Tenth Anniversary Edition

TELECOMMUNICATIONS REGULATION HANDBOOK

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THE WORLD BANK

infoDev

Edited by Colin Blackman and Lara Srivastava

IFC International Finance Corporation World Bank Group

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ABOUT THE TELECOMMUNICATIONS REGULATION HANDBOOK

This tenth anniversary edition of the *Telecommunications Regulation Handbook*, edited by Colin Blackman and Lara Srivastava, is a revised and updated version of the first edition, which was edited by Hank Intven (McCarthy Tétrault) and originally published in November 2000.

Dr. Colin Blackman is a consultant and editor specializing in foresight and communications policy. He is Director of Camford Associates (www.camfordassociates.com) and Editor of *info*: the journal of policy, regulation and strategy for telecommunications, information and media (www.emeraldinsight.com/info.htm).

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The new edition of the *Handbook* draws extensively, but not exclusively, on the seven modules of the ICT Regulation Toolkit, available at www.ictregulationtoolkit.org. The Toolkit is a live resource, which is updated regularly. A snapshot of the Toolkit, as of 11 October 2010, is available as a DVD-ROM appended to this report, including translations into the six working languages of the UN (Arabic, Chinese, English, French, Russian and Spanish) where available.

The editors would like to acknowledge the original authors of the ICT Regulation Toolkit modules:

- Module 1. Regulating the Telecommunications/ICT Sector: Overview, by Telecommunications Management Group (Janet Hernández and Kari Ballot-Lena)
- Module 2. Competition and Price Regulation, by NERA Economic Consulting (Calvin S. Monson, Aniruddha Banerjee, Arturo Briceño, Agustín Ros and Timothy Tardiff); Castalia Strategic Advisors (David Ehrhardt, Stephen Gale, Anna McKinley and Prabhat Sethi); Kalba International (Robert Frieden and Kas Kalba); and Roland Belfin and Heinz Otruba
- Module 3. Authorization of Telecommunication/ICT Services, by McCarthy Tétrault (Hank Intven, Theresa E. Miedema, Brodie Swartz and Jennifer Martin)
- Module 4. Universal Access and Service, by Intelecon Research and Consultancy (Andrew Dymond, Sonja Oestmann, Kyle Whiting and Christopher Smithers) with Claire and Robert Milne (Antelope Consulting)
- Module 5. Radio Spectrum Management, by McLean Foster & Co (Adrian Foster, Martin Cave and Robert W. Jones)
- Module 6. Legal and Institutional Framework, by Telecommunications Management Group (Mindel De La Torre, Janet Hernández, Michele Wu, Sofie Maddens, Amy Zirkle, Jeffrey Bernstein, Daniel Leza, Victor Mulas, Virginia Schiffino , Mariana Vega, Christopher Dean, Nadia Friloux)
- Module 7. New Technologies and Impacts on Regulation, by Telecom Research Group, Center for Information and Communication Technologies, Technical University of Denmark (Knud Skouby, Anders Henten, Morten Falch, Reza Tadayoni and William Melody) and by Janet Hernandez and Jorge Moyano (Telecommunications Management Group).

In addition, a new chapter was commissioned for this Tenth Anniversary edition:

- Chapter 7. A Digital Future: Regulatory Challenges in a Brave New World), by David N. Townsend (David N. Townsend & Associates)

The editors gratefully acknowledge the contributions of all of these authors. In particular the pivotal role of Hank Intven (McCarthy Tétrault) is acknowledged in instigating, writing and editing the original *Handbook* and also in developing the Toolkit.

Thanks are also due to many people who have supported the development of the Toolkit and the publication of the *Handbook* since 2004, including: Ana Carrasco, Valerie D'Costa, Maria Farrell, Tim Kelly, Anna Palladino and Mather Pfeiffenberger (*info*Dev); Boutheina Guermazi, Juan Navas-Sabater and Peter Smith (World Bank); Doreen Bogdan-Martin, Youlia Lozanova, Mario Maniewicz, Susan Schorr and Nancy Sundberg (ITU); David Grimshaw (DFID); Theresa Mediema (consultant); and David Rogerson (Incyte Consulting).

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FOREWORD

Communications are an essential means for reaching the "Bottom of the Pyramid" and enabling individuals to reduce poverty and improve the quality of their lives. We currently live in a world in which more Africans have access to a mobile phone than to any other utility or infrastructure service. This widespread technological dissemination creates new opportunities across all segments of society, but also presents new challenges requiring adaptable strategies. Today's communications landscape is vastly different from the environment in which we developed the first *Telecommunications Regulation Handbook* ten years ago.

Competitive and open communications markets have created opportunities in countries that previously lagged behind. Competitively priced and technologically varied service offerings have allowed businesses to compete and thrive globally. However, there are still serious market gaps (such as providing widespread high speed broadband services at affordable prices and connectivity to remote areas), that, when coupled with evolving and converging technologies, pose challenges to policymakers and regulators.

Technology is changing telecommunications markets by merging, converging and re-organizing them from the inside-out. The future of telecommunications is being written by SMS and Internet Protocol, as well as by traditional packet-switching, and implemented in applications that tie platforms together, creating services we could not have predicted but on which we have come to depend. Communications technologies alone, however, will not drive the innovation that the developing world needs.

The World Bank Group supports the *Telecommunications Regulation Handbook* because this essential guide can assist policymakers in evaluating policy options and deciding on appropriate regulations. Their efforts can support thriving economies by allowing individuals to exercise their own ingenuity to lift themselves and their countries out of poverty. As a result of the rapid rate of technological development, business innovation and changes in social attitudes continue to push communications in unpredictable, innovative directions. Well-trained, informed and independent individuals in ministries, regulatory agencies, companies and universities play a critical role in shaping the future of the communications landscape, thereby creating more opportunities for open collaboration, innovation and economic growth.

The World Bank is pleased to make available the *Telecommunications Regulation Handbook*, both as a resource and as a collaborative platform. These tools benefit the individuals entrusted with creating both a level playing field for and an environment in which communications can reach its potential as a powerful enabling tool for supporting innovation and achieving inclusive sustainable development.

Mohsen A. Khalil
Global Head, Climate Business Group
The World Bank Group
(formerly Director, Global Information & Communication Technologies)

ITU is proud to present, in conjunction with *info*Dev and the World Bank, this tenth anniversary edition of the *Telecommunications Regulation Handbook* charting the transformation of regulatory frameworks in the digital economy.

Today, regulators in the telecommunication industry stand at a crossroads in an era of transition. Since the first edition of the *Handbook* was published in 2000, the industry has transformed beyond recognition. Over the past decade, privatization has continued apace, mobile telephony has succeeded in connecting half the world's population, Internet Protocol (IP)-based networks are in full ascendancy, while the Internet now touches upon nearly every facet of our lives – professional and private. Any one of these trends is revolutionary – together, they are nothing short of cataclysmic. Regulators face an understandably daunting challenge in trying to keep up with such a rapid pace of technological change. In many cases, regulators are seeking to cope with the challenges of convergence and the new online world with old-world tools.

It was in order to equip regulators to deal with these and similar challenges that the first *Telecommunications Regulation Handbook* was published. Following its success, *info*Dev and ITU produced a comprehensive online set of resources for cutting-edge, best-practice regulation, which is essential to the growth of information and communication technology (ICT) services, applications and devices – the *ICT Regulation Toolkit*. The Toolkit is regularly updated and augmented to serve as a compass for regulators facing the ever more complex challenges involved in industry transformation and regulatory reform.

Now, more than ever, regulators need guidance and a solid basis on which to build sound foundations for the future digital economy. They can no longer afford to focus narrowly on classically defined mandates and market definitions. Rather, regulators must understand the evolving converged environment to deal with new and unprecedented issues transcending the original scope of their regulatory practice. A trans-sector focus tailoring regulation to help multiply the effects of ICTs across all sectors of the economy can prove helpful – whilst ensuring that large segments of society are not excluded from the benefits of access to ICTs. Last but not least, regulators need to seek and apply durable policies and principles that can be continually brought to bear in a changing market. Both the *Telecommunications Regulation Handbook* and the *ICT Regulation Toolkit* will continue to assist regulators in marshalling the regulatory expertise they need to navigate the rough seas of technological evolution.

This new edition of the *Telecommunications Regulation Handbook* captures the new market and regulatory strategies to optimize investment in broadband networks and ICT services. As the following chapters show, many of the evolutionary and revolutionary changes in regulation that made possible the mobile miracle of connecting 5 billion users worldwide with access to ICTs, as well as over a billion fixed and mobile broadband subscribers, are still valid today. But for markets to truly flourish, regulators also need new, inspired regulatory approaches that are as innovative as the technologies they regulate.

This new and revised edition of the *Handbook* focuses on examining these new expectations and identifying the regulatory approaches taken throughout the world to stimulate ICT growth in a converged environment and increase access to broadband services. I hope that the *Handbook* will prove invaluable to all its many different types of readers, but especially to ICT regulators and policy-makers in both developed and developing countries alike.

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CHAPTER 1. THE BIG PICTURE: INTRODUCTION TO TELECOMMUNICATIONS REGULATION

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1.1. Introduction

The telecommunications sector has undergone considerable change since the publication of the *Telecommunications Regulation Handbook* a decade ago. The long term evolution of new technologies and services has continued, focusing attention on the growing importance of telecommunications for national economies and the growth of international trade in telecommunications services. In turn this has fuelled the transition in recent decades from monopoly structures to competitive ones.

Apart from these general trends, the global telecommunications landscape in 2010 has been particularly shaped by the rapid take-up of the Internet and mobile wireless communications across the world. At the turn of the millennium, these technologies predominantly served the wealthy elite. Now mobile phones are in the hands of the majority of people on the planet. And the Internet has truly become mainstream with Web 2.0 applications such as Facebook making it relevant for so many people in their daily lives.

The past decade has also witnessed two major setbacks. Following a period of growth in the telecommunications industry in the late 1990s, the "dot com bubble" burst at the beginning of the 21st century, resulting in a steep drop in stock market value for major operators. The crash in the telecommunications market affected numerous companies, but did not appear to deter the development of new technologies and the continuing evolution of the information and communications technology (ICT) sector. The end of the decade has been overshadowed by the global economic crisis. It remains to be seen how the sector will withstand the latest economic shock, particularly as the mobile wireless market nears saturation in most industrialized countries. Wireless is, of course, a continuing success story in the developing world and there remains potential for growth, particularly in those countries that have yet to fully embrace competitive markets.

In such a rapidly evolving field, it is necessary to ensure that regulation adapts to new developments. Countries around the world have been reviewing

their existing frameworks, enacting legislation and creating new regulatory authorities to implement their legal and regulatory framework.

This anniversary edition of the *Handbook* must take account of these developments over the past decade. Most of the fundamental principles remain constant, of course, and the *Handbook* reiterates the basic and underlying principles of telecommunications regulation.

Nevertheless, there are also emerging issues arising from particular new technologies that raise new regulatory issues, e.g., Voice over Internet Protocol (VoIP), Internet Protocol Television (IPTV), social networking, etc. This new edition brings the *Handbook* up to date with regard to such matters. In addition, the wider take up and convergence of ICTs also raises new regulatory issues that traditionally would be seen as separate from telecommunications regulation. However, in the digital age, questions such as protection of minors, privacy and intellectual property are increasingly becoming part of the agenda for policy makers and regulators too. Reflecting these changes this edition of the *Handbook* goes beyond the usual definition of telecommunications regulation to address those issues arising from the transition to a more ubiquitous and participatory digital age.

This introductory chapter provides an overview of the main communications regulation issues – the big picture. It begins by highlighting the important role of information and communications technology as both social and economic enabler and the rapidly evolving and converging nature of communications technologies. A key question – why regulate? – is then explored and the principles of regulation expounded. Regulatory organizations and elements for an effective regulator are described as well as international regulatory frameworks. Finally, the chapter looks ahead to the issues that are likely to be of increasing importance over the next decade.

1.2. Technology in Context

1.2.1. Brave New Words, Brave New Economy

Digital technologies are changing the ways in which the majority of people live, work, play and interact with each other. We can see this reflected in the language we use. Our vocabulary is evolving as existing words assume new meanings – app, burn, text – or appear in new combinations, such as smart phone, cyber crime, file sharing. Some vocabulary is entirely new: the words blog, podcast and googling have become commonplace. The range of technology acronyms in everyday use continues to expand – P2P, SMS, MP3 – and adds to the sense that what we are witnessing is the dawn of a new information age, in which ICTs become part and parcel of daily life. As a result, we now live in what has been termed the "information society". The ongoing World Summit on the Information Society (WSIS) process is global recognition of the impact of ICTs on society, and the need to ensure that a global digital divide does not persist.

ICTs, such as the Internet and the mobile phone, have become vital for almost all economic and social activity. The new digital economy runs on the fuel of ICTs, from e-commerce to professional networking.

A key characteristic of ICTs is that they are regulated by national administrative agencies that are keen on ensuring that principles such as fair competition and universal access are upheld in the public interest. Government regulation of ICTs extends into many disparate areas, ranging from pricing regulation, mergers and market entry to content, copyright, and privacy.

Given the speed of technological innovation, it is not surprising that the substance of ICT regulation has had to evolve rapidly. The liberalization of ICT markets has stimulated cumulative interacting innovations in products, services and technologies with a general convergence or blurring of distinctions between platforms, products and services. These developments necessitate some form of regulatory response to keep them in check.

The evolutionary nature of regulation is evident, for instance, in the moving target of European Union (EU) regulation. There have been successive "packages" updating the regulatory framework, most recently in 2009. A growing number of countries have adopted this framework as member of the European Union. The EU regulatory approach is also reaching outside of Europe and influencing the frameworks that other countries are adopting. The 2009 reform followed several years of consultation and the new framework continues the shift to less sector-specific and more *ex post* regulation in the European Union. Significantly, the EU regulatory package has been forcefully linked to broader policy objectives concerning inclusiveness, innovation, job creation, growth, energy and environmental issues in

information society. The EU is not alone in this. Countries around the world and at all stages of economic development are implementing similar ICT strategies. ICTs also enable the participation of individuals, governments and organizations in the global economy.

1.2.2. ICT as Social and Economic Enabler

These initiatives reflect the growing acceptance that ICTs offer major transformational opportunities. They can contribute to enhanced productivity, competitiveness, growth, wealth creation, and poverty reduction. They have the potential to catapult us from an information society to the next level – that of a knowledge-based society and economy. ICTs provide the means by which knowledge is developed, stored, aggregated, manipulated and diffused.

These opportunities are well known and are not just a developed country phenomenon. ICTs, particularly access to broadband internet, are vital for developing nations as well. The ITU's Build on Broadband project is dedicated to promoting equitable, affordable broadband access to the Internet for all people, regardless of where they live or their financial circumstances. In a speech in 2009, ITU Secretary-General Dr Hamadoun I. Touré stated:

> [I]n the 21st century, affordable broadband access to the Internet is becoming as vital to social and economic development as networks like transport, water and power. Broadband access – and the next generation broadband network infrastructure which underpins it – is a key enabler for economic and social growth… Broadband changes everything. It enables not just great new enabling applications, such as VoIP and IPTV, but also the delivery of essential services – from e-health to e-education to e-commerce to e-government. And broadband is helping us make great progress towards meeting the Millennium Development Goals – and improving the quality of life for countless people around the world.

The importance of ICT was also recognized by World Bank President Robert B. Zoellick in a speech to the African Union Summit in 2010:

> ICT is a key enabler of productivity and creator of jobs. It can help farmers, small businesses, and those excluded from traditional banking services. It can extend and speed up government services. In Ghana, the introduction of IT systems and Business Re-engineering resulted in a drop in average customs clearance time from 2-3 weeks to 1-2 days and a 50% increase in revenue. In Kenya, ICT slashed the number of days it took to register a vehicle from 30 to 1.

A new program focused on bringing ICTs to the developing world was introduced by the World Bank in 2008. This program, called New Economy Skills for Africa Program-Information and Communication Technologies (NESAP-ICT), supports the growth of Information Technology (IT) and IT-Enabled Services (ITES) industry in Sub-Sahara African countries. The NESAP-ICT program noted that ICTs transform the economy and peoples' lives and provided various examples, including:

New jobs: In India, the expansion of the IT-ITES industry over the last 15 years has added more than 10 million direct and indirect jobs. In South Africa, the industry has employed 100,000 workers directly and indirectly by 2009. In the Philippines, a projected 900,000 people will be employed directly or indirectly by IT-ITES by 2010.

Economic growth: In 2009, the Indian IT-ITES industry contributed an estimated US$70 billion to the GDP or six percent share of total GDP. In the Philippines, the industry's contribution in 2010 is expected to reach US$13 billion, or about eight percent of GDP.

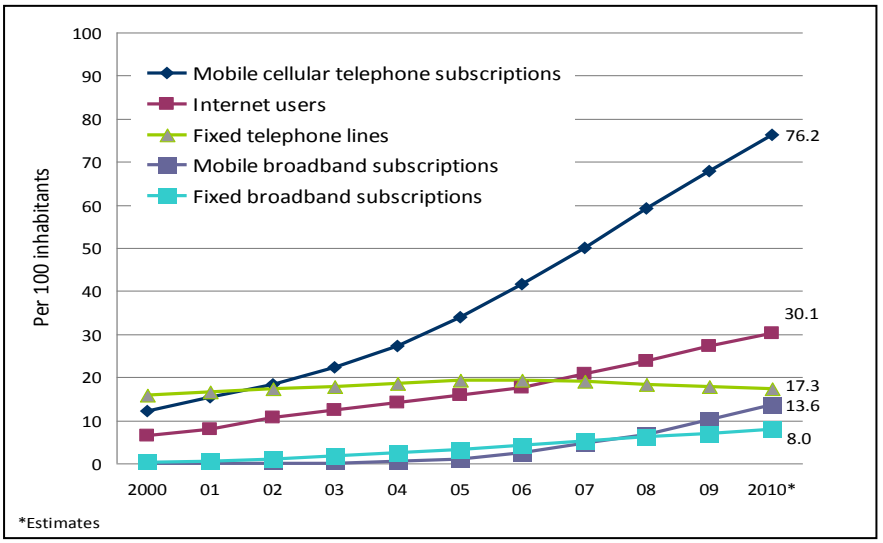
Increased productivity: The rapid spread of e-applications and digital tools to such diverse areas as manufacturing, transportation, logistics, finance, banking, governance, health, education and even in traditional sectors like agriculture is transforming the economies of developing countries. IT investments raise worker productivity three to five times that of non-IT capital. U.S. studies have shown that the IT-ITES industry was responsible for two-thirds of total factor productivity growth between 1995 and 2002 and for nearly all of the growth in labor productivity in that period.[1]

Clearly, ICTs can have an important impact on everyday lives and on general economic activity, but the opportunities only materialize fully to the extent that the regulatory framework, as implemented, supports and fosters both investment in and widespread diffusion of ICTs. Absent these conditions, the full promise of ICTs is unrealized. ICTs offer the prospects of rapid advancements, but if appropriate conditions are not in place, the outcome can be a rapid slide down the digital divide. And although the digital divide is narrowing,

particularly due to the rise of Internet-enabled mobile phones and applications, a new broadband divide is growing that governments need to address.

Figure 1.1 gives a snapshot of global ICT growth over the past decade, showing particularly the extraordinary success of mobile services.

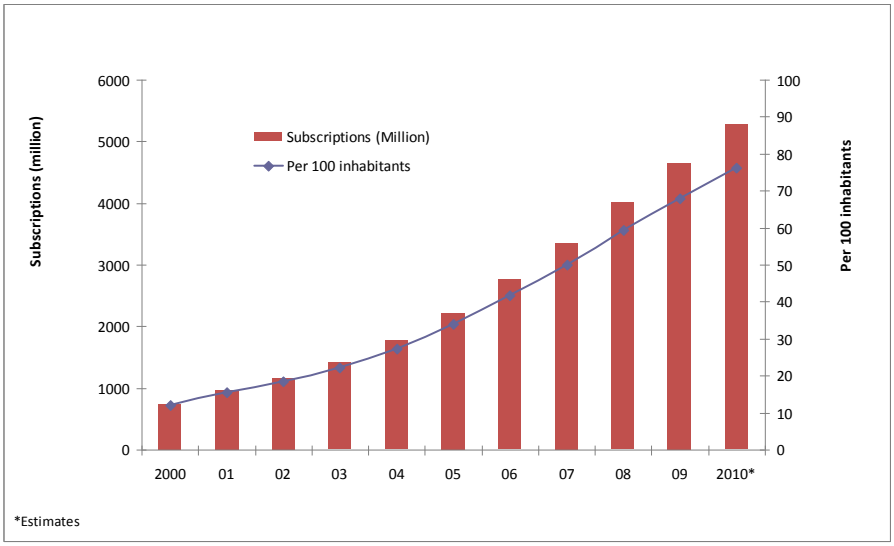
Figure 1.1 Global ICT Developments, 2000-2010



Source: ITU World Telecommunication/ICT Indicators database.

Mobile cellular has been the most rapidly adopted technology in history. In 2002, the total number of mobile subscribers in the world surpassed that of fixed customers. Mobile phone subscriptions worldwide grew from nearly 500 million in 1999 to an estimated 4.6 billon at the end of 2009, translating into a growth in mobile penetration from 8 percent to 68 percent (See Figure 1.2). Today it is the most popular and widespread personal technology on the planet.

Figure 1.2 Global Mobile Cellular Subscriptions, Total and per 100 Inhabitants 2000-2010



Source: ITU World Telecommunication/ICT Indicators database.

The growth in internet users has also been remarkable, with more than a quarter of the world's population now using the internet.

But mobile broadband subscriptions overtook fixed broadband subscribers in 2008, highlighting the huge potential for the mobile internet.

The Asia-Pacific region is the largest mobile market in the world, and by 2013, Asia is expected to have almost three billion mobile subscribers. In 2009, China alone had 747 million mobile subscribers, which far exceeded the combined number of mobile subscribers in Japan and the United States at 115 million and 298 million subscribers, respectively. Sub-Saharan Africa had a mobile penetration rate of 42 subscribers per 100 people in 2009, translating into over 295 million mobile customers.[2]

Mobile phone handsets are now turning into smart-phones equipped with digital cameras, Internet-enabled video, pre-installed social networking applications such as Facebook and music juke box payment terminals. *Billboard* magazine publishes a list of top 20 ring tones, a market that generates billions of dollars in revenue. These new functionalities are transformational. For example, as digital cameras, mobile devices provide benefits such as instant news gathering or create harmful effects like facilitating industrial espionage. Their internet-enabled video, access to social networks and music capability brings them into the realm of media, copyright and internet governance. As a component of the banking system, the mobile network can provide services where the financial network is weak, but there is also the risk of banking fraud and identity theft. These widely used electronic consumer devices now straddle several regulatory jurisdictions, raise new legal issues, and present new challenges to existing regulatory frameworks. From a government standpoint, the challenge becomes how to sustain investment and promote widespread diffusion of technologies, while protecting the legitimate interests of all players, particularly consumers.

ICTs have significantly affected business operations where a large number of new, non-OECD countries have successfully entered the market. This is particularly the case for software and IT-enabled services. Market entry is partly explained by the "death of distance" or the dramatic fall in the costs of international connectivity. The latest manifestation is the proliferation of broadband access networks. Broadband can carry huge quantities of data, at very high speeds. Although postal and courier services can deliver large quantities of data (e.g., a truckload of CDs), they fail the speed test. To transfer the digital information contained in an average two-hour movie downloaded from Apple's iTunes takes about three days using a 56Kbps dial-up modem; two hours using a 1.5 Mbps connection; two minutes using a 100 Mbps connection; and 15 seconds using a 1000 Mbps (1 Gbps).

In the broadband world, large volumes of data can be moved almost instantaneously to widely dispersed locations at low cost. Through the application of ICTs, many services once considered non-tradable are now tradable, such as back-office functions including the management of employee benefits or dental records. "Out-sourcing" and/or "business process off-shoring" (BPO) have seen massive increases, amounting to a total addressable market estimated at US$ 300 billion, of which about US$ 100 billion was off-shored in 2010. In the BPO market, India is a tremendous success story. It has become the dominant player in the BPO market. India's BPO exports grew by 35 percent a year between 2005 and 2008, and employment in the sector increased from 42,000 jobs in 2002 to an estimated 700,000 people in 2008.[3] The global economic downturn of 2009 saw a slowdown in the market but prospects for future growth remain. Other countries like the Philippines, Brazil, Romania and Ireland have also been particularly successful in attracting investment and creating employment from BPO-related activities. These successes have come about due to a commitment from the government to foster and support these activities by implementing necessary policies and developing the supporting regulatory framework. In the case of India, government policies and reforms, including telecommunications reforms implemented in 1999, established the foundations for these new activities.

The use of ICTs in e-government services is also transforming citizens' interactions with the public sector by improving efficiency, effectiveness and accountability of governments. In India, for example, a comparison of manual and e-government services found that computerized services substantially increased cost-savings and access to services. The survey showed that e-services lowered travel costs, made delivery of services more predictable, decreased waiting times, reduced corruption and generally improved overall quality of service.[4]

Although ubiquitous and open networks produce great gains for society as a whole, they also increase our vulnerability. Maximizing the connectivity and openness of networks requires regulators to create new laws in several areas, including privacy and data protection; protection of children online; and prevention of cyber crimes such as identity theft. Regulators must also ensure that law enforcement techniques evolve with technology in order to continue protecting society against those who would take advantage of these vulnerabilities. This requires adequate provisions for emergency services and lawful interception (i.e. "wiretapping").

1.2.3. Innovative Technologies and Services

All ICT organizations have legacy assets, some more than others. The evolving regulatory frameworks have facilitated or even encouraged the introduction of new technologies and services. Ideally, ICT organizations would like to manage the transition to new technologies in a way that allows them to optimize their returns on legacy assets. The reason is that new technologies disrupt (or make obsolete) pre-existing business plans and thereby the value of legacy assets. In economic terms, this is an example of a "Wave of Creative Destruction" in which disruptive technologies can bring wider choices and lower prices for the consumer.

Innovative technologies and NGNs may offer substantial opportunities for incumbents with limited legacy assets, as is the case in many developing economies. But for those with significant legacy assets, innovative technologies and services may be very disruptive if incumbents do not remain competitive and continue to innovate. Chief executive officers in many developed economies may be forced to choose between competing with their own businesses and having another company doing it. The threat of innovation may also cause some strong incumbents to adopt delaying tactics. The extent to which they can adopt such tactics depends largely on the effectiveness of implementing pro-competitive regulatory frameworks. However, innovative technologies and NGNs can benefit incumbent service providers through the lower cost of using more efficient technology. They also allow providers to compete in new service areas in order to offset declines in tradition lines of business.

Incumbents are also facing disruptive elements in cases where, frustrated by existing suppliers, local governments and municipalities are constructing their own networks, sometimes using the "open access" model and the "bottom up" development of applications. For example in Ottawa, Canada, local residents are able to purchase their fiber connections directly from the municipal government, which has built and continues to subsidize fiber network. Such "open access" models are also gaining currency in international networks.[5]

The process of managed transition is becoming more difficult in the current ICT environment for at least two reasons. First, the rate of change in technology is increasing. Second, the organizations introducing the new technologies are not necessarily members of the traditional telecommunications community, but innovators that may not play by the same rules. Established organizations as well as new entrants are arming themselves with different business models like "triple or quad play," "always on," "flat charges," "all you can eat," or even "free." These business models differ from the more traditional models where a limited range of services or a single service are offered at prices based on distance and time. In some instances, the provision of voice services is ancillary to the main line of business of the new entrant. For example, the voice version of Yahoo! Instant Message service is not the core business of the company.

Voice over Internet Protocol (VoIP) is an example of an innovative and disruptive technology (see Chapters 5.6. VoIP demonstrates that the basic premise of traditional voice telephony – the network and voice services must be owned and operated by the same firm – is no longer relevant. VoIP is disrupting the pre-existing business plans of traditional telephone service providers and is being introduced by firms outside the traditional community. For instance, Google launched its Google Voice service in March 2009. Rather than own or operate any part of the underlying network, Google simply offers an application that gives users one phone number for all of their phones, provides free long distance within the United States and has low international calling rates. As a result of this and other examples, traditional operators are responding.

Another innovative and disrupting technology is Internet Protocol television (IPTV). By providing video services, such as live television channels and video-on-demand, as well as interactive services,

over an IP platform, IPTV allows traditional telephone service providers to compete with terrestrial over-the-air broadcasters, cable television operators and satellite television providers.

ICTs have transformed many other activities, notably the media and the creative industries (see Chapter 7.2). Traditional broadcast media offer limited "mass fare" to mass audiences, due to the economics of the sector and radio spectrum restrictions. Cable and satellite platforms have expanded choice for television and radio by offering services such as video-on-demand. However, new technologies expand choice even further and are able to cater to targeted audiences. The combination of broadband (wired or wireless), the digitalization of media content, and the falling costs of producing digital content herald an age of abundance. The falling costs of producing media has placed digital content production, including documentaries, entertainment, news, music, blogs, in the hands of many and has created a bottom-up trend.

The introduction of broadband and the switch to digital from analogue broadcasting will increase delivery capacity enormously in comparison to traditional broadcasting. New content producers have a means of distributing their creations instantly and globally (see Chapter 7.3). Content can be customized to the personal tastes of an individual rather than be defined for a mass audience. Many observers are focusing on the "long tail" of digital content in which a large number of unique services, content or applications are sold in relatively small quantities. Although there are still services and items that large numbers of people will wish to purchase, many small providers and developers can become successful by selling their products to niche markets. With broadband, this "long tail" of niche media content has found a highly receptive audience, for example, through the popularity of the video-sharing site "YouTube." Apple's iPhone App Store provides another example of how small developers are finding great success by targeting the "long tail." After a developer completes a relatively simple process for developing and getting approval for a new application, iPhone subscribers are able to search through and download these specialized applications at fees set by the developer. By the end of 2009, there were more than 125,000 developers in Apple's iPhone Developer Program and subscribers had downloaded over two billion of their applications.[6] This continued abundance of choices in existing and new digital content, produced and distributed at rapidly falling costs on converged platforms, presents new disruptive challenges to both existing players or "majors" (content producers and distributors) and regulators.

The rapid increase in content choices for consumers and the speed of delivery through broadband connections are also transforming social and cultural landscapes. For example, broadband helps to reduce carbon emissions through environmentally-friendly business practices such as remote management of equipment, telecommuting and live video-conferencing and can result in a reduction of carbon emissions five times greater than the emissions that the ICT industry produces (see Chapter 7.8). The growth of innovative technologies, NGNs and convergence promises to become a disruptive force for the way individuals interact with one another in society.

1.3. Why Regulate?

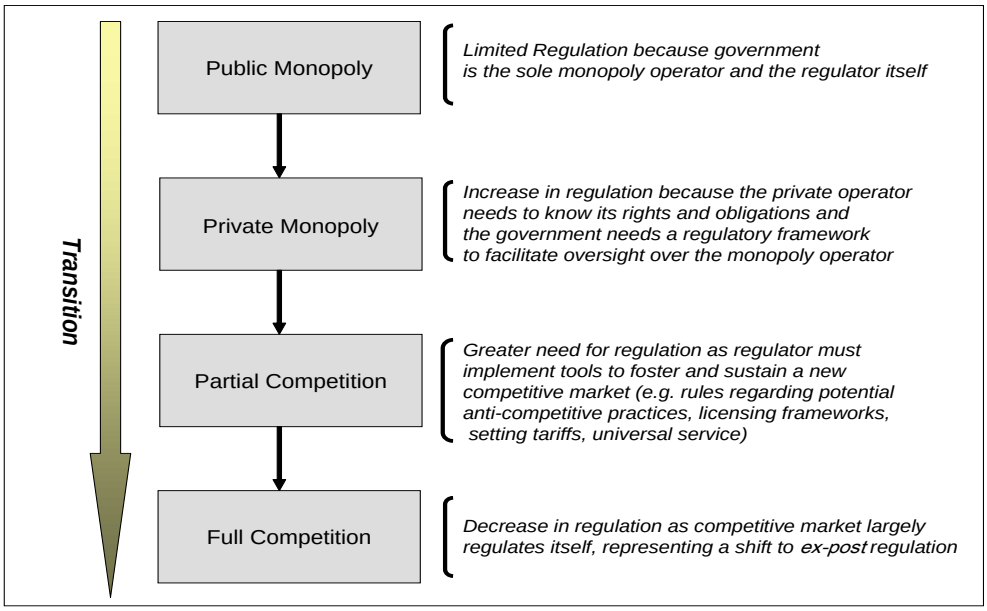
1.3.1. Evolution of Regulatory Reforms

The need for regulation varies depending on the conditions of the marketplace. While the design of the regulatory framework may differ, certain critical elements should be included in an effective regulatory framework, such as the functional aspects of the regulatory authority; decision-making processes; accountability; consumer protection, dispute resolution and enforcement powers. Consideration and proper implementation of these features are key elements for creating an enabling environment for development of the sector and for increased consumer welfare.

In the 1990s, many countries introduced the first wave of reform by privatizing their national operators. Until that time, telecommunications services were largely provided under monopoly conditions and thus limited regulation existed because the government was acting as both operator and regulator. In the very initial stages of liberalization, some countries have created a regulator when introducing a private monopoly. These regulators oversee the sector and ensure that the private operator knows and can comply with the "rules of the game." In the second wave of liberalization, which sometimes occurs simultaneously with privatization, governments typically authorize the entry of new service providers and new services (e.g., mobile services and value-added services) into the market. Generally, this

involves the modification of the licensing framework in order to allow the entry of the new players, as well as the introduction of complementary rules and regulations to allow these operators to participate in the marketplace.

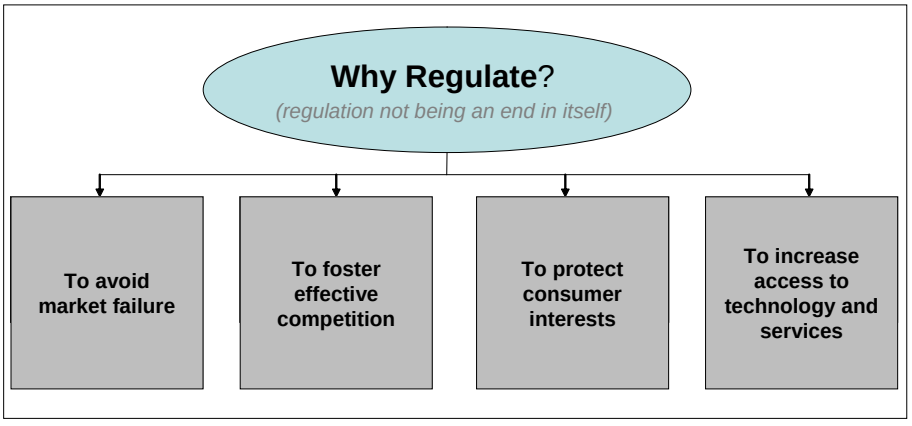
Figure 1.3 Need for Regulation



Source: ICT Regulation Toolkit.

The third wave of liberalization occurs when the incumbent operator's exclusivity period ends and full competition can be introduced. With the introduction of full competition, the role of the regulator actually increases (see Figure 1.3), particularly during the early stages of transition from the former monopoly to effective competition. As noted in Figure 1.4, regulation is not an end in itself, but rather a vehicle to attain, and subsequently sustain, widespread access, effective competition and consumer protection.

Figure 1.4 Goals of Regulation



Source: ICT Regulation Toolkit.

To transition to an effective, competitive environment, regulatory reform must include measures aimed at: (i) creating functional regulators to oversee the introduction of competition; (ii) preparing the incumbent operator to face competition (e.g., deadlines for market exclusivities);

(iii) allocating and managing scarce resources in a non-discriminatory way; (iv) expanding and enhancing access to telecommunications and ICT networks and services; and (v) promoting and protecting consumer interests, including universal access and privacy.

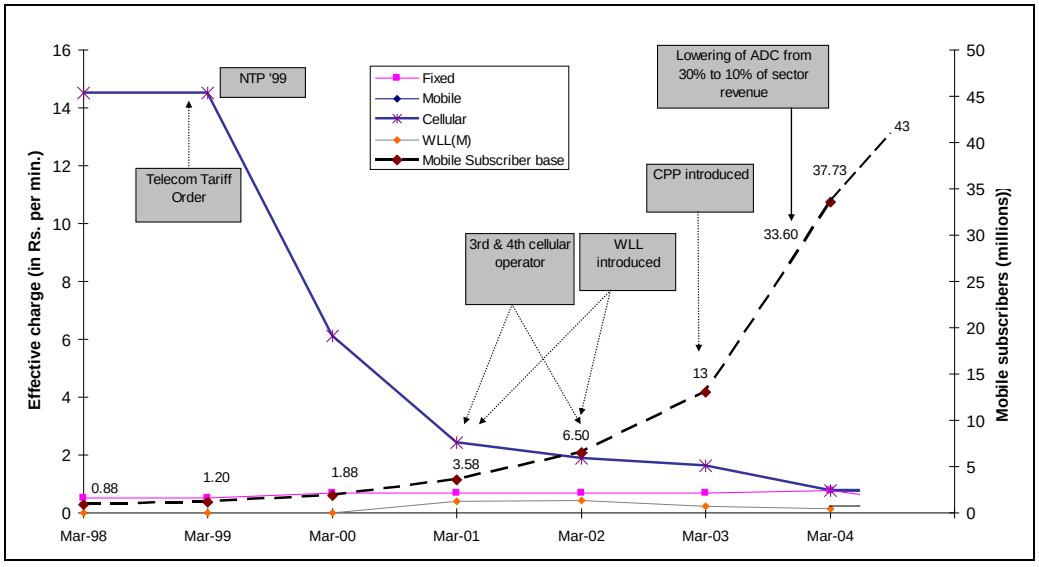
Once a fully competitive environment is attained, it is generally agreed that a more limited need for regulation exists. In certain areas such as universal access and service, however, market forces often fall short of creating the conditions necessary to satisfy public interest objectives and thus regulatory intervention is required. Similarly, regulatory agencies must ensure that spectrum is properly managed and allocated.

Moreover, despite the benefits of new technologies, regulators also must be attentive and responsive to the regulatory issues that arise from the implementation of these new technologies and their related services. For example, regulators are currently grappling with issues such as spam and consumer concerns regarding privacy, which were not issues of concern to regulators 10 years ago. In addition, governments are reviewing their regulatory structures to determine whether their current organizational structures are best suited for regulating a converged marketplace with multiple services offered by the same platform.

Likewise, regulators are realizing that their existing regulatory frameworks may impede the ability of operators to make triple or quadruple play offerings to consumers or use low-cost Voice over Internet Protocol (VoIP). Similarly, numerous governments are currently holding consultations regarding digital television in order to assess what standard should be used for such services. In addition, regulators should ensure that consumers are made aware of potential limitations associated with new technologies (e.g., emergency services may not be available through such services, and services offered may be of lower quality).

The implementation of an effective regulatory framework has resulted in greater economic growth, increased investment, lower prices, better quality of service, higher penetration, and more rapid technological innovation in the sector. In fact, investors consider the regulatory environment to be a critical factor in their analysis of whether or not to invest in a country.

Figure 1.5 The Impact of India's Regulatory Reforms on Mobile Penetration and Price



Source: Telecom Regulatory Authority of India.

