separate institutional frameworks with separate telecommunications and broadcasting regulators can create obstacles or need to coordinate to avoid conflicts. For example, in the Republic of Korea, a dispute over competencies between the Ministry of Information and Communications, the telecommunications

regulator, and the Korean Broadcasting Corporation delayed the introduction of IPTV services. In early 2008, the country completely overhauled its regulatory institutions and merged the two agencies into one.

Other countries have taken different approaches, including putting telecommunications regulation under the mandate of a multisector utilities regulator. Multisector regulators are also useful if regulatory capacity is weak—as in many developing countries. These regulators are one way to use scarce regulatory resources efficiently (Schwartz and Satola 2000).

Other countries have chosen to rely on the application of competition and antitrust rules beyond the communications sector. For example, Germany has a cross-sector regulator that goes beyond the communications sector to include a variety of network infrastructure. The country's Federal Network Agency regulates telecommunications, post, railways, gas, and electricity. It focuses on ensuring competition in these sectors by enforcing nondiscriminatory access and efficient use of system charges (BnetZA 2005). Country examples from Malaysia, Singapore, and India below further illustrate the range of strategies used to organize regulatory agencies in response to multiple play, and, more broadly, convergence.

**Malaysia.** In 1998, Malaysia moved from a complex licensing regime with more than 31 licenses to a “converged” regulation model that unified the communications and multimedia industry. The Communications and Multimedia Act 1998 set out a new regulatory licensing framework for a convergent communications and multimedia industry and the Malaysian Communications and Multimedia Commission Act (1998) created a new regulatory body, the Malaysian Communications and Multimedia Commission (MCMC). Indeed, Malaysia was one of the first countries in the world to create such a regulator.

Malaysia's move to create a converged regulator was seen as a positive step toward enabling innovation and investment in ICT. The MCMC replaced the Department of Telecommunications and undertook its policy and regulatory functions. The MCMC is now

responsible for all ICT regulation in the country, overseeing content as well as infrastructure regulation, and is also responsible for licensing, spectrum management, and universal service.

**Singapore.** In Singapore, the IDA has the task of regulating the telecommunications market. IDA is responsible for competition regulation—including interconnection and access—in addition to licensing and spectrum management. However, the tasks related to the regulation of media infrastructure and content fall to the MDA.

The MDA often has specific requirements from telecommunications service providers if they seek to provide media services. In the case of IPTV, the MDA required that fully licensed service providers must seek specific licenses (MDA 2008). Now that mobile telephony providers are planning mobile television services, the MDA is also consulting stakeholders on a licensing framework for that service.

Such a move might be interpreted as resisting multiple play because it requires new licenses for these services even though the IDA's telecommunications licenses are technology neutral and allow a wide range of services. However, the level of consultation and responsiveness from the regulators, along with a high level of coordination, has reduced the time for decision making and made the process transparent. This maintains some level of certainty in the sector.

For example, as a move to assist in coordination between these agencies, the government has put both the IDA and MDA under a new Ministry of Information, Communications and the Arts (MICA). In the case of spectrum, the IDA and the MDA must cooperate to ensure that sufficient spectrum is made available for broadcasting purposes. For Internet services, the IDA and the MDA impose separate license and regulatory requirements on Internet service providers, which must comply with both sets of requirements (ICT Regulation Toolkit 2008c).

**India.** Responsibility for regulating India's telecommunications sector originally fell to the Telecom Regulatory Authority of India (TRAI) in 1997. Since then, the regulator has been given the additional

responsibility of regulating broadcasting carriage. It also has the power to set tariffs and regulate interconnection, and is responsible for ensuring quality of service for television and radio services.

Management of spectrum, licensing, and universal service, however, does not lie with TRAI. Instead, TRAI makes recommendations in these areas to the Ministry of Communications and Information Technology, which then carries out those functions. TRAI exercises its power primarily in tariff setting, consumer protection, quality of service, and interconnection regulation. TRAI does not regulate content, which is the responsibility of the Ministry of Information and Broadcasting. Since 2000, the government of India has contemplated at various times setting up a “converged” regulator to oversee both the telecommunications and broadcasting sectors. Efforts in this direction have not yet been successful, however.

On issues of convergence, TRAI’s involvement is mostly as the infrastructure regulator. This is partly because most telecommunications service providers in India have a technology-neutral license that also allows them to offer a wide range of services. In specific issues related to, for example, the regulation of content on IPTV or mobile television platforms, TRAI defers to the content regulators. In this manner, India has been able to implement an ad hoc converged regulatory structure.

### **Agency Structure Is Not as Critical as the Mind-Set**

Countries seeking to have enabling policy and legal frameworks for their ICT industries may achieve efficiency gains by having converged regulatory institutions. But there is no direct relationship between changes in institutional frameworks and either regulatory effectiveness or the success of multiple-play business models.

As shown above, Malaysia, Singapore, and India have all had their successes and challenges in dealing with multiple play. All three have responded to the introduction of IPTV, though with varying efficiencies. They have also faced difficulties in regulating new services, such as mobile television in Singapore and interconnected VoIP in India.



More crucial than a converged agency is the mind-set of decision makers. If two ministries are willing to work with each other and the regulator, their efforts toward convergence can be far more effective than if the appropriate ministry is unwilling to coordinate with the regulator. Singapore, for example, has two regulators in the ICT sector, one for telecommunications and one for broadcasting, and the two have worked together to resolve a number of issues related to multiple play. Similarly, Canada has a single regulator for both telecommunications and broadcasting but two different ministries. Yet coordination has been strong—with the result that the Canadian market is seeing fast growth in triple-play availability and subscriptions.

In sum, as long as the parties involved have mechanisms for coordination and are willing to find common ground, multiple play can be dealt with by separate institutions or by one converged institution. Hence, instead of immediately re-creating the institutional framework, regulators can look toward developing meaningful institutional relationships, even if they cannot overhaul their institutional frameworks. Such moves will likely lead to outcomes as good, if not better.

## Conclusion

Around the world, there has been a diverse range of regulatory responses to multiple play in the ICT sector. Regulatory frameworks have responded and adapted differently, depending on specific circumstances and legacy factors. So, even though the technologies and possibilities of multiple play are universal, specific implications and appropriate responses vary by country. Moreover, the experiences of many developed countries suggest that regulatory frameworks need to be revised as technologies, business models, and market conditions evolve. Thus, regulatory responses to multiple play will be specific to both location and time.

Recognizing that every country has different strategic and political priorities and faces different circumstances, this book has tried to avoid prescribing how regulatory frameworks should respond to multiple play. Nevertheless, it has identified some of the issues likely to

arise from the introduction of multiple play in a market, and discussed some of the many possible regulatory responses. Several key emerging trends are clear:

- *Authorizations.* There is a clear trend from narrowly to broadly defined authorizations for service operators. Some countries have reduced license requirements to a minimum, opening the market to free entry if spectrum or other finite available resources are not required.
- *Spectrum management.* There is movement away from traditional administration, which involves allocating spectrum to specific uses, toward expanding the role for market forces in assigning spectrum and defining its uses. Open-access spectrum regimes are also emerging.
- *Interconnection and access.* The old paradigm of circuit-switched interconnection and switch-based cost allocation mechanisms is being replaced by capacity-based IP interconnection for multiservice networks. Countries are pushing for open access to essential facilities for greater competition.
- *Universal service.* Trends are toward competitively neutral mechanisms (such as universal service funds) and a wider scope of universal service (including mobile and broadband access). There are also examples of government partnerships with incumbents to extend and accelerate deployment of broadband networks.
- *Institutional design.* The design of regulatory institutions is moving toward increased coordination or integration of previously separate functions, with several models in use. Some of these involve only increased coordination between regulatory agencies; others feature converged agencies.

The book also identifies some global best-practice principles for regulatory frameworks to respond to multiple play:

- *Create regulatory frameworks that promote competition.* Service providers can deploy multiple-play services only if regulators lower

entry barriers and allow innovation—and, by doing so, increase competition, lower prices, and drive growth. But it is equally important that regulators prevent market failures and do not allow monopolization. Hence, regulatory frameworks that establish level competitive playing fields will provide the greatest benefits for users.