As shown in Figure 1.5, the Telecom Regulatory Authority of India (TRAI) has made a comprehensive reform of the regulatory framework to promote technological neutrality and take advantage of inter-modal competition. These regulatory efforts have brought economic growth to the sector and produced a marked increase in mobile subscribers and a fall in mobile tariffs. In 1999, when its New Telecommunications Policy was adopted, India had about 1.2 million mobile

subscribers, and effective charges were 14.51 Rs./minute. Pro-competitive and liberalization-oriented policies, such as issuing additional mobile licenses in 2001 and 2002, and awarding Wireless Local Loop (WLL) licenses in 2002, had a positive effect both on penetration and prices. As of December 2009, mobile subscribers had increased to 525 million and prices had dropped to 0.64 Rs./minute.[7]

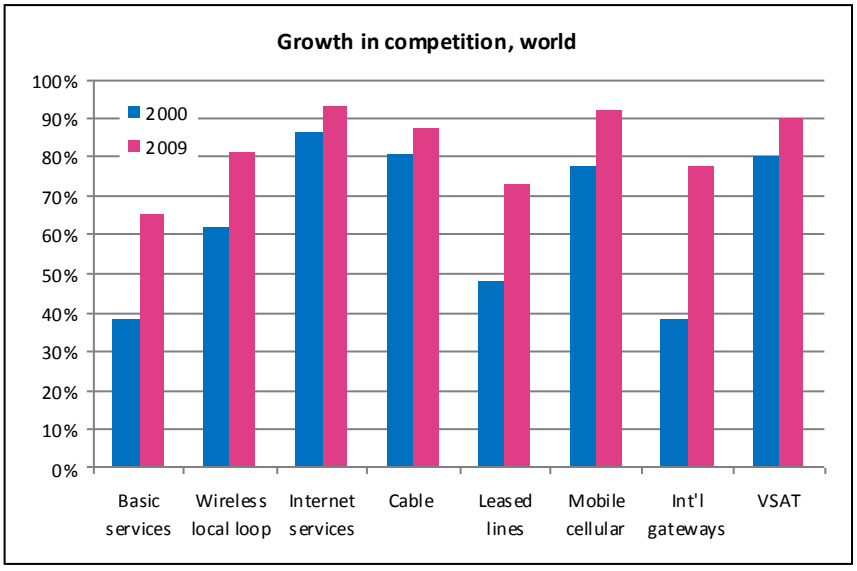
Similarly, lower prices for international telephone calls, for example, are also highly correlated with the level of competition. Regulators must often intervene to remedy shortcomings in competition and ensure that competition is working effectively. In certain cases, this includes imposing some form of regulation, such as rules related to: interconnection charges requiring incumbent operators to charge competitive operators wholesale cost-oriented rates; liberalizing the international gateway; and eliminating restrictions on resale to allow entry of multiple operators and greater competition.

1.3.2. Benchmarking Competition

As discussed above, liberalization and fostering competition are the best means to ensure efficient and high quality services at low costs, and thus, are key regulatory objectives. This once radical message has become mainstream around the world. This section benchmarks the level of competition in key sectors, worldwide and by region. The analysis compares the level of competition in:

- Local service
- Domestic long distance
- International long distance
- Mobile
- Internet services
- Leased lines

Figure 1.6 Growth in Competition in Selected Services between 2000 and 2009

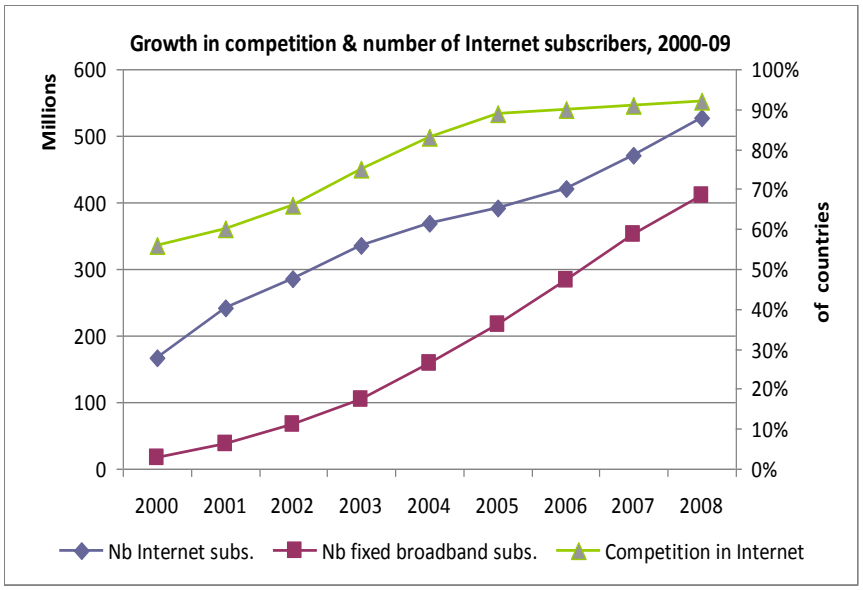


Source: ITU World Telecommunication/ICT Indicators database.

Worldwide Comparison by Sector

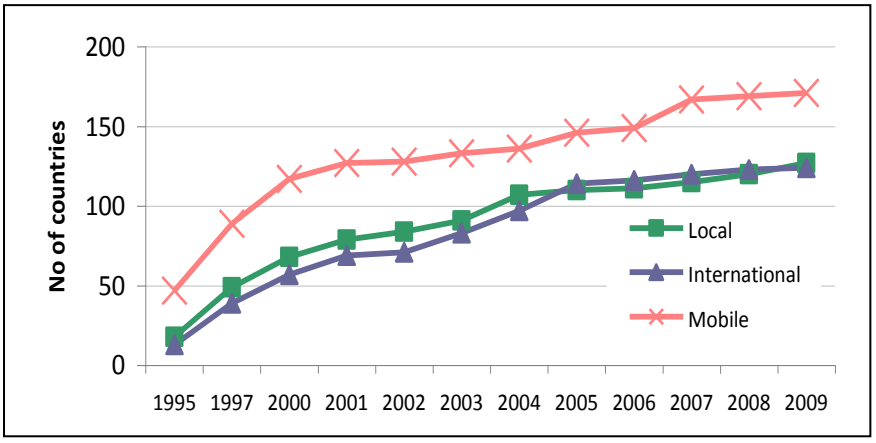
The trend towards liberalization is evident in the data (see Figure 1.6). According to ITU data, as at the end of 2009, over 65 percent of countries worldwide have either full or partial competition in basic services (local, long distance and international services). Competition in mobile and internet services is extremely common – 90 percent of countries have either partial or full competition in the mobile sector and 93 percent in the internet services sector (see Figures 1.7 and 1.8). Leased lines show a similar pattern to the local, domestic long distance and international sectors discussed below. In most regions, the majority of countries have introduced some degree of competition.

Figure 1.7. Internet Subscribers and Growth in Competition between 2000 and 2009



Source: ITU World Telecommunication/ICT Indicators database.

Figure 1.8 Growth in Competition in Local, International and Mobile, 1995-2009



Source: ITU World Telecommunication/ICT Indicators database.

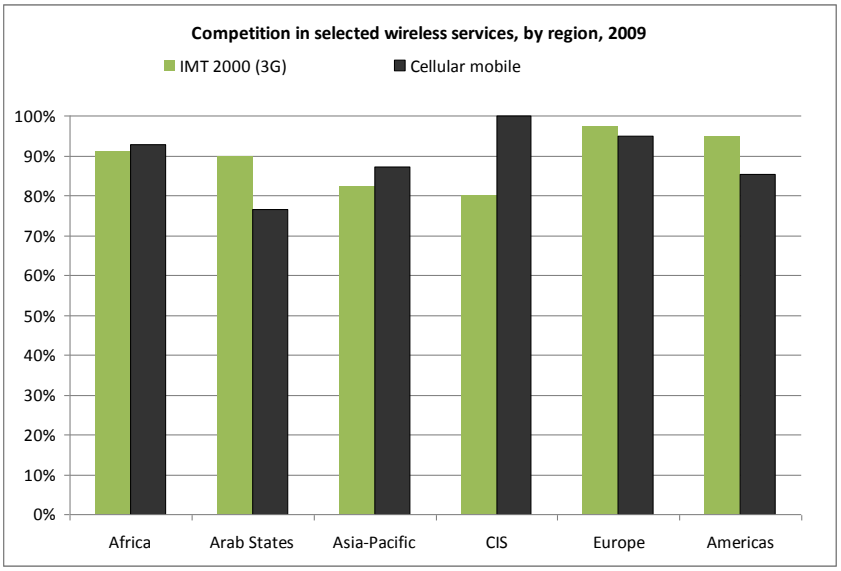
Local Service

Monopoly provision of local service is still prevalent, particularly in Africa and the Arab States, where 44 and 57 percent of countries respectively have a monopoly local service provider. The data show significant competition in Europe and the Commonwealth of Independent States (CIS), where 82 percent of countries report full or partial competition in local service. This reflects the significant impact of the European Union's competition policy and telecommunications requirements.

Domestic Long Distance

The picture for domestic long distance is very similar to the local service sector. Approximately 40 percent of African countries and 52 percent of Arab States have a monopoly in the provision of domestic long distance services. Approximately 60 per cent of countries in Asia-Pacific, 83 percent of countries in Europe, 55 per cent in the CIS and 66 per cent of countries in the Americas, report full or partial competition in this sector.

Figure 1.9 Competition in Selected Wireless Services by Region, 2009



Source: ITU World Telecommunication/ICT Indicators database.

International Long Distance

Competition is more widespread in most regions in the international long distance sector than in local and domestic long distance. In Africa and the Asia Pacific region respectively, 55 and 58 percent of countries have introduced full or partial competition for international calls. In the Americas, 71 percent of countries, in Europe 88 per cent and in the CIS 64 per cent, have full or partial competition in this sector. The Arab States show a higher level of monopoly in this sector compared to other regions (57 percent of Arab States report a monopoly).

Mobile

All regions show a high degree of liberalization in the mobile sector (see also Figure 1.8). 93 per cent of countries worldwide have introduced full or partial competition, with Europe, CIS and Africa leading the way (See Figure 1.9). Competition is accompanied by sector growth, as illustrated by the case of Jamaica (see Box 1.1).

Internet Services

Unsurprisingly, the Internet services sector is by far the most competitive of the sectors surveyed. Over 90 percent of countries in Africa, the Americas and the Asia Pacific region, and all of Europe and the CIS have either full or partial competition in the Internet services sector. Over 78 percent of Arab States have introduced competition.

1.4. Regulatory Organizations

1.4.1. Elements for an Effective Regulator

The aim of a regulator is to ensure that the sector is working properly and that consumer and other stakeholder interests are protected in a fair and balanced manner. An effective regulator is the vehicle to ensure credible market entry, as well as compliance with and enforcement of existing regulations. To achieve this, governments must create and maintain an environment conducive to good governance and regulatory success.

Independence is a critical attribute for a regulator to be effective. Effectiveness, however, has additional dimensions (see Figure 1.10). In a broad sense, an effective regulator is structurally and financially independent, but the real effectiveness of the regulator will depend on how it achieves successful functionality, ideally in an independent and autonomous manner. In addition, an effective regulator should demonstrate other characteristics, including accountability, transparency and predictability.

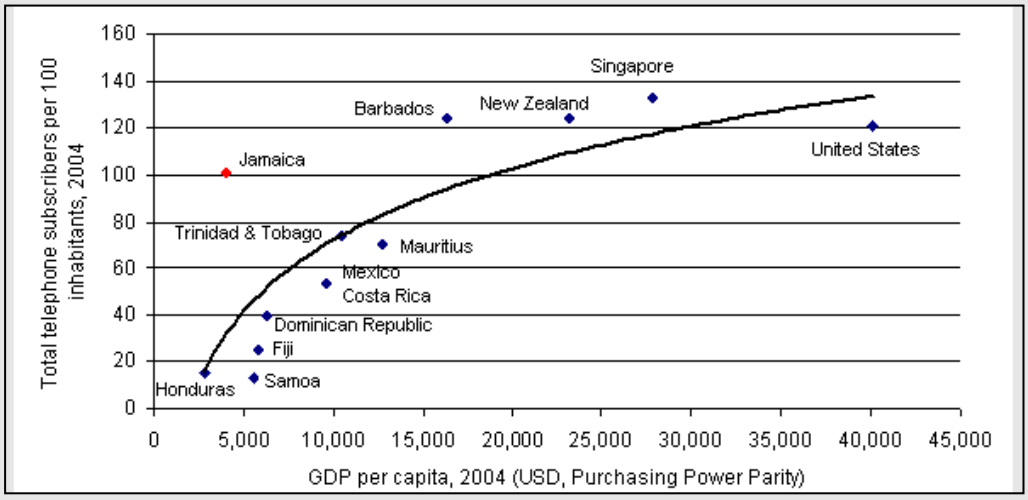
Box 1.1 Jamaica: The Benefits of Mobile Competition

Jamaica liberalized its telecommunications market in 2000 by licensing two new mobile operators, Digicel and Oceanic Digital Jamaica. Prior to the liberalization Cable & Wireless, Jamaica (renamed LIME in November 2008) was the sole provider of both fixed-line and mobile services.

The impact of the two new players had a tremendous impact on the sector. In particular it led to explosive growth in mobile usage with the total mobile subscriber base jumping from 144,000 in 1999 to over 1.5 million in 2005. This growth underpinned a significant increase in the Jamaica's total teledensity, which leapt from 43.53 telephones per 100 people in 2001 to 100.90 in 2004. By 2009, mobile subscribers had doubled again to nearly 3 million.

In 2004 Jamaica's teledensity exceeded what would be expected based on its GDP per capita, comparing favorably to countries with much higher GDP per capita, such as New Zealand, Singapore and the United States.

A 2004 Snapshot: Cross-Country Comparison of Teledensity by Income



The new competing mobile carriers introduced innovations into the Jamaican market, such a pre-paid service, which made it easier for customers to access telephone services. Previously to obtain a telephone service a customer had to fill out various forms, have a formal address and make a substantial deposit. The pre-paid option did not require a deposit, which by its very nature allowed customers the flexibility to have control over their budget. This was particularly attractive to low income customers, and appears to have been a major driver behind the increase in teledensity.

Competition has severely reduced LIME's share in the mobile market. LIME has gone from being the sole provider of mobile service to a market share of 31% in 2005 and about 22% in 2009. Its main competitor, Digicel, captured 62% of the market by 2005 growing further to over 65% by 2009. In fact Digicel's growth has been so tremendous that LIME has approached the regulator requesting that Dicigel be declared to have significant market power.

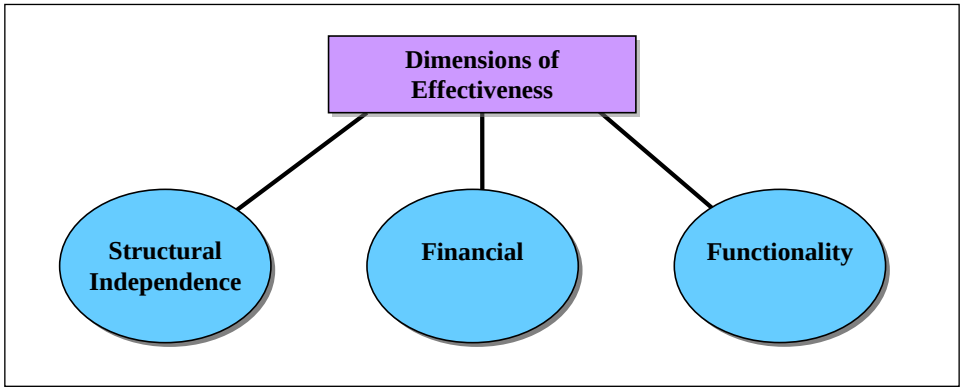
Interestingly, in 2004 Trinidad and Tobago had a teledensity substantially lower than Jamaica's. Although Trinidad and Tobago's per capital GDP was more than twice that of Jamaica, it had not yet liberalized its telecommunications market by 2004. By 2009, the number of mobile subscribers in Jamaica has doubled again to nearly three million (109 subscriptions per inhabitant), an annual growth rate of over 10%. But in newly liberalized Trinidad and Tobago mobile subscribers grew between 2004 and 2009 at nearly 25% pr year, resulting in nearly two million subscribers (147 subscriptions per inhabitant).

Source: ITU World Telecommunication/ICT Indicators database.

1.4.2. Structural Independence

The WTO Reference Paper, which requires countries to establish a regulator separate from the operator, has prompted many countries to establish a structurally independent regulator that separates the function of regulating the telecommunication market from that of supplying services. Providing a regulator with structural independence reduces the possibility of political or industry capture. When a regulatory body bows to external pressure from operators or other government entities, it often lacks independence and its decisions are neither objective nor transparent.

Figure 1.10 Dimensions of Regulatory Effectiveness



Source: ICT Regulation Toolkit.

1.4.3. Financial Independence

In addition, the funding sources and budgeting processes of regulatory authorities also can have an important impact on their independence, efficiency and the cost of regulation. The source of a regulatory authority's funds and the process by which these funds become part of the authority's actual budget can directly impact the degree of a regulator's autonomy and competence when carrying out its responsibilities. While a regulator's budget may come from the government or from the telecommunications sector itself through licensing fees, fines and other administrative charges, the key element is that funding should be free from political and private interest influence.

In certain countries, the regulator's budget is part of the government appropriations allocated to the ministry under whose authority it resides. In these cases, the government's authority to determine the budget gives it a degree of direct influence and intervention, or at least the appearance of such, over the policies and regulations the agency may wish to implement. This may reduce the agency's effectiveness in regulating the telecommunications sector.

On the other hand, relying on multiple sources of funding rather than solely on government appropriations allows regulators to have more financial independence and can make them less subject to outside influences. Regulators, in countries such as Bahrain, Botswana, Brazil, Nigeria, Tanzania and Uganda, have been granted financial independence, coupled with the authority to manage and administer their own funds. This has been found to give regulatory agencies more regulatory certainty so that they can assert more independence in regulating the sector.

1.4.4. Functionality

Despite its best efforts, a government may establish a regulator that is structurally and financially separate from the other branches of government, but yet fails to function in an effective manner. In contrast, a regulator may not be legally separate from the other government agencies, but may have functional effectiveness. Unfortunately, no single feature can ensure functionality. Rather, functionality is predicated on a combination of elements such as well-defined functions and responsibilities; appropriate decision-making authority and enforcement and dispute-resolution powers; clear rules regarding the appointment, removal and mandate of the regulatory authority; incentives to promote professional expertise of the staff; and adequate provisions to address ethical and conflict-of- interest concerns. Functionality is also predicated on regulations that guarantee the consistency, timeliness and accountability of the regulator's decisions, as well as procedures to ensure transparency and public participation in the regulatory process. Without functional effectiveness, it is difficult, if not impossible, for a regulator to attain the necessary credibility among participants in the sector and potential investors.

1.4.5. Organizational and Institutional Approaches to Regulation

Separation of Powers and Relationship of Regulators with Other Entities

The mandate and competencies of the regulatory authority as well as its relationship with government and other market players depend on the delegation of powers by the state. The degree of delegation of such powers is determined by the legal tradition of the country and the political will to create an independent and effective regulatory authority. These factors influence the specific responsibilities, authority, and accountability for the performance of the regulator's specific activities.

Although complete "independence" is nearly impossible to attain, the regulator should have sufficient independence to implement regulations and policies without undue interference from interested parties such as politicians or other government agencies (functional independence). The institutional regulations put in place by laws and regulations as well as the administrative structure of the regulatory authority are critical to ensure such independence, as such, the degree of independence differs considerably from country to country.

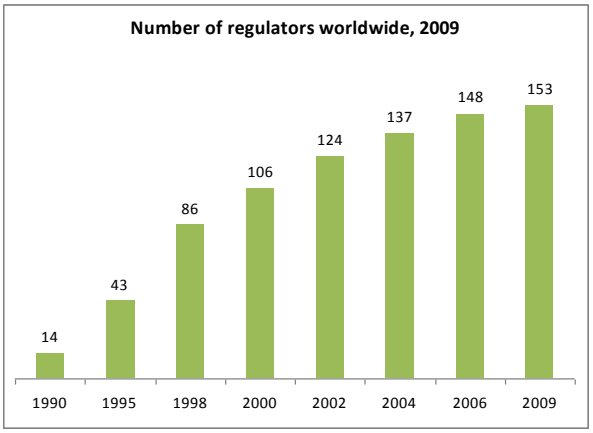
The most common institutional structure currently used is the establishment of an independent regulatory authority with responsibility for implementing and administering the regulatory framework, leaving policymaking responsibilities to a particular ministry (See Table 1.1).

Table 1.1 Regulatory Institutional Structures

FUNCTION	RESPONSIBLE ORGANIZATION
Policy development	Government, ministry or executive branch
Regulation	Separate regulatory authority
Network operation/service provision	Privately and/or commercially operated telecommunications operators

However, it should be noted that independence does not mean that regulators should function in a vacuum, particularly in countries where the legal and judiciary infrastructure is weak. Independence must be balanced with clearly identified requirements for accountability. This involves establishing: (i) detailed policies and laws setting forth explicit objectives governing the regulator; (ii) specific requirements for reporting to the government or parliament; (iii) procedural requirements; and (iv) the possibility of judicial review.

Figure 1.11 Growth in the Number of Regulators Worldwide



Source: ITU World Telecommunication/ICT Indicators database.

At the end of 2009, 153 countries and administrative regions had created a national regulatory authority for their ICT and telecommunication sectors (see Figure 1.11). Africa now has the highest percentage of countries with a separate sector regulator (91 per cent) followed by the Americas (89 per cent) and Europe (88 per cent). The Arab States and Asia-Pacific number 70 per cent and 62 per cent, respectively, and CIS countries 50 per cent.

Institutional Design Options

Once the regulator's mandate and competencies have been established, it is important to determine the regulator's institutional design, as well as its relationship with the government, industry, and the public. The institutional design of the regulator affects the structure of the regulator, including its leadership and management organization and its organizational and administrative structures.

Countries have considered four main institutional design options when faced with the task of designing and creating telecommunications regulatory entities: (i) single-sector regulator; (ii) "converged" regulator; (iii) multi-sector regulator; and (iv) no specific regulatory authority per se but rather a general competition authority with responsibility for overseeing the telecommunications sector.

No institutional design per se guarantees the successful functioning of the regulator, but when designing the institutional structure, the following important principles should be kept in mind.

- Regulators must be perceived by industry to be independent – thus the importance of transparency and accountability of the regulator.
- Regulators should have the expertise to assess and make sound judgments on both technical and industry-specific issues – thus the importance of appropriate appointment and staffing mechanisms.
- Regulators must take into account various viewpoints and interests, including economic, social, and political objectives. This balance should be reflected in the institutional structure and in the system of checks and balances.
- The institutional design, internal structure, and administration must be sufficiently flexible to allow the regulator to respond to market realities.

Single-Sector Regulator

The single-sector regulator's sole function is to oversee the telecommunications sector. This type of organizational structure focuses mainly on the telecommunications (and sometimes postal) sector, with other government entities responsible for broadcasting and information technology issues.

A key advantage of this option relates to staffing, since the staff is specifically dedicated to telecommunications issues. This establishes a core of specialized professionals with a strong set of legal, policy, engineering, and technical skills focused on sector issues.

Another benefit of single-sector regulators relates to the origin of their staffing. In many cases, single-sector regulators tend to initially inherit staff from the former state-owned post and telecommunications companies (PTT). They therefore have a core of specialized professionals from the start with a thorough understanding of the technical issues and strong engineering skills, which is a key advantage when dealing with complex network issues. Opponents of the single-sector regulatory structure argue that the origin of this specific skill set is, in fact, one of the key disadvantages of establishing a single-sector regulator. These critics argue that staff could be biased in favor of the incumbent operator, and thus more subject to capture by dominant forces. While this is an issue to be considered, it is not unique to the single-sector regulator as discussed below.

An additional disadvantage of having a regulator focused on the telecommunications sector alone (or for any other single sector) is that too many regulators are created for different sectors, thus leading to a higher cost of regulation. Similarly, and especially with convergence in the ICT sector blurring the boundaries between industries, overlapping responsibilities between sector regulators has also become an issue. This overlap may sometimes lead to duplication of regulations and require authorizations for what are essentially similar services being offered to the public.

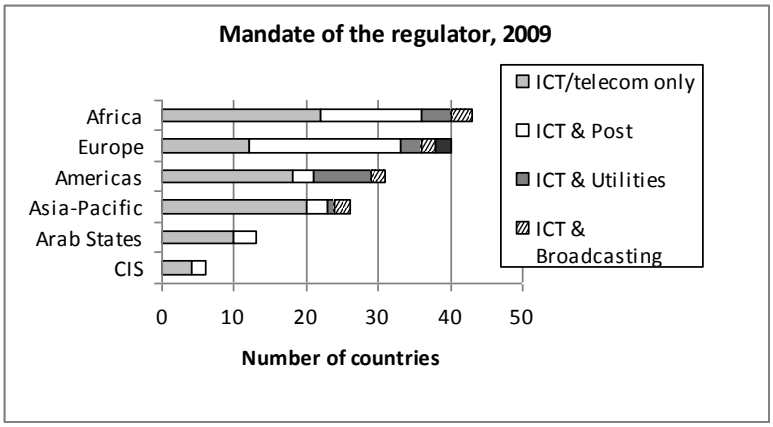
The challenges of convergence have led several countries to move away from single-sector regulators and evolve towards a converged regulator, thus merging agencies in charge of the various aspects of the communications sector.

Converged Regulator

With a converged institutional design, all communications services i.e. telecommunications, including radio communications, broadcasting and media (and in some instances postal services), are under the umbrella of one agency. Several countries such as Austria, Italy, Finland, the Netherlands, Saudi Arabia, Singapore, South Africa and the United Kingdom, have followed the route of converging their institutions dealing with the ICT sector, typically combining formerly discrete agencies responsible for telecommunications, broadcasting or information technology into one entity.

The converged regulator, like the single-sector telecommunications regulator, tends to be strong in specialized engineering skills in the communications sector, a critical skill set to deal with complex network issues. In addition, the converged communications regulator also meets the challenges posed by service convergence, overcoming one of the main disadvantages of a single-sector regulator (i.e. a regulator overly focused on the telecommunications sector).

Figure 1.12 Mandate of the Regulator, 2009



Source: ITU World Telecommunication/ICT Indicators database.

For internal administrative purposes, this model provides greater flexibility and is administratively simpler, given that all services are within one government agency, and the staff responsible for specific services can work with other offices of the regulator that are dealing with related issues. Moreover, a more consistent approach can be taken within the regulatory authority as it adapts to changing technologies and their effect on legacy regulations. In addition, as the regulatory mandate is broadened to accommodate convergence, fewer individual regulators are deemed necessary, therefore resolving some of the overlap of regulatory functions and bringing down the cost of overall regulation.

Multi-sector Regulator

Despite a growing trend toward establishing converged regulatory agencies, the majority (56 per cent) of regulators worldwide have authority only over telecommunications. In some cases, they also have regulatory functions in traditionally adjacent markets, such as postal and information services (see Figure 1.12). This is true for more than half of European countries and a third of countries in Africa and CIS.

Apart from general global trends, different regions have their own particular characteristics. Notably, no regulator in CIS and Arab States is responsible for regulating either broadcasting or utilities. In Europe, CIS and Africa, regulation of postal services has been part of the core mandate of at least a third of sector regulators. Latin America stands out with the highest concentration of multi-sector regulators

Multi-sector regulators oversee not only the telecommunications sector, but other industry sectors with common economic and legal characteristics (e.g., telecommunications, water, energy, and transportation). Costa Rica, the Gambia, Jamaica, Latvia, Luxembourg, Niger and Panama, as well as state public utility commissions in individual states in the United States, have chosen this type of organizational structure.

One of the main arguments generally raised in favor of a multi-sector regulator is based on the perceived lack of resources and the need for economies of scale to effectively regulate the different infrastructure industries and sectors. It is often argued that with this type of structural organization, one set of staff can be used to oversee a variety of industries. As the cases of Belize and Luxembourg demonstrate, however, staff are generally recruited in terms of the sector it is regulating, and only legal and occasionally economic staff are pooled to deal with specific issues that occur across the sectors. Many issues, such as tariffing or spectrum management, are not transferable between sectors.

In addition, the suitability of a multi-sector regulator to properly address next generation communications technologies and services has been questioned. This is because a risk exists that, where economists and legal experts are shared across the utilities sector, the pool of expertise will become more diluted, thus compromising the capability and ultimately the credibility of the regulator.

Another disadvantage of this model is that often the telecommunications sector is the most liberalized under the auspices of the multi-sector regulator. It therefore can be negatively affected if it is regulated

in an environment with utilities that are progressing at a different pace, where the needs and priorities are different. Moreover, by adding sectors, such as electricity and gas, that do not always produce revenues for the regulator, the telecommunications sector may bear a disproportionate share of the costs of regulation, potentially driving up regulatory costs for telecommunications providers.

Supporters of this model argue that having a multi-sector regulator can reduce political and other influences regarding the decision-making process as opposed to, for example, the single-sector regulator. Despite such claims concerning "capture" (meaning undue influence by politicians and/or dominant players), this does not necessarily seem linked to the institutional design option *per se* but is more a product of whether a clear set of "checks and balances" is incorporated in the design of the regulator.

No Specific Telecommunications Regulatory Authority

An alternative institutional approach is to decide not to create any telecommunications-specific regulator, but instead rely on the application of competition and antitrust rules rather than on detailed sector-specific rules and institutional designs.

This model is inexpensive and simple to implement. Moreover, reliance on economy-wide rules and institutions to regulate the sector promotes a coherent treatment between telecommunications and other sectors. Another advantage is that there is less risk of political capture where the judges are ultimately in charge of enforcing economic regulation in the telecommunications sector.

Among the disadvantages of this option is that non-specialized judges are ill-equipped to deal with complex telecommunications regulatory issues. Indeed, sector-specific issues such as interconnection and number portability may be difficult to resolve in the absence of sector-specific requirements.

Today, there is no actual functioning example of this model in any country. Indeed, until the passage of the Telecommunications Act of 2001, New Zealand was the only country implementing this model, as it had chosen to entrust antitrust authorities with the task of administering all rules controlling market power in telecommunications. Instead of sector-specific regulation, the regulatory regime for telecommunications in New Zealand relied primarily upon general competition law, the Commerce Act 1986, to prevent anticompetitive behavior. The Telecommunications Act of 2001, however, established the position of a Telecommunications Commissioner, a specialist stand-alone commissioner within the Commerce Commission, to regulate the telecommunications sector. The commissioner resolves disputes over regulated services; reports to the Minister on further designations or specifications of additional services; and monitors and enforces the Kiwi Share obligations.

Different Organizational Structures

Determining the ideal organizational structure for a regulatory authority requires an assessment of various factors, including the country's needs and objectives; political environment; legal requirements; and available expertise in the labor market. Essentially, there are two models of leadership organization for regulatory authorities: (i) the collegial body (a board or commission composed of multiple members); and (ii) the single regulator (often given the title of chairperson or president). Each has its advantages and disadvantages, and variations of each model are in use around the world.

The collegial body model usually involves a board or commission made up of individuals with different areas of expertise, potentially bringing those varied perspectives to bear on each regulatory issue. In addition, a collegial body could be seen as more independent, as it is less likely that all members would be influenced by the same actors, whether in the government or the private sector. As in any decision-making process involving more than one actor, however, the development of regulatory decisions can be a slower process and more subject to internal struggle.

By comparison, the single regulator model has the potential benefit of a consistent approach to regulation and decision-making, as decision-making authority is vested in a single individual who may have a unified plan for the telecommunications sector. In contrast to the collegial body model, single regulators can make decisions much more quickly, even when constrained by due process regulations. However, the single regulator is also potentially more vulnerable to undue influence exerted by external actors, whether in the

government or in the private sector. In addition, a single individual may not be able to match the expertise of a collegial body made up of individuals from different backgrounds, although experienced staff can provide substantial expertise.

The number of regulators led by collegial bodies and single regulators continues to fluctuate as governments restructure their regulatory frameworks for the telecommunications sector. According to ITU data, approximately 75 percent of the regulators are collegial bodies with the remaining 25 percent constituting single regulators. Significant differences continue to exist between the balance of collegial bodies and single regulators across the various regions.

1.5. International Frameworks

Regulatory reform may accelerate in countries that make global and regional commitments to open their telecommunications markets to foreign investment and harmonize local legislation with that of other countries in similar geographic or economic situations. These commitments may also facilitate global or regional best regulatory practices, and provide telecommunications investors with a level of certainty and predictability.

1.5.1. Multilateral Commitments

Members of the World Trade Organization (WTO) have undertaken treaty obligations that directly affect the telecommunications sector. WTO obligations and commitments constitute legally binding obligations on members, enforceable through the WTO's binding dispute settlement process. As a result, the impact of WTO commitments on a country's regulatory framework can be seen through voluntary compliance of a member's commitments or as a result of enforcement through the WTO's dispute settlement mechanism. Periodic "rounds" of negotiations are used to progressively improve and extend the obligations and commitments.

The General Agreement on Trade in Services (GATS) is foremost among the WTO instruments relevant to telecommunications. The GATS consists, in part, of a basic text and annexes (the "framework"), which apply to all Members. The GATS Annex on Telecommunications recognizes that access to, and use of, public telecommunications networks are essential to the effective provision of services covered under GATS. It requires WTO members to ensure that suppliers of scheduled services may access the "public telecommunications transport network and services" on reasonable and non-discriminatory terms. The 2004 panel ruling in the WTO dispute settlement case on Mexican telecom regulations confirmed the importance and legal weight of these guarantees.

In addition, GATS encompasses a set of schedules that contain market access commitments on specified services that are appended by each Member. Each Member may decide when, and to what extent, to commit on market access for telecommunications. In October 2010, a total of 108 Members had telecommunications commitments, the majority of which result from the basic telecom negotiations (1994-1997). Those negotiations established a basis for structural reform of the telecommunications sector by means of its concerted efforts at removing barriers to entry and competition. However, Members' commitments vary greatly from one schedule to the next. Which services are opened to competition and the types of restrictions maintained reflected the type of reforms in place or anticipated by each government at the time of the negotiations.

The negotiations on basic telecommunications also resulted in the Telecommunications Services: Reference Paper (see Appendix A). It was designed as template of a framework for sector regulation adapted to a competitive environment. The aim of the principles, from a trade standpoint, was to ensure the effectiveness and value of the market access commitments undertaken. Negotiated jointly by trade and telecom officials, however, it largely reflected best practice in pro-reform telecom regulation. Of the 108 WTO Members with telecommunications commitments, 82 had agreed to observe the Reference Paper principles by appending them to their schedules. The six principles of the Reference Paper have come to serve as a "checklist of success" of telecommunications reform in many countries. These principles relate to: (i) competitive safeguards; (ii) interconnection guarantees; (iii) transparent and competition-neutral universal service mechanisms; (iv) public availability of licensing criteria; (v) independence of regulators; and (vi) equitable procedures for allocation and use of scarce resources.

Further market opening is the objective in the current Doha Round of negotiations. At the time of

the July 2008 Package, 39 governments had made offers to improve their existing commitments or to commit for the first time in the telecommunications sector.

1.5.2. Regional Initiatives and Frameworks

Regional commitments also constitute an important driver of liberalization and harmonization of the telecommunications regulatory frameworks. In various continents, regional organizations have spearheaded regulatory reform efforts, creating enabling environments for development in the sector.

Europe

In December 2009, the Council of Ministers and European Parliament adopted a new Telecoms Reform Package, to be transposed into the national laws of the 27 European Member States by May 2011. The adoption followed two years of consultation with national regulators and users and two years of negotiation between the European Commission, the Council and the European Parliament.

The EU telecoms reform package comprises the Better Regulation Directive and the Citizens' Rights Directive. The Better Regulation Directive amends the 2002 Framework Directive and four principal specific directives: (i) the Access Directive; (ii) the Authorization Directive; (iii) the Universal Service Directive; and (iv) the e-Privacy Directive. The package also includes a new Regulation establishing a European Body of Telecoms Regulators (BEREC) to replace the informal European Regulators Group.

The reform package substantially strengthens competition and consumer rights in Europe's telecoms markets, facilitates high-speed internet broadband connections to all Europeans and reaffirms the objective of completing the single market for telecoms networks and services.

Americas and the Caribbean

Mercado Común del Sur (Common Market of Southern Cone or MERCOSUR), created in 1995, is the economic block formed by Argentina, Brazil, Paraguay, Uruguay, and República Bolivariana de Venezuela, with Bolivia, Peru, and Chile as associate member states. Although MERCOSUR does not have a single body of telecommunications rules or directives, decisions issued by the Common Market Council on relevant commercial matters governed under the MERCOSUR treaty are later adopted into the national legislation of the member states. Working Subgroup 1 (SGT1), which is responsible for negotiating matters regarding communications, has issued several recommendations that have been incorporated into the national legislation of the member states in matters such as the provision of basic public telephone services in the bordering areas of MERCOSUR and the harmonization of certain spectrum bands, among others.

The Inter-American Telecommunication Commission (CITEL), an entity of the Organization of American States (OAS), focuses on promoting the development of Telecommunications and ICTs in the Americas. CITEL serves as a permanent forum that brings together government and the private sector for coordinating the Member States' diverse political, economic, social and technical perspectives required to assist in meeting their specific infrastructure needs. CITEL's evaluations include relevant legal, regulatory and technology-related issues such as universal access to ICTs, common standards, network interoperability, and compatible use of the radio spectrum. These CITEL activities uniquely promote country and regional economic development and contribute to consolidated representation of Members' positions at regional, hemisphere and international policy meetings.

The Andean Community (CAN), formed by Bolivia, Colombia, Ecuador, and Peru, with Argentina, Brazil, Chile, Paraguay and Uruguay as associate member states, has been instrumental in promoting liberalization of telecommunications services in the region. In May 1999, it adopted a common and binding decision to remove market entry barriers in the sector (excluding broadcasting). In addition, the Andean Committee of Telecommunications Authorities (CAATEL) advises the various bodies of the Andean Integration System on telecommunications matters at the Community level.

In an effort to introduce competition in the telecommunications sector, the Eastern Caribbean Telecommunications Authority (ECTEL) was established in May 2000 by Treaty signed by the Governments of five Eastern Caribbean States – Commonwealth of Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines. ECTEL is the regulatory body for telecommunications in its Member States, made up of three components – a Council of Ministers, a

regional Directorate and a National Telecommunications Regulatory Commission (NTRC) in each Member State. ECTEL aims to be a model multi-state regulatory system providing quality leadership and advice, by applying fair, transparent and independent processes to promote competition in a fully liberalized telecommunications environment for the creation of socio-economic opportunities within the Eastern Caribbean whilst ensuring global network connectivity.

Africa

The Economic Community of West African States (ECOWAS) is among the various regional economic communities in Africa actively creating initiatives to foster cooperation and integration of their telecommunications and information technology activities. The ECOWAS treaty foresees the harmonization of legislation, including in the telecommunications field, similar to the EU model. For this purpose, ECOWAS, together with The West African Economic and Monetary Union (UEMOA) undertook Telecommunications Regulation Harmonization Project aimed at designing a strategy for the harmonization of telecommunications policies in ECOWAS. ECOWAS Ministers of Telecommunications and Information Technology (ICT) adopted the guidelines in 2006.

The New Partnership for Africa's Development (NEPAD) is a program of the African Union (AU). The NEPAD Agency's work under ICTs is overseen by the NEPAD e-Africa Programme. The vision of the program is to see Africa as a globally competitive digital society. Previously known as the NEPAD e-Africa Commission, the NEPAD e-Africa Programme was endorsed in 2002 by the then Heads of State and Government Implementation Committee (HSGIC) as the NEPAD Task Team responsible for developing policies, strategies and projects at the continental level, as well as managing the structured development of the ICT sector in the context of NEPAD. The aim of the NEPAD e-Africa Programme is to actively pursue cross-sectoral initiatives so that ICT is entrenched in the work of other sectors. The aim is to create synergy with other sectors leading to the realization of relevant e-services to further socio-economic development.

Other African regional initiatives include: the Communications Regulators Association of Southern Africa (CRASA), and the Association of Regulators of Information and Communication in Central and Eastern Africa (ARICEA).

Asia

Over the past decade, creating an effective framework to promote growth in the telecommunications industry has been a top priority for the Association of Southeast Asian Nations (ASEAN), an intergovernmental organization comprised of the Governments of Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. However, ASEAN regulatory reform proposals (e.g., the development of a uniform regulatory framework among ASEAN countries) have yet to yield concrete results, largely due to the lack of binding authority of ASEAN's decisions on its member countries.

1.6. Looking Ahead

Over the past decade, new communications technologies have become cheaper, more useful and more useable and in becoming cheaper, have been embraced by the majority of people in developed countries, as well as a growing proportion of those in the developing world. This dramatic change is bringing with it a range of new challenges, related, for instance, to privacy, security and digital content regulation. These challenges, even though seemingly outside the normal bounds of telecommunications regulation, are increasingly being seen as part of the new regulatory landscape: such is the revolutionary impact of technological convergence.

The last chapter in this *Handbook* explores some of the most important implications of this transformative and converged digital age. It highlights the challenges that regulators may face in the coming years, with communications ubiquity and the advent of new forms of interaction such as Web 2.0. The chapter includes a discussion of content regulation, intellectual property rights, neutrality of access, VoIP, privacy, cybersecurity, and green ICT.

Some of the topics mentioned above are already pushing their way onto the policy and regulatory agenda of some countries. It is clear that these questions cannot be ignored if regulation is to keep up with social and economic as well as technological developments.