- *Rely more on market forces and less on regulation.* Maintaining unchanged legacy regulatory frameworks will likely stifle the growth of multiple play. Instead, regulation can move toward allowing innovation and competition on a level playing field, then step back from intervening unless there are market failures.
- *Allow new technologies to contribute everything they have to offer.* Regulatory frameworks that are technology neutral and allow flexibility in service provision will encourage investments and innovation. Service providers can fully use their networks and reduce costs, increasing business viability and encouraging more efficient markets. Users will benefit from lower prices, more choices, and increased competition.

Experiences thus far suggest that regulatory frameworks based on these principles will remove artificial and unnecessary restrictions. Increased competition on a level playing field promotes investment and innovation and creates the conditions for growth of multiple play.

The analysis in this book also highlights the importance for regulators to consider how to implement their agendas. It is not necessary to do everything at once when responding to multiple play. Instead, politically or capacity-constrained regulators might choose a first step that will have the greatest impact. Given the primacy of the authorization regime, its review and amendment might be a useful such step.

In today's era of multiple play, the emerging role of regulators is to allow service providers to fully exploit the use of communications networks. This goal might best be achieved through regulatory frameworks that promote market competition and innovation and reduce the role of regulation in favor of market forces.

## Notes

1. Multiple play can also be provided by bundling. This is where combinations of services are offered as part of one package or customer relationship. Bundling does not require these services to be provided over one network, or even by one provider. It is a commercial or business arrangement, as opposed to a technological solution. This book does not discuss multiple play through bundling, but focuses on the provision of multiple play over one network, typically using IP networking technology.
2. Each of these regulatory frameworks developed independently, with different assumptions and objectives informing them. While telecommunications regulation focused more on the technical and economic aspects with the intention of network development, broadcasting regulation responded to cultural and political objectives. Internet services often developed in a regulatory vacuum, or with the intention of promoting innovation and competition in services, not networks.
3. The book focuses on these areas because they include many of the key regulatory issues associated with multiple play. A number of other issues—such as the assignment of telephone numbers and quality of services—have not been addressed, because the debate and discussion on them do not fundamentally shift in the era of multiple play. Moreover, the services provided retain their unique identities (for example, numbering of telephone subscribers may follow the same numbering plan whether a cable television or telecommunications provider offers telephone services).
4. A related development is an emerging regulatory agency model with a competition commissioner or authority that is responsible for a number of sectors. In this model, relevant sectors are regulated to maintain a level playing field for all service providers and to protect consumer interests. Further, sector-specific regulation is undertaken by subdivisions or separate focused agencies with significantly less scope than the traditional ICT regulator.
5. The authors thank Professor Robert Frieden for this comment.
6. Symmetry can also apply to content regulation. For example, many countries impose must-carry provisions on cable or satellite television networks, mandating that cable networks carry a certain number of public interest or local channels. But these rules are not always imposed on telecommunications service providers. When telecommunications firms enter the broadcasting market, asymmetric access to and regulation of content might strengthen or weaken their position depending on the market's preference for public interest or local content.

7. The discussion here focuses on four distinct services: mobile telephony, wire-line telephony, video and television services, and Internet services. Together, these services form the basis of most multiple-play business models.
8. For example, telecommunications licenses incorporate network rollout requirements and technical specifications, while broadcasting licenses include references to content codes and coverage requirements. There might also be conditions on foreign ownership, market power, and competition regulation that differ between these sectors.
9. Similarly, in Brazil, when telephone company Telefónica attempted to acquire a stake in pay television provider Way TV, regulatory approval took about six months because there were questions about foreign ownership of broadcasters.
10. Further, the provision of data or even voice over traditional or alternative wireless networks was not a major disruption. However, the trend around the world has been for regulators to see the provision of video services over wireless networks as a problem. The introduction of mobile television and video broadcasting over “telecommunications” networks, for example, has led to significant hand wringing among many regulators. The primary cause for this is the stricter control governments seek over media and broadcasting than telecommunications. Even many countries that have adopted multiple play-friendly regulations are still maintaining older distinctions.
11. Operators can upgrade CDMA2000 networks in the 800 MHz band to data-centric CDMA2000 EV-DO networks. This has happened in 28 countries (for example, Brazil, Cameroon, Indonesia, and Morocco) to date. Further, even the GSM evolution to 3G, WCDMA, is now available in the 900 MHz band. Australia, Finland, France, and the United Kingdom have plans to deploy (or have already deployed) WCDMA in this band.
12. For an in-depth study of spectrum management and reform in developing countries, see Wellenius and Neto (2008).
13. FDD is frequency division duplexing, where transmission and reception channels operate simultaneously but at different frequencies. TDD is time division duplexing, where transmission and reception are over the same frequencies but at different times.
14. Similarly, the allocation of telephone numbers, another finite resource, is important for the growth of VoIP services. Allowing only telephone companies to acquire blocks of telephone numbers will restrict the entry of cable operators into the market even if there are no other barriers. In Japan, a set of

area codes was set aside for IP telephony services, with more flexibility given to services that connected to emergency service numbers. See Morita (2005) for more background.

15. For example, the U.S. Federal Communication Commission's Part 15 rules on how "intentional, unintentional, or incidental radiator may be operated without an individual license" states: "Emanations from the device shall be suppressed as much as practicable, but in no case shall the emanations exceed the levels specified in these rules. . . . Parties responsible for equipment compliance should note that the limits specified in this Part will not prevent harmful interference under all circumstances." As such, manufacturers and users of devices using the unlicensed spectrum have a responsibility to reduce their harmful emissions as much as possible and minimize the possibility of interference with other devices. On the other hand, users of the devices have no right to be protected from harmful interference from another device (see <http://www.fcc.gov/oet/info/rules/part15/part15-9-20-07.pdf>).
16. For a detailed analysis of spectrum management in developing countries, refer to Wellenius and Neto 2008.
17. The next generation of technical developments will further challenge regulators. Dynamic circuit switches and utility computing, as well as the potential for an end to the termination monopoly, are some of these potential developments.
18. In this book, commercial arrangements between telecommunications and media firms that cover the sharing of costs and revenues and may include technical agreements on the flow of data or services, are treated within interconnection, broadening the definition beyond the telecommunications sector.
19. It is worthwhile to point out that asymmetric regulation is potentially beneficial. If all operators are regulated in the same manner, dominant market powers might exert a negative influence on their competitors.
20. For example, the interface between the CDMA and GSM mobile networks in countries such as India and the United States is not regulated.
21. This discussion is covered under the rubric of "network neutrality." Fundamentally, network neutrality seeks to ensure that a network treats different types of traffic or content the same. There are a number of views on the issue, and the debate about whether network neutrality is a useful or harmful tool is ongoing. See Peha (2007) and Wu (2003) for more background on the issue.
22. Tier 1 networks are the major operators that form the backbone of the Internet and other international telecommunications networks. They peer with

other Tier 1 networks for no fee. Tier 2 operators are the national or regional networks that pay to transit other networks. Tier 2 operators buy transit from Tier 1 networks and other Tier 2 networks. In some cases, Tier 2 networks peer or exchange traffic settlement free with other Tier 2 networks.

23. See, for example, Adams and Yellen (1976) and Gultinan (1987).
24. An example is France, where the government has begun to subsidize the building of passive infrastructure, such as ducts and dark fiber, to help cut the costs of network rollout. Similarly, Singapore is tendering for the rollout of passive infrastructure such as cables and ducts in order to support Internet services at 1 Gbps (gigabits per second) and beyond to households and businesses.
25. Given the focus of this book on infrastructure, an analysis of content guidelines is not provided.
26. Author's analysis based on UNDP 2007.
27. Indeed, this is the idea behind the market gap/access gap model.
28. These were the Broadcasting Standards Commission; Director General of Telecommunications, responsible for running the Office of Telecommunications (OfTel); Independent Television Commission; the Radio Authority; and the Secretary of State's nonmilitary radio spectrum manager.