CHAPTER 2. A LEVEL PLAYING FIELD: REGULATING FOR EFFECTIVE COMPETITION

CHAPTER 2. A LEVEL PLAYING FIELD: REGULATING FOR EFFECTIVE COMPETITION

2.1. Introduction

Chapter 2 examines the benefits of a competitive communications market and the implementation of regulation for a level playing field. It considers aspects of sector regulation and competition law, market failure, and *ex ante* vs. *ex post* regulation. Different kinds of anti-competitive conduct, such as abuse of dominant market power, are considered as well as possible remedies. Attention is also paid to the control of mergers and acquisitions and the responsibilities of competition authorities and regulators. The role of price regulation, cost concepts and pricing methods are also examined.

2.2. Competitive Markets

2.2.1. Benefits of Competition

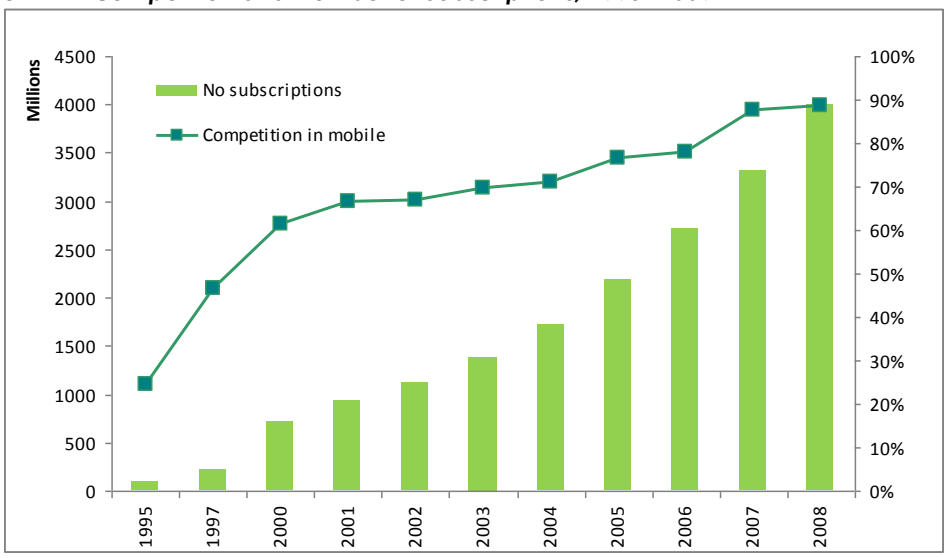
Competition policy and economic regulation are based on the premise that the "public interest" or "social good" is best served when markets work efficiently. This generally occurs in a competitive environment.

Competition is the most efficient and equitable mechanism available for organizing, operating, and disciplining economic markets. Competitive markets distribute resources efficiently and fairly without any need for a single centralized controlling authority. Competition maximizes benefits to society by:

- Ensuring that resources, products, and services are allocated to the person or persons who value them the most (allocative efficiency)
- Forcing market participants to use scarce resources as productively as possible (productive efficiency)
- Encouraging market participants to innovate, and to invest in new technologies at the best time (dynamic efficiency).

There are numerous examples internationally of the benefits of competition in the ICT sector (see Figure 2.1 and Chapter 1).

Figure 2.1 Growth in Competition and Number of Subscriptions, 1995- 2009



Source: ITU World Telecommunication/ICT Indicators database.

2.2.2. Forms of Competition

There are many different forms of competition. Many people think about competition in terms of the textbook model of perfect competition. Perfect competition is an ideal model of a competitive market, but is unlikely to occur in practice.

Markets that are not perfectly competitive can still deliver significant benefits for buyers and sellers. A useful standard for analyzing real world markets is workable or effective competition. The concept of contestability is also useful for analyzing markets in which there are few players but market power is constrained by the potential for entry.

Perfect Competition

The textbook case of perfect competition is an ideal model of a competitive market. Perfect competition rarely (if ever) occurs in practice. It is more an ideal than a market reality, and is therefore of limited use in analyzing the performance of real world markets.

Perfect competition requires a number of conditions:

- The product concerned must be "homogeneous" – that is to say, the product must have identical attributes and quality regardless of who buys or sells it;
- There must be a large number of buyers and sellers for that product;
- Buyers must be homogeneous and perfectly informed;
- No single consumer or firm must buy or sell anything more than an insignificant proportion of the available market volume of that product;
- All buyers and sellers must enjoy the freedom to enter or exit the market at will and without incurring additional costs;
- There must be no economies of scale. Economies of scale arise where the average cost of production falls as the volume of production increases. Where economies of scale exist it is more efficient for a single firm to produce a given volume than for two or more firms that between them produce the same total volume, as the larger firm;
- There must be no economies of scope. Economies of scope arise when different products have significant shared fixed costs, so that a single firm can produce them using a common facility. Where economies of scope exist it is cheaper (and more efficient) to produce different products out of a common plant or facility than to produce them separately;
- There must be no externalities. An externality is an unintended side effect (either beneficial or adverse) of an ordinary economic activity that arises outside the market or price system so that its impact is not reflected in market prices and costs;
- There must be no regulation of the market or franchise obligations; and
- There must be no restrictions on capital.

Effective Competition

Effective competition occurs in economic markets when four major market conditions are present:

- Buyers have access to alternative sellers for the products they desire (or for reasonable substitutes) at prices they are willing to pay,
- Sellers have access to buyers for their products without undue hindrance or restraint from other firms, interest groups, government agencies, or existing laws or regulations,
- The market price of a product is determined by the interaction of consumers and firms. No single consumer or firm (or group of consumers or firms) can determine, or unduly influence, the level of the price, and
- Differences in prices charged by different firms (and paid by different consumers) reflect only differences in cost or product quality/attributes.

In effectively competitive markets, consumers are protected to some degree from exploitative prices that firms, acting unilaterally or as a collusive bloc, could charge. Likewise, firms are protected from manipulation by large individual consumers (or groups of consumers) and from disruption or interference from other firms.

Competition occurs on the basis of both price and the quality or features of the product. Products are often differentiated, that is they are not identical across firms. One form of a product is usually a reasonable substitute for another form of that product. This is often referred to as "functional equivalence". Sellers may also offer product combinations or bundles that appeal to specific consumers or consumer segments.

Effective competition can occur even in markets with relatively few firms that differ substantially in size, market share, and tenure. However, for such markets to be competitive, it is important that there are no barriers to entry and exit.

Market Contestability

High firm concentrations in a given market may not translate to market power. Even in markets where only one or a few firms can efficiently operate (for example due to economies of scale), it is possible for competition to work.

A market is said to be contestable when barriers to entry and exit are so low that the threat of potential entry prevents the incumbent from exercising market power.

In perfectly contestable markets there are no barriers to entry or exit. With free entry into and exit from the market, the threat of potential entry will constrain the behavior of incumbent firms. Should an incumbent firm increase prices above the normal level of profits, then new firms will enter the market and force prices down again.

Contestability requires that there are no sunk costs for market entry. That is, should an entrant fail, it can recover its fixed costs (for example by selling assets or reusing them elsewhere).

Sustainable Competition

Competition is a desirable goal not for its own sake, but because of the benefits it can bring to a market and its users. These benefits derive from the pressure competition places on firms to be efficient, innovative and customer focused in order to thrive and survive. They include lower prices, higher productivity, more service choices, and greater connectivity.

The overall aim of competition policy is to achieve sustainable competition, where competition occurs on a "level playing field" and consumers and operators are not subject to anti-competitive practices.

The telecommunications marketplace is increasingly volatile. In many developed countries the industry has experienced ups and downs of financing and development during the last 10 years. This has resulted in spurts of growth in facilities and services deployment, followed by reductions in service operators and consumer choices and a slowing down of connectivity expansion. This has in turn slowed down the financing of some viable communications projects in developing countries.

Against this background, the regulators' task of fostering the transition to sustainable competition is a complex one. Regulators may be tempted to micromanage the market to ensure that competition (or a particular form of competition) takes place. Alternatively, they may decide prematurely that the market is fully competitive. Neither of these paths is likely to result in sustainable competition.

Regulators are faced with a complex balancing exercise. Individual regulatory decisions need to balance:

- The long term objective of ongoing, sustainable competition,
- The resolution of immediate short-term concerns, and
- Conformance with the regulatory and legislative provisions under which regulators operate.

2.3. Sector Regulation and Competition Law

In practice, many markets do not exhibit all the conditions necessary for workable or effective competition. Market failures occur in many forms. The two forms that are most associated with the need for regulation are:

- Monopoly, including natural monopoly; and
- Externalities.

When market failures arise, it is necessary to consider whether the problem is likely to correct itself. If market failures will not correct themselves, then there may be a need for additional tools to foster effective competition or to prevent socially undesirable outcomes.

This section introduces two broad approaches to promoting competition in the ICT sector, namely competition policy and regulation. Competition policy and regulation are not mutually exclusive. Many countries use a mix of both. However, care is required to ensure that sector regulation and competition laws and policies are developed and applied consistently.

This section discusses the following topics:

- Competition policy
- Regulation
- *Ex ante* and *ex post* regulation
- Advantages and disadvantages of *ex ante* versus *ex post* regulation
- Regulatory forbearance

2.3.1. Competition Policy

Competition policy provides a set of tools to promote sustainable competition and to preserve a market environment in which such competition can flourish. Competition policy may be implemented through general competition laws or through competition enhancing rules in specific sectors. In addition, it must be weighed against other policy objectives, such as consumer protection and the development of a viable telecommunications industry.

In the ICT sector, such rules might include:

- General prohibitions on anti-competitive behavior and mergers or acquisitions that would reduce competition (as in the case of Hong Kong SAR, China), or
- Specific rules designed to encourage competition in the sectors, such as interconnection requirements or unbundling policies.

Competition laws (or "antitrust laws", as they are called in the U.S.) aim to promote efficient competition by penalizing or undoing conduct that reduces competition in a market. Competition laws generally include provisions to:

- Prevent competing firms from banding together ("colluding") to increase prices or reduce quantities of goods and services, or to exclude other firms from a market,
- Prevent firms with a dominant position, or "significant market power", from using their market power to exclude competitors from the market, or otherwise reduce competition,
- Stop mergers or acquisitions that would reduce competition.

With the exception of provisions for mergers and acquisitions, competition laws are generally *ex post* regulation. They give the competition authority or the courts powers to respond to anti-competitive behavior once it has occurred.

2.3.2. Regulation

Regulation is useful where the market along would produce undesirable or socially unacceptable outcomes.

Regulation attempts to prevent socially undesirable outcomes and to direct market activity toward desired outcomes. For example, ICT regulation is widely used to promote prices that reflect efficient costs and promote universal access to basic services.

However, regulation has potentially high costs. The regulatory process is inherently time consuming to administer and requires considerable expenditure of resources. In addition, regulation can have unintended consequences which may be detrimental

to customers and the "public interest". No matter how capable and well intentioned regulators are, they will never be able to produce outcomes as efficient as a well-functioning market.

Accordingly, regulation should only focus on those parts of the ICT sector where there is a clear need for regulation (that is, where effective competition is not feasible) and should only be a temporary measure. Over time, regulators should aim to establish or restore the conditions that provide for effective competition on a sustained basis. This entails, for example, removing or reducing barriers to entry and exit. It also involves enabling the market itself to prevent the incumbent from abusing its market power, for example, through the entry of additional competitors (see Box 2.1).

2.3.3. *Ex Ante and Ex Post* Regulation

Practitioners commonly distinguish between "*ex ante* regulation" and "*ex post* regulation." Various countries have adopted competition policies that rely, to varying degrees, on mixing elements of these two approaches.

Ex Ante Regulation

Ex ante regulation is anticipatory intervention. *Ex ante* regulation uses government-specified controls to:

- Prevent socially undesirable actions or outcomes in markets, or
- Direct market activity towards socially desirable ends.

Ex ante regulation is mainly concerned with market structure, i.e. the number of firms and level of market concentration, entry conditions, and the degree of product differentiation.

Ex ante regulation often takes the form of sector-specific regulation.

Ex Post Regulation

Ex post regulation addresses specific allegations of anti-competitive behavior or market abuse. *Ex post* regulation aims to redress proven misconduct through a range of enforcement options including fines, injunctions, or bans.

*Ex pos*t regulation is mainly concerned with market conduct — the behavior of a firm with respect to both its competitors and its customers.

Ex post regulation often takes the form of competition laws.

2.3.4. The role of competition authorities and regulators

Provisions governing mergers and acquisition are generally included in competition or antitrust laws, where these exist. In this case, investigation of proposed mergers is usually the responsibility of a competition authority.

Some countries with no competition law have included sector specific merger provisions in their telecommunications laws.

In countries with both a competition authority and a telecommunications regulator, both agencies may have a mandate to investigate mergers in the telecommunications sector. For example, in the United States the Federal Trade Commission and the Justice Department have a general responsibility to investigate potentially anti-competitive mergers. However, the Federal Communications Commission may also investigate horizontal mergers between telecommunications firms to determine whether or not the merger is "in the public interest".

Mergers, acquisitions, and joint ventures are all different ways for two or more firms to integrate or coordinate their operations:

- A *merger* is a structural fusion of two firms that results in a common ownership and management structure. Mergers usually happen through stock swaps.
- An *acquisition* is a type of merger in which a firm with more resources and greater market strength may acquire another firm. The acquiring firm usually uses some combination of stocks, debt, and cash to finance the transaction.
- A *joint venture* is a strategic alliance between two firms that share resources, equity, revenues, expenses, and management to pursue a common goal. Each firm usually retains its own corporate identity.

Mergers and acquisitions are discussed further in Chapter 2.5.

2.3.5. Regulatory Forbearance

Regulation is not a panacea. While it may address market power concerns, regulation comes with

costs. Where it is possible, effective competition will generally deliver better outcomes than regulation.

Where regulation is necessary, regulatory forbearance is the key to good outcomes. Regulatory forbearance is about focusing regulation to where it is needed, and withdrawing regulation in those parts of the market where it is no longer necessary. In other words, the concept of regulatory forbearance rests on the goal of a gradual removal of *ex ante* regulation and an accompanying increase in the use of general *ex post* competition regulation.

Box 2.1 Regulatory Principles - Ofcom (U.K.)

Ofcom will regulate with a clearly articulated and publicly reviewed annual plan, with stated policy objectives.

Ofcom will intervene where there is a specific statutory duty to work towards a public policy goal which markets alone cannot achieve.

Ofcom will operate with a bias against intervention, but with a willingness to intervene firmly, promptly and effectively where required.

Ofcom will strive to ensure its interventions will be evidence-based, proportionate, consistent, accountable and transparent in both deliberation and outcome.

Ofcom will always seek the least intrusive regulatory mechanisms to achieve its policy objectives.

Ofcom will research markets constantly and will aim to remain at the forefront of technological understanding.

Ofcom will consult widely with all relevant stakeholders and assess the impact of regulatory action before imposing regulation upon a market.

Source: Ofcom.

The concept of regulatory forbearance has two elements:

- A regulator may refrain from applying certain regulatory conditions or from intervening in certain markets. For example, the Canadian Radio-television and Telecommunications Commission has explicitly stated that it will forbear from regulating certain services.
- A regulator may reduce the scope of regulation or withdraw entirely from regulating specified markets.

In the United Kingdom, Ofcom's approach to regulation is based on seven regulatory principles, as set out in Box 2.1. Amongst other things, Ofcom emphasizes regulatory forbearance in its operations, relying on markets where possible and operating with a bias against intervention. Where intervention is required, Ofcom aims to react firmly and promptly, using the least intrusive regulatory mechanisms available.

2.4. Competition Analysis

2.4.1. Markets and Market Definition

The first step in any competition analysis is to define the relevant market.

The purpose of market definition is to determine the boundaries of a given market. Only then will it be possible to analyze the prospects for competition in the market, opportunities for particular firms to acquire and exercise market power, and implications for consumer welfare.

A market exists where buyers wishing to buy a good or service come into contact with sellers wishing to sell that good or service, so that transactions occur. For competition purposes, a market includes all those suppliers, and buyers, between whom there is close competition, that is:

- All those goods or services that are close substitutes in the eyes of buyers, and
- All those suppliers who produce (or could easily switch to produce) those goods or services.

The "SSNIP" or "Hypothetical Monopolist" Test

The "SSNIP" or "hypothetical monopolist" test defines a market as:

> The smallest group of products and the smallest geographical area in which a hypothetical monopoly could successfully implement a "small but significant and non-transitory increase in price" (or "SSNIP").

For example, imagine that a hypothetical firm has a monopoly over the supply of the all widgets within a defined geographical area. Could that firm increase the price of widgets, for example by 5 or 10 percent, and sustain the increased price in the future?

If such a price increase would cause consumers to switch to alternative products or to suppliers in neighboring areas, then the relevant market includes those products or areas. Similarly, if the price increase would cause other suppliers to start selling widgets in the geographic area being considered then the relevant market includes those suppliers.

New Zealand's competition authority, the Commerce Commission, defines markets in terms of five dimensions (see Figure 2.2).

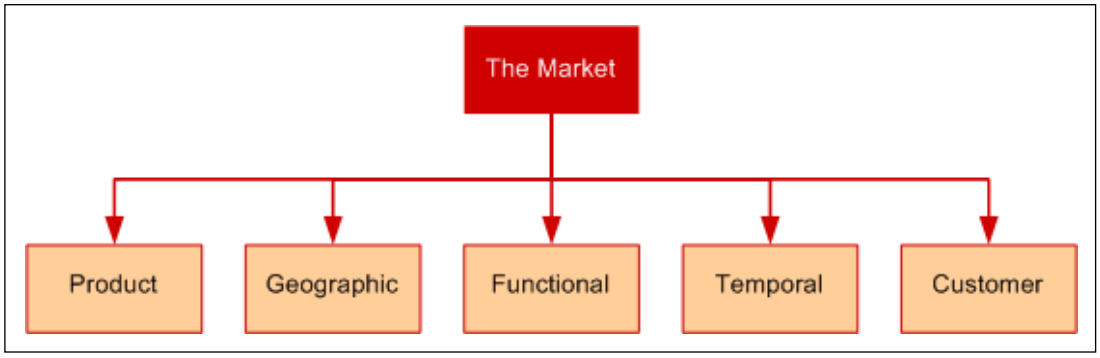
- The goods or services supplied and purchased (the product dimension)
- The geographic area from which the goods or services are obtained, or within which the goods or services are supplied (the geographic dimension)
- The level in the production or distribution chain (the functional dimension)
- The time frame or timing within which the market operates, where relevant (the temporal dimension), and
- The different customer types within a market, where relevant (the customer dimension).

Market Definition and Substitutability

The definition of a market is based on the substitutability of differentiated products or services. Whether two differentiated products should be considered to be in the same market depends on the extent to which they are reasonable substitutes:

- From the point of view of consumers (whether they are "functionally equivalent");
- From the point of view of suppliers (the ease with which firms not already supplying the product or service in question can start doing so).

Figure 2.2 Dimensions of Market Definition



Source: New Zealand Commerce Commission.

As well as considering whether products are substitutes based on their product attributes, a market definition must also determine the geographic boundaries of the market. The test for assessing the geographic scope of a market is:

> Can a SSNIP for a product in one location substantially affect the price of the same product in another location?

If the answer is "yes", then the relevant geographic market includes both locations.

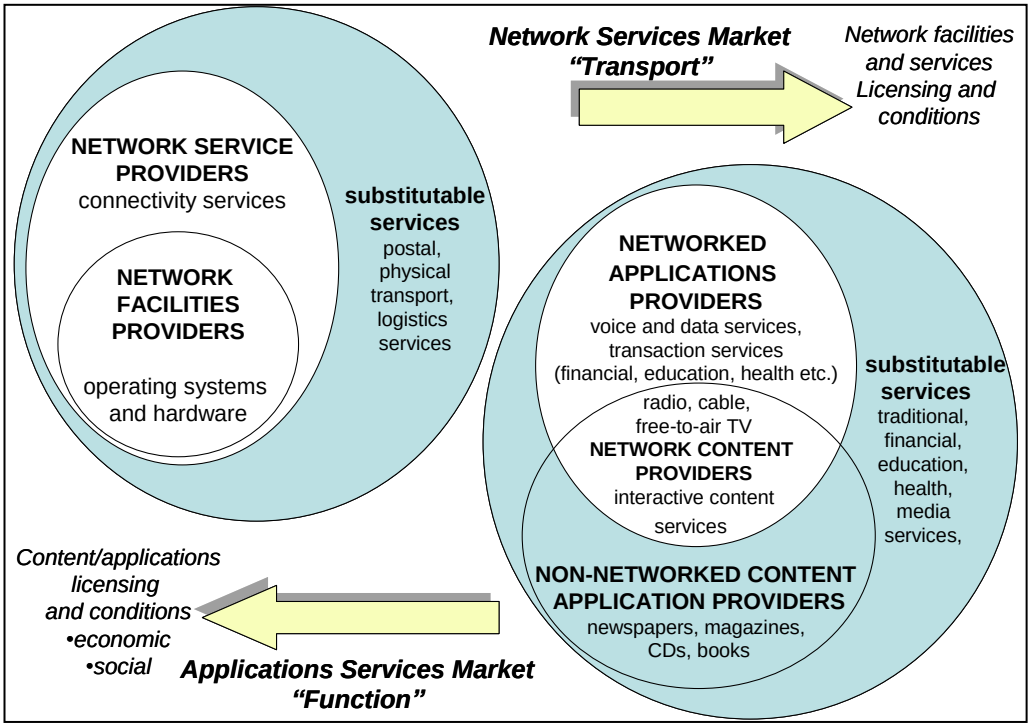
Defining a market in the ICT sector can be difficult. Effective substitutes may not be limited to services supplied by similar telecommunications carriers (or by carriers at all).

For example:

- Voice and data services are now available from conventional wireline or wireless networks, using either circuit-switched or packet-switched technologies;
- Voice mail services are available from telecommunications networks, answering machines, or manned answering services.

Figure 2.3 illustrates the wide range of possible services and technologies that can fall within the definition of a communications market in an era of convergence.

Figure 2.3 Market Diversification in an Era of Convergence



Source: ICT Regulation Toolkit.

Other Dimensions of Market Definition

Market definition may consider other dimensions of the product or service in question, where they are relevant. Other dimensions include:

- The functional dimension: The relevant level of the production or distribution chain, e.g., is the market at the wholesale or retail level?
- The temporal dimension: The timeframe or timing within which the market operates

The customer dimension: The different customer types within a market. For example should large business customers and residential customers be viewed as separate markets?

Box 2.2 Malaysia: Defining the Communications Market

The Communications and Multimedia Act (1998) specifically recognizes the impact of convergence between telecommunications and other communications sectors in defining markets for competition analysis. Under the Act, a "communications market" is an economic market for:

- A network service,
- An applications service,
- Goods or services used in conjunction with a network service or an applications service (e.g., television and telephone equipment, or billing services), or
- Access to facilities used in conjunction with a network service or an applications service.

Malaysia's approach to defining "communications markets" seeks to recognize the impact of convergence in ICT sectors. Under convergence, technological change is creating new opportunities for competitive rivalry, causing traditionally separate service markets to merge. The Act requires market definition to have regard to all sources of actual or potential competition in a communications market. This includes the use of mobile and other wireless access technologies (including, for example digital broadcasting and datacasting).

Source: Malaysian Communications and Multimedia Commission's Guideline on Substantial Lessening of Competition (RG/SLC/1/00(1)).

2.4.2. Market Power

Defining Market Power

Market power has been defined as:[8]

> The ability of a firm to raise prices above competitive levels, without promptly losing a substantial portion of its business to existing rivals or firms that become rivals as a result of the price increase.

Market power is only damaging if the firm concerned abuses that power. Should a firm with market power raise prices above competitive levels, this can dampen consumer demand, generate efficiency losses, and harm the public interest.

In addition, firms with significant market power or dominance may be able to implement a range of strategies to reduce competition, and enhance their position in the market.

Testing for Market Power

The starting point in looking for market power is the competitive price level. Pricing above the marginal or incremental cost of a service cannot be regarded *per se* as evidence of market power. In real world markets, the competitive price level will often be higher than incremental cost. In industries with high fixed costs, such as telecommunications, prices must include mark-ups over incremental costs in order for firms to break even across their whole business.

Regulated prices may also be an inappropriate starting point for detecting market power, as they may differ from competitive price levels. For example, in many countries prices for certain "basic" telephone services are set below their economic cost, to meet universal service goals. In these circumstances market power cannot, and should not, be inferred by comparing any given firm's price to the regulated price level.

For a finding of market power, the price increase must be sustainable. Firms may be able to temporarily increase prices above competitive levels, for example due to opportunistic behavior or as a result of innovation. However, in the absence of market power, such price increases are unsustainable. True market power requires that the firm be able to profitably implement the price increase for a significant period of time.

A high market share does not necessarily infer market power. Firms may gain high market shares through means other than market power. A firm's market share may increase, at least temporarily, due to a successful new invention or better customer service.

Alternatively, a firm may have a high market share for historical reasons. For example, incumbent telecommunications firms were once monopoly franchises in most countries and have high market shares as a result. As competition emerges, an incumbent's market share cannot guarantee it the ability to charge prices higher than its competitors.

Market share in itself is neither necessary nor sufficient for market power. Firms with high market shares may be constrained from raising prices by a range of factors, including:

- Competition from other suppliers already in the market;
- The potential for competition from new entrants; and
- The "countervailing power" of customers in the market, for example their willingness to do without the service if the price increases.

Several quantitative measures exist that can help to assess whether a firm may have market power. These indexes include measures of market concentration (such as the Hirschman-Herfindahl Index), and measures of price such as the Lerner Index.

Dominance and Significant Market Power

The mere fact that a firm possesses dominance or Significant Market Power (SMP) does not by itself imply abuse of that dominance or market power. However, such firms have the ability to raise prices above competitive levels, and may also be able to hinder competition.

There is no universally accepted definition of dominance. In general, a firm is considered to be dominant based on its market share. In some jurisdictions additional factors are also considered in assessing dominance. In the United States it has been largely left to courts to decide what constitutes dominance and, for the most part, they have applied criteria based solely on market shares.

The European Commission also takes into account:

- Firm size,
- The role of any essential facility,
- Any technological advantages, or privileged access to financial resources,

- The strength of the countervailing power of consumers,
- Economies of scale and scope,
- Barriers to entry,
- Product differentiation,
- Potential competition, and
- The type and availability of sales channels.

The European Commission introduced the concept of SMP to bring an element of *ex ante* regulation to competition policy in telecommunications (see Box 2.3). The concept of SMP has since been adopted in other jurisdictions.

The European Commission defines SMP as the ability of a firm to act independently of competitors and customers.

Under the European model, firms that are found to have SMP are subject to additional *ex ante* regulatory obligations. This allows telecommunications regulators to impose *ex ante* regulatory obligations on firms with SMP, such as:

- Obligations to align interconnection prices with costs,
- Accounting separation requirements, and
- Mandatory publication of reference interconnection offers.

Box 2.3 European Commission: Market Definition and Assessing Market Power

Market Definition

The European Commission uses the "hypothetical monopoly test" to determine an appropriate market definition. A market is defined as the narrowest possible product sphere in which a hypothetical monopolist could profitably sustain a small but significant increase in price (in the range of 5% to 10%).

The following steps describe the Commission's market analysis procedure:

- Tentatively define the product market by determining whether two products belong in the same market.
- Tentatively define the geographic market in terms of competitors' market shares, prices, and price differentials.
- Conduct a more detailed analysis of demand-side and supply-side substitutability: 1) Determine whether customers can switch to an alternate product in response to a small (5-10 percent) increase in price; Determine whether suppliers can readily switch to providing the alternate product in the relevant market.
- Further investigate the conditions in which competing firms operate. This may entail exploring the recent past activities of those firms, consumer behavior and preferences (through demand elasticities and other studies), regulatory or market barriers to entry, market segmentation and the viability of efficient price discrimination.
- Use consultations with firms and consumers and on-the-spot inspections to further inform and refine the market definition analysis.

Assessment of Significant Market Power

Under the Commission Guidelines, a firm has significant market power if, either individually or jointly with other firms, it has a position that allows it to behave in a way that is appreciably independent of its competitors and customers. The Guidelines identify a range of factors to consider in determining whether a firm has significant market power:

- Market share. Substantial market share is generally needed for a firm to have market power. Though possible, it would be very unusual for a firm with a market share below 25% to have significant market power. The courts have usually found that firms with market shares of 50% or more have a dominant position,
- Potential competitors that could enter the market. If barriers to entry are low, the possibility of entry may prevent a firm increasing its price despite having a high market share. If barriers to entry are high, the firm is more likely to have the ability to substantially increase its prices,
- Control of essential infrastructure that cannot be easily duplicated. If a firm controls essential network infrastructure such as the main local telephone exchange, it may be able to impede competition
- Absence of customer buying power. If a firm has many small customers it is less likely to have the ability to negotiate than if the firm has a several large customers
- Economies of scale. An established firm may be able to achieve substantially lower per-unit costs than a competitor could, which may act as a barrier to entry
- Economies of scope. An established firm may be able to manufacture several products at once, and achieve lower costs than a competitor
- A highly developed distribution and sales network. A well-established firm may have exclusivity agreements with distributors, making it difficult for competitors to enter the market.

Source: European Commission Guidelines on Significant Market Power (2002/C 165/03).

2.4.3. Barriers to Entry

In a competitive market, the threat of potential entry is an important constraint on firms already in the market. Should an incumbent firm increase its price above competitive levels, potential competitors would respond to this opportunity for profit by entering. Competitive entry would force prices down again. High barriers to entry prevent such competitive entry, and thus increase the market power of incumbent firms.

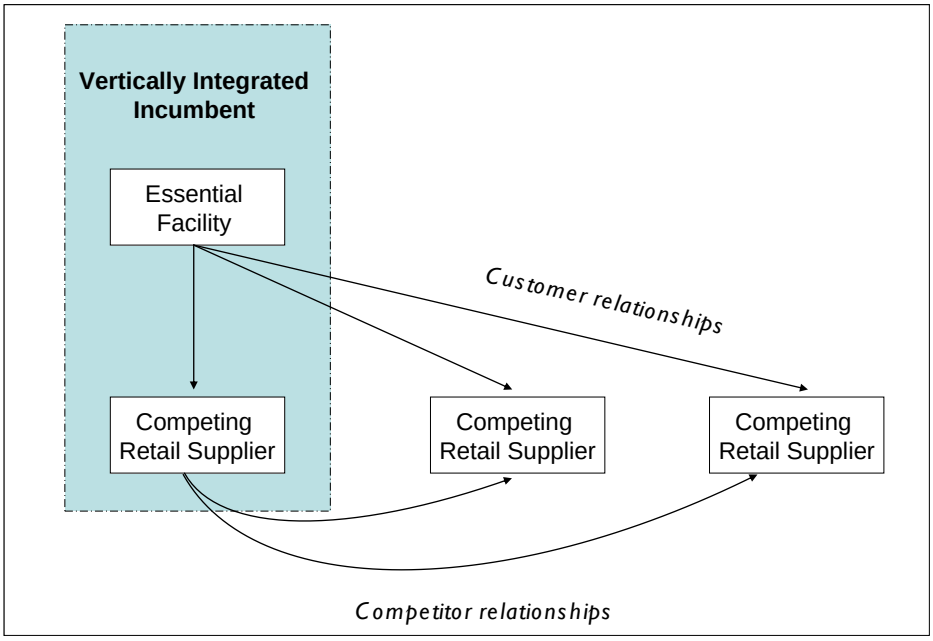
A barrier to entry (typically in the long run) is a cost that a new entrant incurs, but that incumbent firms avoid. This cost asymmetry can prevent the potential entrant from competing with the incumbent even if its other costs are exactly the same as the incumbent's, and both face identical prices. Thus, barriers to entry may prevent entry by otherwise equally efficient competitors.

A barrier to exit is a cost (typically experienced only when exiting the market) that is so prohibitive that it can reduce, or destroy altogether, a firm's incentives to enter the market in the first place. Therefore, a barrier to exit may pose a barrier to entry as well.

Barriers to entry may arise due to:

- *Legal barriers*: Prior to liberalization it was common to prohibit entry into telecommunications markets. This is still the case in some countries.
- *Economies of scale and scope*: For example, in the telecommunications sector, a new facilities-based entrant may have no choice but to start out at a relatively large scale of operations, in order to achieve unit costs close to the incumbent's.
- *High fixed or sunk costs*: If an entrant must incur high sunk costs to enter the market, then the entrant must be prepared to absorb those sunk costs in the event that it fails. However, at the time the new carrier is weighing its prospects and incurring sunk costs, the incumbent carrier faces none of the same risks or costs (even if it did so at an earlier point in time). This basic asymmetry in their positions may pose an entry barrier for the prospective new carrier.
- *Essential facilities*: If an entrant needs access to an essential facility that is controlled by one of its competitors, this creates a barrier to entry. The entrant must incur the cost of purchasing access to the facility — a cost not faced by the firm that owns the essential facility.

Figure 2.4 Essential Facilities



Source: ICT Regulation Toolkit.

2.4.4. Essential Facilities

Essential facilities are resources or facilities that have the following properties:

- They are critical inputs to retail production. Essential facilities are located at the wholesale level of the production chain, and are essential inputs in the production or supply of the retail product or service.
- They are fully owned and controlled by vertically integrated incumbent firms. The owner of the facility participates in the retail as well as the wholesale stage of the market.
- They are a monopoly. Retail competitors can only acquire an essential facility from the incumbent firm that owns and controls it.
- It is not feasible, either economically or technologically, for retail competitors to duplicate the essential facility or develop a substitute for it.

At the wholesale level the incumbent supplies other firms with a critical input, and those firms are dependent on the incumbent for that input. At the retail level, the incumbent competes with those same firms (see Figure 2.4). The owner of an essential facility may seek to use its position to prevent or impede competition, by implementing a "price squeeze" or even refusing to supply the facility.

2.4.5. Common Forms of Anti-Competitive Conduct

Telecommunications firms with market power may try to use their position to reduce competition. This section gives an overview of some common forms of anticompetitive conduct, such as:

- Abuse of dominance,
- Refusal to supply,
- Vertical price squeezes,
- Cross-subsidization,
- Misuse of information,
- Customer lock-in and restrictive agreements,
- Exclusionary and predatory pricing,
- Tying and bundling of services.

Abuse of Dominance

Abuse of dominance occurs when a dominant firm adopts predatory or exclusionary business practices with the aim of eliminating or substantially lessening competition and excluding competitors. Abuse of dominance may entail:

- Refusals to deal, for example a refusal to supply an essential facility to a competitor;
- Exclusive dealing arrangements, in which a seller prevents its distributors from selling competing products or services;
- Tying and bundling, where a firm sells makes the purchase of one product or service conditional on the purchase of a second product or service;
- Predatory pricing, where a firm sets prices below cost in order to force a competitor out of the market;
- Non-price predation, where a firm adjusts the quality of its product offering to customers with the aim of harming its competitor. For example, an incumbent might offer an improved level of service to just those customers served by a new entrant.

A firm does not need to be dominant (in the sense of possessing a high market share) in order to implement these strategies. However, the consequences for competition can be particularly severe when the firm concerned is dominant (see Box 2.4).

Box 2.4 Abuse of Dominance in Morocco

Until 2002, Maroc Télécom was Morocco's only incumbent basic telecommunications service provider and operated the only fixed network in the country.

Amidst de-regulatory steps taken in Morocco in 1999 and after, Médi Télécom was licensed to operate a GSM mobile network in competition with Maroc Télécom. In early 2001, Maroc Télécom began offering a 10% discount to anyone calling a Maroc Télécom mobile phone from a fixed line. Its competitor, Médi Télécom charged that this was anti-competitive and complained to the Moroccan National Telecommunications Regulatory Agency (ANRT).

The ANRT reviewed the case and concluded that the discount offered only to Maroc Télécom customers was discriminatory and constituted an act of abuse of dominance, given that Maroc Télécom was to remain the fixed network monopoly until 2002. Maroc Télécom eventually suspended the 10% discount in light of the ANRT's ruling.

Source: "Case Study: Morocco" International Telecommunication Union, Effective Regulation.

Refusal to Supply

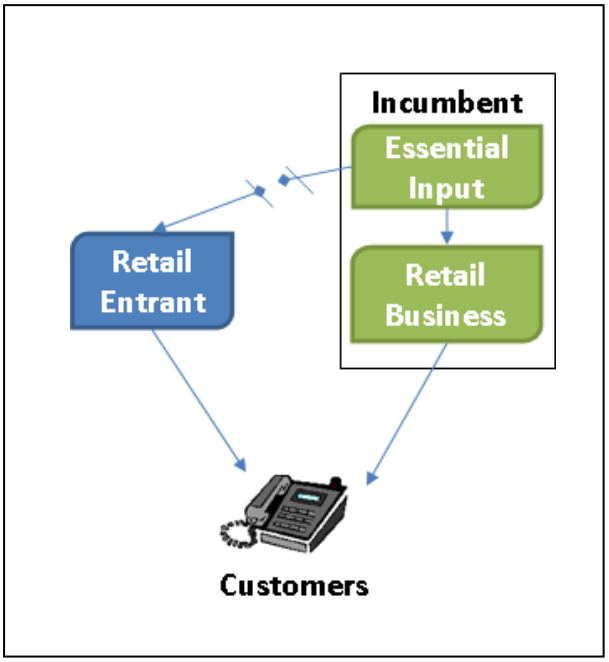
Incumbent firms often control access to facilities that are essential inputs in the supply of services at the retail level. Competing retailers depend on the incumbent for access to the essential facility.

In the telecommunications sector, for example, the local loop connecting end customers to the network is often regarded as an essential facility.

Incumbent firms may attempt to prevent competitors from entering the market by refusing to provide access to an essential facility. To encourage competition, many jurisdictions require firms with control over essential facilities to provide access to retail competitors. Rules may also determine the way in which access prices will be agreed, and procedures for resolving any disputes.

Figure 2.5 shows a vertically integrated incumbent firm and a downstream entrant. The incumbent firm controls an essential input, on which the downstream entrant depends in order to provide services to its customers. The incumbent also competes with the downstream entrant at the retail level. By refusing to supply the essential input, the incumbent can prevent the downstream entrant from competing.

Figure 2.5 Refusal to Supply an Essential Facility



Source: ICT Regulation Toolkit.

To be able to implement a vertical price squeeze, a firm must be vertically integrated, and control an essential wholesale input to the retail service. A firm implementing a price squeeze offers to supply this essential input to its retail competitors only at a price greatly in excess of its costs.

Vertical Price Squeeze

The key elements of a price squeeze are:

- The firm demands a price for the essential facility that is so high that it is not possible for an equally-efficient retail-stage competitor to operate profitably (or even survive) given the level of retail prices; and
- The firm does not charge its own downstream operation this high price.

In an extreme case, the firm might demand a price for the essential input that is higher than the full retail price of the service.

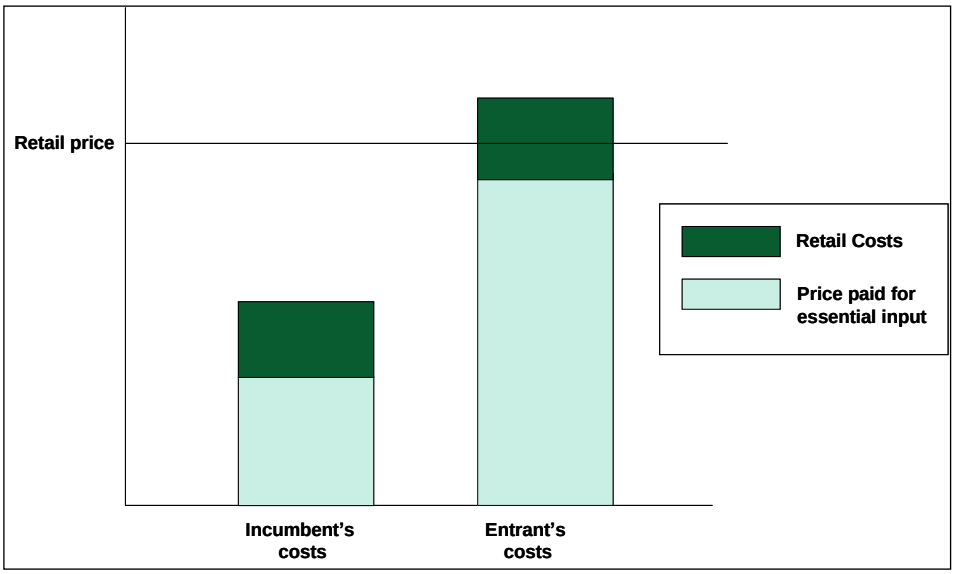
A vertical price squeeze can only succeed if the essential input has no effective substitutes. If such substitutes are available, the price squeeze will simply encourage entrants to use the substitute to produce competing retail services.

A price squeeze has a similar effect to a refusal to supply an essential facility. By charging a high price for the essential input, a vertically integrated firm can reduce the effectiveness of its competitors, or in the extreme force them out of the market.

In Figure 2.6, an incumbent firm owns an essential input, on which an entrant depends in order to provide service to its customers. Both firms have the same costs at the retail stage of the market. The incumbent obtains the essential input at incremental cost, but charges the entrant a price substantially greater than incremental cost. As a result, the entrant's total costs exceed the retail price for the service, and it is forced to exit the market.

In 2003, Deutsche Telekom (DT) was found to have abused its dominant position by committing a price squeeze, contrary to Article 82 of the European Commission Treaty (see Box 2.5). DT offered local access services at the retail level to end-users and at the wholesale level on an unbundled basis to competitors. DT was thus active in both upstream and downstream markets even though DT was legally obliged to provide competitors with wholesale access to its local loops.

Figure 2.6 Example of a Vertical Price Squeeze



Source: ICT Regulation Toolkit.

In its decision finding that DT had abused its dominant position, the European Commission found that DT charged new entrants higher fees for wholesale access to the local loop than what DT charged its retail subscribers for fixed line subscriptions. The Commission assessed the margin between DT's wholesale access prices and the weighted average price of its corresponding retail services for access (analog, ISDN, and ADSL). Given that wholesale access prices were higher than the weighted average of the corresponding retail prices charged to end-users, the Commission determined that the price margin was insufficient for new entrants to compete with DT. The Commission concluded that DT's pricing practices constituted a price squeeze. The Commission further concluded that DT's pricing for local access services deterred new competitors from entering the local access market and reduced the choice of telecommunications service providers for consumers and suppressed price competition. DT unsuccessfully appealed this decision to the European Court of First Instance (CFI).

Cross-Subsidization

In the ICT sector, it is common for firms to supply a large number of services. Network operators generally sell services in both competitive and non-competitive markets. A firm with market power in one area may charge a high price for non-competitive services and use the proceeds to subsidize low prices for competitive services.

If the firm breaks even overall, a given service receives a subsidy if it does not generate sufficient revenue to cover its total service long run incremental cost (TSLRIC).

For example, let us consider an incumbent firm with market power in the provision of long distance calls. The incumbent could use its market power to charge high prices to long distance customers, and use the excess revenue to support low prices for internet access, thereby undercutting competing internet access providers.

Box 2.5 Article 82 - European Commission Treaty

Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market in so far as it may affect trade between Member States.

Such abuse may, in particular, consist in:

(a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;

(b) limiting production, markets or technical development to the prejudice of consumers;

(c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;

(d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

Source: ICT Regulation Toolkit.

By cross-subsidizing competitive services, a telecommunications firm can:

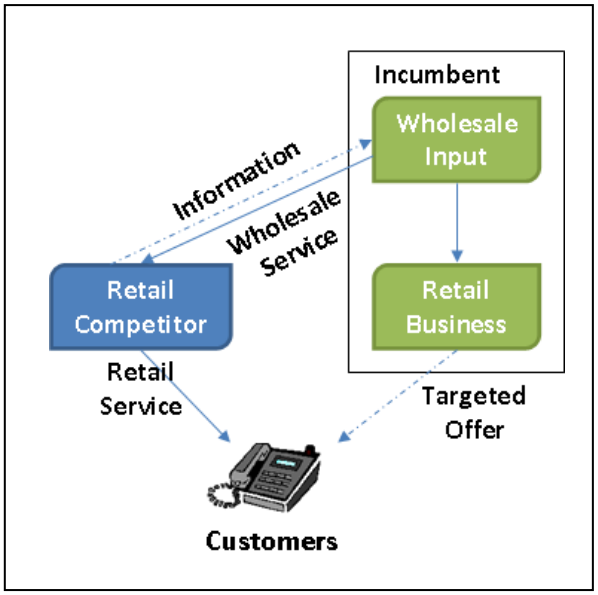
- Ensure that it covers its overall costs, including fixed costs, and
- Strengthen the firm's competitive position where it matters most, namely in the supply of its more competitive products.

Cross-subsidization will only maximize the firm's profitability if the resulting gain in market share in the competitive market outweighs the loss in revenue from the reduced price. This is because the firm could still increase prices for the non-competitive service, even if it did not subsidize the competitive service. So its next best option would be to increase the non-competitive price and keep the resulting revenue.

Misuse of Information

It is common for vertically integrated firms to sell wholesale products ("essential facilities") to other firms, while competing against those same firms in retail markets. In this situation the vertically integrated firm can obtain sensitive commercial or business information through its wholesale transactions that gives it a competitive advantage in its retail activities.

Figure 2.7 Misuse of Information



Source: ICT Regulation Toolkit.

For example, suppose a vertically integrated incumbent firm is the sole source of dedicated access lines needed to provide retail private line services. Other firms may have no choice but to acquire wholesale dedicated access lines from the incumbent. To complete the wholesale transaction, the incumbent needs information about the identity, size, and other characteristics of end-users being targeted by its competitors. It could use this information to target the same end-users with superior service offerings, placing its competitors at a considerable competitive disadvantage. This would constitute a misuse of information (see Figure 2.7).

Customer Lock-In

Service providers may attempt to "lock in" customers to prevent them from switching to alternative products, technologies, or suppliers. Customer lock-in involves raising customers' switching costs so that that the cost of switching outweighs the potential benefits from switching.

Switching costs may be:

- Transactional, for example the cost of replacing existing equipment and technology in order to move to a different service provider, or
- Contractual, for example penalties for breaking an existing contract with one service provider, in order to switch to a new service provider.

Contractual provisions that increase switching costs are not necessarily anti-competitive. Service providers may use contractual provisions that ensure customer loyalty to recover legitimate underlying costs over a period of time, for example:

- Service providers may incur substantial upfront fixed costs to acquire and serve customers. For example, it is common for mobile service providers to subsidize the cost of mobile handsets and recover the cost of the subsidy through service charges over time.
- Service providers may have incentives to spread non customer-specific fixed costs over as many customers as possible. In order to do this, a service provider may use contractual provisions to ensure customer loyalty and maintain its installed customer base.

Where the customer's switching cost is less than the present value of the expected revenue from the customer, competing firms may offer to pay the customer's switching cost. In this case, switching costs are not effective as a means of locking in customers.

Exclusionary or Predatory Pricing

Predatory pricing is a pricing strategy used by an established firm to eliminate competition from equally efficient firms, and secure a monopoly position in a previously competitive market.

A firm practicing predatory pricing lowers its price below cost and maintains it there until equally efficient competitors are forced to incur unsustainable losses and exit the market. The firm then raises its price to a monopoly level in order to recoup its lost profits.

Predatory pricing is a risky strategy. The firm involved incurs high up-front losses, with no guarantee of future gains from monopolization. The strategy will only be profitable if, once all competitors have been forced out of the market, the incumbent is able to raise its prices to a monopoly level and keep them there. If the firm is subject to either direct price regulation or some other form of control, predatory pricing is unlikely to succeed.

Predatory pricing requires high barriers to entry. If firms are able to enter the market easily, then each time the incumbent increases its price, new entrants will be attracted to the market, forcing the incumbent to drop its price again.

A less aggressive type of exclusionary pricing is known as limit pricing. This occurs when a firm with low costs sets prices above its own costs, but below a potential competitor's costs. This can discourage new firms from entering the market, but may not force existing competitors out of the market.

For it to succeed, limit pricing may require tacit collusion from all or most existing firms. Existing firms must be willing to reduce the market price below profit maximizing levels, so that any higher cost entrants have no prospect of making a profit.

Limit pricing may only discourage entry by less efficient firms. So even though limit pricing may deter new entry, it does not necessarily hurt customers or reduce social welfare.

Tying and Bundling

Tying

Tying of services occurs where a service provider makes the purchase of one product or service over which it has market power (the "tying good") conditional on the purchase of a second, competitively supplied, product or service (the "tied good"). By tying services, a service provider can try to use market power in one market to give itself an advantage in another, competitive market. Customers who opt to buy the tied good from a competitor cannot find a feasible substitute for the service provider's tying good. Tying is primarily a strategy to maximize profits. It can be profitable in the following cases:

- Where the demands for the two products are complementary, such that end users consume both products together (for example a network subscription and local calls); or
- If the tying good is regulated and the regulated price is below the service provider's profit maximizing level. In this case a successful tying strategy would enable the service provider to increase its overall profitability by increasing the price of the tied good.

Tying will not be profitable where:

- The demands for the two products are independent, so that end users are unlikely to consume them jointly;
- The price of the tying good is already at the service provider's profit maximizing level. In this case there is no room to increase profits further; or
- The two products are consumed in fixed proportions. To maximize its profits, all the service provider needs to do is set the price for the product over which it has market power at its profit maximizing level.

A tying strategy is only likely to exclude competitors from the market for the tied good if competitors are unable to overcome the loss of sales to customers who have been successfully tied. For example this might be the case if:

- Competitors face economies of scale, so that a loss of sales causes their average costs to increase, or
- The tied good is associated with network externalities, so that a loss of sales to some customers causes other customers to leave as well.

Even where tying does have an exclusionary effect, this may be an unintended consequence of a strategy to maximize profits.

Service bundling

Service bundling occurs where a service provider offers two or more services separately, but gives a

discount to customers who purchase the services as a combined bundle. Bundling is typically pro-competitive and consumer friendly.

Bundling is common in telecommunications and other multiproduct industries, reflecting both cost savings from producing services jointly, and consumer preferences for service bundles. In telecommunications, local and long distance services are often bundled with services such as call waiting, call forwarding, voice mail, or Internet access. "Triple play" offerings bundle telephone, TV and Internet services, while "quad play" strategies may also include mobile services.

2.4.6. Remedies for Anti-Competitive Conduct

This section provides an overview of the remedies available to governments and regulators for responding to:

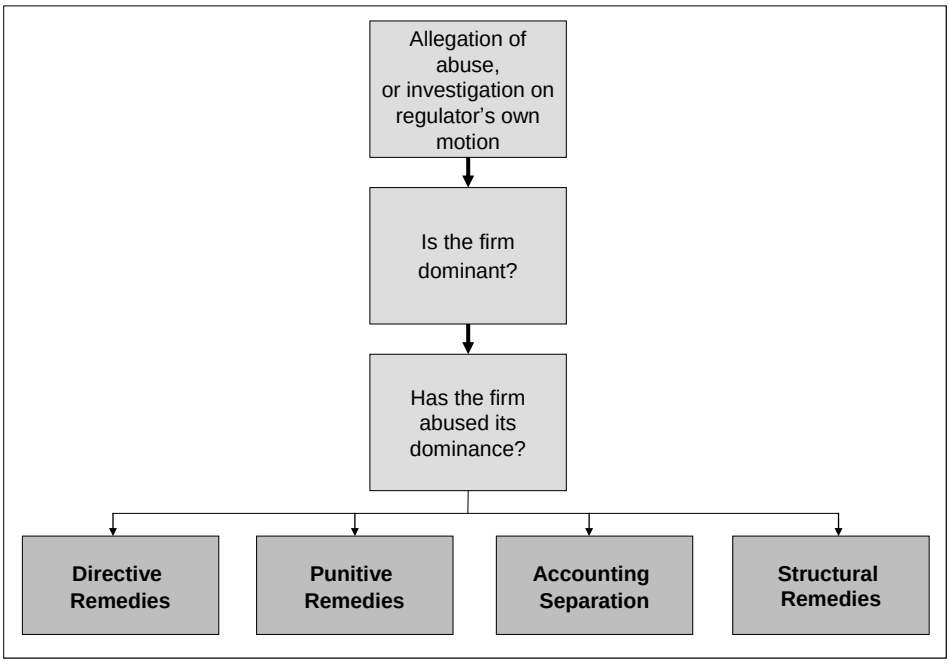
- Abuse of dominance,
- Refusal to supply and vertical price squeezes,
- Cross-subsidization,
- Misuse of information,
- Customer lock-in and restrictive agreements,
- Exclusionary and predatory pricing,
- Tying and bundling of services.

Remedies for Abuse of Dominance

Abuse of dominance occurs when a firm uses its dominant position in a market to lessen competition in that (or another) market.

The first step in any investigation of alleged abuse of dominance is to determine whether the firm in question has a dominant position, or significant market power, in the relevant market (Figure 2.8).

Figure 2.8 Responding to Abuses of Dominance



Source: ICT Regulation Toolkit.

The second step is to consider whether the behavior in question constitutes an abuse of the firm's dominant position. Is the behavior harmful to competition and to consumers? It is important to distinguish between aggressively competitive behavior that harms individual competitors but benefits customers (for example by reducing prices), and behavior that is anti-competitive.

A range of possible remedies exists. The appropriate remedy will depend on the specific nature and

seriousness of the behavior, and the likelihood that the firm will repeat the behavior in the future.

Directive Remedies

Directive remedies, such as injunctions or bans, require the firm to:

- Cease its abusive behavior, or
- Make specific changes to its behavior so it is no longer damaging to competition.

Directive remedies may require ongoing monitoring, to ensure that the behavioral change is sustained.

Punitive Remedies

Punitive remedies include:

- Fining the firm,
- Ordering the firm to pay compensation to its competitors and/or customers,

Fining company officers with direct responsibility for the behavior.

Punitive remedies are intended to discourage abusive behavior in the first place by making such behavior unprofitable. However, this objective must be weighed against the potential to "chill" the behavior of dominant firms. If the cost of being found to have abused a dominant position is very high, then dominant firms will err on the side of caution. They may not engage in aggressively competitive behavior, in case such behavior is found to be anti-competitive.

Accounting Separation

Accounting separation aims to separate out the competitive and non-competitive parts of the firm's business, without going to the extent of full structural separation.

For example, this can be achieved by requiring the dominant firm to publish a set of regulatory accounts for the non-competitive part of its business. The objective is to make the costs of non-competitive services transparent so that regulators and others can more easily detect possible abuses. New Zealand used this approach as part of its "light handed" regulatory regime, prior to 2001. New Zealand's current regulatory regime also obliges the Commerce Commission to require the incumbent service provider to undertake accounting separation and to publish information related to its accounts.

Accounting separation is a form of *ex ante* regulation – it is more concerned with preventing future anti-competitive behavior than punishing past abuses.

Structural remedies

If the anti-competitive behavior is very damaging and there is a high probability of repetition, structural separation may be necessary. For example, this might involve breaking the firm into two competing firms with smaller individual market shares, or separating monopoly and competitive elements of the firm. A landmark example of structural separation is the United States break up of AT&T in 1984.

Functional separation describes a situation in which a business establishes operationally separate entities, without any change in overall ownership or control. In the United Kingdom, functional separation was implemented in the incumbent BT as of January 2006 and is credited with resulting in a surge of broadband connections (from 100,000 unbundled lines in December 2005 to 5.5 million in 2008).[9] BT's Openreach was set up to ensure that all rival operators have a quality of access to BT's local networks.

Remedies for Refusal to Supply and Price Squeezes

Where a vertically integrated incumbent firm controls a facility that is an essential input to its retail competitors, this can create a "bottleneck" to competition. The vertically integrated firm may prevent competitive entry by refusing to supply the essential input. Or it may charge a price for the input so high that it is not possible for competitors to operate profitably, given the level of retail prices.

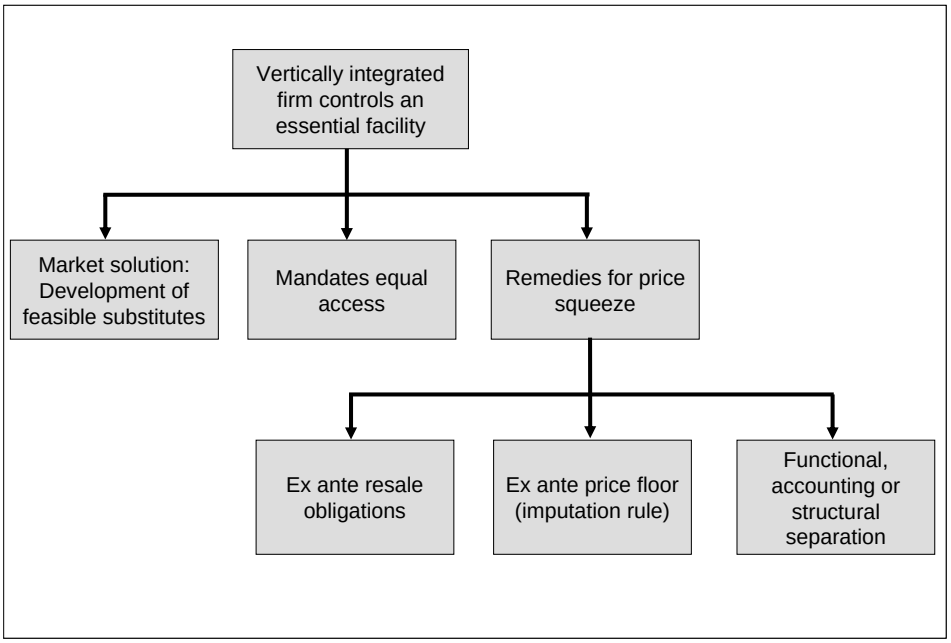
There are two possible remedies (see Figure 2.9):

- The market may provide a technological solution, by developing feasible substitutes for the facility.
- The government may require the vertically integrated firm to provide equal access to the essential facility to any firm that requests access, including competitors. Typically, this means imposing non-exclusion and non-discrimination obligations on the owners of essential facilities.

Even if the vertically integrated firm agrees to supply the essential facility to its competitors, it may still attempt a vertical price squeeze. A number of remedies for vertical price squeezes exist, including:

- *Ex ante* resale obligations;
- *Ex ante* price floors; or
- *Ex post* structural remedies.

Figure 2.9 Remedies for Refusal to Supply and Vertical Price Squeezes



Source: ICT Regulation Toolkit.

Ex Ante Resale Obligations

Resale obligations require the vertically integrated firm to make its retail services available for resale by any competitor. Competitors gain access to the wholesale components of the service when they resell the vertically integrated firm's retail services. This approach is used in the United States, under the Telecommunications Act 1996.

The generally accepted price rule for resold services is "retail minus" or "avoided cost discount". Under this rule, the price paid by resellers is equal to the retail price of the service, less the cost resellers avoid by substituting their own retailing functions for the vertically integrated firm's.

Not all competitors are interested in using resale as their retail market strategy. Alternative protections against price squeezes may be needed.

Ex Ante Price Floors

A price floor sets a minimum retail price for the incumbent's retail service, with reference to wholesale prices. A price floor should ensure that competitors are as efficient as the vertically integrated firm, so that they are able to cover their costs. The rule for setting a price floor, i.e. the "imputation rule", can be stated in a number of ways:

- The retail price must be no less than the wholesale price plus the direct incremental cost of the vertically integrated firm's pure retailing functions.
- The retail price must be no less than the vertically integrated firm's wholesale price, plus the direct incremental cost of the vertically integrated firm's pure retailing functions, plus the difference between the firm's direct incremental cost to provide the wholesale facility to itself and its direct incremental cost to provide that same facility to its competitors.
- The retail price must be no less than the vertically integrated firm's direct incremental cost to supply the product, plus the profit margin it could earn from selling the essential input to its competitors.
- The profit margin on the vertically integrated firm's price for the retail product must be no less than the profit margin it earns from selling the essential input to its competitors.

The above imputation rules are equivalent, but provide different insights into the conditions that must hold for a vertical price squeeze to be impossible.

Ex Post Structural Remedies

Structural remedies seek to separate the wholesale and retail operations of the vertically integrated firm, to remove the opportunity for a price squeeze, through:

- Functional or accounting separation of the firm's wholesale and retail operations, or
- Full structural separation of the firm's operations (by divesting either the wholesale or retail operation).

These measures may achieve the objective of preventing a price squeeze, but they can have substantial costs. In particular, under structural separation the firm would lose any efficiencies or cost savings from vertical integration. This loss would ultimately fall on customers, through higher prices.

Remedies for Cross-Subsidization

A firm with market power in one market may charge a high price for non-competitive products and use the proceeds to subsidize low prices for competitive products.

The remedies for cross-subsidization are preventive in nature. A regulator might:

- Implement and enforce a price floor;
- Require accounting separation of the costs of the firm's competitive and non-competitive products.

Price Floor

For a firm that at least breaks even across all of its products, any single product receives a subsidy if the revenue it generates fails to recover its total service long run incremental cost (TSLRIC). Thus, the effective price floor in a test of whether a product receives a subsidy can be stated as:

TSLRIC of the service / number of units produced

For a multiproduct firm, the rule for preventing cross-subsidization requires that, for a firm that at least breaks even, every product must satisfy this price floor test.

Accounting Separation

The objective of accounting separation in this context is to separate the costs of the firm's competitive and non-competitive products. This can be achieved through price regulation (either direct regulation, or a "price cap"). Such regulation can prevent cross-subsidization by allocating competitive and non-competitive products to separate "baskets", with separate controls or rules for each basket.

Remedies for Misuse of Information

It is common for a vertically integrated firm to supply an essential wholesale facility to other firms against which it competes at the retail level. The firm may obtain commercially sensitive information in the course of providing the wholesale service, which it may use at the retail level for marketing purposes. This can place a potential entrant at a substantial competitive disadvantage.

Remedies for misuse of information are generally *ex ante* in nature, and include:

- Establishing strict rules or procedures governing the use or disclosure of commercially sensitive information, and setting limits on the sharing of sensitive information between a carrier and its affiliates;
- "Win back" rules, limiting the extent to which the vertically integrated firm may directly market to customers that choose to switch to a competitor.

Remedies for Customer Lock-In

High switching costs and customer lock-in tactics do not necessarily cause problems for competition or exclude competitors. Most service agreements that seek to lock-in customers do not warrant regulatory interference. Indeed, in some cases, high switching costs may trigger market responses that improve efficiency.

Cases of lock-in need to be considered on a case by case basis, taking account of the following:

- The degree of competition in the market;
- Whether the firm in question has market power, or a dominant position; and
- The effect of the locking-in arrangements on competition (are the arrangements blocking efficient competitors)?

Remedies for Predatory Pricing

A firm engages in predatory pricing by temporarily pricing below cost in order to force its competitors out of the market.

Predatory pricing is notoriously difficult to prove. It can be difficult in practice to distinguish predatory pricing from aggressively competitive below-cost

pricing (such as "loss leaders" and promotional activities).

Establishing whether predatory pricing has taken place requires that two tests be met:

- Whether the firm is pricing below cost; and
- Whether the firm has an "objectively reasonable expectation" of being able to recover the losses it must incur by pricing at below cost.

Is the Firm Pricing Below Cost?

There is no universally accepted test to determine whether a firm is pricing below cost.

Under the Areeda-Turner rule, prices must be below a firm's short run marginal cost to qualify as predatory pricing. Recognizing that short run marginal cost is very difficult to measure, alternative short run measures of cost may be used - short run average variable cost (SRAVC) or short run incremental cost (SRIC).

Many economists promote the use of long run incremental cost (LRIC) as the appropriate cost threshold for predatory pricing. If two firms are equally efficient, they must have the same long run incremental cost. When one of them sets a price below LRIC, the other firm cannot match that price without incurring a loss.

Regardless of the measure used, calculations of firm-specific costs for individual services can be highly contentious.

Does the Firm Expect to Recover its Losses?

Many practitioners are skeptical about the prospect that a firm could know in advance all of the information needed to implement a predatory pricing strategy. In order to have a reasonable expectation that the strategy will succeed, the firm must know:

- How long it must price below cost before it succeeds in forcing its competitors out of the market;
- The size of the loss that it must withstand while predatory pricing is in effect; and
- The probability that it will recover its losses once it has achieved a monopoly.

Remedies

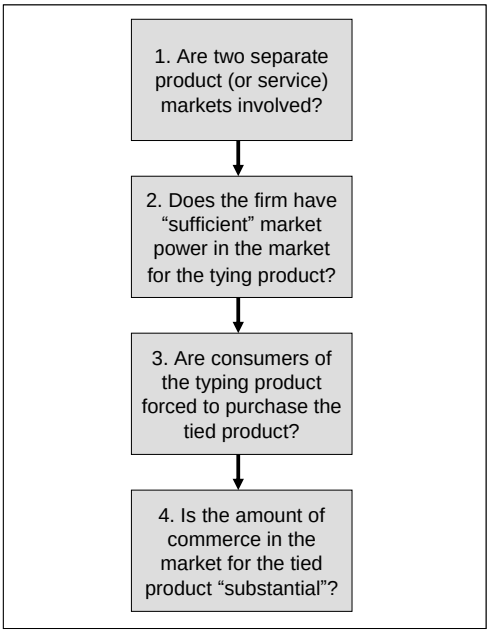
Ex post antitrust remedies, such as fines or compensation, may be available for proven instances of predatory pricing. However, predatory pricing is difficult to prove with sufficient certainty to justify punitive measures.

A more useful remedy for predatory pricing is an appropriate price floor for the affected product or service. This is a preventive remedy, requiring *ex ante* regulation.

Remedies for Tying and Bundling

There are few circumstances in which tying can be profit-enhancing for the firm concerned. Accordingly firms with market power will often have no incentive to engage in a tying strategy.

Figure 2.10 Test for Alleged Tying



Source: ICT Regulation Toolkit.

In recognition of this, the courts in the United States have developed a four-part test for analyzing allegations of tying (see Figure 2.10).

In addition to these tests, some courts require that the alleged harm exceed any efficiencies produced by the alleged tying, before allowing a complaint to proceed.

On the other hand, bundling is generally a pro-competitive, and customer-friendly, strategy. As such bundling does not call for regulatory intervention.

2.5. Control of Mergers and Acquisitions

2.5.1. Horizontal Mergers

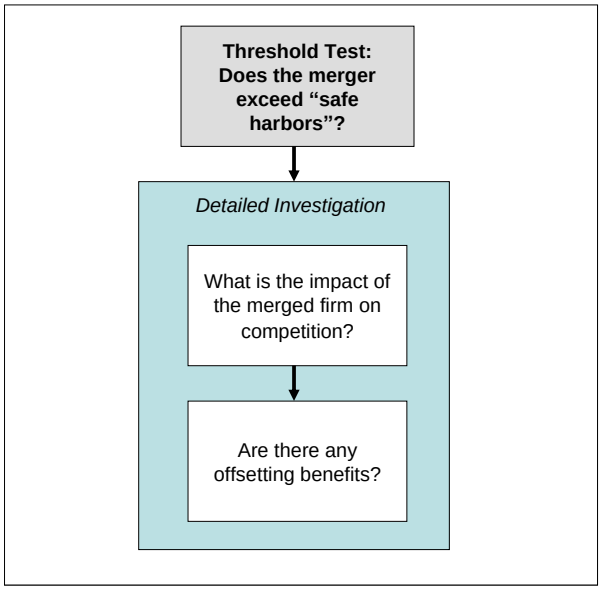
A horizontal merger brings together firms that produce the same product within the same market.

Horizontal mergers can be either beneficial or detrimental overall. By definition, horizontal mergers reduce the number of actual competitors in the market. Horizontal mergers may also produce cost savings and other benefits. If these benefits outweigh any reduction in competition, then the merger should be allowed to proceed.

Analyzing Horizontal Mergers

Competition authorities commonly take a two-stage approach to analyzing horizontal mergers (see Figure 2.11).

Figure 2.11 Two Stage Process for Analyzing Mergers



Source: ICT Regulation Toolkit.

The first stage uses measurable thresholds or "safe harbors" to determine whether a merger is likely to raise serious competition concerns. If a merger falls within the specified threshold then it is considered to be "safe", and may proceed without further investigation. For example, in the United States, antitrust authorities set thresholds based on the change in market concentration from a proposed merger. In Europe, the *Merger Control Regulation* applies only to mergers, acquisitions, and joint ventures that satisfy thresholds based on the turnover of the firms involved.

The purpose of these thresholds is to focus resources on investigating those transactions that are most likely to raise serious competition concerns. Those mergers that do not fall within specified safe harbors are investigated in depth.

A full merger investigation should consider a range of factors to determine whether the merger would increase market power, and to evaluate any offsetting benefits. Relevant factors include:

- Technological change and dynamic efficiencies that would result from the merger;
- Cost savings and other efficiencies claimed by the merging firms;
- The ease of market entry, or existence of any barriers to entry;
- The potential for collusion among firms in the market following the merger;
- The possibility that the merged entity may act anti-competitively;
- Whether one or both of the merging firms are likely to survive or fail if the merger does not proceed;
- Whether the merger would eliminate any potential competitors;
- Whether customers in the market have "countervailing power" that would constrain the merged entity.

Remedies

If a merger is found to substantially reduce competition, or give the merged entity a dominant position in a market, the first step is to evaluate any benefits from the merger. If the merger is likely to generate benefits that outweigh the damage to competition, then it should be allowed to proceed.

In some jurisdictions regulatory authorities may impose *ex ante* obligations on a merged firm, where the merger would otherwise be anti-competitive. For example, in both the United States and Europe, National Regulatory Authorities may impose conditions on a merger that would otherwise be anti-competitive.

2.5.2. Vertical Mergers

A vertical merger brings together firms in potential customer-supplier relationships, such as that between a firm that provides wholesale or intermediate products to a firm that produces retail or final products.

Vertical mergers are generally considered beneficial. Vertical mergers can:

- Reduce transaction costs by streamlining the process of acquiring and converting inputs into outputs;
- Improve efficiency through more integrated production; and
- Eliminate the potential for a "double markup", which can occur where there is market power at both the wholesale and retail stage of the market.

Vertical mergers may raise competition concerns in limited sets of circumstances.

A vertical merger may "foreclose" the market by preventing non-integrated retail competitors from staying and competing in the market (see Box 2.6). Foreclosure generally requires pre-existing market power at one or more levels in the new vertically integrated firm. For example, a firm controlling an essential facility at the wholesale level might merge with a retailer. The merged firm may withhold supply of the essential facility to its retail competitors, preventing them from competing.

Alternatively, a vertical merger may be motivated by the goal of raising costs for rivals. For example, a retail firm might merge with the supplier of a wholesale input. By removing a source of supply from the wholesale stage of the market, the retailer is able to increase the price of the input to its competitors (but not itself).

Analyzing Vertical Mergers

Analysis of vertical mergers focuses around the two areas of concern above. In the United States, competition authorities typically pay attention to three key issues, namely whether the merged firm can:

- Raise the costs of its retail rivals - if it can, the remedy is a requirement that the wholesale resource be made available at non-discriminatory prices.
- Misuse competitively sensitive information gathered about rivals when selling them the wholesale resource - if it can, the remedy is to implement rules and procedures to prohibit information-sharing between the firm's retail and wholesale operations.
- Foreclose retail competitors from the market by exercising market power at the wholesale stage of the market - If it can, the remedy is to require the merged firm to provide equal access to the wholesale resource to its non-integrated retail-stage competitors (See Figure 2.12).

Box 2.6 Telia/ Sonera Merger

In May 2002, a merger was proposed between Telia, a Swedish telecommunications and cable television operator and the largest service provider in Scandinavia, and Sonera, Finland's largest mobile telephony operator and provider of national and international long distance services as well as local loop and cable TV infrastructure. The proposed merger raised both vertical and horizontal issues. The European Commission raised concerns regarding continued competition in the Finnish wireless telephony market, given Sonera's dominant position if it didn't have Telia as an actual and potential competitor in Finland. The Commission also raised various antitrust issues based on the following:

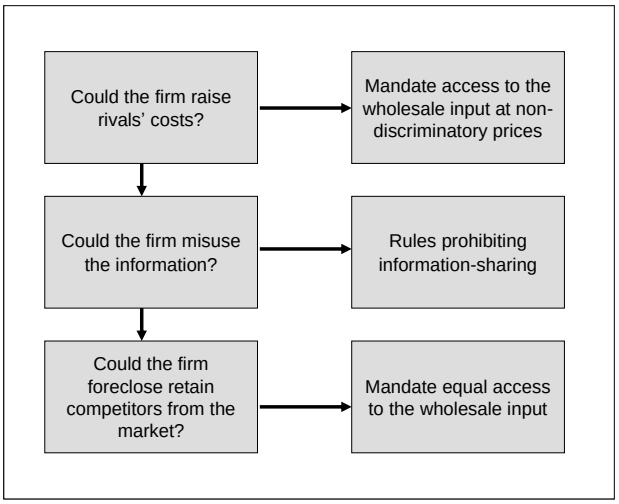
- Both had strong positions in the supply of various retail services
- Both had monopolies over wholesale termination on their respective fixed and mobile networks
- Both were leaders in the provision of wholesale international roaming services on their respective mobile networks

The Commission feared that the companies' strengths in the wholesale markets could lead to foreclosure of retail competitors and monopolistic behavior.

In July 2002, the European Commission approved the merger, but imposed several "commitments" on the merging companies. Those commitments began with specific legal and structural separation guidelines to ensure future competition. Telia and Sonera were required to operate their fixed and mobile networks as separate subsidiaries in both Sweden and Finland, and grant third parties non-discriminatory network access. Telia was required to divest its mobile network in Finland, and potential buyers were allowed nationwide roaming on commercial terms on Sonera's mobile network. In addition, the European Commission required that each new company arising from the merger appoint a new, external director.

Source: European Commission.

Figure 2.12 Analyzing Vertical Mergers



Source: ICT Regulation Toolkit.

2.5.3. Joint Ventures

Joint ventures can have many different objectives, and have different implications for competition.

Joint ventures with the purpose of fixing prices, restricting output, or allocating markets between firms reduce competition, and generally should not be permitted.

Joint ventures may generate efficiency gains and cost savings. In this case, regulators or competition authorities should consider whether the joint venture will increase market power sufficiently to cause a substantial lessening of competition. Will the joint venture lead to an increase in prices or a reduction in output? If the potential gains from the joint venture outweigh any competitive damage, then the joint venture should be allowed to proceed.

In some cases joint ventures include an agreement for the parties to acquire assets or voting rights in their respective firms. This type of arrangement is more durable than a conventional joint venture, and so requires additional scrutiny. The investigation should consider factors such as:

- The level of competition in the relevant market;
- The number and power of competitors in the relevant market;
- The market power of the parties in the joint venture;
- The background of, and the relationship among, the parties in the joint venture;
- The setting in which the joint venture was created;
- The relationship between the lines of commerce of the joint venture and of the individual parties in the joint venture.

Telecommunications Joint Ventures

Telecommunications joint ventures come in many forms. They may have one or more of the following objectives:

- Integration of operations at one or more stages of the production process,
- Pooling of diverse resources and talents in order to conduct research and development, or
- Building efficient marketing and sales channels.

Telecommunications joint ventures raise three broad types of competition concern:

- The potential for collusion among the parties in the joint venture,
- A loss of potential competition, and
- The potential for market exclusion and access discrimination.

Ultimately, regardless of the benefits they produce for the collaborating parties, joint ventures must deliver consumer benefits and entail limited integration (in both duration and scope) in order to enhance the public interest.

2.6. Regulating Prices

2.6.1. Why Regulate Prices?

If effective competition is not possible in wholesale or retail markets, it may be necessary to regulate the prices dominant firms can charge. Without price regulation, dominant firms can increase prices above competitive levels, harming their customers.

Regulation has potentially high costs. Among other things, it substitutes the regulator's judgment for market interactions. No matter how capable and well intentioned regulators are, they will never be able to produce outcomes as efficient as a properly functioning market.

Regulators should therefore forebear from interfering in pricing decisions unless regulation is justified (see Box 2.7). In other words, unless the expected benefits from regulating prices outweigh the expected costs from doing so, they must not

intervene. Intervention requires that prices are set too high overall or they are anti-competitive:

- *Prices are set too high*:
  If an operator or service provider has market power they may increase prices above competitive levels. This will suppress demand for the service, leading to a loss of social welfare.
- *Prices are anti-competitive*:
  An operator or service provider with market power may engage in pricing practices that hinder competition in a market. Three important anti-competitive pricing practices are cross subsidization, price squeezes, and predatory pricing.

Regulatory Options

If there is a case for regulating prices, a number of regulatory options exist, such as:

- Rate of return regulation;
- Incentive regulation,; and
- International benchmarking of prices.

Regulatory Criteria

The following common regulatory goals provide useful criteria for assessing options for price regulation:

- *Prevent the exercise of market power*:
  An important goal of regulation is to ensure that prices are fair and reasonable, where competitive forces are insufficient. Any regulatory price control mechanism should encourage prices that reflect what one would observe in a competitive environment,
- *Achieve economic efficiency*:
  The regulatory mechanism chosen should improve economic efficiency. There are several measures of economic efficiency:
  - Technical efficiency (or "productive efficiency") requires that goods and resources produced in the telecommunications industry should be produced at the lowest possible cost. This ensures that society's scarce resources are used efficiently and are not wasted,
  - Allocative efficiency requires that the prices one observes in a market are based upon and equal to the underlying costs that society incurs to produce those services (generally the long run incremental cost of producing the service). This will ensure that customers whose valuation of the service exceeds the cost of producing the service will purchase the service. Customers who place a lower valuation on the service will forgo it. This ensures that the "optimal" amount of the service is consumed, given cost and demand conditions. In the ICT sector prices must include some mark-up to recover shared and common costs. Mark-ups should be set so as to minimize the impact on allocative efficiency, and
  - Dynamic efficiency requires that firms should have the proper incentives to invest in new technologies and deploy new services,
- *Promote competition:*
  Many regulators operate under a legal framework where the goal is to permit and promote competition. Where the legal framework permits competition, it is important that regulation (at a minimum) does no harm to competition,
- *Minimize regulatory cost*:
  All else being equal, regulators should choose a regulatory mechanism that is less costly to implement over one that is costlier to implement;
- *Ensure high quality of service*:
  In addition to ensuring that the prices of telecommunications services are fair, regulators are also concerned that consumers should receive a high quality service. In ranking alternative regulatory options, regulators should give preference to mechanisms that result in higher quality service, all else being equal;
- *Ensure telephone prices are competitive with other jurisdictions*:
  This is a relevant objective in countries, such as Singapore, that use telecommunications infrastructure as a tool for competitive advantage. In these countries, telecommunications infrastructure plays an important role in attracting foreign investment. It is therefore important that telecommunications prices are competitive with other possible destinations for foreign investment;

Box 2.7 Hong Kong SAR, China: Price Regulation

In January 2005, the Office of the Telecommunications Authority (OFTA) announced the lifting of the prior approval requirement on the dominant operator, PCCW-HKT Telephone Limited's (PCCW-HKT) prices. This change was made by issuing a new fixed carrier (FC) license. Under the new FC license, PCCW-HKT does not have to get its prices approved by the Telecommunications Authority (TA), including moves to offer discounts and other benefits in response to price competition.

This decision reflects a change in OFTA's approach from ex ante regulation to ex post regulation. The change to ex post regulation was prompted by significant changes in market circumstances for the fixed telecommunications service segment in Hong Kong SAR, China since ex ante tariff regulation was first implemented in 1995. Key market changes include:

- Persistent market share erosion for the incumbent,
- The emergence of alternative products, and
- The lowering of barriers to entry.

The TA found that, under the current market circumstances, the existing *ex ante* tariff approval scheme was no longer effective in facilitating competition. It is implementing ex post regulation through a new Fixed Carrier (FC) license. Under PCCW-HKT's new FC license:

- PCCW-HKT does not have to get its prices approved by the TA, including moves to offer discounts and other benefits in response to price competition. However, any amendments to any published tariff of PCCW-HKT for interconnection, which was in force at 1 December 2004 and continues in force must first be approved by the TA in writing with a view to safeguarding against any anti-competitive interconnection charges. This includes tariffs for:
  - Interconnection between PCCW-HKT and mobile carrier licensees, public mobile radiotelephone service licensees or personal communications services licensees,
  - Interconnection between value added services and the public switched telephone network operated by PCCW-HKT,
  - Broadband copper local loop and exchange co-location services,
  - Internal protocol — virtual private network services, and
  - Residential cell relay services.

Interconnection requirements that arise after 1 December 2004 will relate to new networks or products not yet in operation. OFTA considers that existing operators will have had fair opportunity to develop competing products, and so it would be inappropriate to apply ex ante tariff regulation over any such new interconnection requirements.