# References and Other Resources

ACMA (Australian Communications and Media Authority). 2007. Digital Data Service Obligation (DDSO) fact sheet. [http://www.acma.gov.au/WEB/STAN/DARD/pc=PC\\_1722](http://www.acma.gov.au/WEB/STAN/DARD/pc=PC_1722).

Adams, W. J., and J. L. Yellen. 1976. "Commodity Bundling and the Burden of Monopoly." *The Quarterly Journal of Economics* 90 (3): 475–98.

AFX Asia. 2007. "Singapore's Starhub 2006 Net Profit Rises 62.7 on Strong Revenue in All Segments." February 14.

All Africa. 2005. "Firm Imports Sh72m Expansion Kit." January 3.

Antonelli, C. 1992. *The Diffusion of Advanced Telecommunications in Developing Countries*. Paris: Organisation for Economic Co-operation and Development.

AseanAffairs. 2008. "OpenNet Bags Singapore Broadband Deal." September 27. [http://www.aseanaffairs.com/page/opennet\\_bags\\_singapore\\_broadband\\_deal](http://www.aseanaffairs.com/page/opennet_bags_singapore_broadband_deal).

Associated Press. 2007. "Judge Sides with AT&T in Effort to Offer Cable Television in Connecticut." October 31.

Au, M. H. 2006. "Possibilities for Deregulation: A Case Study of Hong Kong." In *Communications—The Next Decade*, ed. E. Richards, R. Foster, and T. Kiedrowski, 310–21. Norwich, U.K.: Office of Communications.

Balancing Act. n.d. "Kenya—Legal VoIP Begins to Shake Up the Market and Bring Prices Down." [http://www.balancingact-africa.com/news/back/balancing-act\\_297.html](http://www.balancingact-africa.com/news/back/balancing-act_297.html).



Bar, F., and C. Sandvig. 2000. "Rules from Truth: Communication Policy after Convergence." Paper presented at the Telecommunications Policy Research Conference, Alexandria, VA, September 23–25.

BBC News. 2007. "Government Mulls Broadband Help." September 19.

Bezzina, J. 2005. "Interconnection Challenges in a Converging Environment: Policy Implications for African Telecommunications Regulators." World Bank, Washington, DC.

Bloomberg. 2009. "Facebook Employees Offered \$100 Million for Shares." July 13. <http://www.bloomberg.com/apps/news?pid=20601087&sid=a3StPF2tZb0I>.

BNET. 2006. "Deutsche Telekom's VDSL Flap with Regulator in EC Hands." Telecom Policy Report. August 14. [http://findarticles.com/p/articles/mi\\_m0PJR/is\\_32\\_4/ai\\_n26957242/](http://findarticles.com/p/articles/mi_m0PJR/is_32_4/ai_n26957242/).

BnetZA. 2005. "Tasks of the Federal Network Agency." [http://www.bundesnetzagentur.de/enid/4041290011d19b575d540acb9c76af8,0/The\\_Agency/Functions\\_xk.html](http://www.bundesnetzagentur.de/enid/4041290011d19b575d540acb9c76af8,0/The_Agency/Functions_xk.html).

BT (formerly British Telecom). 2006. "Delivering the 21st Century Network." [http://www.btplc.com/21CN/WhatisBTsaying/Speechesandpresentations/External\\_Final\\_iss\\_6\\_generic\\_pres\\_jan06.ppt](http://www.btplc.com/21CN/WhatisBTsaying/Speechesandpresentations/External_Final_iss_6_generic_pres_jan06.ppt).

Burdon, Steve. 2006. "The Convergence Continuum Model: A Framework for Analysing Regulatory Reform in Asia-Pacific. In *Communications—The Next Decade*, ed. E. Richards, R. Foster, and T. Kiedrowski, 294–309. Norwich, U.K.: Office of Communications.

Burns, John, Phillipa Marks, Florence LeBorgne, and Richard Rudd. 2004. "Study on Spectrum Management in the Field of Broadcasting: Implications of Digital Switchover for Spectrum Management." [http://ec.europa.eu/information\\_society/policy/comm/doc/library/ext\\_studies/spectrum\\_mgmt\\_bc\\_dswof/final\\_report\\_v3.pdf](http://ec.europa.eu/information_society/policy/comm/doc/library/ext_studies/spectrum_mgmt_bc_dswof/final_report_v3.pdf).

Business Monitor International. 2008. "UAE Market Overview."

*The Business Times*. 2006a. "All Set to Disrupt Telecoms Industry." July 24.

———. 2006b. "StarHub Unfazed by Internet TV Challenge." November 9.

Cave, M. 2005. "Investment Incentives and Local Loop Prices." Unpublished paper. <http://www.arcep.fr/fileadmin/reprise/dossiers/degrouper/MartinCave1233.pdf>.

Cisco Systems. 2007. "Annual Report." <http://www.cisco.com/web/about/ac49/ac20/ac19/ar2007/index.html>.

Comcast. 2009. "Corporate Overview." <http://www.comcast.com/corporate/about/pressroom/corporateoverview/corporateoverview.html>.

Department for Culture, Media, and Sport and Department for Business, Innovation and Skills (United Kingdom). 2009. "Digital Britain: Final Report." London. <http://www.culture.gov.uk/images/publications/digitalbritain-final-report-jun09.pdf>.

Deutsche Bank. 2007. "Global Markets Research: India Media Industry."

Dow Jones International News. 2000. "Japan Govt May Create National Fiber-Optic Network." November 1.

eBay. 2009. "2008 Annual Report." [http://files.shareholder.com/downloads/ebay/744707610x0x281367/1b773a7c-8c14-45b8-915a-1716ca37dda0/eBay\\_2008\\_AR.pdf](http://files.shareholder.com/downloads/ebay/744707610x0x281367/1b773a7c-8c14-45b8-915a-1716ca37dda0/eBay_2008_AR.pdf).

Economist Intelligence Unit. 2007. "Africa: Tariffs Tumble, VoIP Rises." EIU, New York.

*The Economist*. 2007. "Screen Test—Mobile Television." September 8.

Estache, A., and M. E. Pinglo. 2004. "Are Returns to Private Infrastructure in Developing Countries Consistent with Risks Since the Asian Crisis?" World Bank Policy Research Working Paper No. 3373, World Bank, Washington, DC.

European Commission. n.d. "Competition in ICT: Overview." [http://ec.europa.eu/comm/competition/sectors/ICT/overview\\_en.html](http://ec.europa.eu/comm/competition/sectors/ICT/overview_en.html).

European Commission. 2002a. "Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the Authorisation of Electronic Communications Networks and Services (Authorisation Directive)." [http://eur-lex.europa.eu/pri/en/oj/dat/2002/1\\_108/1\\_10820020424en00210032.pdf](http://eur-lex.europa.eu/pri/en/oj/dat/2002/1_108/1_10820020424en00210032.pdf).

———. 2002b. "Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on Access to, and Interconnection of, Electronic Communications Networks and Associated Facilities (Access Directive)." [http://ec.europa.eu/information\\_society/topics/telecoms/regulatory/new\\_rf/documents/1\\_10820020424en00070020.pdf](http://ec.europa.eu/information_society/topics/telecoms/regulatory/new_rf/documents/1_10820020424en00070020.pdf).

Faulhaber, G. R., and D. J. Farber. 2002. "Spectrum Management: Property Rights, Markets, and The Commons." Working Paper 02-12, American Enterprise Institute–Brookings Joint Center, Washington, DC.

FCC (U.S. Federal Communications Commission). 2005a. "FCC Launches Broad Inquiry into Management and Oversight of Universal Service Fund." FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-259330A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-259330A1.pdf).

———. 2005b. "First Report and Order and Notice of Public Rule Making: IP-Enabled Services." WC Docket Nos. 04-36 and 05-196. FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-05-116A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-116A1.pdf).

———. 2006. "Report and Order and Notice of Proposed Rulemaking: Universal Service Contribution Methodology." FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-94A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A1.pdf).

———. 2007a. "FCC Chairman Kevin Martin Statement on Wireline Bureau Granting Time Warner Petition for Declaratory Ruling on Interconnection with Incumbent LECs." Press Release, March 1. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-270985A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270985A1.pdf).