- PCCW-HKT is required to notify the TA of any discount to its published tariffs at least one day before the discount becomes effective. The exception to this is external call services and external bandwidth services, which have been found non-dominant by the TA in the past, reflecting the absence of competition concerns. The TA may amend the list of services exempted from the requirement of discount notification from time to time,
- The TA can publish a discount notified by the licensee, when "public interest" justifies it, according to consumer, competition and government policy considerations,
- PCCW-HKT must still meet accounting separation requirements. Furthermore, the company is required to supply information sufficient for the TA to establish a reasonable cost basis for the service, including but not limited to the long run average incremental cost (LRAIC) on a current cost basis.

Following submissions in response to the consultation, the TA decided that other existing operators will also have the option of exchanging their existing *ex ante* license for an ex post FC license. To exercise this option, operators must make a written request to change their license to the TA.

Source: OFTA, Office of the Telecommunications Authority, Hong Kong SAR, China.

- *Generate compensatory earnings*:
  Any regulatory mechanism should provide the regulated company with the opportunity to earn a reasonable profit and to achieve compensatory earnings. If not, the firm may be forced to reduce investment and quality of service may decline.

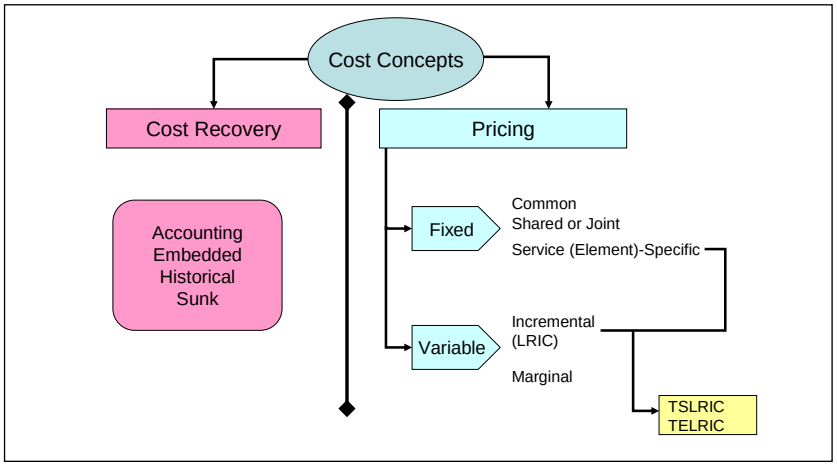
2.6.2. Measuring Costs

There is a variety of cost concepts that can be useful in answering key questions about a firm's activities. This section provides an overview of cost measures that are particularly relevant to price regulation, namely:

- Historic costs;
- Sunk costs;
- Forward-looking costs;
- Fixed costs (service specific, shared and common costs);
- Variable costs: marginal costs, incremental cost (including LRIC and TSLRIC);
- Stand-alone cost,; and
- Short and long run cost concepts.

Figure 2.13 shows how these cost concepts relate to each other.

Figure 2.13 Cost Concepts in Regulatory Economics



Source: ICT Regulation Toolkit.

Historic cost is an accounting cost measure. The historic cost (or *embedded cost*) of an activity is the sum of the costs the firm actually attributes to providing that activity in a given accounting period. Historic cost reflects what a firm actually pays for capital equipment, its actual costs of operating and maintaining that equipment, and any other costs incurred to provide service during that accounting period.

Sunk cost is an economic cost concept, but like accounting cost concepts, measures costs incurred in the past. Sunk costs are historic costs that are irreversibly spent and independent of the future quantity of service supplied. An example of a sunk cost is the cost of a marketing campaign for a new service. Once spent, this cost cannot be recovered regardless of whether the service continues to be provided.

The *economic cost* of an activity is the actual forward-looking cost of that activity. This is the cost of accomplishing that activity in the most efficient way possible, given technological, geographical and other real world constraints. Forward-looking costs are the costs of present and future uses of a firm's (or society's) resources. Only forward-looking costs are relevant for making pricing, production, and investment decisions in the present, or the future.

Costs can be broken into the fixed costs and variable costs of providing a given service.

Fixed costs do not vary as the volume of a service provided changes. For a firm that provides several services, fixed costs can be categorized as follows:

- *Service-specific costs*: Costs the firm must incur to provide a specific service. A firm supplying any level of the service would incur service-specific fixed costs, but would avoid these costs altogether by ceasing production of the service.
- *Shared costs*: Costs the firm must incur to provide a group of services. Shared fixed costs do not vary with the level of any individual service in the group, and do not vary with decisions to produce or cease producing any service or subset of services within the group. The firm can avoid shared fixed costs if it no longer provides any of the services in the group.
- *Common costs*: These are fixed costs that are shared by all services produced by the firm. The cost of the president's desk is a classic example of a fixed cost that is common to all services.

Variable costs vary with the volume of service provided. Two measures of variable costs are incremental cost and marginal cost.

Incremental cost is the additional cost of producing a given increment of output. How much do the firm's total costs change if the volume of a particular service increases (or decreases) by a given amount?

Marginal cost is the incremental cost of producing one additional unit of output. Marginal cost is a limiting case of incremental cost, where the increment is a single extra unit of service in addition to the amount currently provided.

Incremental cost is usually considered over the long run. *Long-run incremental cost (LRIC)* is the cost of producing a given increment of output, including an allowance for an appropriate return on capital to

reflect the costs of financing investment in facilities used for interconnection, as well as the capital costs of those facilities.

Total-service long-run incremental cost (TSLRIC) is a special case of incremental cost, where the relevant increment is the total volume of the service in question, and the time perspective is the long-run. TSLRIC is the additional cost incurred by a firm when adding a new service to its existing lineup of services (holding the quantities of all those other services constant). For an existing service, TSLRIC measures the decrease in costs associated with discontinuing supply of the service entirely, other things being constant. TSLRIC is equivalent to the concept of total element long-run incremental cost (TELRIC) used in the United States.

Stand-alone cost (SAC) is the cost that a stand-alone firm (producing no other services) would incur to produce a particular service. For a single-service firm, TSLRIC and SAC are equal. For a multiple service firm, SAC will generally be greater than TSLRIC, because SAC incorporates shared fixed costs and common fixed costs.

Firms incur costs in the short run or the long run. *Short run costs* are the costs of providing a given service, assuming that the current stock of capital is fixed. Over the long run, firms can vary their stock of capital, e.g., by investing in new plant. The *long run cost* of a service therefore includes the cost of the capital plant required to supply that service.

2.6.3. Methods of Price Regulation

Different approaches have been developed over the years to regulate telecommunications prices. Traditionally, in many countries *ad hoc* and discretionary methods were often used to support social objectives. These have increasingly given way to methods involving rules-based approaches which are designed to provide stability and certainty.

Rate of Return Regulation

Rate of return regulation is a way of regulating the prices charged by a firm. It restricts the amount of profit (return) that the regulated firm can earn. Rate of return regulation has been used extensively to regulate utilities in many countries. It has been used in the United States since public utility regulation began in the early 1900s.

There are two steps to implementing rate of return regulation:

- First, determine the economically appropriate revenue requirement. This is based on prudently incurred expenses and a "fair" return on invested capital, and
- Second, set prices for individual services so revenue earned from all the regulated services is not greater than the revenue requirement.

Calculating the Revenue Requirement

The revenue requirement is generally calculated using the following formula:

Revenue Requirement = Operating Expenses + Depreciation + Taxes + (Net Book Value * Rate of Return)

The rate of return used is the post-tax rate of return the firm is permitted to earn. This is also known as the opportunity cost of investor capital. It is based on a weighted average of the cost of debt and equity financing.

Operating expenses should include only those expenses the firm has prudently incurred to provide the regulated services.

The net book value of the firm's capital assets should include only those capital assets used by the firm specifically to provide the regulated service. The formula includes an allowance for depreciation, so only the book value of the assets net of depreciation should be included in this amount.

Setting Prices for Regulated Services

The regulator needs to set prices that allow the regulated firm to collect its revenue requirement. This requires that the sum of total expected revenue for each regulated service is no greater than the permitted revenue requirement. This can be expressed mathematically as:

$$\sum_{i=1}^{N} P_i * Q_i \leq RR$$

Where Pi and Qi are, respectively, price and quantity of service i and N is the total number of regulated services. RR is the revenue requirement

As indicated in the formula above, in order to calculate prices under rate of return regulation, the regulator first needs a reasonable forecast of demand for the regulated services.

For a multiple-service firm, there is an element of discretion in allocating the revenue requirement amongst different services. As a guiding principle,

the regulator should ensure that prices of individual services are set at prices that minimize distortion of customer behavior.

The costs used to determine prices under rate of return regulation are the actual embedded costs of the firm, not forward-looking economic costs.

Under rate of return regulation, the firm can request rate increases if, for whatever reason, it believes revenues are not sufficient to achieve a normal return on invested capital.

Incentive Regulation

The term "incentive regulation" refers to the types of regulatory mechanisms that seek to improve on the weak incentives for efficiency in traditional rate of return regulation.

Incentive regulation includes:

- Banded rate of return regulation;
- Earnings sharing;
- Revenue sharing;
- Price freezes;
- Rate case moratoriums;
- Pure price caps; and
- Hybrid price caps.

Banded Rate of Return Regulation

With banded rate of return regulation, the regulator specifies a range of authorized earnings for the regulated firm at the beginning of the regulatory period. If actual company earnings fall within the range, the company's prices are considered to be fair and the regulator does not intervene.

If the firm's earnings fall outside the permitted band the regulator intervenes in the following cases:

- If earnings are higher than the permitted ceiling, the firm must share these gains with its customers;
- If earnings are lower than the floor, the company is permitted to increase rates.

Prices are thus initially set so that earnings fall within the permitted band, and price adjustments are required only if earnings fall outside the defined range.

Banded rate of return regulation is not a common form of price regulation. This is because banded rate of return shares most of the weaknesses of traditional rate of return regulation. It does not eliminate the need for frequent rate hearings and does little to provide incentives for the regulated firm to reduce costs, unless the regulator defines a very wide band.

Earnings Sharing

Earnings sharing is similar to banded rate of return regulation, but uses a more precisely defined mechanism for sharing excess profits with customers. The regulator defines a band (referred to as a "deadband") within which the firm is free to keep all earnings. Earnings above or below some deadband are shared in various proportions between the company and the customer.

The deadband under "earnings sharing" tends to be wider than under "banded rate of return regulation". As a result, the firm has greater incentives to achieve productivity growth and increase efficiency.

Some regulators have used earnings sharing mechanisms when a price cap plan is first introduced, to reduce the risk to customers and the firm of moving to a new form of regulation.

For example, earnings sharing plans were popular forms of incentive regulation and were a component of some of the initial price cap plans implemented in the United States. However, earnings sharing does dilute the incentive efficiency properties that exist under a pure price cap regime and, as a result, companies and regulators have moved away from this form of incentive regulation.

Revenue Sharing

Revenue sharing regulation is not common. Revenue sharing requires the regulated firm to share with customers any revenues over a specified threshold. This contrasts with earnings sharing regulation in which regulated firms are required to share earnings net of costs. Typically the regulated firm retains all of its revenue provided that its total revenue does not exceed a specified threshold. The firm must share some proportion of any revenue generated above that threshold with its customers.

Price Freezes

A price freeze specifies that a company's prices cannot change within a defined period of time. At the end of the defined period, the regulator may undertake a rate review. The ability to capture any additional profit during the period of a price freeze gives the firm an incentive to reduce its costs.

Regulators tend to use price freezes in conjunction with other forms of regulation, especially price cap

regulation. In telecommunications, price freezes in a price cap plan usually apply to basic residential service. These services have historically been set at low levels due to universal service concerns and there is often a desire to maintain that policy under a price cap regime.

Rate Case Moratoriums

A rate case moratorium is an agreement between the regulator and the regulated company to abstain from general rate increases for particular services. A rate case moratorium usually also suspends investigations of the firm's earnings, guaranteeing the regulated firm that profits made at current prices will not be taken away.

A moratorium imposes a regulatory lag. This is intended encourage the regulated firm to reduce operating costs, because the firm will be able to retain the resulting increase in earnings. The length of a rate case moratorium is typically between two and five years, and is usually specified in advance.

Pure Price Cap Regulation

Under price cap regulation, the regulator controls the prices charged by the firm, rather than the firm's earnings. This focus on prices (and not profits) is what provides for improved efficiency incentives.

The regulator determines an annual price cap formula. This formula determines whether prices should change in each annual period, and by how much. The regulator usually specifies in advance how long the formula will apply for.

Under a typical price cap, the regulated firm is permitted to alter its average price for a basket of regulated services at the rate of the general level of inflation minus an efficiency factor based on the regulated firm's expected efficiency (the "X-factor"). Some regulators also allow the firm to adjust for changes in costs beyond its control, by including an exogenous cost component in the price cap formula (the "Z-factor").

An example of a price cap formula is set out below:

$$PCI_t = PCI_{t-1} * [1 + CPI - X \pm Z]$$

In the above formula, PCIt and PCIt-1 are the price cap index in the current year and the previous year, respectively. CPI is the Consumer Price Index (or an alternative index of inflation). X and Z are adjustments for expected efficiency gains and for exogenous costs, as discussed above

Price caps have a number of advantages over other forms of regulation that focus on the firm's realized earnings. The fact that the regulated firm is permitted to retain any realized earnings creates strong incentives to improve efficiency and reduce costs, beyond the level required by the X-factor. The infrequent reviews of the price cap formula reduce regulatory costs (by avoiding frequent rate cases), and encourage the firm to implement strategies to reduce costs in future periods, as well as in the current year. Finally, under price cap regulation, the regulated firm has much more flexibility in the prices that it can charge its customers as long as average prices do not exceed the cap.

Regulators around the world have used price caps extensively in the telecommunications industry. The regulator in the United Kingdom introduced price caps in 1984, and they are now increasingly common in the rest of Europe. In the United States, price cap regulation began replacing traditional rate of return regulation for telecommunications carriers in 1989. By the mid to late 1990s, nearly every state had a price cap regime in place for the telecommunications industry.

Hybrid Price Cap

Under a hybrid price cap scheme the regulator combines a price cap mechanism with a mechanism that uses realized earnings to determine prices. The most common type of hybrid price cap is one where the regulator sets a price cap formula and an explicit earnings sharing requirement. If the firm's regulated earnings exceed a certain threshold then it must share part of the gains with customers. Conversely, if earnings fall below the threshold, a share of the losses falls on customers. This provides the firm an incentive to improve its efficiency, while also addressing concerns about excessive profits (for example, if the regulator sets an X-factor that subsequently appears to be too generous).

Rate of Return Regulation vs. Price Caps

Table 2.1 compares the advantages and pitfalls of rate of return regulation and price caps, against the regulatory criteria discussed in this section.

Table 2.1 Comparing Rate of Return and Price Cap Regulation

	Rate of return (ROR)	Price cap
Prevent exercise of market power	**Yes.** The regulated firm can only earn a normal rate of return.	**Yes.** The CPI-X constraint in the price cap formula prevents the firm from exercising market power (if chosen with care). The firm may exercise market power in prices for individual services, provided that the average price of the basket of services is within the cap. Some regulators impose additional caps on individual services to prevent this.
Technical efficiency	**No.** The regulator directly controls profits. If the firm lowers costs by becoming more efficiency, and so increases profits, prices will be lowered in the next rate case. The firm will not reap the benefit from reducing costs and so has no incentive to do so.	**Yes.** Firms are automatically rewarded with higher earnings when they reduce costs or expanding demand (and penalized when costs increase). This encourages efficient behavior
Allocative efficiency	**No.** Prices usually based on embedded costs, not forward-looking costs. Prices for individual services need not equal the costs of the service.	**Yes.** Firms have flexibility to set prices for individual services based on forward-looking costs. It is possible for individual prices to deviate from costs, particularly if the X-factor is set incorrectly.
Dynamic efficiency	**No.** The firm does not retain any increase in profit from introducing new technology or services, and so has no incentive to do so.	**Yes.** The firm has incentives to invest efficiently, because it must justify its investment on the profits it expects to earn from the investment (like firms in competitive markets).
Promote competition	**No.** Does not generally permit pricing flexibility for the firm to set prices to reflect forward-looking costs in response to competition. Compared to price cap regulation, the firm is better able to misreport costs between competitive and non-competitive services, in order to cross-subsidize competitive services.	**Yes.** The firm is less likely to cross-subsidize services. It is common to group regulated services into separate baskets for less competitive and more competitive services, preventing cross-subsidization. The firm has sufficient pricing flexibility to respond to competitive pressures by setting prices that reflect underlying costs and demand conditions
Minimize regulatory costs	**No.** Rate proceedings are often lengthy and resource intensive.	**Yes.** Price cap proceedings are less costly than rate proceedings, and are infrequent (once every 3 to 5 years). Between reviews, regulatory costs are low.
Ensure high service quality	**Yes.** The higher the net book value of the firm's assets, the greater the return it is permitted to earn. There is a risk that service quality may be higher than efficient levels.	**No.** Firms have strong incentives to reduce operating costs, which may lead to reduced service quality
Prices competitive with other jurisdictions	**No.** Prices are generally set with no reference to prices in other jurisdictions.	**No.** Prices are generally set with no reference to prices in other jurisdictions.
Generate compensatory earnings	**Yes.** Rate of return regulation ensures that the regulated firm generates sufficient compensatory earnings.	**No guarantee.** If the X-factor is chosen correctly and the firm performs, the firm should generate sufficient compensatory earnings. A sound price cap penalizes the firm for business mistakes or poor performance.

2.6.4. Benchmarking Prices

International benchmarking is the process of establishing the price of a service based on prices in other jurisdictions. Benchmarking can be used as a common sense check on the results of cost models (see Box 2.8). Alternatively, it can be used directly to set prices.

For example in Singapore, the price SingTel can charge is based on the prices of telephone services in neighboring Asian countries, New York, and London.

Benchmarking involves the following:

- *Selecting a sample of countries or operators* (countries used in the benchmark should be at similar stages of socio-economic and industry development as the country whose interconnection rates are being considered);

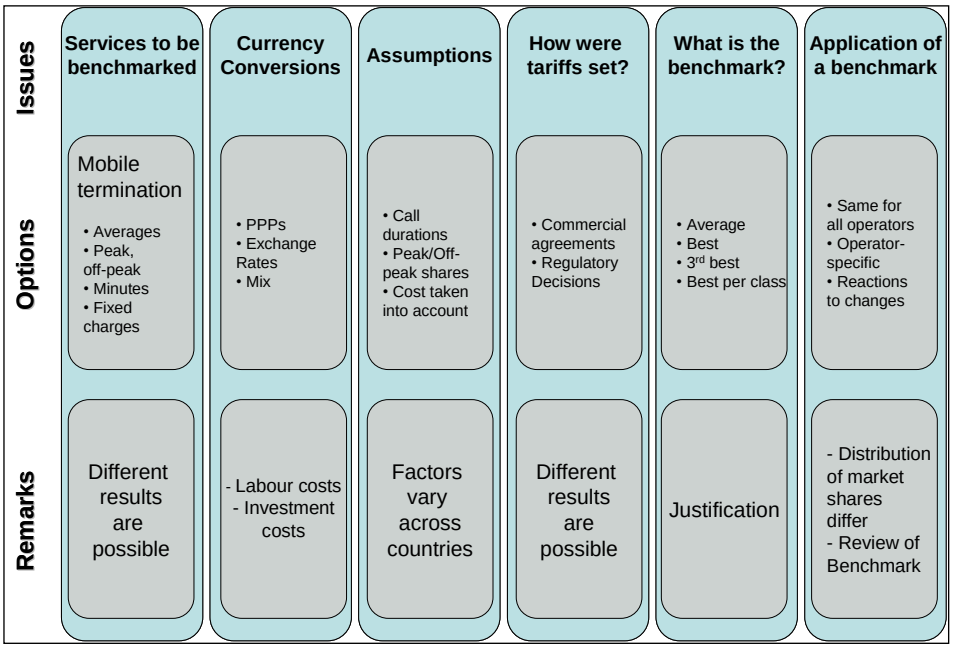
- *Gathering price data* for the service(s) under consideration in each of the sample countries; and
- *Adjusting benchmarked rates* to account for differences between the country being regulated and the benchmark countries.

While using benchmarking for tariffs, it is important to take into account the various factors that can justify differing tariff cost structures. For instance:

- The size of populations, subscriber density and geographical dimensions of the territory are key factors that influence costs.
- Different topographies may cause significant cost differences. For example, providing coverage and capacity will be more costly in areas with mountains, compared to level terrains.
- Differences in cost structures can reflect different rents for premises and offices, labor costs, tax, etc.
- Differences in traffic demand and patterns influence network structure, network dimensions, and, therefore, underlying costs.
- Spectrum licensing costs and the availability of spectrum may vary.

Figure 2.14 illustrates decisions that may be necessary when benchmarking is used to determine a competitive level of tariffs.

Figure 2.14 Benchmarking Issues



Source: ICT Regulation Toolkit.

Recommendations

Benchmarking of tariffs is recommended in cases where there is no available costing data, or only rudimentary data is available, and a decision has to be taken in a very short time frame. The methodology is relatively easy and requires a limited set of input data. It is especially important that the costing methodology of the underlying benchmarks is known, as there is a risk that benchmarks will be based on other benchmarks.

In benchmarking, regulators should choose methodologies used in countries in the same region, or countries with comparable circumstances. This helps ensure that the selected methodologies are relevant and useful. Benchmarking of input data should include checking that the input parameters for costing models reflect international best practices. Several public data sources should be used, and the variety will ensure a higher quality for input data.

Box 2.8 The Bahamas: Benchmarking of International Long Distance (ILD) Call Prices

In May 2006, the Public Utilities Commission of The Bahamas authorized The Bahamas Telecommunications Company (BTC) to introduce reduced prices for International Long Distance (ILD) calls as part of a wider price rebalancing program. The decision was informed by price benchmarking. This box summarizes the justification for resorting to benchmarking, the methodology employed, and the Commission's final decision.

Background

BTC is the dominant fixed operator and holds an exclusive license in cellular mobile services. System Resource Group (doing business as IndiGO Networks) operates a fixed radiocommunications systems offering local access, International Long Distance (ILD) and Domestic Long Distance (DLD) calls in competition with BTC.

The government of The Bahamas mandated the state-owned BTC to gradually rebalance its prices, to make them more cost reflective). In January 2005, BTC made a formal application to increase monthly prices for telephone lines and reduce prices for ILD calls. In analyzing BTC's application, the Commission was required ensure that rebalanced prices were not anti-competitive. For those services where BTC faces competition this means rebalanced prices must not be below cost.

Reason for Benchmarking

In support of the application, BTC estimated the forward-looking economic costs it incurred to provide services along with details of the cost standard and principles underlying those estimates. As is the experience in some other Caribbean markets, the Commission encountered delays in completing its examination of the forward-looking cost study.

The Commission is required by statute to act in a timely manner. Rather than delay price rebalancing, the Commission sought to make its decision based on existing information. The Commission was able to approve increases in monthly prices for telephone lines based on historic cost data available to it. However, no such data existed for ILD calls. The Commission therefore used price benchmarking to evaluate the proposed decrease in ILD prices.

Benchmarking Methodology

The purpose of the benchmarking exercise was to establish whether the prices proposed by BTC were above or below the efficient cost incurred by operators in competitive markets to provide ILD services. Prices in competitive markets are assumed to be reasonable proxies of the efficient cost of providing ILD services.

The study compared BTC's proposed prices with prices in 16 countries with both competitive and monopoly markets in ILD services. Of the 16 countries, 13 had competitive ILD markets while liberalization had not yet occurred in the remaining three countries (Antigua & Barbuda, Turks & Caicos Islands, British Virgin Islands). There were also disparities amongst the countries, in population, network size, geography/topography, and income.

Countries were selected based on:

- Their economic importance to The Bahamas (the United States, Canada, the United Kingdom, and Switzerland are The Bahamas' principal trading partners),

- Per capita income (high income island economies with per capita GDP of $17,000 to $40,000 — Guernsey, British Virgin Islands, Barbados, Bermuda, Cayman Islands), and

- Economic structures that were similar to The Bahamas (Antigua & Barbuda, Turks & Caicos Islands, Cayman Islands, Barbados, Bermuda, British Virgin Islands, Anguilla, Jamaica, Dominica, St. Vincent & Grenadines, and Grenada). These regional economies compete with the Bahamas in tourism and or financial services.

The main findings of the benchmarking exercise were:

- The price of making a call from The Bahamas to countries with competitive ILD markets were significantly higher than the price customers in competitive markets paid to make a call to The Bahamas,

- Customers in countries with competitive ILD markets paid significantly lower prices to make telephone calls to The Bahamas than their counterparts in monopoly markets,

- BTC's existing and proposed prices were more comparable to prices in monopoly markets.

Commission's Decision

The Commission concluded that the prices proposed by BTC were not below the efficient cost incurred by BTC to provide ILD calls. The Commission also took note of the disparities between the countries. It concluded that limited competition in the market, coupled with BTC's pricing structure were the principal reasons why BTC's existing and proposed prices were comparable to prices in monopoly markets.

The Commission noted that BTC's proposed prices were still high by international standards. However, BTC indicated in its response to the Commission's public consultation document that it proposed to apply for approval for further reductions in prices for international and domestic long distance calls.

As a result, the Commission saw no justification to deny BTC's request to reduce ILD prices. The Commission granted approval for BTC to introduce the proposed prices, and modified Schedule 1 of BTC's License accordingly.

Source: Public Utilities Commission of The Bahamas.

CHAPTER 3. GROWING THE MARKET: LICENSING AND AUTHORIZING SERVICES

CHAPTER 3. GROWING THE MARKET: LICENSING AND AUTHORIZING SERVICES

3.1. Introduction

Chapter 3 explores the role of licensing and authorization in growing national and global markets. The chapter looks at licensing objectives and different types of licensing such as individual and general licenses. The various steps in a competitive licensing process are set out in detail. Authorization principles and procedures are outlined and consideration is given to special authorization situations, such as licensing public-private partnerships. The chapter also looks at the impact of convergence on the development of unified and multi-service licensing and the growing need to lift restrictions on licensees. Finally, the chapter concludes by highlighting the role of standards in growing the market and the need to bridge the standards gap experienced by many developing countries.

3.2. The Trend Towards General Authorization

Traditionally, in many parts of the world, a license was issued to authorize a person to provide telecommunications services or to operate telecommunications facilities. Such licenses generally described key rights and obligations of licensees and often defined conditions relating to the provision of services. These licenses also tended to be service-specific and technology-specific. A licensee was authorized to provide a particular type of service over a specific type of network. In other cases, a licensee was authorized to operate specifically defined types of telecommunications facilities. A wide range of different licensing approaches has been adopted around the world.

Today the practice of issuing detailed individual licenses to specific telecommunications, or ICT service providers, is gradually being replaced by general authorization regimes. However, the issuance of detailed individual licenses remains common in developing economies. Moreover, issuing detailed individual authorizations remains the norm for authorizing the use of radio spectrum where the demand for the use of a particular frequency band exceeds availability.

In general authorization regimes in developed economies, few, if any, conditions are included in a license document issued to a specific service provider. Instead, regulatory conditions are generally established in rules or regulations that apply equally to all service providers of the same class (e.g., cellular mobile providers) or across the whole ICT industry. While general authorization regimes are most prevalent in developed economies, these regimes have also been adopted in a number of developing and transitional economies. In developing or transitional economies, where the regulatory framework governing the ICT sector is still maturing, it is common for general authorizations to contain a fairly detailed set of terms and conditions. There are thus different variants of general authorization regimes.

With increased liberalization, some regulators are removing any and all authorization requirements for certain specific ICT services. These service markets are then open to entry by any new service providers, without restriction. Open entry regimes are generally found only in countries with a highly developed, competitive ICT sector and a robust set of institutions that can safeguard consumer interests and protect against anti-competitive conduct.

There has also been a movement away from the issuance of service and technology-specific authorizations. In light of rapid technological development and service innovations, countries are increasingly moving towards the adoption of multi-service and neutral or "unified" authorization frameworks. These frameworks feature authorizations that are service and/or technology neutral, allowing licensees to offer a range of services under the umbrella of a single authorization, using any type of communications infrastructure and technology capable of delivering the desired services. There are a range of different approaches to multi-service and unified licensing around the world.

At one end of the spectrum are wide-open authorization regimes, where no form of governmental approval is required to start an ICT service business or to operate network facilities. At the other end are individual licensing regimes with lengthy authorization documents customized to the circumstances of a specific service provider. In between are many forms of general authorization or "class licenses" that authorize and provide generally applicable regulatory conditions for classes of ICT service providers.

This chapter uses the term "authorization" to refer to all forms of licensing, permission or approval required from regulatory authorities to carry on business as an ICT service provider.

3.3. Licensing Objectives and Types

3.3.1. Overview

The development and implementation of authorization policies is one of the most important steps in reforming the ICT sector. Authorization policies determine the structure and level of competition and, ultimately, the efficiency of the supply of ICT services to the public.

Historically, many countries developed authorization policies on an *ad hoc* basis. Frequently, policies were only developed when specific decisions were made to authorize additional service providers. However, as the global regulatory experience evolved, an increasing number of countries adopted explicit authorization policies. Many countries developed policies based on the experience of regulatory reform and telecommunications market liberalization in other countries. In developing and emerging markets, authorization policies often provide for (1) immediate opening of peripheral telecom markets to competition, and (2) phased opening of voice telephony and related "core" markets.

Clearly stated telecommunication policies remove uncertainty and regulatory risk for service providers and their investors. However, regulation is an art, not a mathematical science, and it is neither possible nor desirable to attempt to prescribe detailed policies for all situations that may arise. ICT markets and technologies are too dynamic to permit that. An ideal ICT policy should establish the main objectives and approaches of government policy and deal with major issues of national concern to service providers and investors. However, the more detailed provisions are better left to subsidiary legislation or regulatory rules which can be amended to meet evolving market conditions.

3.3.2. Licensing Objectives and Policies

The development and implementation of authorization policies is one of the most important steps in reforming the ICT sector. Authorization policies determine the structure and level of competition in telecommunications markets and,

ultimately, the efficiency of the supply of ICT services to the public.

Governments and regulators typically have a variety of reasons or objectives for licensing telecommunications and ICT service providers. Some common authorization objectives include:

- Privatization or commercialization;
- Expansion of networks and services and other universal service objectives;
- Regulating provision of an essential public service;
- Attracting investment in the telecommunications-ICT sector;
- Regulating market structure;
- Establishing a framework for competition;
- Allocation of scarce resources;
- Generating government revenues;
- Consumer protection;
- Establishing a framework for quality of service; and
- Regulatory certainty.

3.3.3. License Types

Just as there are different types of authorization authorities in different countries, different types of authorization regimes have been adopted (see Table 3.1). Again, with the sharing of global experience, there has been a convergence in the types of authorization regimes adopted in various countries. Today, the approaches to authorizing ICT service providers and services can be divided into three main categories:

1. Individual authorizations;
2. General authorizations; and
3. Open entry – i.e. no authorization requirement.

There is a clear trend toward the use of general authorizations and open entry regimes in developed economies, consistent with the general liberalization and convergence of ICT markets (see Box 3.1). However, individual authorizations continue to be in place in a large number of countries, particularly in developing and transitional economies. Moreover, individual authorizations are used to license the use of radio spectrum when the demand for use of a particular band of radio frequency exceeds availability.

Table 3.1 Main Types of Authorization Regimes

TYPES OF AUTHORIZATION REQUIREMENT	MAIN FEATURES
Individual Authorizations	• issued to a single named service provider • usually a customized authorization document • often contains detailed conditions • frequently granted through some from of • competitive selection process
General Authorizations (Class licenses)	• useful where individual authorizations are not justified, and where significant regulatory objectives can be achieved by establishing general conditions • normally set out basic rights and obligations, and regulatory provisions of general application to the class of services authorized • normally issued without a competitive selection process; all qualified entities are usually authorized to provide service or operate facilities
Open Entry	• no authorization process or qualification • no requirements, beyond rules generally applicable to the ICT sector • registration requirements or other rules of general application are sometimes imposed by regulation

Source: Adapted from Intven, Oliver and Sepulveda, 2000

Box 3.1Japan- Registration or Notification

Before 1 April 2004, telecommunication carriers in Japan were categorized into two types under the Telecommunications Business Law: "Type 1 telecommunications carriers," which offered services using their own facilities, and "Type 2 telecommunications carriers," which did not have their own facilities and which leased their lines.

Carriers were required to obtain permission to engage in a Type 1 business or were required to submit a registration or notification of their entry into the market to engage in a Type 2 business.

In light of heightened competition and the emergence of numerous substitute services – and also out of a desire to review the regulations for market entry and service provision -- the Telecommunications Business Law was completely reviewed in 2003 and the amended law came into force on 1 April 2004. The amendments:

- abolished the distinction between telecommunication circuit facilities of Type 1 and Type 2 carriers;
- abolished the permission system for market entry and withdrawal and introduced a registration and notification system in its place;
- abolished tariff regulation; and
- improved consumer protection rules, holding carriers more accountable for service provision and handling of complaints.

With regard to registration and notification, the amended Telecommunications Business Law states that:

- Any person who intends to operate a telecommunications business by installing telecommunications circuit facilities on a scale exceeding the standards specified in the applicable Ministry of Internal Affairs and Communications (MIC) ordinance shall obtain registration from the Minister for Internal Affairs and Communications.
- Any person (except a person who has to obtain registration) who intends to operate a telecommunications business shall submit a notification to the Minister for Internal Affairs and Communications.

Source: ITU, 2004.

3.4. Competing for Licenses

3.4.1. The Competitive Licensing Process

Competitive licensing processes are generally used to issue an individual license to a single service provider or a limited number of them. In a competitive licensing process, the regulator (or other licensing authority) typically describes the business opportunity and invites interested parties to submit applications for the license to enter the business (see Box 3.2). The successful applicant is normally selected through a form of competitive evaluation, such as a comparative evaluation process (sometimes called a "beauty contest"), an auction, or some combination of the two.

A competition for the award of an individual license is frequently referred to as a "licensing" or "tender" process or a "request for applications" process. In this chapter, we use the term "competitive licensing process" to refer generally to a competitive selection process, by which a number of applicants compete for the right to hold a limited number of licenses.

Competitive licensing processes generally have a number of phases. After determining the basic objectives of a licensing process, the regulator will establish the schedule for the process and prepare a guide to be used by applicants in the licensing process. Typically, the licensing process begins when the regulator issues some form of notice of invitation to apply for the license.

In some cases, the licensing process includes a pre-qualification phase, in which potential applicants are screened in order to limit the competition to qualified applicants. The pre-qualification phase is followed by the qualification phase and the selection phase, where the regulator uses a competitive mechanism (or combination of mechanisms) to select the successful applicant. In other cases, however, the licensing process does not feature a pre-qualification phase and instead proceeds directly to the selection phase. he licensing process culminates with the selection of the successful applicant and the award of license or licenses.

3.4.2. Scheduling the Licensing Process

In most cases, the guide to the licensing process includes a schedule for the process. Publishing a schedule for the licensing process facilitates compliance with one of the requirements set out in the WTO Regulation Reference Paper (see Appendix A). The Paper requires that certain information about licensing, including the "period of time normally required to reach a decision concerning an application for a licensing," be made publicly available.

Box 3.2 Checklist of Typical Steps in a Competitive Licensing Process

- **Develop a market entry policy**
  - o Establishes the goals of the authorization process and shapes the foundation for the process.
  - o Make key determinations about the structure of the licensing process
- **Determine the schedule for the process**
  - o Determine whether the process will include pre-qualification and qualification rounds, determine which selection mechanism to employ, and determine the criteria for pre-qualification, qualification, and selection, as applicable.
  - o Make policy determinations concerning the number of licenses to be awarded, the terms and conditions of license, and other key policy matters.
- **Issue public notice of the license competition**
  - o Use traditional media (business magazines and newspapers), online resources, and the regulator's website to provide notice of the competition.
- **Publish the guide to the licensing process**
  - o The guide to the licensing process may be published at the same time as the issuance of public notice of the competition or shortly thereafter.
  - o If the licensing process includes a pre-qualification stage, the guide to the licensing process may be issued only to applicants who have successfully pre-qualified. In this case, the guide to the licensing process may be issued after the pre-qualification stage. In such a case, directions on how to pre-qualify and a high-level summary of the licensing opportunity should be issued along with the public notice of the opportunity.
- **Publish the schedule for the license competition**
- **Pre-qualification stage (if applicable**)
  - o Issue directions on how to pre-qualify for the licensing competition and provide at least a high level summary of the licensing opportunity.
  - o Possibly host a question-and-answer session to address inquiries about the process.
  - o Receive and evaluate submissions.
  - o Notify those who have made submissions about whether they have successfully pre-qualified.
  - o Distribute the detailed guide to the licensing process to successfully pre-qualified applicants.
- **Qualification stage (if applicable**)
  - o Ensure that the guide to the licensing process has been made publicly available or distributed to pre-qualified applicants, as applicable.
  - o Possibly host a question-and-answer session to provide further information about the competition and to address inquiries about the process.
  - o Receive submissions on qualification. Submissions regarding selection may be received at the same time, for example, as in the classic "two envelope" system.
  - o Evaluate submissions on qualification. Unless the qualification and selection stages have been combined, the submissions regarding qualification and selection should occur separately. Qualification submissions should be evaluated first.
  - o Provide notice to applicants about whether they have successfully qualified to be considered for the award of license before moving on to the selection phase. Notice to applicants may be accompanied by a public announcement of the applicants who have successfully qualified to compete for the award of license.
  - o Consider returning the unopened submissions on selection of applicants who failed to qualify.
- **Selection stage and award of license**
  - o Apply the selection mechanism, e.g., host the license auction or evaluate submissions in a comparative evaluation process.
  - o Notify the successful applicant(s) in writing of the award of license.
  - o Issue public notice announcing the winner(s) of the licensing process.
  - o Generally, it is good practice to require successful applicants to confirm their acceptance of the award of license in writing.
  - o Ensure that the successful applicant has completed all necessary requirements (e.g., payment of an initial license fee) before the actual issuance of license.
- **Issuance of license**
  - o After receiving confirmation that all necessary requirements have been met by the successful applicant, issue the license.

Source: McCarthy Tétrault LLP, 2005.

The schedule sets out the framework for how the licensing process will unfold. It normally lists all significant steps in the licensing process and the date and time for such steps. The deadlines governing tasks that applicants are required to complete are a particularly important item in the schedule. Many schedules also include the timelines for the review of the licensing applications and the date on which the decision concerning the award of licensing will be announced. Other important steps may be mentioned in the schedule, for example, the effective date of the license.

Dates and deadlines set out in licensing schedules are usually specific. In addition to noting the day, month, and year of a particular event, it is often advisable to include a fixed time (including relevant time zone) for certain steps.

In setting a schedule, the regulator should balance its own interests, the interests of the public, and the interests of potential applicants. For example, the interest in moving the authorization process ahead as quickly as possible after issuing the request for applications must be balanced against the need to provide potential applicants with sufficient time to conduct due diligence and to prepare the required materials for the application.

3.4.3. The Guide to the Licensing Process

As mentioned above, a regulator will generally issue a guide for applicants, outlining the licensing process. Such a guide is sometimes referred to as a "Request for Applications for a License," "Licensing Guidelines," or even "Licensing Tender" (see Box 3.3). These documents will be referred to collectively as the "guide to the licensing process".

The guide to the licensing process typically covers important information about the licensing competition that allows applicants to analyze the prospective opportunity and to submit responsive applications. This information may include: background to the competition; market conditions; the scope of the license; the rights and obligations of the successful licensee; the procedures that will be followed in the competition; qualification criteria; selection criteria; fees; and the schedule for the licensing process. In some cases, the guide also appends a draft license, as well as information about relevant investment legislation and policies, interconnection guidelines, an application for spectrum, the existing tariff, the national numbering plan and a tariff guideline. The guide to the licensing process is often made available to the public or to qualified bidders as soon as a notice of invitation to apply for the license is released.

Box 3.3 Nepal -- Request for Applications for a License to Provide Rural Telecommunications Service (RTS) in the Eastern Development Region

In 2003, the Nepal Telecommunications Authority (NTA) issued a Request for Applications (RFA) for a license to provide rural telecommunications services ("RTS") in Nepal. The RFA states that the NTA plans to issue one license. The successful licensee will be paid a one-time capital subsidy. The RTS tender process includes a qualification stage. Selection of the licensee is based, in part, on the lowest subsidy bid submitted.