———. 2007b. "Federal-State Joint Board on Universal Service Statement on Long Term, Comprehensive High-Cost Universal Service Reform." WC Docket No. 05-337/CC Docket No. 96-45. FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-07J-3A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07J-3A1.pdf).

———. 2007c. "Report and Order, Declaratory Ruling, Order on Remand, and Notice of Proposed Rulemaking." WC Docket No. 07-243; WC Docket No. 07-244; WC Docket No. 04-36; CC Docket No. 95-116. FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-07-188A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-188A1.pdf).

———. 2007d. "Report and Order." WC Docket No. 04-36; WT Docket No. 96-198; CG Docket No. 03-123; CC Docket No. 92-105. FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-07-110A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-110A1.pdf).

———. 2007e. "Time Warner Request for Declaratory Ruling that Competitive Local Exchange Carriers May Obtain Interconnection under Section 251 of the Communications Act of 1934, as Amended, to Provide Wholesale Telecommunications Services to VoIP Providers." WC Docket No. -6-55. FCC, Washington, DC. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DA-07-709A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-07-709A1.pdf).

———. 2008a. "Report and Order and Further Notice of Proposed Rulemaking: Leased Commercial Access." MB Docket No. 07-42. [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-07-208A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-208A1.doc).

———. 2008b. “Wireless Auctions: Information Page.” [http://wireless.fcc.gov/auctions/default.htm?job=auction\\_factsheet&id=73](http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=73).

Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway (Germany). 2005. “Tasks of the Federal Network Agency.” [http://www.bundesnetzagentur.de/enid/4041290011d19b575d540acbf9c76af8,0/The\\_Agency/Functions\\_xk.html](http://www.bundesnetzagentur.de/enid/4041290011d19b575d540acbf9c76af8,0/The_Agency/Functions_xk.html).

FinancialWire. 2008. “Comcast to Take Stake in Sprint, Clearwire Wireless Broadband Business.” May 8.

Frieden, R. M. 2006. “Network Neutrality or Bias?—Handicapping the Odds for a Tiered and Branded Internet.” Working Paper 1755, bep Legal Series. <http://law.bepress.com/expressto/eps/1755/>.

GAO (U.S. Government Accountability Office). 2004. “Wire-Based Competition Benefited Consumers in Selected Markets.” Report to the Subcommittee on Antitrust, Competition Policy and Consumer Rights, Committee on the Judiciary, U.S. Senate, Washington, DC. <http://www.gao.gov/new.items/d04241.pdf>.

García-Murillo, M. 2005. “Regulatory Responses to Convergence: Experiences from Four Countries.” *Journal of Policy, Regulation and Strategy for Telecommunications* 7 (1): 20–40.

Gauthey, G. 2006. “Fibre, a Real Breakthrough.” *La Lettre de l’Autorité* No. 53.

Gilbert + Tobin and CRA International 2007. “Economic Study on IP Interworking.” White paper prepared for GSM Association, London. [http://www.gsmworld.com/documents/ip\\_intercon\\_sum.pdf](http://www.gsmworld.com/documents/ip_intercon_sum.pdf).

Global Insight. 2006a. “Deutsche Telekom Forced to Open VDSL Network to Rivals.” August 22.

———. 2006b. “Ofcom Considers Equipping All Homes with Broadband.” December 1.

———. 2007. “Telefónica Launches Own TV Service in Brazil.” August 16.

———. 2008a. “Singapore’s Next Gen National Broadband Project to Gain an Additional US\$180-mil. in Government Funding.” April 8.

———. 2008b. “Government Calls for Proposals on Australian National Fibre Broadband Network.” April 11.

Grace, J., C. Kenny, and C. Qiang. 2004. "Information and Communication Technologies and Broad-Based Development: A Partial Review of the Evidence." Working Paper 12, World Bank, Washington, DC.

Guermazi, B., and D. Satola. 2005. "Creating the 'Right' Enabling Environment for ICT." In *E-Development: From Excitement to Effectiveness*, ed. Robert Schware, 23–46. Washington, DC: World Bank.

Guiltinan, J. P. 1987. "The Price Bundling of Services: A Normative Framework." *Journal of Marketing* 51 (2): 74–85.

Hazlett, T. W., and G. Bittlingmayer. 2003. "The Political Economy of Cable 'Open Access.'" *Stanford Technology Law Review* 4. [http://stlr.stanford.edu/STLR/Articles/03\\_STLR\\_4/article\\_pdf.pdf](http://stlr.stanford.edu/STLR/Articles/03_STLR_4/article_pdf.pdf).

Henten, A., M. Falch, and R. Tadayoni. 2002. "Some Implications for Regulation of ICT and Media Convergence." Discussion Paper 0202. World Dialogue on Regulation for Network Economies, Copenhagen.

ICT Regulation Toolkit. 2008a. "Advantages and Disadvantages of Ex Ante versus Ex Post Regulation." infoDev and International Telecommunication Union, Washington, DC. <http://www.ictregulationtoolkit.org/en/Section.1677.html>.

———. 2008b. "Authorization." infoDev and International Telecommunication Union, Washington, DC. <http://www.ictregulationtoolkit.org/en/Section.3112.html>.

———. 2008c. "Institutional Design Options." infoDev and International Telecommunication Union, Washington, DC. <http://www.ictregulationtoolkit.org/en/Section.1267.html>.

———. 2008d. "Main Types of Authorization Regimes." infoDev and International Telecommunication Union, Washington, DC. <http://www.ictregulationtoolkit.org/en/Section.544.html>.

IDA (Infocomm Development Authority of Singapore). 2008. "Proposed Regulatory Framework for Telephony Services over Wireless Broadband Access Networks and Interconnection Framework for Telephone Services." Infocomm Development Authority, Singapore. [http://www.ida.gov.sg/doc/Policies%20and%20Regulation/Policies\\_and\\_Regulation\\_Level2/20070705095743/WBAIntc.pdf](http://www.ida.gov.sg/doc/Policies%20and%20Regulation/Policies_and_Regulation_Level2/20070705095743/WBAIntc.pdf).

———. 2009. "Singapore's Nationwide Next Generation National Broadband Network Deployment On Track." <http://www.ida.gov.sg/News%20and%20Events/20050725173124.aspx?getPagetype=20>.

*International Herald Tribune*. 1996. "Beyond Minitel: France on the Internet." January 8.

Internet World Stats. 2007. <http://www.internetworldstats.com/dsl.htm>.

Ismail, S. 2004. "Parity Rules: Mapping Regulatory Treatment of Similar Services." *Federal Communications Law Journal* 56 (3): 448–88. <http://law.indiana.edu/fclj/pubs/v56/no3/Ismail%20Final%20202.pdf>.

———. 2007. "The Status of Voice over Internet Protocol (VoIP) Worldwide, 2006." FoV paper 04, International Telecommunication Union, Geneva.

ITU (International Telecommunication Union). 2006. *World Information Society Report*. Geneva: International Telecommunication Union.

———. 2008. "ITU Eye." <http://www.itu.int/ITU-D/icteye/Default.aspx>.

Jamison, M. A., L. Holt, and S. V. Berg. 2005. "Measuring and Mitigating Regulatory Risk in Private Infrastructure Investment." *The Electricity Journal* 18: 6.

Johnson, S. 2009. "How Twitter Will Change the Way We Live." *Time*. June 5.

Katz, M. L. 2000. "Regulation: The Next 1000 Years, A Background Paper." In *Six Degrees of Competition: Correlating Regulation with the Telecommunications Marketplace*, 27–56. Report of the Fourteenth Annual Aspen Institute Conference on Telecommunications Policy, The Aspen Institute, Washington, DC. <http://www.aspeninstitute.org/sites/default/files/content/docs/communications%20and%20society%20program/SIXDEGREES%2520FINAL%2520.PDF>.

Katz, M. L., and Glenn A. Woroch. 1998. "Introduction: Convergence, Competition, and Regulation." *Industrial and Corporate Change* 6 (4): 701–18.