The RFA outlines, among other things, the following:

An Introduction, including a brief overview of the purpose of the RFA, a timetable for the RFA process and the address for correspondence with the NTA.

Background Information about the Nepalese Telecommunications Sector, including information related to the geography and government structure of Nepal, the Nepal Telecommunications Corporation (NTC) network, the RTS policy and NTC rates, numbering, and other licenses.

Rights and Obligations of the Licensee, including information related to, inter alia, exclusivity, network roll-out requirements, RTS subsidy payments, service quality, interconnection, access to public and private lands, the term of the license and spectrum allocation.

Instruction to the Applicants, including information related to, inter alia, the selection process, eligibility and qualification, content and format of the application, communications and requests for clarification, the cost of the application and bidding, the modification of the terms of the license and other legal and formal requirements.

The RFA also includes 17 annexes. These annexes include, inter alia: relevant legislation; interconnection guidelines; the RTS subsidy proposal form; an application for spectrum; a draft license; excerpts from the World Bank Procurement Guidelines; a map of Nepal; the existing tariff of NTC; the national numbering plan; and a tariff guideline.

Source: ICT Regulation Toolkit.

3.4.4. The Pre-Qualification Phase

The licensing process generally begins with a public notice of the license competition. The public notice increases the transparency of the authorization process and is in keeping with current best practices in the ICT sector. Public notice is often issued in a preliminary or pre-qualification phase..

It is sometimes desirable to limit the field of applicants to parties that have demonstrable financial and technical qualifications to achieve the objectives of the regulator. In these cases, the licensing process will have a pre-qualification phase. Some factors that are relevant to the decision about whether to include a pre-qualification phase include:

- *The nature of the telecommunications market and the level of competition*:
  Pre-qualification is less important in the case of highly-competitive services since consumers can switch away from a service provider that fails to provide adequate services with minimal cost and disruption;
- *The nature of telecommunications services*:
  Pre-qualification is often prudent when licensing processes for services involve the use of valuable spectrum and other scarce resources to ensure that these resources are awarded to applicants who are financially and technically capable of providing the service; and
- *The type of selection mechanism to be applied in the licensing process*:
  Prequalification is less important in comparative evaluation licensing processes since comparative evaluations are often structured to include an evaluation of the financial and technical merits of applicants.

During the pre-qualification phase, potential applicants must demonstrate that they meet the pre-qualification criteria to be eligible to participate in the license competition. The pre-qualification criteria are usually minimum requirements that establish a baseline of financial capability and technical competence. In order to enhance transparency and certainty in the licensing process, it is preferable that the pre-qualification criteria be objective rather than subjective measurements of financial viability and technical competence. An objective pre-qualification criterion that is often used requires applicants to demonstrate that they, or an affiliated entity, have actually provided certain types of services or operated a network of a certain size.

Regulators sometimes impose a significant application fee instead of, or in addition to, relying on a formal pre-qualification. Such an application fee will discourage frivolous bidders. The fee may be tied to the submission of an application or may be charged for the purchase of the guide to the licensing process.

One potential disadvantage of requiring pre-qualification is that the pre-qualification round extends the licensing process and delays the actual issuance of the license. Potential delay can be minimized by adopting objective criteria that are relatively easy to adjudicate. In any event, the regulator may ultimately save time by requiring that applicants pre-qualify, since the regulator will then have fewer applications to review during the selection process.

Authorization processes that have included a pre-qualification phase include: the Kenyan GSM licensing process and licensing process for a second national operator; the Jordanian process for the issuance of a third mobile license; the Saudi Arabian cellular mobile services licensing process; and the Saudi Arabian data services licensing process.

3.4.5. The Qualification Phase

Some licensing processes include a qualification phase during which applicants must demonstrate that they meet the qualification criteria for the license and are therefore eligible to be considered for selection for the award of license. The qualification phase is separate from the pre-qualification phase, although sometimes these two phases are combined. In some licensing processes, the qualification phase and selection phase are dealt with separately. In this case, the evaluation of licensing applicants occurs in two phases.

First, applicants are evaluated to ensure that they meet the qualification criteria. Successful applicants then proceed to the selection phase of the licensing process. During this phase, applications are assessed on the basis of the selection criteria and the license is awarded to the successful applicant.

A classic example of the use of a qualification phase and a selection phase is the "two-envelope" approach. Under this approach, each applicant submits two envelopes. The first envelope contains an applicant's submissions regarding its ability to meet the qualification criteria. The second envelope

contains information provided by the applicant about the selection criteria.

During the qualification stage, the first envelope is opened and the submissions of applicants are reviewed to determine which ones are technically, financially or otherwise qualified to proceed to the selection phase. Applicants are then informed about whether they have advanced to the selection phase of the licensing process. The second envelopes of non-qualified applicants are usually returned un-opened. Sometimes an explanation is given as to which qualification criteria the applicant failed to meet. Such an explanation is consistent with the requirement of the WTO Regulation Reference Paper to make reasons for denial of a license known to the applicant upon request.

During the selection phase, the second envelopes submitted by qualified applicants are opened. The most common and objective selection criterion is the financial amount of a bid. This may be based on the highest bid, for example, in the case of a IMT-2000 (3G) license. But it may also be the lowest bid, for example in the case of a least-cost subsidy auction.

In some cases, the qualification and selection processes are held simultaneously, such as in a comparative evaluation process.

Transparency in the qualification phase is promoted by communicating clearly with potential applicants about how their submissions will be evaluated. In particular, it is advisable to inform potential applicants whether minimum compliance with the qualification criteria is sufficient to advance them to the selection phase of the competition. There has been litigation against regulators in some countries where the qualification criteria were specified but some otherwise qualified applicants were subsequently rejected on the basis that they were less qualified than others.

Distinguishing Between Qualification and Selection Criteria

It is important to distinguish between qualification criteria and selection criteria. Qualification criteria are requirements that all applicants must meet to be eligible to compete for the license during the selection stage. Selection criteria are used to determine which applicant will actually be awarded the license or licenses.

In the case of a general authorization, only the qualification criteria are relevant because no selection is made. In the case of a selection process for an individual license, both qualification and selection criteria are normally developed. It is generally advisable to conduct a licensing process in at least two phases. The qualification phase is completed first. For less complex licensing processes, the pre-qualification and qualification phases are sometimes combined as one. Only qualified applicants participate in the second phase – the licensee selection process.

Qualification Criteria

As noted above, qualification criteria are minimum requirements that all potential applicants must meet in order to be eligible to compete for the license during the selection stage. Various requirements may be used as qualification criteria. Some can be more onerous than others. Qualification criteria should be published in advance of the commencement of the qualification phase. This is consistent with the provisions of the WTO Reference Paper, which stipulate that "all licensing criteria" must be made publicly available.

To maximize the transparency of the process, direction may be provided on how potential applicants may demonstrate that they have met qualification criteria, such as technical competence or financial backing. The most common type of evidence involves prior experience in operating a network with a specific number of subscribers.

There are potentially negative consequences to adopting very specific qualification criteria and to specifying in detail the type of evidence that will suffice to demonstrate that these criteria have been met. This specificity makes the process more rigid and constrains the regulator's flexibility to address novel situations or unexpected but useful qualifications. Maintaining some degree of regulatory discretion in the qualification process may be appropriate.

Some of the considerations relevant to selecting appropriate qualification criteria include: the type of service being licensed; whether the license will include monopoly rights or other forms of exclusivity; whether the licensing process includes a pre-qualification phase; and the type of selection mechanism applied in the licensing process. Table 3.2 summarizes qualification criteria (and their rationale) for certain license types.

Table 3.2 Qualification Criteria by Type of License

LICENCE TYPE	POSSIBLE QUALIFICATION CRITERIA	RATIONALE
First new competitive fixed network (local or international service)	• Applicant not currently licensed to offer a competitive service; not associated with the incumbent • Applicant has a minimum number of fixed lines in service in other countries/markets (an international PTO as partner) • Relevant experience in similar markets (direct or by contract) • Financial comfort letter from recognized bank • Business plan, including pro forma financial statements and a marketing plan • Technical plan, including details of network planning and roll out and technology selections	• Effective competition will not develop between related entities • Only experienced service providers can meet the significant challenges facing a start up fixed line competitor • Experience and contacts in local market increases prospects of successful start-up • Evidence of access to required financing • Evidence of financial viability and likelihood of success of the project; disadvantage in that it is costly to prepare plan • Business plan and technical plan can demonstrate detailed and viable service plans and knowledge of local economic and other conditions
Competitive cellular service (first new entrant in an emerging market)	• Similar to, but less onerous than, above	• Presence of competition reduces (but does not eliminate) public costs of failure • Significant economic and sector development objectives will be achieved by successful launch • Valuable and scarce spectrum will be allocated to the selected service provider on an exclusive basis
Data transmission service in highly competitive market	• None	• General authorization is best approach • No scarce resources involved • Existing competition makes success or failure of this service provider relatively unimportant
Broadband wireless services in highly competitive market	• Financial comfort letter • Evidence of experience in successful operation of similar businesses in any market	• Spectrum is a scarce and valuable resource. Regulator has a important role to play in ensuring efficient use and avoiding warehousing

Source: Adapted from Intven, Oliver and Sepulveda, 2000.

Regulators around the world have adopted diverse sets of qualification criteria. For example, the Estonian regulator adopted three qualification requirements for its 3G tender process in 2004. Participants were required: (i) to have submitted an application for participation, along with all necessary documentation; (ii) not to be an operator to whom a technical authorization of 3G mobile telephone network had previously been given pursuant to an earlier proceeding; and (iii) to have transferred the deposit sum in the appropriate account of the Ministry of Finance by the deadline for such deposit.

Potential applicants in the Norwegian 3G tender process (2000) were required to meet three main "minimum requirements": (i) conformity with the terms of the invitation to tender, including the requirements related to scope, form, and content of the application; (ii) certain financial requirements pertaining to development and operations; (iii) and a commitment to meet the specified coverage requirements and corresponding roll-out obligations.

The Federal Office of Communications (OFCOM), the Swiss regulator, included only one qualification criterion in the 2003 licensing process for licenses to

provide telecommunications services based on the GSM standard. This criterion was that sufficient financing for the participant's proposed project had been secured for the term of the license, based on commercial and technical planning. The tender document stipulated that OFCOM would consider that a participant had fulfilled this criterion if: the project was based on a consistent and realistic business plan; a consistent and realistic investment and financing plan exists for the project; and the financial means necessary for the realization of the project are available or can be made available, and this can be proven.

Participants in the 2003 Nepalese Rural Telecommunications Services (RTS) licensing process were required to meet four requirements in order to become a "Qualified Applicant," and therefore eligible to compete for the award of license during the selection stage. First, the participant's application package for the RTS license had to be complete and prepared in accordance with the terms of the Request for Applications (RFA) for the Issuance of an RTS License.

Second, the participant must have satisfied all the eligibility requirements of the RFA, including, *inter alia*, requirements relating to: the purchase of a copy of the RFA; the provision of all required information; company registration; Nepalese participation; financing capacity; operational experience; and field proven equipment. The RFA includes specific details about these eligibility requirements and how participants were to demonstrate that these requirements had been met.

Third, the information contained in the participant's application for license must have demonstrated that the applicant met or was capable of meeting the RTS license requirements related to service quality and availability and network roll-out requirements, as specified in the RFA.

Finally, the participant must not have been disqualified for any other reason, including, inter alia, reasons relating to the failure to submit the application for license in a timely fashion; failure to submit a complete application; failure to provide the required bid security amount for the license; and failure to comply with any of the procedures outlined in the RFA.

3.4.6. Selection Process

The heart of the licensing process is the selection phase. There are two main types of competitive selection processes: comparative evaluation approaches (or "beauty contests") and auctions. Other methods include lotteries and a variety of hybrid approaches that use elements of pre-qualification, comparative evaluation, and auctions or lotteries. A guide to a licensing process should provide details about the selection mechanisms, the selection criteria and the process to be followed.

Comparative Evaluations and Auctions

Comparative Evaluation Approach

In a comparative evaluation, or "beauty contest," the award of license is determined on the basis of a merit-based assessment of competitive applications. Each application is evaluated on the basis of a pre-set list of selection criteria or on the basis of the applicant's ability to fulfill certain, more general, requirements. This approach allows regulators to award the license to the service provider that is best placed to meet the specific objectives of the licensing process.

There are many forms of comparative evaluation schemes. In some cases, licenses are awarded to applicants expected to make the best use of the limited resources associated with the license to serve the public. In other cases, the evaluation is based on criteria related to technical competence, experience, and cost efficiency. Some comparative evaluations rely in part on quantitative measures, such as the number of years of operational experience. Others rely on more qualitative (and thus subjective) criteria, such as the quality of management.

The Norwegian 3G license tender process in 2000 featured a comparative evaluation as the selection mechanism. Applicants were evaluated on the basis of two primary selection criteria: geographic coverage and coverage in terms of population of network and services, and network roll out.

In the 2002 South African tender process for a license to provide public switched telecommunications services (PSTS), a comparative evaluation was used to select the successful applicant. The South African regulator evaluated each valid and eligible application based on a set of somewhat unusual criteria that had particular relevance to the political, socio-economic context in

the country. The seven selection criteria for the license were as follows:

- financing and business plan;
- experience in the provision of PSTS, strategic vision regarding the integrated provision of the service and a competitive strategy;
- human resource development policy and practices for training and promotion, especially entry level positions;
- technical feasibility of the project;
- proposed integration of the Black Economic Empowerment (BEE) into management of the licensee company and board representation;
- proposed integration of Eskom and Transnet into management of the company and board representation; and
- empowerment of women, disabled persons, and youth.

In the 2003 Swiss GSM telecommunications services licensing tender, the selection of the successful applicant was also based upon a comparative evaluation. OFCOM conducted a weighted assessment of four selection criteria: the quality of the applicant's business and service plan; technical concept and implementation; market stimulation and innovative strength; and coherence and plausibility of the project.

Specific selection criteria should be clearly described in the guide to the licensing process. Best practices also suggest that the weighting for each criterion should be determined in advance and communicated to applicants. This promotes transparency in the licensing process. This also helps applicants to prepare more responsive applications to ensure that the regulator selects the best qualified applicant for the award of license. Norway, South Africa, and Switzerland all communicated the relative weights of each selection criteria in advance of the selection phase.

Auctions

While the comparative evaluation approach involves the selection of an applicant based on merit, auctions involve little or no qualitative analysis of the merits of the applicant. Instead, selection is based on a single evaluative criterion, namely the amount bid by qualified applicants.

There are many different types of auctions (see Box 3.4). The most common approach involves selection of the qualified applicant who submits the highest bid for the right to hold a license. This type of auction was used in several GSM licensing processes in Europe, including the German, British, Dutch, and Italian authorization processes.

In the 2004 Estonian 3G licensing process, the successful application was selected using a multi-stage tender auction with an unlimited number of stages. The sole selection criterion was the amount of the tender offer. The applicant that bid the highest tender offer was awarded the license.

In least-cost subsidy auctions, a selection is made based on which qualified applicant requires the lowest subsidy to provide a non-economic service. The services authorized using a least-cost subsidy auction are generally subsidized as part of a country's universal access program. In a least-cost subsidy auction, applicants bid on the basis of subsidies they would require to provide the authorized services. The applicant that bids the lowest subsidy is awarded the license, along with the right to the subsidy it has proposed. Such auctions have been used successfully on a number of occasions to license subsidized rural telecommunications services in Latin America, and more recently in other regions. For example, the Nepalese regulator recently used this mechanism to issue a rural telecommunications services license in its country.

Auctions can also be based on any other measurable indicator that is financial or based on financial considerations. These might include the lowest consumer tariff to be charged, the highest quality of service or the greatest level of service to non-economic areas.

In many auctions, bidders are pre-qualified using criteria similar to those used in comparative evaluation processes. As a result, participation in these auctions is limited to bidders with proven financial and technical capabilities.

Hybrid Approaches

There are variations of the two main selection approaches. In some cases, hybrid approaches blend elements of a comparative evaluation with elements of an auction. For example, applicants may be scored on a number of quality-based criteria and market-based criteria, such as the amount of their bid for the license, financial security, technical

competence, and operational experience. In this case, the applicant with the highest combined score may be awarded the license. Table 3.3 compares the advantages and disadvantages associated with different types of selection mechanisms.

Table 3.3 Advantages and Disadvantages of Different Selection Mechanisms

SELECTION CRITERIA	ADVANTAGES	DISADVANTAGES
Comparative Evaluation – based on subjective assessment and comparison by the regulator of applications based on a list of qualitative and/or quantitative criteria	Maximum flexibility and discretion to select the most attractive application • Allows applicants to focus on factors they believe are important and to convince regulator accordingly	• Non-transparent • Subject to accusations of bias or corruption from losing bidders which are hard to refute and damage regulatory credibility • Risk of confusion among bidders who may not clearly understand regulatory priorities
Pure Auction – selection from among qualified bidders based on the highest financial bid	• Maximum transparency • Market efficiency – license awarded to the bidder which values it most • High bidder will have strong incentive to roll out service quickly to recover its bid • Suited to licensing in competitive markets	• Payment of fee can divert financial resources from service provision to auction fees (government revenue) • Encourages applicants to minimize resources devoted to other important priorities (i.e. rollout, coverage etc.)
Pure Auction – selection based on quantitative criteria, other than cash, relating to the service (i.e. time required to meet roll-out target, commitments on maximum prices for consumers)	• As above • Regulator can focus bidder resources on service development or other priorities as opposed to government revenues	• Encourages applicants to minimize resources devoted to priorities which are not selection criteria, unless they make business sense
Combined auction/comparative selection via weighted formula	• A compromise which has many of the benefits of both auction and comparative selection • Applicants are awarded points based on selection criteria	• Difficult to develop a sound formula that compares "apples to apples" • Compromise has disadvantages of both comparative selection and auctions • Less transparent than pure auctions

Criteria for Selection

As noted above, selection criteria are used in the assessment of qualified license applicants to determine which one will be awarded the license or licenses. A wide range of criteria can be used in the selection process, including quantitative and qualitative criteria. A comparative evaluation procedure may involve one or the other or both types of criteria.

The type of selection criteria that should be used in a licensing process depends on the objectives of the licensing process and the relative advantages and disadvantages of each type of criteria in the particular license circumstances.

The selection mechanism also plays an important role in shaping the selection criteria featured in a licensing process. While auctions require a set of criteria that are largely quantitative, beauty contests, by contrast, may feature more qualitative criteria. Hybrid approaches typically feature both qualitative and quantitative criteria. The decision whether to include a pre-qualification or a qualification stage also impacts the type of selection criteria that are applied in a licensing process.

Award of the License

The selection process concludes with the award of license. It is a good practice to specify when and where the award of license will be announced. It is

also good practice to require the successful applicant to confirm its acceptance of the award in writing within a prescribed amount of time. If the successful applicant is required to comply with any conditions before the license is issued (e.g., the payment of a license fee), such requirements should be clearly identified.

To increase confidence in the licensing process, it is important to build as much transparency and certainty as possible into the selection process. There are a number of ways that regulators can enhance transparency and certainty. For instance, regulators can:

- Describe the selection mechanism in the guide to the licensing process, along with the selection criteria and the weight that will be given to each criterion;
- Provide a coherent and complete set of selection procedures that will be followed during the selection process, including an outline of all of the major steps in the process and any required action of applicants at each step, along with the deadlines associated with each step;
- Specify all the materials that must be submitted for review during the selection process, as well as the acceptable form for submitting such materials;
- Address contingencies that frequently occur (e.g., ties in the selection process) in the information provided in the guide to the licensing process;
- Consult openly with applicants about any unanticipated circumstances and communicate the proposed course of action clearly.

Box 3.4 Different Approaches to Structuring Auctions

Regulators have taken different approaches to structuring auctions for tender processes. One common form is the multiple round auction with an unlimited number of stages. This type of auction was used in the 2008 Canadian auction for spectrum licenses for Advanced Wireless Services (AWS) and other spectrum in the 2GHz range. In the Canadian AWS auction, applicants bid for related sets of licenses in simultaneous multiple rounds. The design of the auction featured an "activity rule" that penalized bidders who were inactive in order to maintain the pace of the auction. The rounds in the auction continued until there was a round in the final stage in which there was no further activity (defined as a "cessation of bidding"). The standing high bidders on each license at the cessation of bidding were deemed the provisional winners of those licenses.

Finland adopted a simultaneous multiple-round auction format for its 2500-2690 MHz auction in November 2009. The 15 frequency blocks available in the auction were auctioned at the same time. The auction involved several rounds of bidding. Like the Canadian AWS auction, the Finnish auction featured an activity rule that required bidders to be active during each round of bidding, subject to the provision that each bidder was permitted to sit out up to three bidding rounds. The auction concluded in the bidding round where there were no new bids received and where no bidders elected to sit out the bidding round. The bidder who had the standing highest bid for one or more frequency blocks won those frequencies in the auction.

There are a myriad of variations on the multiple round auction. Some multiple round auctions feature sequential rounds, where the bidding for each license takes place separately. Other auctions proceed through rounds simultaneously such that more than one license may be auctioned at the same time. Multiple round auctions may be "open", with an unlimited number of stages, or "closed", with a limited number of stages. There are also different methods for how participants may bid in the auction and how participants are disqualified.

Another common form of auction is the single round auction. This form of auction is simpler than the multiple round auction as it involves only one step. Typically, each applicant is required to place its bid in a sealed envelope and to submit the bid with its application package. The envelopes are opened at a pre-determined date, and the license is awarded to the applicant with the best bid. The second phase of the Nigerian spectrum auction for the award of licenses in the 2GHz range featured a sealed bid, single round auction. This phase was preceded by a simultaneous multiple round auction to determine the top five bidders. Only the top five bidders were eligible to participate in Phase 2 of the auction. The second phase of the Nigerian 800 MHz spectrum auction also featured a sealed bid single round auction.

The Nepalese regulator adopted a single-staged auction approach in its rural telecommunications services ("RTS") licensing process. In the Nepalese case, the RTS license was to be awarded with a subsidy for the provision of services. Applicants were required to bid upon the amount of subsidy required. The license was awarded to the applicant that bid the lowest subsidy amount.

The Nepalese RTS licensing auction illustrates another possible variation in the structuring of auctions, namely the criterion used to judge participant's bids. In the Nepalese RTS licensing auction, the criterion was the amount of subsidy required. In the Estonian licensing auction, the criterion was the value placed by the applicant on the authorization.

Source: ICT Regulation Toolkit.

3.4.7. Fees

Many different kinds of authorization fees have been imposed on the telecommunications industry. At present, however, the most notable trend in the ICT sector is the reduction of fees to make services more affordable.

Fees differ in a number of material respects, including their purposes, how they are calculated, on whom or on which services they are imposed, and whether they are recurring or paid on a one-time basis. The main types of authorization fees include:

- *Administrative fees*
  These fees compensate a regulator for its costs of regulation and are therefore set on a cost-recovery basis. They are increasingly common, and are often considered the "best practice."
- *Spectrum management fees*
  These fees are typically based on similar cost-recovery principles as administrative fees. They are usually charged separately from "operating authorization fees."
- *Discretionary administrative or spectrum fees* These fees are established on a one-time or periodic basis (e.g., annually). They are not cost-based. Instead, they are set on an arbitrary "value of authorization" basis or established using some type of benchmarking of other rates.
- *Royalties, premium or "rent"*
  These are paid to a government or regulator for the right to operate a network, provide a service or use a limited resource, such as radio spectrum or numbers. They may be set arbitrarily, by using benchmarking, or by using market-based "auction fees."
- *Other special-purpose fees*
  These fees, bundled with authorization fees, include access deficit charges, universal service fees, industry taxes, etc. Transparency and good authorization practice requires such fees to be separated from authorization fees.

Where more than one type of authorization fee is charged, it is good practice to unbundle them, i.e. calculate them separately. This improves transparency and makes it easier to verify that the administrative charges related to cost recovery are indeed cost based. Unbundling fees has particular relevance for transparency and accountability when different ministries or agencies impose fees on the same service providers. For example, authorization fees imposed by the regulator should be separated from spectrum management fees, which may be imposed by a wholly separate ministry or agency.

While some authorization fees are levied on a one-time basis only (e.g., a one-time, initial authorization fee), other types of fees are recurring and must be paid on a periodic basis (e.g., royalty payments, universal service fees, and administrative fees). In some cases, an authorization may be subject to both a one-time fee and a recurring fee. Most regulators provide details in tender documents about what charges, if any, will be levied on licensees and how such charges will be calculated in order to promote greater transparency and certainty.

Non-recurring fees, such as one-time authorization fees, are often payable in one lump sum amount within a certain amount of time after an authorization has been awarded. However, some regulators have attempted to ease the payment burden by allowing licensees to pay the fee in installments at set intervals after the authorization has been issued. The two most common payment schemes are "split payments", where unequal portions of the fee are payable over the term of the license, and the payment of equal, periodic installments over a set number of years.

One-time initial authorization fees may be fixed fees or fees that are set according to the market value of the authorization. Fixed fees are set at an arbitrary amount determined by the regulator or Minister. These fees are commonly used in comparative evaluation processes ("beauty contests"). In order to promote transparency in the authorization process, however, it is prudent to adopt a market-set fee. Market-set fees are developed by using common telecommunications valuation methodologies. Examples of measurements that may be used to determine a market-set fee include: a measurement of discounted cash flow; a measurement of net present value; benchmarking against regional or international results for comparable licenses and markets; previously applied license fees (in the case of multiple licenses issued at different time periods); and a specific amount set to address government revenue objectives.

Recurring fees are payable at regular intervals throughout the life of the authorization. In many cases, recurring fees must be paid on an annual basis. The basis on which recurring fees are set varies. In some countries, licensees are required to pay a portion of their annual revenues or "turnover" to the government. In other cases, where the

recurring charge is designed to compensate the regulator for its costs, recurring fees are set on a cost recovery basis.

Authorization fees paid for the right to operate a network, to provide certain services, or for the right to use a scarce resource have evolved considerably since 2000 with the explosion in wireless technologies.

When first introduced in the telecommunications sector, annual recurring revenue charges were quite high. Regulators have recognized, however, that a reduction in the level of revenue-percentage payable to the government is prudent to avoid imposing barriers to entry. Both India and Venezuela have taken measures to reduce the level of revenue-sharing with the government imposed on telecommunications operators.

Policy considerations sometimes play a central role in determining what type of fees will be levied on services providers and how such fees should be calculated. Regulators can advance a number of policy objectives by setting license fees at reasonable levels during the initial years of market development. This may promote social goals, such as universal access or service affordability, or economic objectives, such as stimulating competition in the sector by lowering barriers to market entry..

3.5. Authorization Principles and Procedures

While authorization practices vary from country to country, there are frequently common features. The following sections review practices and procedures commonly employed to improve the effectiveness, efficiency, and transparency of authorization processes.

Procedural Transparency

Procedural transparency is one of the hallmarks of a good authorization process. Transparency increases the confidence of service providers, investors, and other stakeholders in the authorization process. Accordingly, transparency reduces investment risk and increases the attractiveness of investment in national ICT markets. This in turn stimulates the expansion of ICT infrastructure and services. The importance of transparency in the authorization process is emphasized in the WTO Regulation Reference Paper.

In transparent authorization processes, authorizations are generally issued, amended, or revoked based on criteria published in advance.

Public Consultations

It is good practice to engage in public consultations before and during an authorization process. Consultation with telecom sector stakeholders helps to foster a transparent regulatory environment. Consultations also provide the regulator with valuable feedback directly from industry members and other stakeholders on a proposed authorization initiative. Receiving input from these stakeholders helps the regulator make fully informed decisions about the proposed authorization procedures and the proposed authorization terms and conditions in order to maximize the prospects for a successful authorization process. Indeed, consultation is often the least expensive form of "research" a regulator can use to improve the information base on which its decisions are made. Even where regulators choose, for commercial or other reasons, to conduct some discussion with potential applicants out of the public eye, it is useful to conduct public consultation early in an authorization process. This improves the design of the authorization process. Consultation can be particularly important where a general authorization is to be issued. Advance publication of proposed conditions of general authorizations provides an important opportunity for public comment – especially comment by interested service providers.

The Public Consultation Process

Public consultation may occur both before and during the authorization process. It can be formal or informal. However, in the context of any major authorization initiative, it is generally advisable for the regulator to establish a formal and transparent consultation process.

A good approach for a more formal consultation process involves the publication of a notice or public consultation paper that states the regulator's intention to launch an authorization process, and invites comments on the proposed approach. The notice should set forth reasonable details of the proposed authorization approach and any specific issues on which comments are sought. Where the regulator is unsure of the best approach, comments may be invited on different options. The Consultation Paper on the Unified Licensing Regime published by the Telecommunications Regulatory

Authority of India (TRAI) in 2004 is a good example of this type of formal consultation process.

Notices should be sent to all interested parties, including prospective applicants, existing licensees, and consumer and industry interest groups. Notices are sometimes published on the regulator's website, as has been the case in Jordan, Saudi Arabia, and Ireland, for example. Notices are sometimes also published in official gazettes or the popular business press.

Notices may be issued in short form, inviting interested parties to request copies of a more detailed notice or consultation paper. A less formal "call for comment" may be included in a public notice issued by a regulator. In some cases, a call for comment refers interested parties to a particular website or document where such parties can find more information about the consultation process. Calls for comment may also include some background information or analysis concerning the issue or issues raised for consideration. Although simple calls for comment may not be formally published as a government white paper or include analysis as detailed as consultation papers, they may be just as effective in promoting transparency and soliciting feedback from stakeholders.

The Jordanian public consultation on the licensing of a new mobile operator is a good example of a public consultation document that takes the form of a call for comment. Another good example of a simple call for comments to a public consultation is the ECTEL consultation on draft telecommunications (fees) regulations that it proposed for adoption in its Member States.

A practice that promotes the regulatory objectives associated with public consultations is to allow stakeholders to participate in the consultation process. One of the most basic ways to achieve this is to ensure that the public consultation document clearly identifies how interested parties can provide their comments. Although some regulators prefer to receive contributions by post or by e-mail only, other regulators, such as the Irish regulator, invite responses to be filed by post, e-mail, facsimile, or online.

In some cases, regulators may hold a public hearing or meeting to discuss the issues raised in the public consultation.

Copies of written comments may be published to foster greater transparency. An opportunity is sometimes provided for a round of reply comments. This keeps parties more honest and accurate in making their initial submissions, and assists the regulator in assessing the merits of positions taken or information supplied in parties' comments.

Follow-up by the regulator following the deadline for filing comments is an important part of the public consultation process. The regulator should give fair consideration to such submissions and comments, even if the proposals contained therein are not adopted. To this end, regulators may consider publishing a report on the public consultation that summarizes the submissions received during the consultation and sets out the regulator's determinations about the matters raised in the consultation. Such a report provides detail and certainty about the regulatory decision on the matter in question. It also bolsters the transparency of the decision-making process.

Alternatively, the regulator may choose to use the submissions as input for the next stage of its licensing process, e.g., the issuance of a licensing regulation or a call for applications for licenses. For instance, in its 2004 public consultation document, India's regulator, TRAI, summarized comments received during earlier stages in the transition to a unified licensing regime.

Authorization Renewal, Amendment, and Renegotiation

Individual licenses are normally granted for fixed terms. Thus, specific issues arise when handling renewals at the end of a license term. Licenses may be renewed, renewed with amendments, or simply terminated at the end of a license term. Termination is extremely rare, since it would deprive customers of service. It is seldom used except in the case of non-operational licenses or serious and continuous breaches of license conditions, laws or other regulatory instruments.

The legal framework for license renewals and amendments is normally prescribed in national telecommunications laws or regulations. Sometimes it is found in the conditions of the license itself, or in the terms of privatization-related agreements, such as shareholders agreements between governments and strategic investors.

Many countries have introduced reforms in their authorization regimes, such as the move from individual licensing to general authorizations. Such

reforms raise the issue of how to treat licenses granted under a previous regime. In some cases, existing or new laws grant regulators the right to amend licenses unilaterally under the new regime. In others, incentives are provided to continue licenses under the new regime, or to amend license conditions to bring them in line with the new regime. Various approaches have been taken to the continuation of licenses in order to reflect changing authorization regimes.

Public consultations often play an important role in managing transitions to a new authorization regime. These consultations can provide the regulator with useful feedback about the concerns of stakeholders and practical matters related to developing and implementing a new authorization regime. These consultations also provide a useful means of disseminating background information on the transition.

Perhaps the most difficult cases are those involving the termination of monopoly or exclusivity rights granted under previous regimes, which are no longer consistent with the telecommunications market liberalization policies featured in new authorization regimes. In a number of countries, the introduction of competition has run counter to the incumbent operator's legal rights to exclusivity in service provision or network operation. In some cases, governments or regulators have not wanted to wait for the incumbent's monopoly rights to expire, since this could delay the introduction of competition and its benefits for sector development.

Terminating monopoly rights can be a difficult and controversial process. Monopoly rights are generally highly valued by incumbents, and, failing agreement, many incumbents are prepared to take legal action to defend these rights. Arbitrary exercises of regulatory power to revoke or amend exclusivity rights or other license conditions may result in litigation and complaints under international trade agreements.

In some cases, new legislation is introduced that mandates the termination of the incumbent's period of exclusivity. However, such legislation may be subject to legal challenge in some countries on the grounds that it constitutes an illegal "taking" or cancellation of property rights.

In other cases, governments or regulators have negotiated mutually acceptable arrangements with incumbent operators to terminate or amend their exclusive rights. In some cases, it is possible to agree to phase out an incumbent's monopoly over a period of time in return for concessions, such as tariff reform, rate rebalancing, and the right to be issued additional operating rights under a new authorization scheme.

In cases where the government or regulator enters into re-negotiations to amend license conditions, it is often prudent to apply sound, generally accepted dispute resolution principles. These principles have been widely documented in books and articles on negotiation. The following three basic principles of good negotiation strategy are worth bearing in mind: (i) focus on the parties' long-term interests, and avoid focusing on positions; (ii) develop options for mutual gain; and (iii) use objective criteria to assess options.

Balancing Certainty and Flexibility

Telecommunications authorization should balance regulatory certainty with the flexibility necessary to address future changes in technology, market structure, and government policy. This balance is never easy to achieve. Regulators in countries with higher telecommunications sector risks should generally favor regulatory certainty to attract investment. Those with more stable economic and regulatory environments normally have the luxury of increased flexibility and can introduce reforms without undue market impacts.

One way for a regulator to balance certainty and flexibility is to rely primarily on legislation, regulations and regulatory decisions, rather than the terms and conditions in authorizations, for developing a regulatory framework. Legislation, regulations, and regulatory decisions are typically easier for a government, Minister, or regulator to amend without violating rights accorded to service providers in a license agreement. In such a case, licensees would enjoy a fair amount of certainty that the terms and conditions of their license are not subject to change, while the Minister and the regulator retain the flexibility to respond to key changes in the sector.

In some cases, it is not possible to rely on instruments such as legislation or regulations to set the regulatory framework. Where a country's regulatory regime is not well developed, it has often been necessary to include a reasonably comprehensive codification of the basic regulatory regime in an authorization. This is necessary to provide the certainty required to attract new entrants

and substantial investment to the sector. In this case, the terms and conditions of the authorization must be crafted to ensure a reasonable balance between certainty and flexibility.

There are several ways of interjecting flexibility into the terms and conditions of authorizations, including:

1. Permitting unilateral authorization amendments by the regulator;
2. Establishing short authorization terms;
3. Permitting authorization amendments with the mutual consent of the licensee and regulator; and
4. Permitting unilateral amendments by the regulator of specific types of authorization conditions considered key to the general regulatory regime, provided such amendments are made in a procedurally fair and competitively neutral manner.

The first two approaches are not consistent with regulatory certainty. They will generally make it difficult, if not impossible, to attract the investment and financing required for a major authorization, such as a fixed line or cellular authorization. The third approach increases regulatory certainty, but can constrain the introduction of regulatory reforms.

The fourth approach is more attractive as regards regulatory certainty. To implement it, a distinction can be made between authorization conditions that are of a regulatory nature and those which can only be amended with the agreement of the licensee. For example, authorization conditions on industry-wide universal service mechanisms or general terms of interconnection may be subject to amendment by the regulator.

Other conditions of a purely contractual nature or which are fundamental to the economic value of the authorization may be subject to modification only with the consent of the service provider. These would normally include conditions such as the term of the authorization and the authorization acquisition fee payable.

Where the regulator has the right to amend the general regulatory conditions of an authorization, such amendments should be made in a transparent and competitively neutral manner. Any amendments should be preceded by consultation with the licensee and other affected parties. In some cases, a right of appeal or review may be warranted.

Distinguishing Authorizations from Procurement

The act of authorizing a telecommunications service provider should be distinguished from the government procurement process. The government procurement process involves the purchase by the government of goods or services using public money. These goods or services are sometimes used internally by the government and sometimes used by the government to fulfill its public duties. By contrast, a regulator is not buying goods or services using public money when it authorizes a telecommunications service provider. Authorization involves the granting of certain rights and obligations to an authorized service provider. It can be seen as the granting of a business opportunity to qualified investors who agree to comply with certain authorization conditions and regulations. In the case of authorizations, then, the regulator is more a seller than a buyer.

Two important recommendations for the authorization process flow from the recognition that authorization is, in essence, the offering of a business opportunity. First, the regulator must offer an opportunity that is financially attractive to experienced and competent service providers. While some authorization opportunities are an easy sell, others, particularly those in emerging and transitional markets, must be carefully structured and marketed to attract qualified applicants. Experience shows that almost any call for applications for authorizations will attract some bidders. However, many are not financially or technically capable of meeting the regulator's objectives to expand and improve services.

Second, government procurement procedures are generally not suitable for a telecommunications authorization process. Many countries have bureaucratic, centralized procurement administrations. Detailed government procurement procedures are often developed for good reason – to reduce corruption. However application of these procedures can cause legal and administrative headaches, delay, and confusion about the real goals of the authorization process.

Spectrum Auctions

The provision of ICT services that use radio frequencies generally require two authorizations: one to provide the ICT service and a second authorization for the use of the radio frequency. A

cellular service provider, for example, must receive authorizations to use the required spectrum and to operate the cellular networks. Spectrum authorizations required to provide a service are often granted as part of an individual authorization process (see Chapter 4.4).

Authorizations to operate an ICT service and use the required radio spectrum should be granted at the same time. There should be no delays or risks of inconsistent regulatory requirements as between the two types of authorizations. If two separate authorizations are issued, they should be issued simultaneously. A good approach is to attach a draft spectrum authorization as well as a draft service provider's authorization to a request for applications for authorizations.

One reason for retaining two separate authorizations is administrative convenience in the management of spectrum resources. In most countries, spectrum management is delegated to a different administrative group from the group that regulates other aspects of telecommunications operations, such as price regulation or anti-competitive conduct.

By having a separate, consistent form of spectrum authorization, technical, reporting and compliance requirements can be standardized for all users of the radio spectrum.

3.6. Special Authorization Situations

While authorization practices may have common features, there are frequently particular circumstances that require the use of special authorization practices. In this section, we review a number of special authorization processes used in specific circumstances.

3.6.1. Public-Private Partnerships and Concessions

In most countries, the authorization of ICT services involves a unilateral grant of authorization from a regulator to a private sector operator. However, there have been many variations on the theme of authorizing ICT operations. In some countries, private sector investors have entered into business arrangements with governments or state-owned service providers that are more in the nature of joint ventures with government entities than simple grants of rights to operate telecommunications facilities or provide services. These may be referred to as concessions, franchises, Build-Operate-Transfer (BOT) schemes, Build-Transfer-Operate (BTO) schemes, Build-Own-Operate (BOO) schemes.

Collectively, many of these arrangements have been referred to as Public-Private Partnerships (PPPs). PPPs are increasingly common vehicles for the financing and operations of large infrastructure projects, such as highways, airports, and ports. In the past, PPP arrangements were useful in attracting private investment to markets where privatization or private-sector participation in the telecommunications sector was legally or constitutionally restricted. However, they have become less common in the telecommunications sector, as a result of a growing recognition that there is little public benefit to state ownership or operation of telecommunications service providers. PPP schemes are generally seen to be inconsistent with the promotion of liberalized telecommunications markets and competitively-neutral regulation and policies.

Concessions and License Agreements

In most countries, the term "concession" refers to a commercial agreement between a government and the private builder, owner, or service provider of an element of public infrastructure (such as a toll road or power plant) or a business located on public property. Concession agreements were once fairly common in the telecommunications sector in some regions, particularly where there were legal or constitutional restrictions against private sector ownership or operation of telecommunications facilities. However, such agreements are becoming increasingly less common in the telecommunications sector. They are generally seen to be inconsistent with the promotion of liberalized telecommunications markets and competitively-neutral regulation and policies. The reasons for the decline in such agreements are similar to those for the decline in use of PPP arrangements generally (see above).

Concession agreements had several advantages in attracting private sector investment, particularly in markets with high levels of political or regulatory risk. Such agreements sometimes granted governments an ownership stake and revenue-sharing interest, therefore providing governments with an incentive to support the growth of the telecommunications business in question. Also, the legal remedies available for breach of contract normally applied to concessions, such as money

damages and arbitration. Negotiations often fine-tune concession terms to establish the protections and incentives necessary to attract investors and to guarantee performance by the concession holder in each particular situation.

A related approach adopted in some countries is to grant "license agreements." In many cases, license agreements were relatively similar to the detailed individual licenses granted in other countries. However, they typically included some obligations – often regulatory rather than commercial – on the part of the government, regulator, or other government signatory. For example, a license agreement might establish the basis of setting tariffs during the license period, by way of a specific price cap formula. By including such mutual obligations in an agreement, the licensee received additional legal protections against changes in its basic operating environment. A major disadvantage of license agreements was that many had quite long terms, therefore effectively restricting sector-wide regulatory reforms from being implemented without the consent of the parties to existing license agreements.

Some license agreements have both regulatory and commercial concession features. It is often important to distinguish between the two. A good approach is to deal with the concession features in a concession contract between the host government (not the regulator) and the investor. In project finance terms, such an agreement would be called a government support agreement.

It should be noted that the terms concession and license agreement have different meanings in different countries. In some Latin American countries, concessions contain most of the features and types of conditions contained in individual licenses in other countries. They might be called license agreements elsewhere. An example is the Telmex concession in Mexico. Some other countries, particularly in Asia, have granted "concessions" that are in the nature of joint venture agreements rather than granting full authorizations to operate telecommunications networks independent of the government.

Public-Private Partnerships (PPPs)

In the past, PPPs were often structured as BOT schemes (e.g., Thailand, Philippines), BTO schemes (e.g.,, Lebanon, India, Indonesia – Joint Operating Schemes or KSOs – East Timor), BOO schemes (e.g., Malaysia, Solomon Islands), or similar arrangements. In general, BOT, BTO and BOO arrangements are all project finance structures aimed at attracting investment and management expertise required to develop telecommunications infrastructure in countries with state-controlled telecommunications sectors.

A variation on these structures involves contracts where an investor does not build or own any facilities, but shares in revenues from a state-owned service provider in return for providing financing, management or both. Financing contracts of this type have been entered into in China and Indonesia. An example of a management contract with revenue sharing is the Vietnamese "Business Cooperation Contract."

Most of the PPP structures discussed here have experienced initial success in promoting network expansion. In part this was because they were not characterized as authorizations to private service providers but rather as contracts under which private contractors would build and operate telecommunications services "owned" by the government or by a state-owned service provider. This arrangement allowed for private sector participation in telecommunications service providers without breaching laws or policies that prevented private sector ownership of service providers.

However, experience in Lebanon, Indonesia, and elsewhere suggests that these models are not viable in the long term. Investors in BOT projects, for example, lack the long-term security and equity interests of a full network licensee. They are therefore motivated to maximize short-term profitability at the expense of long term network or service development. A BOT must either terminate, with the resulting withdrawal of the private investor, or it must be converted into a true authorization. If the investor withdraws, the service provider may or may not be able to continue to expand and manage the service on its own. If the concession is converted to an authorization, serious questions may arise regarding the fairness and transparency of the authorization process. In all cases, the conversion of BOT-types schemes into conventional ICT authorizations can be problematic.

Most countries now realize that there is little public benefit to state ownership or operation of telecommunications service providers. With the liberalization and privatization of the global ICT

industry, joint venture arrangements between governments or PTTs and private sector investors have become less common in the ICT sector in recent years. PPPs also raise concerns about whether public policy and regulation will be competitively neutral if the government holds a stake in one or more of the commercial players in the ICT sector. Nevertheless, some PPP arrangements remain in place and new projects continue to be initiated (e.g., the e-Mitra e-governance project in Rajasthan, India.).

3.6.2. Reauthorization of Incumbent Service Providers

The telecommunications reform process in most countries includes privatization of PTTs and the granting of competitive authorizations in various market segments. Many countries have completed this process; others are in the midst of implementing it, and a few have not yet started.

A major step in the privatization and liberalization process in many countries is the issuance of an authorization to incumbent service providers. Prior to privatization and liberalization, many incumbent service providers were PTTs that may have operated for half a century or more without a formal authorization. Special consideration must be given to the process of authorization of an incumbent and to the definition of the incumbent's rights and obligations to facilitate a successful transition to a liberalized telecommunications market.

New telecommunications laws or amendments often authorize the issuance of a license or licenses to the incumbent service provider. In some cases, incumbent service providers may receive a mix of individual authorizations and general authorizations. This approach can be useful in cases where it is considered necessary to issue an individual authorization to establish the basic rights and obligations of a PTT to operate the fixed public switched telecommunications network (for example where a privatization is pending). In such a case, the rights of the incumbent PTT to provide other services that have been opened to competition, such as VSAT, data transmission or value added services, may be subject to general authorizations. These general authorizations would apply equally to all other service providers of the same class of service.

The rights and obligations set out in new authorizations for an incumbent operator must generally be adapted to a new and evolving sector policy and regulatory regime. In particular, the rights and obligations must often be adapted to the realities of a market- based economy, especially where the service provider is to be privatized and is to face competition for the first time in some markets.

In some countries, incumbents are granted authorizations for new services (e.g., cellular, data communications, ISP, value-added services) around the same time as authorizations are granted to new providers for those services. The incumbents sometimes receive the authorization outside the competitive selection process that may be used to choose new entrants. This has been the case for cellular mobile authorizations in both developed and less-developed countries.

A concern about fairness may arise if the incumbent service provider is automatically entitled to be authorized to provide services for which other service providers must obtain an authorization through a competitive authorization process. Concerns about competitive fairness may also arise with respect to the fees payable for these authorizations. Often the new entrant pays a significant amount for the authorization under a competitive selection process but the incumbent does not.

Concerns about unfair advantages given to the incumbent relating to fees has sometimes been addressed by requiring incumbent service providers to pay a fee equal to the amount of the winning bid or a fixed percentage of that amount. This occurred when Jordan authorized a second GSM service provider in 2000. When Colombia authorized second cellular service providers in each of three regional markets, the existing service providers were required to pay 95 percent of the amount of the winning bid in the applicable region. In other countries however, the incumbent service provider has not been required to pay authorization fees, even though new entrants do pay these fees.

While there is not always a right answer in these situations, care must be taken to promote a competitively neutral environment. If preferential treatment is given to an incumbent, there should be clear benefits to the public for doing so. These may include maintenance of extraordinary network rollout obligations or other specific universal service objectives.

Table 3.4 Common Authorization Classifications

FIXED LOCAL SERVICES	DIGITAL SUBSCRIBER LINE (DSL)
Fixed domestic long distance services	Cable Data
Fixed international long distance	Leased lines
Mobile local services	Very Small Aperture Terminal (VSAT)
Mobile domestic long distance	Fixed Satellite Service (FSS)
Mobile international long distance	Mobile Satellite Service (MSS)
Public voice telephony	Global Mobile Personal Communications Service (GMPCS)
Mobile cellular network	Third Generation Mobile (IMT2000)
Cable TV network	Paging
Cable TV service	Public Mobile Radio Trunked Services (PMRTS)
Wireless Local Loop	Internet service provision
Value-added services (e.g., email, database access, electronic data interchange, etc)	Data

Source: ITU, 2007.

3.7. Licensing for Convergence

Convergence is one of the most important recent trends in the ICT sector. It has changed how services are delivered and has blurred the lines between fixed and mobile services. The move towards Next-Generation Networks (NGN) is the most recent step in the convergence-driven evolution of the ICT sector. The following sections outline authorization issues raised by convergence and review the practices and procedural approaches being developed in response to these issues.

Recent innovations in ICTs and services are raising interesting discussions in the industry. Some consider there is a radical revolution under way, a paradigm shift of sorts. Others believe it is merely an incremental evolution. What is clear is that these innovations have significantly changed and continue to change the manner in which services are provided, the types and typology of services and the nature of networks themselves. From the perspective of authorizations, two developments have had a particularly significant impact on the ICT sector: convergence and the move to Next Generation Networks (NGN). As the parameters of the ICT sector change, there is a need for a careful re-consideration of traditional authorization practices and approaches.

Convergence and NGN have eroded traditional market boundaries and have heightened the importance of neutrality and flexibility in authorization regimes. At the same time, as network operators and access providers invest heavily in upgrading equipment and building new infrastructure, service providers seek regulatory certainty. Regulators must balance the need for regulatory certainty with the need for a regulatory framework that is sufficiently flexible to allow stakeholders to enjoy the benefits of technological innovations such as efficiency gains and new services. Regulators must be attuned to new bottlenecks and market dominance that may emerge in the ICT sector.

3.7.1. Unified and Multi-service Licensing

In light of the regulatory issues that flow from convergence and the transition to an NGN environment, regulators have begun to adapt the traditional, service-specific approach to authorizations as described in Chapter 3.4.3. In today's era of convergence, it can be said that there are three broad types of authorizations:

Service-specific authorizations

These authorizations allow the licensee to provide a specific type of service. Usually the licensee is required to use a specific type of network and technological infrastructure. However, some service specific authorization regimes are technology neutral (e.g., the fixed and mobile services regimes in Saudi Arabia and the Canadian basic international telecommunications services licenses). These types of authorizations are sometimes issued as individual

licenses (particularly in developing and transitional economies) and sometimes as general authorizations.

Unified (or global) authorizations

These authorizations are technology and service-neutral. They allow licensees to provide all forms of services under the umbrella of a single authorization, using any type of communications infrastructure and technology capable of delivering the desired service. In most countries, unified authorizations are issued as individual licenses. However, in some countries, the process for issuing the unified authorization blends aspects of general authorization processes and competitive licensing regimes. These hybrid processes can best be described as non-competitive individual licensing processes: while applicants do not compete for a limited number of authorizations, they must meet a variety of criteria to qualify for a license and their applications are subject to close regulatory scrutiny.

Multi-service authorizations

These authorizations allow service providers to offer multiple services under the umbrella of a single authorization, using any type of communications infrastructure and technology capable of delivering the services in question (see Box 3.5). Like unified authorizations, multi-service authorizations are technology neutral. However, multi-service authorizations are more limited than unified authorizations; licensees are permitted to provide any of a designated set of services, but not any and all services. Multi-service authorizations are sometimes issued as general authorizations and, in other cases, are issued as individual licenses. It is not uncommon for a country to have both general authorization regimes and individual license regimes for their multi-service authorizations. Individual multi-service authorizations are often issued using a non-competitive individual licensing process.

Box 3.5 Features of the Transition to the Multi-Service Authorization Regime in South Africa

Chapter 15 of the Electronic Communications Act, 2005 (ECA) sets out the general framework for the transition to South Africa's new technology- and service-neutral multi-service authorization regime. The key features of the transition include:

Mandatory migration to the new authorization regime. The migration occurs through a conversion of existing licenses to one or more licenses that comply with the ECA.

The Independent Communications Authority of South Africa (ICASA) must convert all existing licenses by granting new licenses that comply with the ECA within 24 months of the adoption of the ECA. (The schedule for conversion has been extended into 2008.)

The new licenses must be granted on no less favorable terms than the existing licenses. However, as part of the conversion process, the ICASA may grant rights and impose obligations on a licensee to ensure that existing licenses comply with the ECA.

All existing licenses issued under the Telecommunications Act (one of the predecessors to the ECA) remain valid until converted to a new license by the ICASA. Existing licenses remain subject to all terms and conditions that are not inconsistent with the ECA until these licenses are converted and re-issued under the ECA.

All licenses converted pursuant to the ECA retain their original term of validity unless otherwise specified by the ICASA.

Once an existing license is converted and re-issued, the new license is governed by the terms of the ECA and the existing license is considered to have been surrendered and is of no force or effect.

The ICASA is not permitted to grant or to include in the terms of a converted license any monopoly or exclusionary rights in any network or services contemplated in the ECA or related legislation. Existing monopoly and exclusionary rights are null and void, subject to the proviso that radio frequency spectrum that is assigned to a license holder is not considered to be a monopoly or to constitute exclusionary rights.

Source: South Africa, Electronic Communications Act, 2005

3.7.2. Lifting Restrictions on Licensees

The dynamic nature of the ICT sector and the significant investments that operators must make to transition to a converged, Next Generation Networks (NGN) environment has prompted some regulators to ease some of the restrictions previously placed on licensees.

Spectrum refarming

Spectrum refarming refers to using spectrum initially allocated for 2G services to provide 3G services instead. In response to consumer demand and in light of technological advancements that have made it possible to use frequency bands allocated for 2G services to provide 3G services, a number of

regulators now permit licensees to refarm allocated spectrum. In Hong Kong SAR, China, mobile service providers have been given the right to choose to use 2G or 3G technology in the spectrum assigned to them in their 2G authorizations. In 2009 the European Union updated its GSM directive approving the re-farming of the 900MHz frequency bandwidth so it can be used for 3G, allowing for future 4G services to be accommodated.

Spectrum trading

Regulators have also allowed greater flexibility for spectrum licensees to resell all or some of their allocated spectrum on commercially negotiated terms. Countries that now permit such spectrum trading include: Australia, Canada, Georgia, Guatemala, New Zealand, Norway, the United States, and the United Kingdom. Austria, France, Germany, the Netherlands, and Sweden have permitted spectrum trading on a more restricted basis.

When issuing authorizations that will require the use of spectrum, regulators might consider giving licensees the freedom to determine whether to use 2G or 3G technology to deliver the authorized services. This gives licensees the flexibility to use the most efficient technology available to them. An alternate approach is to specify that a licensee must use 2G (or 3G) technology, but to include a provision that stipulates that a licensee may apply to use a different technology during the term of the authorization. This approach gives the regulator a bit more control and oversight over the type of technology used by licensees, but also adds some flexibility to respond to changing market conditions.

Infrastructure sharing

In order to facilitate the transition to NGN, another important area in which regulators have begun to lift restrictions on licensees is infrastructure sharing. While some regulators approach infrastructure sharing with caution in light of the need to safeguard competition, they have also recognized the potential benefits of carefully managed infrastructure sharing. An important benefit relates to the reduction of the capital and operating expenditures of operators. Reducing such expenditures helps to facilitate the provision of low cost access to services for end users. Moreover, infrastructure sharing responds to the needs of operators who are incurring high costs as they upgrade existing infrastructure and build new infrastructure in preparation for NGN.

Infrastructure that has been increasingly opened to sharing includes non-replicable resources such as towers, ducts, and rights of way. Some regulators have also considered spectrum sharing. Spectrum sharing is technologically possible though care must be taken to avoid harmful interference. Such interference can be avoided using spectrum sharing strategies that are implemented on the basis of geography, time, or frequency separation.

An innovative strategy set out in the best practice guidelines adopted at the International Telecommunications Union's 2008 Global Symposium for Regulators, focuses on authorizing market players who only provide passive network elements and who do not compete for end-users. These authorizations would apply to market players such as mobile tower companies, public utilities companies with rights of way, and fiber backhaul providers. Licensees would be authorized to provide access to key infrastructure to service providers and to manage the usage of such infrastructure.

3.8. Global Standards Making and Compliance

As the global economy and society becomes ever more dependent on ICT, the role that standards play becomes more important in supporting the growing market. Standards have a key role to play in the take up of ICT. For instance, standards underpin wireless communications, NGN and the Internet. The role of standards is to ensure that these applications are fully interoperable, so that their potential may be fulfilled. Standards are technical specifications that support the development of open and competitive markets for the benefit of both consumers and industry.

3.8.1. The Need for Standards

Standardization and standards ensure a degree of uniformity, fairness, and quality across a wide array of disciplines and processes. Generally speaking, standards are a key means of diffusing innovation through the economy as a whole, ensuring that the majority of firms do not lag too far behind early adopters of new ideas. Standards can play a vital role in growing the market both nationally and globally.

In essence, a standard describes the technical consensus on performance of a product or service. Standards impact on all areas of economic life, e.g., supporting safety regulations, assuring quality and

enabling compatibility of products. New standards may emerge through a competitive market process or by accepted use.

Econometric studies have established a clear link between standardization in the economy, productivity, growth and overall economic growth. Studies for Australia, Canada, France, Germany and the United Kingdom, show that, overall, standards may account for between one eighth and one quarter of productivity growth. In 2005 standards were estimated to make an annual contribution to the U.K. economy of over $3.5 billion, and 13% of the growth in labor productivity in the United Kingdom from 1948 onwards was attributed to the role of standards. The annual benefits of standards to the German economy have been estimated at €16 billion.

Compared to the cost of financing standards, the benefits are huge: a study in 2000 on the financing of the European standardization system showed that the cost of developing European standards was €700m, of which 93% was funded by the private sector with the remaining 7% from public funds. Thus it is clear that the return on investment for both industry and government is substantial.

Standards, whether voluntary or compulsory, are typically conceived at the national level. However, some degree of global harmonization is necessary as national policies have implications for international trade, travel, and the distribution of technical expertise. This is particularly so in telecommunications, which has increasingly become global in nature. This is why it is essential for governments and industry to participate in the supra national standards making process.

In telecommunications, standards dictate rules of interconnection and transnational relations through technical specifications. Communications, whether voice, data or video messages, cannot take place without standards linking the sender and the receiver. Thus, two key objectives of standardization in telecommunications are interoperability and interconnection.

The European Telecommunications Standards Institute (ETSI) defines a standard as, "A technical specification approved by a recognized standardization body for repeated or continuous application, with which compliance is not compulsory". Standards may be international, regional, or national in their making and application, with representative industry organizations or legal bodies developing and adopting standards.

Since 1865, the International Telecommunication Union (ITU) has been central to setting global standards in telecommunications. Since its inception, the ITU has been brokering industry consensus on the technologies and services that form the backbone of the world's largest, most interconnected man-made system. In 2007 alone, the ITU's Telecommunication Standardization Sector (ITU-T) produced over 160 new and revised standards (ITU-T Recommendations), covering core network functionality and broadband to next-generation services like IPTV.

One ITU success story has been 3G standards for mobile communications, otherwise known as International Mobile Telecommunications (IMT)-2000. Following 10 years of negotiation 3G communications were officially allotted the spectrum between 400 MHz and 3 GHz at the ITU World Radio Conference in 2000. Without agreements of this kind, mobile networks would remain fragmented and interoperability would not be achieved. IMT-2000 enabled the provision of value-added services and applications on the basis of a single standard. A key element was provision of seamless global roaming, enabling users to move across borders while using the same number and handset.

3.8.2. Bridging the Standards Divide

In the global standards making process, there is a disparity between developed and developing countries in how far they are involved in the process – leading to what has been termed the "standardization gap". There are fewer ICT firms in the developing world and, because of the highly specialized and technical nature of standards, this field is sometimes viewed as purely technical. But ICT standards are not only necessary for ensuring interoperability and connectivity within a global information infrastructure; their use can also have significant social and economic effects.

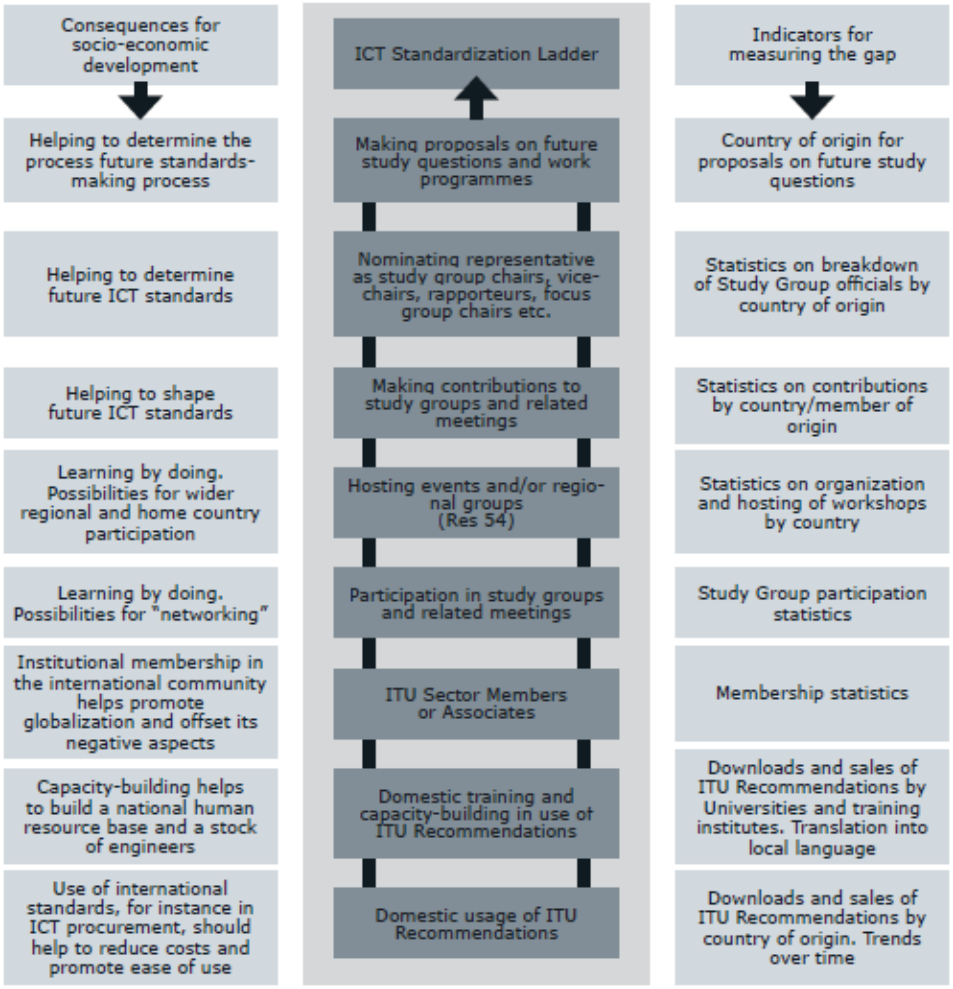
Such inequality is a factor in the persistence of the digital divide. All countries need to be able to help set standards, and know how to implement them, in order to reflect their interests and enjoy better opportunities for economic development and technological innovation. To tackle the issue, the ITU embarked on an initiative called *Bridging the Standardization Gap,* to improve the capacity of

developing countries to participate in standardization, including descriptions of best practice and the situation in various nations.

Based on the research so far, countries generally fall into one of four national categories of standards capability: low, basic, intermediate or advanced.

These four levels are illustrated in Figure 3.1. ITU's "Ladder of Standardization Development" shows how countries can engage in different levels of participation in the ITU standardization process in particular - from simply using Recommendations and becoming a member of study groups and regional forums, to making written contributions and taking a leadership role.

Figure 3.1 ITU Ladder of Standardization Development



Source: ITU, Bridging the Standardization Gap, 2009.

The policy decisions that countries can take in order to advance their participation in standardization work were also outlined in the *Bridging the Standardization Gap* report. Best practice shows that a national ICT standards strategy is essential, and should include an inventory of what is currently in place in terms of standards usage, policies, regulations, development activities, institutions, and education. A budget should be described for government involvement in this field, and the strategy should define the roles and responsibilities of various institutions, across the full range of public or private stakeholders. Also, it should specify ways to deal with important topics such as cybersecurity, and the protection of critical infrastructure and personal data. To advise the government, a high-level standards advisory council should be formed from experts from industry, academia and relevant organizations.

3.8.3. Standards and ICT Accessibility

While ensuring access for those in developing countries is a priority, it also is vital to provide access and resources for traditionally underrepresented groups around the world, such as the elderly, the disabled, and the indigenous. Product design is the largest hindrance to including members of these groups because of limited mobility or geographical location. Setting standards for accessibility to ICTs is necessary to ensure access for all and to increase the likelihood that the needs of those underserved will be better understood and responsibly met.

The Joint Technical Committee (JTC1), a committee of the ISO and IEC, established the Special Working Group on Accessibility (SWG-A), which specifically deals with accessibility and ICT concerns. JTC1 and SWG-A identify seven main categories for which standards for ICTs need to be set. These include:

- High level standards;
- Hardware/equipment- oriented standards;
- Software/service-oriented standards;
- User capabilities-oriented standards;
- Environment-oriented standards;
- Communications services-oriented standards; and
- Other relevant standards.

These standards guide industry professionals in creating more inclusive products targeted towards certain demographics. Not least, by targeting non-traditional (laggard) users, this approach to standards should help to grow markets as a whole.

CHAPTER 4. GOING MOBILE: MANAGING THE SPECTRUM

CHAPTER 4. GOING MOBILE: MANAGING THE SPECTRUM

4.1. Introduction

Historically, accessing and using radio spectrum has been highly regulated, in order to prevent interference amongst various users in adjacent frequency bands. Since 2000, there have been significant innovations in the theory and practice of spectrum regulation. There is now a growing consensus that past and current regulatory practices have delayed the introduction and growth of beneficial technologies and services or have artificially increased costs. As a result, there is a renewed emphasis on striking the best possible balance between the certainty of administrative approaches and the flexibility of more light-handed market-based regulation.

This chapter begins by looking at the radio spectrum as a resource and the changing demands for spectrum arising from new technologies and new services. The economic and technical objectives of managing spectrum are described as well as international and national frameworks for planning, and technical standards. The chapter considers mechanisms for assigning spectrum, including spectrum authorization, regulatory strategies and technical aspects of assignment. Spectrum pricing is also described, including objectives and methods for cost recovery. The importance of using the spectrum efficiently and the role of monitoring is emphasized. The chapter concludes with the growing need for flexibility in spectrum management.

4.2. Changing Demands for Spectrum

4.2.1. The Radio Spectrum as Valuable Resource

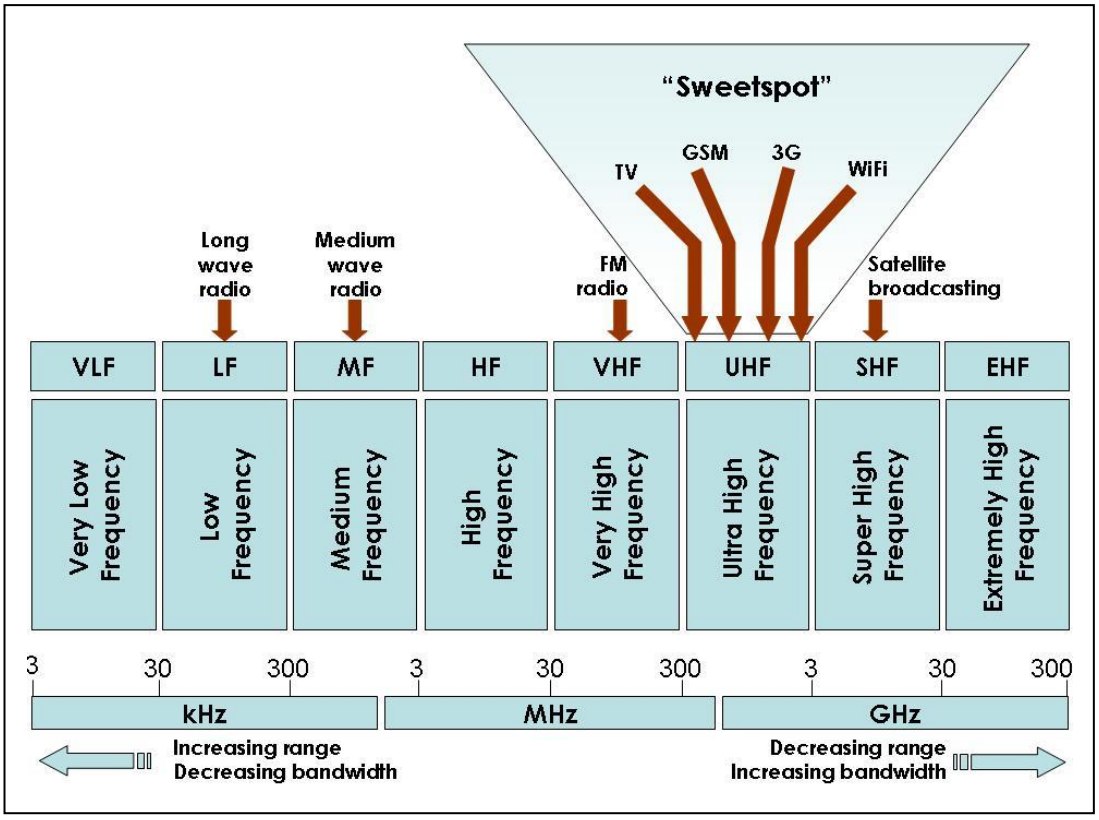
The radio spectrum is used for a plethora of economic, social, cultural, scientific and developmental purposes with an enormous number of end-user services: communications for firms, households and public bodies, including critical safety and security communications used by defense forces, emergency services and air traffic control; various kinds of radar; broadcasting; scientific research; and so on. From an economic viewpoint, the spectrum is a resource used by a wide range of entities, including public bodies such as defense or emergency services, and for a number of applications, including narrow and broadband

mobile telecommunications, broadcasting, aeronautical and marine communications, and scientific applications such as radio astronomy and environmental sensing.

The past decade has seen significant changes in this field as the demand for mobile communications has skyrocketed. Globally, the number of mobile cellular subscribers exceeded the number of fixed lines in 2002, and the number of mobile broadband subscribers overtook fixed broadband in 2008 (see Figure 1.1 in Chapter 1). But "going mobile" places even more strain on the radio spectrum and means that pressure to manage it as efficiently as possible will undoubtedly increase.

Technically speaking, the radio spectrum is the portion of the electromagnetic spectrum that carries radio waves (see Figure 4.1). The boundaries of the radio spectrum are defined by the frequencies of the transmitted signals, and are usually considered to range from 9 kHz (kilohertz; thousand cycles per second) to 3000 GHz (gigahertz; billion cycles per second). The key characteristics of the spectrum are the propagation features and the amount of information which signals can carry. In general, signals sent using higher frequencies reach shorter distances but have a higher information-carrying capacity. These physical characteristics of the spectrum limit the currently identified range of applications for which any particular frequency band is suitable.

Figure 4.1 The Radio Spectrum and its Use



Source: Adapted from Ofcom.

The spectrum as an economic resource is unusual in that it is both non-exhaustible and non-storable. Unlike oil and water, the spectrum will never run out, although it may become increasingly congested. Also, it cannot be accumulated for later use. These factors put a premium on a streamlined process for making spectrum available for purposes which are useful to society. In fact, because spectrum has so many uses, arbitrating among them in cases of shortage can be difficult.

Effective spectrum management can make a big difference to a country's prosperity, especially as

wireless technologies have become the main means of connecting businesses and households to voice, data and media services. It is becoming increasingly evident that as developing countries address broader issues of information policy and regulatory reform, wireless services are outpacing wireline connectivity and the spotlight is turning to spectrum management. In a globalizing world with rapid technological innovation and increasing demand for radio frequencies, effective spectrum policy should promote the roll-out of services, reduce barriers of entry, and promote innovation.

As a resource, the spectrum has both technical and economic dimensions:

- Economically, the efficient use of spectrum, as a starting point, means the maximization of the value of outputs produced from available spectrum including the valuation of public outputs provided by the government or other public authorities.
- Technically, the efficient use of spectrum, at a basic level, implies the fullest possible use of all available spectrum. Two measures of technical efficiency are occupancy and data rate. Time, for example, can be used as a measure of technical efficiency, in the sense of how constant or how heavy the usage of spectrum is over time. Data rates refer to how much data and information can be transmitted for a given amount of spectrum capacity.

4.2.2. The Need for Spectrum Management?

Spectrum management is an extremely important part of telecommunications policy and regulation. The spectrum is allocated for particular uses, and specific technical and service rules, developed by spectrum managers, govern those allocations. As a result, technical and service rules are a crucial determinant of the structure and performance of industry and of institutions devoted to ensuring public safety, security and national defense.

There are four main areas of work in spectrum management: planning, engineering, authorization and monitoring. These are briefly described below:

1. Spectrum planning involves the allocation of portions of the frequency spectrum to specified uses in accordance with international agreements, technical characteristics and potential use of different parts of the spectrum, and national priorities and policies.
2. Spectrum authorization involves granting access under certain specified conditions to the spectrum resource by various types of radio communication equipment and the certification of radio operators.
3. Spectrum engineering involves the development of electromagnetic compatibility standards for equipment that emits or is susceptible to radio frequencies.
4. Spectrum monitoring and compliance involves the monitoring of the use of the radio spectrum and the implementation of measures to control unauthorized use.

4.2.3. Economic and Technical Objectives

The goal of economic activity is to provide goods and services to end-users – whether bought in the market place or provided to the public by governments. Spectrum is an input into the services that end-users (households, firms and public agencies) value. In defining high-level objectives for spectrum policy, it is thus sensible to take as a starting point the need to maximize the value of outputs produced by the spectrum available, including the valuation of public outputs provided by the government or other public authorities.

Allocation of scarce spectrum to different uses should be done so that the marginal economic benefit of additional spectrum is the same for every use. Some important conclusions follow from this objective. Suppose a given quantity of spectrum is available for use in only two sectors, mobile communications and commercial broadcasting. How should it be divided between the two uses? Weighing the value users place on both services, the cost of providing these services and the amount of spectrum used by them is necessary. In turn, relating the use of spectrum to its value pressures all users, private and public, to make more efficient use of their allocated spectrum, thereby freeing up more spectrum for use generally. Market-based approaches such as auctions and spectrum trading are viewed as superior ways of achieving economic efficiency in assignment than administered methods.

At first glance, technically efficient spectrum use commends itself as a self-explanatory benefit. Indeed, technical efficiency may rationally count as the leading factor in spectrum allocation decisions.

Applying the matter in practice, however, can bring competing policy goals into play.

Occupancy and data rate are two measures used in determining how efficiently certain assigned frequencies are being used by services and users. In practice, however, both of these measures have problems. Some uses are crucial, yet only occasional. In the absence of procedures for sharing spectrum with other users, which may be costly to implement, capacity which is often left unused may be essential for public safety services. Equally, the data rate measures fail to take account of the value of the information being carried. A meaningless jumble might be sent very efficiently, but it would still be a meaningless jumble. This suggests that such measures make little sense, as they abstract from the key element of economic calculation concerning the value of the service which the spectrum is being used to produce.

Even though spectrum management is ultimately in the interests of private and public end-users, there are many more stakeholders involved in the sector. Examples of those using spectrum include equipment manufacturers, technology companies, public sector users and others, all of whom can be affected by spectrum management decisions. It is essential that the processes employed to regulate spectrum use are efficient for all users. Knowledge and expertise of affected users are required. The regulator will have to face the challenge of balancing the needs of all stakeholders with differing sectoral interests.

4.2.4. National and international planning

International Planning

The governance of spectrum use on a global basis is a core responsibility of the International Telecommunication Union (ITU) and, in particular, its Radiocommunication Sector (ITU-R). The mission of ITU-R is, *inter alia*, to ensure rational, equitable, efficient and economic use of the radio frequency spectrum by all radio communication services, including those using satellite orbits, and to carry out studies and adopt recommendations on radio communication matters. The ITU is a specialized agency of the United Nations. It is not a global authority in the manner of a national regulator, since the international rules are written by those governed by them, i.e. the Member States of the ITU. These rules are administered by the ITU's Radiocommunication Bureau (BR) and conformity with the rules is based on goodwill and supported by regulations at the national level.

The international framework for the utilization of the radio frequency spectrum is set out in the ITU's Radio Regulations. Spectrum related information, such as details concerning individual nationally based frequency assignments, are regularly submitted to the ITU's Radiocommunication Bureau for purposes of coordination with other countries and then registered in the Master International Frequency Register. This information is published in the Radiocommunication Bureau's International Frequency Information Circular.

In addition to international activities, there are often bilateral and multilateral agreements by which the use of spectrum is harmonized across national borders. There are two types of international activities; project activities and transactional activities. International project activities are those which have a defined beginning and ending date such as the World Radiocommunication Conference – 20012 (WRC). Like all types of project activities, tasks and sub-tasks can be defined and milestones established. Transactional international activities such as frequency coordination requests are of an ongoing nature.

There is, of course, considerable flexibility for the establishment of national policies following recommendations contained within the ITU-R framework.

National Planning

At the national level, spectrum management can be undertaken directly by government, as part of a ministry, or by an independent regulator operating under a legislative mandate or policy guidelines. It can also be managed by industry on a self-regulating basis or be assigned to a band manager. Band managers can be in the business of leasing on a for-profit basis valuable spectrum to third parties. Under proposed Federal Communications Commission rules, a band manager is granted a license under which the manager will allow others to construct and operate stations at any available site within the licensed area and on any channel for which the band managers is licensed. The preferred option depends upon a nation's historical and institutional circumstances. The key question being what delivers best on objectives.

The governance arrangements for spectrum regulators differ throughout the world, but broadly fall into two categories:

- The regulator is an independent agency, normally established by statute, with specified powers and responsibilities; or
- The regulator is part of a government ministry.

Good governance involves transparent arrangements for accountability and fairness. While decisions on spectrum allocation (among uses) and assignment (to individual users) inevitably reflect public policy objectives, government or political interference in detailed decisions, such as which firm should receive a particular license, should be avoided. The reward for such forbearance is enhanced investor confidence and, ultimately, more and better services for end-users. Whether an independent agency or a government body is better for spectrum regulation will depend on particular circumstances. In some countries, agencies may be more susceptible to capture by special interests; in others, governments. It is therefore difficult to propose a single rule.

There are a number of important policy questions to be reviewed and resolved affecting the regulation of spectrum at the national level. These policy questions include the government's own use of spectrum. One underlying concern for spectrum assigned to government departments is underutilization. Other policy matters include the extent to which market mechanisms should be used to assign spectrum and used set the price for spectrum; and, what are the permanent or temporary property rights of licensed and unlicensed users.

Determining who may use spectrum within a given country involves planning mechanisms. In general where there is greater reliance on the market to assign spectrum, less planning is required.

4.2.5. Traditional Approaches and Recent Innovations

Historically, regulators have assigned frequencies by issuing licenses to specific users for specific purposes, limiting access to and use of the radio spectrum. This traditional, administrative approach to spectrum management can prescribe how spectrum is used and, with good planning, how interference between uses can be controlled. This reflects the joint concerns of governments to coordinate frequency use internationally and to avoid interference at a time when radio technology was in its infancy. More recently, there has been significant innovation in the theory and practice of that regulation. This follows a growing consensus that regulatory practices originally intended to promote the public interest may, in some cases, have either delayed the introduction and growth of new technologies and services, or artificially increased their costs. There is, therefore, renewed emphasis on striking the best possible balance between the certainty of interference-free spectrum to encourage a stable roll-out of services and flexibility to allow improvements in cost, services and technologies to spread more readily to consumers and public services.

It is important to emphasize a key feature of the administrative method, which is that restrictions on allowable uses are made by the spectrum manager. Potential users of spectrum can make proposals for allocations, for example, for new communication technologies, but without the allocation being made, matters cannot progress further.

As can be expected, such methods are often slow and unresponsive to new technological opportunities. It requires a level of knowledge and foresight on the part of the spectrum regulator which is often more assumed than real. Attention has recently focused on creating genuine markets for spectrum and spectrum licenses under which both the ownership and use of spectrum can change in the course of a license's operation. This is a major step beyond the typical auctioning of licenses which are not subject to trading and change of use. It does, however, require the full specification of which "property rights" to spectrum can be traded and utilized.

Market methods may be employed both at the initial issue of spectrum licenses, such as when auctions are used and, more significantly, when users have been authorized to buy or sell spectrum rights in the lifetime of a license (trading) and permitted to change the use of the relevant spectrum to different services (sometimes called liberalization).

It is generally believed that with a greater number of spectrum users, a more competitive market exists and there is less need for regulating end-users. The design of the assignment mechanism and of associated conditions of use is crucial to the establishment of infrastructure-based competition. The assignment mechanism can shape the market

structure by dividing up the spectrum and limiting the amount that any one user can acquire.