Kirkpatrick, C., D. Parker, and Y.-F. Zhang. 2006. "Foreign Direct Investment in Infrastructure in Developing Countries: Does Regulation Make a Difference?" *Transnational Corporations* 15 (1): 143–71.

Liberty Global. n.d. "Annual Reports." <http://www.lgi.com/ir.html>.

Marcus, J. Scott. 2007. "NGN Interconnection and Access." Report for International Telecommunication Union Global Symposium of Regulators, Dubai, February 5–7. [http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/discussion\\_papers/JScott\\_Marcus\\_Interconnection\\_IP-based.pdf](http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/discussion_papers/JScott_Marcus_Interconnection_IP-based.pdf).

Marketwire. 2008. "Infonetics Research: IP Router Sales Up in a Usually Down Quarter." June 4.

———. 2009. “Jajah Platform Connects One Billionth Call.” <http://www.marketwire.com/press-release/Jajah-Inc-1007602.html>.

MDA (Singapore Media Development Authority). 2007. “Public Consultation: Policy and Regulatory Framework for Mobile Broadcasting Services in Singapore.” Media Development Authority, Singapore.

———. 2008. “Licence Framework for Broadcasting IPTV Services.” Media Development Authority, Singapore.

Morita, N. 2005. “IP Telephony and NGN.” [http://www.apricot.net/apricot2005/slides/T12-4\\_2.pdf](http://www.apricot.net/apricot2005/slides/T12-4_2.pdf).

MuniWireless. 2008. “Sarkozy Digital Plan 2012 Is Ambitious, but Overshadowed by Financial Crisis.” <http://www.muniwireless.com/2008/10/23/sarkozy-digital-plan-ambitious-but-overshadowed-by-financial-crisis/>.

MyBroadband. 2007. <http://mybroadband.co.za/news/Cellular/1518.html>. October 4 (accessed May 28, 2008).

*The Nation* (Thailand). 2008. “DTAC Sees Red over VoIP Calls.” February 16.

*New Haven Register*. 2007. “Consumers Win on TV Competition.” November 9.

*The New York Times*. 2007. “Unlike U.S., Japan Pushes Fiber Over Profit.” October 3.

Nigerian Communications Commission. 2003. Unified Access Service License, Section 24.1. <http://www.ncc.gov.ng/LicenseDocuments/Unified%20Access%20Service%20License.pdf>.

Noam, E. 2007. “State of Telecom 2007.” Presentation at the Columbia Institute for Tele-Information, Columbia University, New York.

NTIA (National Telecommunications and Information Administration). 2008. “Networked Nation: Broadband America 2007.” NTIA, Washington, DC.

OECD (Organisation for Economic Co-operation and Development). 2006. “Multiple Play: Pricing and Policy Trends.” OECD, Paris. <http://www.oecd.org/dataoecd/47/32/36546318.pdf>.

Ofcom (Office of Communications, United Kingdom). 2006. “Maximising the Benefits of the Digital Dividend.” [http://www.ofcom.org.uk/media/news/2006/12/nr\\_20061219](http://www.ofcom.org.uk/media/news/2006/12/nr_20061219).

———. 2007. “Choice, Competition, Innovation: Delivering the Benefits of the Digital Dividend.” [http://www.ofcom.org.uk/media/news/2007/12/nr\\_20071213a](http://www.ofcom.org.uk/media/news/2007/12/nr_20071213a).

Papadias, L., A. Riedl, and J. G. Westerhof. 2006. “Public Funding for Broadband Network—Recent Developments.” *European Competition Policy Newsletter* 3: 13–18.

Paul Budde Communications Pty Ltd. 2007. “France: Telecom Market Overview.” Paul Budde Communications Pty Ltd., Bucketty, Australia.

———. 2008. “France—Broadband Market—Fibre and Wireless Services.” Paul Budde Communications Pty Ltd., Bucketty, Australia.

———. 2009. “France—Key Statistics, Telecom Market & Regulatory Overviews.” Paul Budde Communications Pty Ltd., Bucketty, Australia.

Peha, J. M. 2007. “The Benefits and Risks of Mandating Network Neutrality, and the Quest for a Balanced Policy.” *International Journal of Communication* 1: 644–68.

Pyramid Research. 2007. “From Triple-Play to Quad-Play.” Pyramid Research, Cambridge, MA.

Qiang, C. Z-W. 2009. “Broadband Infrastructure Investment in Stimulus Packages: Relevance for Developing Countries.” World Bank, Washington, DC. [http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Broadband\\_Investment\\_in\\_Stimulus\\_Packages.pdf](http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1208273252769/Broadband_Investment_in_Stimulus_Packages.pdf).

Raja, S., and M. Williams. 2007. “Converging Media/Diverging Experiences.” Paper presented at the Telecommunications Policy Research Conference, Alexandria, VA, September 28–30.

RealMoney.com. 2007. “China 3G Drama Continues.” December 28.

Reporters without Borders. 2008. “Country Report: Bahrain.”

Schwartz, T., and D. Satola. 2000. “Telecommunications Legislation in Transitional and Developing Economies.” Technical Paper No. 489, World Bank, Washington, DC.

Scott, M. J., and D. Elixmann. 2007. “Regulatory Approaches to NGNs: An International Comparison.” Presented at the Telecommunications Policy Research Conference, Alexandria, VA, September 28–30.



Sigurdsson, H. M. 2007. "Techno-Economics of Residential Broadband Deployment." Center for Information and Communication Technologies, Technical University of Denmark, Copenhagen.

Singh, R., and S. Raja. 2009. "Nothing Endures but Change: Thinking Strategically about ICT Convergence." In *Information and Communications for Development 2009: Extending Reach and Increasing Impact*, 19–34. Washington, DC: World Bank.

———. 2008. "Convergence in ICT Services: Regulatory Responses to Multiple Play." Working Paper 44620. World Bank, Washington, DC.

Skype. 2005. Press Release, November 21.

Smith, W. 2000. "Regulatory Infrastructure for the Poor: Perspectives on Regulatory System Design." World Bank, Washington, DC.

SSKI Research. 2007. "Entertainment and Media." Bombay.

Stern, P. A., and D. N. Townsend. 2007. "New Models for Universal Access to Telecommunications Services in Latin America." Joint study by Regulatel, Public-Private Infrastructure Advisory Facility, Global Partnership on Output-Based Aid, United Nations, European Union, Economic Commission for Latin America and the Caribbean (CEPAL), and the World Bank.

*Straits Times* (Singapore). 2005a. "Pay Television Key to SingTel's Hub Ambition." October 31.

———. 2005b. "SingTel May Offer Pay-Television Services Next Year." October 1.

———. 2006. "SingTel's Pay Television Foray May Come at High Cost." November 20.

———. 2007. "SingTel Gets 10-Year Nationwide Internet Television License." January 16.

Telecommunications Management Group. 2008. "IPTV: The Killer Broadband Application." Telecommunications Management Group, Arlington, VA.

Telecommunications Reports. 2007. "Court Rules AT&T Can Offer IPTV under New Video Law." 15 November.

TelecomWeb News Break. 2007. "Connecticut AG Demands a Halt to AT&T IPTV Sales." August 7.

TeleGeography. 2007. "Voice Report." TeleGeography, Washington, DC.

———. 2009a. GlobalComms Database. TeleGeography, Washington, DC.

———. 2009b. "Voice Report." TeleGeography, Washington, DC.

———. 2009c. "WiMax Market Tracker: Quarter 1 2009." TeleGeography, Washington, DC.

*Times Online*. 2009. "Australia Puts Superfast Broadband On Line." April 7. [http://business.timesonline.co.uk/tol/business/industry\\_sectors/technology/article6050063.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/technology/article6050063.ece).

TR's State NewsWire. 2006. "AT&T Credits IPTV Ruling for \$336M Investment Plan." June 23.

TRAI (Telecom Regulatory Authority of India). 2008. "Recommendations on 3rd Phase of Private FM Radio Broadcasting." TRAI, New Delhi.

U.K. Department for Culture, Media and Sport. 2006. "Convergence Think Tank." <http://www.culture.gov.uk/Convergence/index.html>.

———. 2009. "Digital Britain." [http://www.culture.gov.uk/what\\_we\\_do/broadcasting/5631.aspx](http://www.culture.gov.uk/what_we_do/broadcasting/5631.aspx).

UNDP (United Nations Development Programme). 2007. *Human Development Report 2007/2008*. New York: UNDP.

Universal Service Fund (Pakistan). 2008. "Broadband Programme." Universal Service Fund, Ministry of Information Technology, Islamabad. <http://www.usf.org.pk/Broadband-Programme.aspx>.

U.S. Congressional Research Service. 2003. "FCC Media Ownership Rules: Issues for Congress." U.S. Congressional Research Service, Washington, DC.

Verizon Communications. 2006. "Annual Report." [http://investor.verizon.com/financial/annual/2006/downloads/06\\_vz\\_ar.pdf](http://investor.verizon.com/financial/annual/2006/downloads/06_vz_ar.pdf).

———. 2009a. 1st Quarter 2009 Earnings Conference Call, April 27, 2009: <http://investor.verizon.com/news/20090427/20090427.pdf>.

———. 2009b. 2nd Quarter 2009 Earnings Conference Call, July 27, 2009: <http://investor.verizon.com/news/20090727/20090727.pdf>.

*The Wall Street Journal*. 2006. "How France Became a Leader in Offering Faster Broadband." March 28.

Wang, E. H. 1999. "ICT and Economic Development in Taiwan: Analysis of the Evidence." *Telecommunications Policy* 23: 235–43.

Waverman, L. 2006. "The Challenges of a Digital World and the Need for a New Regulatory Paradigm." In *Communications—The Next Decade*, ed. E. Richards, R. Foster, and T. Kiedrowski, 158–75. Norwich, U.K.: Office of Communications.

Wellenius, B., and I. Neto. 2008. "Managing the Radio Spectrum: Framework for Reform in Developing Countries." Policy Research Working Paper, World Bank, Washington, DC.

Windhausen, John, Jr. 2008. "A Blueprint for Big Broadband." EDUCASE, Washington, DC. <http://net.educause.edu/ir/library/pdf/EPO0801.pdf>.

Wireless Intelligence. 2008. "Asia Pacific Connections."

———. 2009. "Number of Connections by Bearer Technology." (data from Q2 2009).

World Trade Organization. 1996. "Negotiating Group on Basic Telecommunications." [http://www.wto.org/english/tratop\\_e/serv\\_e/telecom\\_e/tel23\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm).

Wu, T. 2003. "Network Neutrality, Broadband Discrimination." *Journal of Telecommunications and High Technology Law* 2 (1): 141–79.

# Index

Boxes, figures, notes, and tables are indicated by *b*, *f*, *n*, and *t*, respectively.

## A

- access regulation, 82–85, 99
- Afghanistan, 16, 32<sup>n4</sup>
- Africa, VoIP restraints in, 21
- agencies, regulatory, 41, 93–98, 99, 101<sup>n4</sup>
- Arab Republic of Egypt, 11<sup>t</sup>, 13<sup>b</sup>, 35<sup>b</sup>
- Argentina, 13<sup>b</sup>
- asymmetry/symmetry in regulatory frameworks, 36–37, 44, 47–48, 59–60, 101–2<sup>n6</sup>
- Australia
  - access regulation, 84
  - authorizations regime, 56
  - next-generation networks, investment in, 91<sup>b</sup>
  - regulatory responses to multiple play in, 42<sup>t</sup>
  - spectrum management, 63, 66<sup>f</sup>, 68, 72, 102<sup>n11</sup>
  - universal service regulations, 86, 90, 91<sup>b</sup>
- Austria, 66<sup>f</sup>
- authorizations regime, 49–63
  - automatic authorization, 52–54
  - conclusions regarding, 99
  - definition of authorizations, 49
  - design trends in, 61–63
  - effect on multiple play services, 49–52
  - fees, 62
  - flexibility and technology neutrality in, 56–58, 61–62
  - implementation of regulatory reform via, 41
  - migration to new regime, 62
  - reform, piecemeal versus wholesale approach to, 60–61
  - restrictive versus open regimes, 52–54, 53<sup>b</sup>, 61, 62
  - scope and extent of multiple play, 54–58, 57<sup>b</sup>
  - separation from spectrum management, 71
  - spectrum charges, 62
  - summary results of survey of six countries, 42–43<sup>b</sup>
  - symmetric licensing terms, 59–60
  - terms and conditions of license, 62–63
  - time period of license, 63
  - types of, 49, 50<sup>t</sup>

**B**

barriers to entry, 36–37, 38*t*, 41, 44  
 best-practice principles, 6–7, 99–100  
 bill-and-keep model, 78–79

**Brazil**

anticompetitive effects of  
   convergence in, 19  
 authorizations regime, 102*n*9  
 broadband network development  
   in, 2  
 corporate convergence in, 12*b*  
 forms of convergence in, 11*t*  
 multiple play, growing supply of/  
   demand for, 35*b*  
 spectrum management in, 102*n*11

BRIC countries (Brazil, Russia, India,  
 and China), 2

broadband network development,  
 1–3, 13–14

broadband wireless, 65–67, 66*f*  
 bundling, 101*n*1

business models, converged (corporate  
 convergence), 3–4,  
 10, 11*t*, 20

**C**

cable television infrastructure,  
   converged services via, 15  
 calling party's network pays (CPNP),  
 78, 79

Cameroon, 102*n*11

Canada, 15, 42*t*, 98

CDMA EV-DO (code division  
 multiple access, evolution,  
 data-optimized)  
 technology, 68

CDMA (code division multiple  
 access) standard, 68,  
 103*n*20

Chile, 4, 11*t*, 13*b*, 35*b*, 66

**China**

access regulation, 83  
 authorizations regime, 56, 63  
 broadband network  
   development in, 2

interconnection, 73, 83

next-generation networks,  
   investment in, 91*b*  
 spectrum management, 67, 69  
 wireline services, declining  
   subscriber base for, 26*b*

Cisco Systems, 12

code division multiple access,  
   evolution, data-optimized  
   (CDMA EV-DO)  
   technology, 68

code division multiple access  
 (CDMA) standard,  
 68, 103*n*20

**competition**

as best-practice principle in  
 regulatory regimes, 99–100

direct government investment,  
   anticompetitive effects  
   of, 28

effects of convergence on, 17–20

interconnection issues, 78, 80*b*

legacy regulatory frameworks,  
   challenges for multiple play  
   in, 36–37, 38*t*

policy reform and promotion of,  
 27, 31

regulation promoting, 41,  
 44–47, 45–46*b*

consultation with stakeholders  
 in regulatory reform, 39,  
 40*b*

content online, 3

convergence in ICT, vii–viii, 1–20

benefits and risks of, 14–20

best-practice principles, 6–7

competition, effects on, 17–20

defined, 1, 9

in developing countries, 12–13*b*

growing momentum of, 1–4

market and technology drivers,  
 10–14

policy responses to, 4–5, 20–31.

*See also* policy responses to  
 convergence

- regulatory responses to, 5–7, 33–104. *See also* regulatory responses to multiple play types of, 4, 10, 11*t*
  - corporate convergence, 3–4, 10, 11*t*, 20
  - cost-effectiveness
    - of convergence, 12, 19
    - as goal for users and service providers, 3
    - interconnection, cost- and revenue-sharing arrangements for, 78–80, 80*b*
    - tariff reductions, 15–16
    - VoIP versus conventional carriers, 53*b*
  - CPNP (calling party's network pays), 78, 79
  - Croatia, 66*f*
  - Czech Republic, 66*f*
- D**
- digital data service obligation (DDSO), Australia, 90
  - digital dividend, 31–32*n*3
  - digital video broadcasting (DVB), 15, 16, 65–66
  - direct government investment in ICT sector, 28–29, 104*n*24
- E**
- Egypt, Arab Republic of, 11*t*, 13*b*, 35*b*
  - enabling approach
    - policy responses to convergence, 22*t*, 25–31, 26–27*b*
    - regulatory responses to multiple play, 38–39, 41–48, 42–43*b*, 76
  - entry and entry barriers, 36–37, 38*t*, 41, 44
  - Estonia, 94
- European Union (EU)
- authorization regime, 50*t*, 52–54, 56–57
  - direct government investment in ICT in, 28–29, 32*n*8
  - interconnection, 74
  - spectrum management, 67
- F**
- Facebook, 3, 7*n*1
  - facilities, access to, 82–85, 99
  - FCC. *See* Federal Communications Commission (FCC), U.S.
  - FDD (frequency division duplexing), 69, 102*n*13
  - Federal Communications Commission (FCC), U.S.
    - access regulation, 85
    - agencies, regulatory, 90, 92
    - authorizations regime, 56, 60
    - interconnection, 76, 79, 85
    - policy responses, 20, 24
    - spectrum management, 69, 103*n*15
  - fiber optics, 2, 13*b*, 15, 26*b*, 27–28
  - Finland, 49, 58, 102*n*11
  - flexibility
    - in authorizations regime, 56–58, 61–62
    - in spectrum management, 67, 69–71, 72
  - fourth-generation (4G) services, 2–3
  - France
    - access regulation, 82
    - enabling approach to convergence in, 28, 29
    - interconnection, 73, 82
    - multiple play in, 34–35
    - passive infrastructure subsidization, 104*n*24
    - spectrum management, 66, 102*n*11
    - tariff reductions in, 15
    - universal service regulations, 90
  - frequency division duplexing (FDD), 69, 102*n*13

**G**

GAO (Government Accountability Office), U.S., 45–46*b*

Germany

- access regulation, 84
- agencies, regulatory, 95
- direct government investment in ICT, 28
- spectrum management, 63, 66*f*; 67

global system for mobile (GSM) standard, 68, 103*n*20

Government Accountability Office (GAO), U.S., 45–46*b*

government engagement with ICT sector, levels of, 25–30

Greece, 26*b*

GSM (global system for mobile) standard, 68, 103*n*20

**H**

Hong Kong, China, 56, 63, 67, 73, 83

Hungary, 66

**I**

iBurst, 16

ICT (information and communications technology), convergence in. *See* convergence in ICT

incentives for investment in advanced ICT services, 27–28

India

- agencies, regulatory, 95, 96–97
- authorizations regime, 53*b*, 55, 56, 58, 61
- broadband network development in, 2
- competition in, 45–46*b*
- forms of convergence in, 11*t*
- IPTV services offered in, 12*b*, 35*b*
- news broadcasting restrictions in, 23, 32*n*6
- next-generation networks, investment in, 91*b*

regulatory responses to multiple play in, 42*t*

spectrum management, 67, 68, 103*n*20

symmetry of regulatory framework, 48

universal service, 81, 86, 89, 90, 91*b*

wireline services, declining subscriber base for, 26*b*

Indonesia, 65, 66*f*, 102*n*11

information and communications technology (ICT), convergence in. *See* convergence in ICT

institutional design of regulatory agencies, 41, 93–98, 99, 101*n*4

interconnection, 72–85

broadened meaning of, 73–74

competition and, 78, 80*b*

conclusions regarding, 99

cost- and revenue-sharing arrangements, 78–80, 80*b*

facilities, access to, 82–85

multiple play, implications of, 74–76

targeting service providers, 80–81

technology neutrality in, 76–78

International Telecommunication Union, 67, 68–69, 94

Internet protocol television

(IPTV) services

agencies, regulatory, 95

authorization regime and, 55, 59–60

broadband penetration and, 17

competition, increasing, 18

in developing countries, 12*b*, 13*b*

growing supply of/demand for, 33, 35–36*b*

universal service regulations, 88

Ireland, 26*b*, 66*f*

Italy, 66*f*

**J**

Jajah, 3, 11*t*, 17–18, 53*b*

## Japan

- access regulation, 84
- authorization regime, 49, 58
- enabling approach to convergence
  - in, 27–28
- interconnection, 80, 84
- next-generation networks,
  - investment in, 91*b*
- nonvoice services over
  - wireless networks,
    - demand for, 66*f*
- telephone numbers, allocation
  - of, 103*n*14
- wireline services, declining
  - subscriber base for, 26*b*

job creation in wireless

telephony, 26–27*b*

**K**

## Kenya

- authorization regime, 49, 50*t*
- DVB in, 16
- enabling approach to convergence
  - in, 27
- spectrum management, 67
- symmetry of regulatory
  - framework, 48
- VoIP in, 23

Khalil, Mohsen A., viii

Korea, Republic of, 27, 66, 91*b*, 94–95

**L**

legal modifications, 41

licensing. *See* authorizations regime; spectrum management

**M**

## Malaysia

- agencies, regulatory, 95–96, 97
- authorization regime, 49,
  - 50*t*, 56, 57*b*

enabling approach to convergence
 

- in, 27

next-generation networks,
 

- investment in, 91*b*

wireline services,
 

- declining subscriber
  - base for, 26*b*

market drivers of convergence
 

- in ICT, 10–14

market entry, 36–37, 38*t*, 41, 44

market forces over regulation,
 

- reliance on, 100

market mechanisms for spectrum
 

- management, movement
  - to, 71–72

Mexico, 72, 77

mobile wireless services

increasing subscriber base for,
 

- 26*b*, 64*f*

mobile television

authorizations regimes, 43*t*,
 

- 55, 56, 102*n*10

interconnection, 79

regulatory agencies and, 96, 97

spectrum management,
 

- 65, 66–67

user benefits of convergence
 

- and, 15

nonvoice (data) services,
 

- increasing demand
  - for, 65, 66*f*

Moldova, 49, 58

Morocco, 102*n*11

MP3 music files, 33

MTNL, India, 12*b*

multiple play

benefits and risks of, 5, 11*t*

broadband wireless enabling,
 

- 65–67, 66*f*

defined, 4, 10, 11*t*, 33

growing supply of/demand
 

- for, 34–35, 35–36*b*

interconnection, implications
 

- for, 74–76

policy implications of, 11*t*



- regulatory responses to, 5–7,  
33–104. *See also* regulatory  
responses to multiple play  
wireless networks advancing,  
63–67, 64*f*, 66*f*
- music downloads, 16, 33
- Myanmar, 17
- N**
- Netherlands, 66*f*
- network convergence, 4, 10,  
11*t*, 17–18
- network neutrality, 103–4*n*21
- New Zealand, 63, 66*f*, 72, 91*b*
- next-generation network  
gap, 90, 91*b*
- Nigeria, 11*t*, 12–13*b*, 52, 58, 67
- O**
- Organisation for Economic  
Co-operation and  
Development (OECD), 88
- P**
- Pakistan, 2, 91*b*
- passive infrastructure, building, 86,  
104*n*24
- payment models, 78–79
- Philippines, 16, 55, 66*f*
- Poland, 11*t*, 66*f*, 79
- policy responses to convergence,  
4–5, 20–31  
constant change in ICT  
sector, dealing  
with, 30–31  
enabling approach, 22*t*,  
25–31, 26–27*b*  
range of, 21, 22*t*  
resistance, 21–23, 22*t*  
watch and wait approach,  
22*t*, 23–25
- public switched telephone networks  
(PSTNs), 75, 76, 92
- R**
- receiving party's network pays  
(RPNP), 78, 79
- regulatory responses to multiple play,  
5–7, 33–104  
access to facilities, 82–85, 99  
agencies, regulatory, 41,  
93–98, 99, 101*n*4  
authorizations regime, 49–63. *See  
also* authorizations regime  
best-practice principles, 99–100  
competition, promoting, 41,  
44–47, 45–46*b*  
consultation with stakeholders,  
39, 40*b*  
enabling environment, creating,  
38–39, 41–48, 42–43*b*, 76  
growing supply of/demand  
for multiple play,  
34–35, 35–36*b*  
implementation of, 39–41  
interconnection, 72–85. *See also*  
interconnection  
legacy frameworks, challenges for  
multiple play in, 36–37, 38*t*  
legal modifications, 41  
spectrum management, 63–72. *See  
also* spectrum management  
symmetry, importance of, 36–37,  
44, 47–48, 59–60, 101–2*n*6  
universal service, 2, 42–43*b*, 62,  
85–93, 99
- Republic of Korea, 27, 66, 91*b*, 94–95
- República Bolivariana de Venezuela, 66
- RPNP (receiving party's network  
pays), 78, 79
- Russia, 2
- S**
- service convergence. *See* multiple play
- service neutrality in spectrum  
management, 69–70
- service providers  
benefits of convergence for, 17–19  
cost-effectiveness as goal for, 3

- interconnection regulations
    - targeting, 80–81
  - legacy regulatory frameworks,
    - challenges for multiple play in, 36–37, 38*t*
  - Singapore
    - access regulation, 84–85
    - agencies, regulatory, 94, 95, 96, 97–98
    - authorizations regime, 49, 55, 56, 58
    - enabling approach to convergence in, 27
    - increased competition, potential for, 18
    - interconnection, 73, 75, 77, 84–85
    - next-generation networks,
      - investment in, 91*b*
    - passive infrastructure
      - subsidization, 104*n*24
    - regulatory responses to multiple play in, 43*t*
    - spectrum management, 63, 65
    - symmetry of regulatory framework, 48
  - Skype, 3, 11*t*, 14, 23, 34
  - Skype Out, 3, 53*b*
  - Slovenia, 66
  - social networking sites, 3
  - South Africa, 26*b*
  - Spain, 79
  - spectrum management, 63–72
    - assignment of spectrum, 62
    - conclusions regarding, 99
    - flexibility, importance of, 67, 69–71, 72
    - market mechanisms, movement to, 71–72
    - scope of spectrum licenses,
      - expanding, 67–71
    - separation from authorization regime, 71
    - service neutrality in, 69–70
    - summary results of survey of six countries, 42–43*b*
    - technology neutrality in, 68–69
    - wireless networks, advancing
      - multiple play via, 63–67, 64*f*, 66*f*
  - spectrum trading, 72
  - Sri Lanka, 11*t*, 12*b*, 35–36*b*, 91*b*
  - stakeholder consultation in regulatory reform, 39, 40*b*
  - strategic policy responses. *See* policy responses to convergence
  - Sweden, 15–16
  - Switzerland, 66*f*
  - symmetry/asymmetry in regulatory frameworks, 36–37, 44, 47–48, 59–60, 101–2*n*6
- T**
- Taiwan, China, 91*b*
  - Tanzania, 23
  - tariff reductions, 15–16, 25
  - TDD (time division duplexing), 69, 102–3*n*13
  - TD-SCMA (time division synchronous code division multiple access) standard, China, 69
  - technology drivers of convergence in ICT, 10–14
  - technology neutrality
    - in authorizations regime, 56–58, 61–62
    - as best-practice principle, 100
    - in interconnection regulation, 76–78
    - in spectrum management, 68–69
  - telephone numbers, allocation of, 103*n*14
  - television
    - IPTV. *See* Internet protocol television (IPTV) services
    - mobile. *See under* mobile wireless services
  - Thailand, 72, 76–77
  - third-generation (3G) services, 2, 12*b*, 13*b*, 65, 68–69

time division duplexing (TDD),  
69, 102–3*n*13

time division synchronous code  
division multiple access  
(TD-SDCMA) standard,  
China, 69

triple-play services  
costs of, 15, 16  
in developing countries,  
12*b*, 13*b*  
number of subscribers  
worldwide, 14, 15  
regulatory responses to, 34,  
35–36*b*, 55, 98  
upgrading networks for, 18, 26*b*

Twitter, 3, 7*n*1

## U

Uganda, 23, 48, 49, 58

Ukraine, 11*t*, 13*b*, 36*b*

unbundling, 82–84

United Arab Emirates, 21–23

United Kingdom  
access regulation, 82, 84  
agencies, regulatory, 94  
Digital Britain universal  
service fund, 2  
enabling approach to convergence  
in, 27, 29–30  
interconnection, 73, 81, 82, 84  
next-generation networks,  
investment in, 91*b*  
nonvoice (data) services, increasing  
demand for, 66*f*  
regulatory responses to multiple  
play in, 43*t*  
service providers, opportunities  
for, 19  
spectrum management, 63, 66,  
69–70, 102*n*11  
universal service  
regulations, 90  
wireline services, declining  
subscriber base for, 26*b*

United States. *See also* Federal  
Communications  
Commission (FCC), U.S.  
access regulation, 85  
agencies, regulatory, 94  
authorizations regime, 56, 59–60  
competition in, 45–46*b*  
corporate convergence in, 20  
GAO, 45–46*b*  
interconnection, 72, 76, 79, 85  
job creation in wireless  
telephony, 26–27*b*  
multiple play in, 34–35  
next-generation networks,  
investment in, 91*b*  
policy response to convergence  
in, 24–25  
regulatory responses to multiple  
play in, 43*t*  
service providers, opportunities  
for, 18  
spectrum management, 63,  
66, 103*n*15  
universal service regulations, 86,  
88, 90, 92  
universal service, 2, 42–43*b*,  
62, 85–93, 99

users  
benefits of convergence  
for, 14–17  
cost-effectiveness as goal for, 3

## V

Venezuela, República  
Bolivariana de, 66

video-over-IP services, 24

voice-over-Internet protocol (VoIP)  
agencies, regulatory, 94, 97  
authorization regimes, 52, 53*b*, 60  
cost-effectiveness of, 3  
interconnection, 75, 76, 77  
resistant governmental approach  
to, 21–23  
spectrum management, 65

telephone numbers, allocation  
of, 103*n*14  
universal service regulations,  
86, 88, 92

**W**

wideband code division multiple  
access (WCDMA),  
68, 102*n*11  
Wi-Fi, 16, 63, 71  
WiMax, 16, 69  
Windows Media Video (WMV)  
files, 33  
wireless technology. *See also* mobile  
wireless services

broadband wireless, 65–67, 66*f*  
convergence driving increased  
coverage of advanced  
services over, 16  
growth and development in, 2–3  
spectrum management, 63–67,  
64*f*, 66*f*  
wireline versus wireless services,  
subscriber base for,  
26–27*b*, 64*f*  
World Radiocommunications  
Conferences, 68–69

**Y**

YouTube, 3, 7*n*1

## ECO-AUDIT

### *Environmental Benefits Statement*

The World Bank is committed to preserving endangered forests and natural resources. The Office of the Publisher has chosen to print *Convergence in Information and Communication Technology: Strategic and Regulatory Considerations* on recycled paper with 30 percent postconsumer fiber in accordance with the recommended standards for paper usage set by the Green Press Initiative, a nonprofit program supporting publishers in using fiber that is not sourced from endangered forests. For more information, visit [www.greenpressinitiative.org](http://www.greenpressinitiative.org).

Saved:

- 2 trees
- 1 million Btu of total energy
- 225 lb. of net greenhouse gases
- 1,084 gal. of waste water
- 66 lb. of solid waste





Growth in the information and communication technology (ICT) sector has exploded over the past 20 years. Continuous dynamic market and technology developments in this sector have led to a phenomenon known as *convergence*, which is defined in this volume as the erosion of boundaries between previously separate ICT services, networks, and business practices. Some examples include cable television networks that offer phone service, Internet television, and mergers between media and telecommunications firms.

The results are exciting and hold significant promise for developing countries, which can benefit from expanded access, greater competition, and increased investments. However, convergence in ICT is challenging traditional policy and regulatory frameworks. With convergence occurring in countries across the spectrum of economic development, it is critical that policy makers and regulators understand and respond in ways that maximize the benefits while mitigating the risks.

This volume analyzes the strategic and regulatory dimensions of convergence. It offers policy makers and regulators examples from countries around the world as they address this phenomenon. The authors suggest that countries that enable convergence are likely to reap the greater rewards, but the precise nature of the response will vary by country. Hence, this book offers global principles that should be tailored to local circumstances as regulatory frameworks evolve to address convergence.

ISBN 978-0-8213-8169-4



SKU 18169



THE WORLD BANK