Some spectrum, especially for short-range use (wireless LAN, radio frequency identification devices, microwave ovens, various remote control devices, wireless security systems) need not be licensed at all, either because users seldom interfere with one another or because new technologies can be used which are capable of dealing with interference as it happens. Unlicensed spectrum was initially of little interest, but in recent years it has been debated more widely. This has been made possible by several technological developments:

- Deployments of new technologies in the 2.4 GHz band, particularly W-LANs, have been commercially successful, leading many to ask whether further unlicensed allocations would result in more innovation and deployment.
- The development of ultra wideband (UWB) and the promise of software-defined radio (SDR) have led some to question whether these technologies can overcome historical problems with unlicensed spectrum.

If such coexistence can be achieved, a spectrum commons may be desirable.

Regulators should look for the right balance among the three methods of administrative assignment, market factors and spectrum commons. The choice will be based on factors such as the general scarcity of spectrum in various parts of the country and portions of the spectrum, the human and financial resources available to the regulator, the types of use – commercial or public service, and opportunities for innovation and commerce. The growing recognition that spectrum regulators may not be able to collect and process the information needed to make plans for efficient administrative assignments is one of the factors promoting spectrum reform throughout the world.

4.2.6. Transparent Regulation and Processes

One of the most important features of the work performed by a spectrum regulator is transparency. Transparency must form the basis of all work done by a regulator and should be a feature of every process the spectrum manager puts into force. The public and all stakeholders should understand the functions of the regulator. They should be able to see the work of the regulatory authority as open, accessible, and accountable. In terms of the processes followed, they should find the processes both predictable and fair. These are all easy principles to accept, but sometimes difficult to follow in practice. The benefits of transparent regulation are summarized in Box 4.1.

Box 4.1 Benefits of Transparent Regulation

1. Efficiency and Effectiveness: Open processes enhance consensus and create confidence in the regulator. Increased public participation promotes diverse ideas in decision-making and increases support for rules and policies, making implementation easier. In addition, transparency can lead to greater efficiency by ensuring that duplication of functions is avoided.

2. Certainty and Reliability: Regulatory credibility and legitimacy builds stability and is essential for attracting investment. This is particularly important in newly liberalized markets, where potential entrants need to have trust that their investments will be protected from arbitrary action and that further commercial development will not be thwarted by sudden changes in "rules of the game."

3. Accountability and Independence: Openness promotes accountability and legitimacy, reinforces regulatory independence, and reduces political and industry interference. Stakeholders can thus have confidence that their views will be heard, without bias, by the regulator. When regulatory actions are open to public, regulators are more likely to engage in careful and reflective decision-making.

4. Continuity: A stable set of rules governing transparency will transcend political changes and outlast political appointments, ensuring a continuous regulatory record regardless of who is in charge of the regulatory agency or which political party is in office.

Source: ITU, 2002, Chapter 6.

4.3. Planning and Technical Standards

4.3.1. Spectrum Planning

Spectrum planning ensures that the spectrum resource is used to the fullest extent possible. The radio spectrum supports a wide range of business, personal, industrial, scientific, medical research and cultural activities, both public and private. Communications are foremost among those activities and, together with other radio services, are increasingly important to economic and social development.

It is helpful to grasp the various uses and the characteristics of radio spectrum used to enable these services. Table 4.1 shows different radio services with various frequency ranges and band propagation characteristics.

Table 4.1 Examples of Radio Frequency Propagation and Related Services

BAND	FREQUENCY	RANGE	USE	BANDWIDTH	INTERFERENCE
VLF	3-30 kHz	1000's km	Long range radio-navigation	Very narrow	Wide Spread
LF	30-300 kHz	1000's km	Same as VLF strategic communications	Very Narrow	Wide Spread
MF	.3-3 MHz	2-3000 km	Same as VLF strategic communications	Moderate	Wide Spread
HF	3-30 MHz	up to 1000 km	Global broadcast and Point to Point	Wide	Wide Spread
VHF	30-300 MHz	2-300 km	Broadcast, PCS, Mobile, WAN	Very Wide	Confined
UHF	.3-3 GHz	< 100 km	Broadcast, PCS, Mobile, WAN	Very wide	Confined
SHF	3-30 GHz	Varies 30 km to 2000 km	Broadcast, PCS, Mobile, WAN, Satellite Communication	Very Wide up to 1 GHz.	Confined
EHF	30-300 GHz	Varies 20 km to 2000 km	Microcell, Point to Point, ,PCS and Satellite	Very Wide up to 10 GHz.	Confined

Spectrum resource planning ensures the efficient and effective use of the spectrum resource. Spectrum regulators need to make decisions about the uses of spectrum and on who should be allowed to use it (i.e. uses and users). Planning is usually undertaken for long-term, medium-term and short-term timeframes. Long range (strategic) planning (10 to 20 years) is required to foresee spectrum requirements far into the future. Medium-term planning (5 to 10 years) is needed to determine what changes should be made to regional, sub-regional, national and local spectrum policies to meet the changing needs of users and evolving technology that have already been identified. Finally, short-term planning (anything under 5 years) is important where, depending on the nature of spectrum governance in place, changes to spectrum policies can be made to adjust earlier decisions.

Forecasting future spectrum use is critically important if future spectrum needs are to be met. The challenge of forecasting spectrum can be overcome by employing various techniques including projections based on historical growth; and through monitoring of new technologies and noting their spectrum requirements. It is critically important to consult with spectrum users for they are usually in the best position to forecast growth in their sector.

It is also important to know the current uses of spectrum as a baseline for future planning. This can be ascertained from existing records of frequency use across the entire radio spectrum. International and often national frequency registers are used to aid planning and facilitated through the use of computer-automated tools.

4.3.2. Technical Standards

Technical standards describe how spectrum is used – spectrum use standards; and standards which state

conditions of technical compliance – radio equipment standards:

- Spectrum use standards state the minimal technical requirements for the efficient use of a specified frequency band or bands. Furthermore, spectrum-use standards can be designed to match ITU-R Recommendations.
- Radio equipment standards are used by the regulator in the license approval process, as well as in testing and certification of radio equipment such as transmitters, receivers and antennas to determine compliance with radio or manufacturer specifications. Radio equipment standards state the limits (if at all) on how certain radio equipment may interfere with other equipment in either shared or adjacent frequency assignments and form the basis for certification and testing. Equipment is said to be certified when it complies with applicable standards of the country. The ITU also has equipment standard regulations for reference by its members. Radio equipment standards also:
  - specify the minimal acceptable technical specifications and performance characteristics of radio equipment in general use;
  - exist for both licensed radiocommunication equipment or stations and license-exempt radiocommunication equipment which include low-power devices such as garage-door openers, radio frequency identification devices (RFIDs) or equipment utilizing ISM or unlicensed bands such as WiFi and WiMax.

  As a result, radio equipment standards and certification processes for specific types of equipment are the same for all manufacturers and importers, ensuring consistent quality for consumers. Finally, the regulator can use radio equipment standards to require that manufacturers produce equipment which provides for greater efficiency in spectrum use.

Technical standards are important to users of radiocommunication services and radio equipment since operators and suppliers rely on technical standards as a basis for preventing interference and in many cases ensure that radio systems perform as designed. Standards documentation provides; general information describing the equipment and the application, an indication of licensing and certification requirements, channeling arrangements, modulation techniques used by the equipment, and transmitter power and transmission limits for unwanted emissions.

Other Standards

There are other standards associated with the use of radio such as radiation standards and land use standards. The authority for regulating these standards most likely rests with other ministries and agencies. Once a decision by government on policy or regulation has been reached however, the spectrum management authority may need to take certain measures such as making modifications to radiocommunication equipment standards to ensure public safety.

- Radiation standards refer to electromagnetic emissions at certain frequencies that may be harmful to life or some other concern to public safety. The spectrum manager is not typically responsible for conducting the research and determining the scientific basis for these concerns. Agencies of government such as the ministries of health and public and private research institutes conduct research to substantiate concerns.
- In connection with the deployment of radiocommunication systems, other standards relating to the environment, construction and land use may apply. This is particularly true where location with respect to essential facilities such as power transmission lines and airports is a factor.

Developing Technical Standards

Developing radiocommunication equipment standards and spectrum-use standards occurs at the national, regional and international levels. In some cases, due to the importance and size of the national economy, national standards acquire international importance. Smaller nations routinely adopt, either formally or informally, radiocommunication equipment standards developed by other standards organizations, which is a cost-effective manner of designing a set of standards. Indeed, countries within almost all regions, including Europe, the Caribbean, Africa and Asia have opted to recognize both European (ETSI) and North American standards (FCC and ANSI). There are standards bodies in most regions of the world and particularly in regions where high technology and

telecommunication and radiocommunication equipment are manufactured.

Coordinating Technical Standards across Regions

Testing compliance of radiocommunication equipment with national standards is done by either government-operated testing facilities or by private sector laboratories. National governments increasingly favor private sector facilities since technological change and innovation lead to ongoing acquisitions of high-cost test equipment. Policies and regulations have evolved around the coordination of standards testing across regions and markets through the certification of conformity assessment bodies (CABs). CABs are organizations recognized by the spectrum management authority to conduct testing and certification of radiocommunication equipment. A mutual recognition agreement amongst importing and exporting participants to establish mutual acceptance of the results of testing and equipment certification procedures undertaken by those bodies in assessing conformity of equipment to the importing parties' own technical regulations.

Conformity to radiocommunication equipment standards and certification are necessary conditions for interoperability of radiocommunications services and terminals such as handsets. It is not a guarantee, however. Across a region or within a country, a common technology or standard such as GSM or CDMA may be used by service providers with similar networks but operating at different frequencies, making it difficult for users to migrate between networks. The absence of roaming agreements may also prevent interoperability even when frequencies and technologies are the same.

4.4. Mechanisms for Assigning and Pricing Spectrum

4.4.1. Spectrum Authorization

Authorization is the process by which users gain access to the spectrum resource. This may involve assigning specific frequencies to users, allotting certain frequency bands or sub-bands to specific users, who may or may not be able to transfer such spectrum rights to others. In some cases it may mean simply authorizing the use of specific equipment or categories of equipment.

Spectrum authorization activities include analyzing requirements for proposed frequencies in accordance with national plans and policies for frequency allocation. They include actions to protect radiocommunication systems from harmful and obstructing interference. Spectrum authorization strategies are used to ensure proper use, facilitate reuse, and achieve spectrum efficiency.

It is perhaps helpful to define three key terms:

- Allocations are entries in a table of frequency allocations which sets out the use of a given frequency band for use by one or more radiocommunication services. An allocation is a distribution of frequencies to radio services.
- Allotments are entries for designated channels in a plan for use by one or more countries in those countries or within designated areas for a radiocommunication service under specified conditions. An allotment is a distribution of frequencies to geographical areas or countries.
- Assignments are authorizations given to radio stations to use radio frequencies or radio frequency channels under specified conditions. An assignment is a distribution of a frequency or frequencies to a given radio station.

Some basic principles and rules have been established.

- Allocations are made on a primary or on a secondary basis.
- Stations of a secondary service cannot cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date.
- Stations of a secondary service cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or to which frequencies may be assigned at a later date.
- Stations of a secondary service can, however, claim protection from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

4.4.2. Regulatory Strategies for Allocation and Assignment

At the national level, spectrum is most often allocated in accordance with existing international

ITU frequency allocations and prospective changes resulting from national planning processes. Traditional allocation processes have evolved around service definitions and associated technical rules. Allocations need to support increased usage of cost effective communications achieved through service expansion and interoperability and reduced equipment cost.

Rapid changes in the marketplace caused by demand growth and rapid technology development make traditional service oriented allocations somewhat inflexible. For example, use of spread spectrum techniques and more efficient equipment permits increased sharing of spectrum, even if some minimum levels of interference are experienced.

Spectrum allocation strategies include:

- Flexibility in the use of spectrum achieved by way of less emphasis on services and use of spectrum sharing techniques.
- Consistency with International Allocation Agreements to ensure comparable costs and service integration.
- Emphasis on technology neutrality combined with continued diligence in eliminating harmful interference.
- Protection of frequency use and freedom from harmful interference in sub-bands allocated for public safety and security.

Assignment involves assigning and licensing of frequencies to systems and individual services. An operator is assigned a set of frequencies in order to provide communications services. The assignment of frequencies is done, in a way, to avoid harmful interference with other users in adjacent bands. Spectrum should be used efficiently and so assigned frequencies should follow channeling plans which follow appropriate technical standards and result in the reuse assigned spectrum. Underutilized spectrum and unoccupied assigned spectrum are wasteful uses of the resource. Assignment and pricing techniques should support efficient and optimal use of assigned spectrum.

Spectrum assignment strategies include:

- Users of assigned spectrum must comply with license conditions and applicable technical standards otherwise licenses can be revoked.
- Government should enforce license conditions and ensure interference free use.
- Public safety and security must be safeguarded through active surveillance and enforcement.
- Capacity planning and band planning should be done involving multilateral industry consultative processes and assignment and planning databases should be publicly available.
- The regulator can establish the right to recall and refarm spectrum.
- Certain assignments can be unlicensed due to public interest and administrative efficiency.

Additional spectrum authorization activities include licensing, examination, certification of radio operators, equipment, type approval, type acceptance and international notification and registration. In terms of licenses, there are various types, including individual licenses, system licenses, class licenses and general licenses (see Chapter 3.4). Some uses of spectrum are not licensed. It is important, however, to recognize that unlicensed does not necessarily mean unregulated since equipment may still need to meet certain technical standards.

4.4.3. Technical Aspects of Assignment

A major challenge for assignment procedures arises when technological innovation alters the optimal use to which a particular frequency should be put. In certain circumstances, this does not create a problem. Thus if, under an administrative procedure, a license expires at the moment when a change of use is desirable, a new license can be issued to provide the new service. If a market regime involving secondary trading and involving change of use is in place, then the purchase and sale of the relevant spectrum license should allow the transition to take place without regulatory intervention. Indeed one of the arguments for the use of markets is that it takes the regulator out of the process of responding to technological change which is occurring at an increasing rate.

In reality, however, things are usually a great deal messier. There may be uncertainty over what entitlement to spectrum a licensee has. In a market regime where licenses are of limited duration (e.g., twenty years), there may be a period of uncertainty, when a switch to a new use is desirable but no one is prepared to make the necessary investments to achieve it, because of uncertainty about future access to spectrum.

4.4.4. Methods for Assignment

Several methods can be used to grant access to spectrum. If there is no excess demand for spectrum licenses, the method chosen might be "first-come, first-served": a reserved basis for certain uses or users in a form of *a priori* planning and so-called beauty contests which may be held to decide who will be assigned certain frequencies or bands of frequencies. Applicants might have to be qualified in specified ways but the qualified applicants would be granted licenses until the license term was exhausted.

If excess demand is anticipated, use of a competitive assignment process is normally preferred. For this to be done fairly and transparently, the regulator must set out the various criteria to be employed, relating, for example, to the technical and financial qualifications of applicants, their access to capital, the scope and geographical range of their services, and so on. Each criterion should have a pre-announced weight, and an objective method of measurement should be specified.

If an auction method is used to make an assignment, the procedures to be employed must be set out in fine detail to ensure that all competitors are on an equal footing. For example, if a sealed bid is employed, the date and place at which it must be lodged have to be clear. If an open auction process is utilized, in which bidders make offers for licenses in successive rounds of bidding, a whole range of procedures relating to the frequency of rounds, increments in amounts bid, obligations to make new bids and so on must be specified.

Precisely what the spectrum manager has to do in order to achieve an effective assignment depends on the method chosen, and also upon linkages with other authorizations such as the issuing of broadcasting licenses. New technological developments may change the methods used to issue authorizations and may require "refarming" of spectrum. The process of refarming will require engineering and administrative support and, in some cases, financial support. For example, costs to refarm spectrum can be passed onto new licensees or a refarming fund administered by the regulator can be used to assist new licensees who cannot bear the cost of technology change arising from the relocation of their radiocommunication service to new assigned frequencies (unlicensed or special use).

In all cases, it is vital that the regulatory body abide strictly by the conditions it has specified for the assignment. Any departure or evidence of partiality, prejudice or of conflict of interest will be damaging in several ways. First, legal challenges can delay the start of services of benefit to end users, possibly for many years. Second, doubts about the integrity of the process will deter companies from participating in competitive assignment processes. As a result, inferior candidates may be successful, leading to long-term harm for consumers

4.4.5. License Conditions

Spectrum authorization typically involves the licensing of frequency assignments and radiocommunication equipment by the spectrum manager. Licensing places restrictions on the use of assigned frequencies to prevent harmful interference. Under either administrative or market-based methods, utmost clarity is required about what license conditions are entailed by the license. These must be specified in respect of technology, geography and time.

The most complex is technology. Under administrative assignment of licenses to a particular user providing a particular service (e.g., a specified form of radar, GSM, etc.), the technological restrictions in the license are normally defined in terms of the location, power and geographic coverage of the specified apparatus. The specifications are chosen to avoid interference with other users. Any departure by the licensee from these conditions is a breach of the license. If, however, spectrum licenses are flexible and can be employed for any purpose – following a trade of the license, for example – apparatus licensing of the kind described above does not work, as each possible use will be associated with different equipment. In these circumstances, licensees will have to face restrictions in what emissions their activities are allowed to make at the boundaries of the license area, i.e. what spill over they can make into adjoining geographic areas and frequencies. This is considerably more complex.

The geographical scope of a license is more easily specified once the interference issue noted above has been resolved. The duration of the license must also be specified and can include features such as renewal options and conditions for trading which have been already discussed.

4.4.6. Spectrum Pricing

Administrative methods of setting spectrum prices are increasingly being supplemented by the use of market based methods for determining spectrum prices. Spectrum pricing methods have taken various forms: from setting license fees at a level sufficient to recovering the cost of spectrum management; through to applying administrative incentive prices (AIP); and, to auctions and using them to make initial assignments and as a consequence establish a price for spectrum.

Objectives of Spectrum Pricing

The pre-eminent policy objective for spectrum pricing is that it should be done in a way which promotes spectrum efficiency. Spectrum efficiency comes with a cost and the spectrum manager should attempt to find an optimal cost/benefit trade-off. Second, use of the spectrum provides considerable benefit to national and regional economies and this benefit should be maximized. Next, managing radio frequency spectrum costs money and someone has to pay these costs. As a principle, those who benefit from the use of the spectrum should be the ones to pay these costs. A user-pay principle should apply. Finally, important social and cultural objectives can be advanced by use of the spectrum and spectrum pricing should facilitate the achievement of government social and cultural objectives.

Allowing a spectrum regulator to establish its own charging regime, collecting all spectrum related revenues and retaining them to fund spectrum management activities can be a source of concern to policy-makers. In economic terms, the regulator is effectively a monopoly and has little incentive to contain its costs if it can increase its revenues by raising license fees and other charges. Safeguards can be put in place to avoid such practices, such as putting limits on the growth of the regulator's expenditures.

In countries where spectrum revenues exceed the cost of spectrum management and sometimes by a large margin, governments view this as a spectrum dividend whereby the government and, hence, all members of the public reap the financial benefits of such royalties. However, attention must be paid to the broader legislation within a country, as spectrum revenues in excess of costs may be viewed as taxation. The power of taxation may be reserved to another government entity and the legislation dealing with spectrum management may or may not be constructed so as to allow revenues to exceed costs.

Methods for Cost Recovery

The activities of each licensee impose direct costs on the regulator. These include the costs of issuing, maintaining data, spectrum monitoring and enforcing its individual licenses. Some costs will be common to a band or to a radio service (such as band planning), whereas others will be common to a group of bands. Some, such as management overheads, will straddle all licensees.

Regulators have tackled the issue of setting prices to recover costs in several ways. Some have used detailed costing models to establish which licenses have imposed which costs. Others have used "rules of thumb", such as setting charges on the basis of a percentage of the licensee's turnover, but this may attract criticism from those who think they are overcharged. In these circumstances, a simple model of direct costs can be developed. As well, a method of allocating indirect or common costs will be needed, e.g., based on licensees in proportion to the direct costs which they impose. Or they can be allocated in accordance with the amount of spectrum (e.g., in MHz) with which a license is associated.

Spectrum or license charges can be assessed as a percentage of (royalty on) revenues or profits, which has to be handed to the spectrum regulator under the terms of the license received or profits earned by an operator. This can be a way to cover regulatory costs, or it can be designed to raise revenue for the government.

Another method for recovering costs involves trying to set proxy prices which might otherwise emerge in a market context, and then set charges which license holders have to pay in relation to costs of spectrum management. This is sometimes called "administered incentive pricing" (AIP): "administered" because they are set by the regulator with potential "incentive" properties. These types of license fees are designed to not simply recover the cost to manage spectrum but also promote efficient spectrum use. The idea is that if a user has unused spectrum, they will choose to return it rather than pay the charge. Also, if a user can pay a lower fee by using spectrum more efficiently, that user may adopt more spectrum-efficient operations.

Spectrum should be priced in any use at its opportunity cost by applying the right level of price pressure without forcing excessive economies which result in valuable spectrum being unused. The right level of price can be found by estimating the value of other resources that would be saved if the same spectrum were redeployed to produce some other service, or the extra costs incurred if it were not available to provide the service causing the current service to be produced with less spectrum. Doing this in practice will require the regulator to identify the relevant alternative or alternatives, and perform the necessary cost calculations. This will inevitably produce results which are only approximate, but the regulator may conclude that it is better to apply incentives for cost efficiency via a price which is only approximately right rather than not to charge any price at all.

If AIPs are based on opportunity cost, then it follows that they should be zero (and replaced, probably, by cost recovery prices based on direct cost only) if the spectrum has no alternative use. This might arise because:

- There is no shortage of spectrum in the relevant frequency, so that all users can be accommodated;
- There is a legal impediment to using the spectrum in question for other purposes; this might apply for instance, to spectrum used for the purposes of aeronautical communication under the auspices of the International Civil Aviation Organization (ICAO).

AIP is therefore another tool available to regulators to encourage spectrum efficiency. It is applicable in an administrative regime for spectrum assignments and can be applied to private and public sector users. But the regulator must be sure that the AIP are taking effect. For example, if a ministry paying AIP on spectrum simply has its budgetary allocation increased to allow it to pay, there is no incentive to economize and the regime is ineffectual.

At first sight, cost recovery fees might seem to fall in this category since cost recovery prices may motivate a user to return excess spectrum or to use spectrum more efficiently. However, the primary motivation for this method is to fund the spectrum regulator (and perhaps gain some additional revenue) and prices are more likely to be set too low to impose an appropriate level of discipline on licensees. This arises because the value to a nation of its spectrum greatly often exceeds the cost of operating the spectrum regulation organization.

The choice between these approaches has to be made by the regulator in the light of considerations of fairness, and the likely effect of the charges on spectrum use. If a high allocation of indirect costs makes a license uneconomic, the matter may require reconsideration.

Auctions

Auctions are essentially a method of assigning spectrum at the time of its first issue by the spectrum regulator to those who value the spectrum most highly. It is normal for bids to be made in monetary terms, where the competitor offering the largest sum wins the license. Spectrum prices emerge as a consequence of winning bids in auctions or from secondary trades of existing licenses. Auction and spectrum trading transaction prices not only embody "opportunity costs" – the cost-saving potential of the spectrum license, but also any excess profits which the license holder can derive through exclusivity or market power. As a result, they should be used with caution.

Sometimes bids for licenses may be on terms other than price. For example, competitors can bid against one another over which will offer service over the largest geographical area. Competition can be in terms of which operator will charge the lowest amount for service or requires the least amount of subsidy. Once the rules are established, however, the winner is determined by the operation of the competitive process, not by an administrative decision.

The key differences between auctions and comparative hearings or administrative decisions are that:

1. An auction assigns the license to the firm which bids the most, and that may in certain conditions be the most efficient firm;
2. A competitive auction will, if it operates properly, direct any excess profits from providing the service to go to the government rather than the operator, as would be the case if the operator were chosen via a competitive hearing.

Hundreds of spectrum auctions have now been conducted. Some have attracted great attention by generating billions of Euros or dollars from bidders.

Most have been on a much smaller scale. Even so it still remains the case that most of the spectrum in use in all countries has been allocated by administrative methods. In practice, auctions tend to be confined to cases where:

- The spectrum available is in scarce supply;
- Many firms want to acquire a license;
- The service to be provided with the spectrum can be precisely defined;
- The monetary value of the license is relatively high, justifying what can be a complex assignment procedure.

Some examples are given below:

1. A spectrum regulator proposes to assign a single license for the provision of a national second generation mobile telephone service. The successful applicant must commit itself to providing coverage to 50% of the land area and 80% the population. Sealed bids must be submitted by a specified date, by firms which have pre-qualified (i.e. have shown their competence to be the licensee). The winner in the firm which bids the most.
2. Two or more licenses to provide national 3G mobile services are auctioned. Pre-qualified applicants bid against east other in an open bidding auction, i.e. they have the opportunity to submit new bids for the licenses at pre-specified intervals. The auction ends when the winning bids for each license are the same, in term of bidder and sum bid, as they were in the previous round. To ensure completion of such an auction, firms must be made to bid at a specified frequency.

A successful auction requires a clear understanding by participants of what rights and obligations are available to the winner or will be imposed upon them. If there is uncertainty about this, it will discourage competitive bidding. Auctions differ in two main ways: in the number of lots (or licenses) made available; and the way the auction is conducted. There has been a significant number of mobile licenses grant by auction around the world and they form a good basis for analysis and understanding. In relation to these wireless communication licenses, some the key variables in designing the auctions were:

1. The number of licenses to be offered to the service: this decision is of fundamental importance, since it determines the structure of the services market. The objective of maximizing consumer welfare suggests the harnessing of competitive forces to the maximum – i.e. issuing, subject to spectrum availability, as many licenses as the market will be able to support (plus one or two extras to permit freedom of entry into the market);
2. Any commitments made at the time of the auction relating to restrictions on the award of subsequent licenses;
3. Whether national or local regional licenses are issued; here the regulator may find it helpful to anticipate the kind of business plans (national or regional) firms are likely to have and make licenses available. There is nothing to preclude a mixture of national and regional licenses;
4. How long the licenses will last: too short a period may discourage investment in the services, while too long a period may allow the spectrum in question to stagnate if it cannot be sold on for another purpose;
5. Any obligations a licensee may have to make periodic payments in the course of the license;
6. Any network roll-out obligations or "use it or lose it" clause;
7. Any foreign ownership restrictions.

A range of methods have been employed and some have been judged successful. Regulators can learn from this experience to choose a procedure which meets their circumstances. The greatest experience has been accumulated in the United States, where the Federal Communications Commission (FCC) has run a series of auctions starting in July 1994.

Several lessons emerge from these auctions, which typically have involved the auctioning of multiple local licenses which can be aggregated to provide regional or national services:

- Open bidding is better than a single sealed bid;
- Simultaneous open bidding is better than a sequential auction, in which licenses are auctioned one after another;
- Allowing bidders to bid for packages (e.g., a group of local licenses capable of providing

wider area services) is desirable in principle but difficult in practice;

- Collusion is a major problem, which can be countered by concealing bidders' identities (i.e. publishing the bid, but not who made them), and setting high resume prices, amongst other ways.

The most conspicuous auctions were those for 3G (UMTS) licenses in Europe. In 2000/01 a sequence of auctions took place, beginning with the United Kingdom, where operators bid large amounts ($35 billion for five 3G licenses). Although revenues from the German auction several months later were also high, thereafter they declined on a per capita basis.

Where a small number of national licenses are being auctioned, for example in a developing country, a simpler approach is possible. A good example of this is provided by the auction of three identical GSM licenses in Nigeria in 2002. This was done with a carefully thought-out process which involved invitation and pre-qualification stages, as well as the auction itself. Recognizing the problem of collusion, the designers made alternative plans which depended on the number of qualified bidders for the three licenses. If there were five or more - i.e. if bidders exceeded the number of licenses by more than one, an ascending clock auction would be held. If there were only four, a sealed bid process would be implemented.

Defining Property Rights

Where trading occurs, it is necessary that buyer and seller – as well as the regulator and the courts where appropriate – share the same understanding of the bundle of rights and obligations which are changing hands. This is true of land, for example, and also of a spectrum license. Clearly defined property rights are thus a precondition for efficient spectrum markets. The dimensions of rights and obligations in a spectrum license include:

1. The band which is available for use;
2. The geographical area in which it can be used;
3. The period for which the license is entitled;
4. The uses to which it can be put;
5. The licensee's degree of protection from other users; and,
6. The licensee's obligation not to interfere with other spectrum user's rights.

Freedom from interference and restrictions of rights to interfere with others are two major related dimensions of property rights in spectrum licenses. Under administrative assignment procedures, the license typically specifies the transmitting apparatus, where it may be located, and the power at which it may be operated. By setting conditions for all licenses in this way and using an interference model to simulate the impact of apparatus on neighboring reception equipment, interference can be controlled.

However, when change of use is allowed under a license, this form of control is no longer feasible as the nature and location of the apparatus to be employed are no longer given: they are now up to the licensee. This requires a redesign of the interference model, from one where calculating the impact of specific apparatus is done, to one which sets limits to the emissions the licensee can deliver at the geographical and frequency boundaries of the spectrum it is licensed to use. Various approaches to specifying these limits have been applied in Australia, the United Kingdom, and the United States.

Under a secondary trading regime, licensees can bargain with one another to make adjustments to specified boundary emission levels. If such deals benefit both sides, it is likely, but not inevitable, that they will be made.

Lotteries

Finally, spectrum can be assigned by means of a lottery: a winning ticket chosen at random will carry with it a spectrum award. This is a "non-pricing" method of assignment. Although this procedure may seem attractive and equitable, it has many drawbacks. First, if many apply, the cost of administration may be large, especially if all applicants have to be vetted for suitability. Second, the lucky winners may not have the qualifications to operate the licenses efficiently. If they are not allowed to sell the license, this may be a recipe for disaster. And if, thirdly, they are allowed to sell them on to efficient operators, the winners will be appropriating auction proceeds which would otherwise go to the government.

4.5. Monitoring Spectrum

Effective spectrum monitoring supports activities to ensure interference-free assignments and includes

the use of data and electromagnetic compatibility (EMC) verification activities. Monitoring and compliance activities are also needed to ensure user compliance with both license conditions and technical standards, helping users avoid incompatible frequency usage through the identification of sources of harmful interference. Furthermore, spectrum use planning and resolution of spectrum scarcity issues can be accomplished through study and analysis of spectrum occupancy data. Understanding the level of spectrum use or occupancy in comparison to assignments is important for efficient use of the spectrum resource. Spectrum monitoring provides statistical information on the technical and operational nature of spectrum occupancy.

The following central underlying objectives are supported by spectrum monitoring:

- Improving spectrum efficiency by determining actual frequency usage and occupancy, assessing availability of spectrum for future uses;
- Ensuring compliance with national spectrum management regulations to shape and sustain radio environments and user behavior, maximizing the benefit of the spectrum resource to society;
- Resolution of interference problems for existing and potential users.

4.5.1. Spectrum Efficiency

One radiocommunication system is more "spectrum efficient" than another if it conveys the desired information using less of the spectrum resource. Spectrum efficiency also involves the arrangement of communication systems within the spectrum resource. In this broader sense, spectrum is used inefficiently when systems are not packed together as tightly as possible in frequency bands (as when excessive guard bands are used), or when portions of frequency bands are unused while other bands with similar physical characteristics are congested. The allocation of frequency bands, the development of channeling plans, and the assignment of frequencies to specific systems all affect spectrum efficiency.

In order to promote spectrum efficiency, spectrum managers must possess some means of quantifying spectrum use and evaluating various radio technologies and frequency selection techniques. Management decisions can then be based on the relative spectrum efficiency of the various technologies and techniques. Data is collected through spectrum monitoring measures of spectrum occupancy and utilization for purposes of making assignments including the effects of spectrum reuse and band clearing efforts. Also, as spectrum becomes scarcer in highly congested areas, monitoring data is used to support spectrum engineering activities including validation of tolerance levels, determining the probability of interference and development of band-sharing strategies.

4.5.2. License Compliance

Spectrum monitoring also supports compliance with license conditions and regulations through determination of deviations from authorized parameters, identification of sources of interference and location of legal and illegal transmitters.

A radio system can deny the use of part of the spectrum resource to another system that would either cause interference to, or experience interference from, the first system. A radio system is said to "use" spectrum resources when it denies other systems the use of those resources. Spectrum use can be quantified, subject to certain assumptions, both for a single radiocommunication system and for a related group of systems. The spectrum manager needs to choose the measuring system carefully and to ensure capabilities exist with the spectrum management agency to effectively monitor and analyze frequency bands. Circumstances will vary by country and monitoring solutions should be tailored to meet needs, budget and institutional capacity.

The ITU has created a system which classifies radio emissions according to the bandwidth, method of modulation, nature of the modulating signal, and type of information transmitted on the carrier signal. These form the technical basis for establishing equipment specifications for radio systems designed to operate within certain frequencies.

Emissions of a radio transmitter are authorized to an assigned frequency band within the necessary bandwidth and tolerance for the frequency band. Emissions which do not meet technical parameters are unwanted emissions consisting of spurious emissions and out-of band emissions. These types of emissions can be generated accidentally or through distortions caused by various components of the radio system.

Transmission of radio signals emitted by a radio transmitter can therefore be in-band in accordance with technical parameters or unwanted owing to several causes including out-of-band emissions and spurious emissions.

Monitoring is therefore done to obtain detailed information on the technical or operational characteristics of radio systems. The spectrum manager will monitor radio equipment to determine conformity with applicable standards. This can be done as part of an equipment certification process where measurements can be taken and recorded and then used in analyzing the compatibility of radio systems - electromagnetic compatibility (EMC).

4.5.3. Resolving Interference Problems

Spectrum monitoring activities determine measurements of radio waves and radiation causing interference to authorized transmitters and receivers. Interference may be the result of authorized emissions causing unintended results such as spurious emissions. Interference may also be caused by unauthorized transmitters or devices operating beyond technical specifications. In either case, the spectrum manager will use a combination of engineering analysis and data obtained from spectrum measurements to resolve problems associated with interference problems.

The identification of unauthorized transmitters can be difficult to achieve, especially in congested areas and where various services share the same frequencies. In some bands, where spectrum sharing is encouraged through the use of class licenses or radio frequency no protection is provided from acceptable levels of interference.

4.5.4. Management Approaches

At the international level or multilateral and bilateral bases and at the national level, there are several management and process models typically used in spectrum monitoring. ITU member countries often work together to operate monitoring facilities and to coordinate efforts to prevent, detect, and control of (harmful) interference to radio transmitters since it is recognized that development and duplication of monitoring facilities is both uneconomical and operationally inefficient. Article 16 of the Radio Regulations lays down the provisions governing the establishment and operation of the international monitoring system.

Stations comprising the international system check for transmissions that have effects beyond national boundaries, particularly for frequencies below 30 MHz, are in accordance with the internationally agreed conditions of operation. This includes checking frequency, bandwidth, emission type and usage. Where non-compliance with any prescribed condition is determined, the ITU provides for an infringement report to be sent via the Radiocommunication Bureau to the country responsible.

Cooperation involving non-governmental organizations and industry associations who advise regulators on policy and technical matters also occurs between countries. For example, broadcast and microwave propagation issues and solutions are identified and analyzed by associations and confirmed through spectrum monitoring tasks performed by the regulator.

Monitoring and enforcement of license and technical standards at the national level has traditionally been a responsibility of spectrum regulators, whether within independent agencies, or attached to ministries of telecommunications. Departments such as defense and transport also often have responsibility over frequencies allocated to governmental use. In addition to public sector agencies, private sector participants are sometimes involved in the monitoring and problem resolution processes. These include industry associations and advisory councils.

There are several examples where band management organizations govern specified frequency ranges under government authorization. An agency of government or non-governmental organizations (NGOs) assumes responsibility for essential monitoring activities and shares information on problems affecting civilian applications. Another example involves industry associations taking responsibility for monitoring and taking steps to resolve interference problems in fixed-link microwave services. Finally, the spectrum regulator concentrates its monitoring resources on public priority frequency bands affecting essential services, including air navigational aids, fire, safety, ambulance, police and areas of concentrated commercial activity such as is typically found in VHF/UHF.

4.5.5. Spectrum Monitoring Technology

Fixed, remote, unmanned and mobile monitoring equipment can be combined to provide tools for verification of licensing compliance, channel occupancy, spectrum planning, and regulatory enforcement. Those can also provide greater flexibility in the design of national and regional monitoring systems. Monitoring equipment and integrated software tools are complex and expensive and integrated monitoring systems can be very expensive as well. Fortunately, advances in computerization, monitoring technology, and security techniques have permitted greater use of remote unmanned monitoring techniques involving integrated spectrum observations.

The basic types of monitoring equipment include; antenna, spectrum analyzers, and direction-finding equipment. These basic types can be further categorized by frequency range (HF, VHF, UHF, etc.) and signal type – analog or digital. With the advent of spread spectrum and computer-based radio technologies like cognitive radio, the sophistication, complexity and prices for monitoring equipment have risen. Simple systems for VHF/UHF monitoring can be comprised of several fixed antennas, receivers and limited function spectrum analyzers. More complex systems can consist of multiple sites and mobile and fixed stations. The approaches to monitoring and the architecture of the spectrum manager's monitoring system have a bearing on the types of systems needed and the configuration of operations and resources.

An antenna is simply an electronic component designed to radiate energy and transmit or receive radio waves. Different antenna types are used for different radio frequencies and for different coverage areas. All antennas radiate some energy in all directions but careful construction can result in focused directivity and negligible power radiated in other directions. Antennas are linked to either radio receivers or signal generators of direction-finding equipment and can be applied in mobile and stationary systems, providing complete coverage of the frequency range from 100 Hz to 30 GHz and beyond in the case of some manufacturers.

Spectrum analyzers help determine whether each radio service operates at the assigned frequency and within the allocated channel bandwidth. The common measurements taken by a spectrum analyzer include frequency, power, modulation, distortion, and noise. Understanding the spectral content of a signal is important, especially in systems with limited bandwidth. Since transmitters and other intentional radiators operate at closely spaced adjacent frequencies, power amplifiers and other components are measured to determine the amount of signal energy that spills over into adjacent channels and causes interference. The concern is that these unwanted emissions, either radiated or conducted (through the power lines or other interconnecting wires), might impair the operation of other systems.

Radio Direction-Finding, or RDF, is the technique used for determining the direction and/or location of a radio transmission/transmitter. Radio direction-finding using triangulation techniques can also be used to determine the location of a radio transmission. Radio direction-finding is used by spectrum managers to locate the source of radio frequency interference.

4.5.6. Designing Spectrum Monitoring Systems

Key considerations in the design of spectrum monitoring systems include types of equipment, speed and sophistication of data capture and processing, degree of integration with software tools for analysis and comparison with other license and type approval data. Other considerations include proximity to active airspace, staff skills, and mobile versus fixed locations.

State-of-the-art spectrum monitoring equipment is highly integrated. Integration typically involves the use of graphical user interface (GUI) based spectrum management tools and systems which are specifically designed to operate multiple electronic components simultaneously and remotely over data protocols such as TCP/IP. This allows for an integrated network system for management of the radio spectrum using remote devices. These devices can be located at existing government sites and facilities on the outskirts of population centers. Remote devices permit access to monitoring equipment from anywhere through compatible computer, a modem and a telephone line or network connection (LAN or WAN).

There are organizational and functional aspects to architecting spectrum monitoring systems. Organizational components include centralized, regional and remote locations for siting of monitoring equipment in stations and operational

staffing or use of unmanned remote capabilities, where applicable. Functional components of spectrum monitoring systems include: central monitoring control; operational consoles for operation of equipment and analysis of data; and data networking and management systems for data communications and repository.

4.5.7. Enforcing License Requirements

Spectrum users need to comply with license requirements and technical rules and regulations since without effective regulations and enforcement procedures, the integrity of the spectrum management process can be compromised. Spectrum managers are particularly concerned with interference problems affecting public safety and security services such as ambulance, fire fighting, police, and navigational services at airports.

Monitoring is used to obtain detailed information on the technical and operational characteristics of radio systems which are in use or are being tested for future use. Measurements will typically include frequency, power and emission spectrum of a transmitter. License conditions can be verified against actual use of equipment aiding in the determination of electromagnetic compatibility (EMC).

In the case of harmful interference, the spectrum manager may, at the owner's expense, do any one or more of the following:

1. Take suitable measures to eliminate or reduce the interference or disturbance;
2. Remedy a fault in or the improper operation of the equipment;
3. Modify or alter the equipment; or;
4. Disconnect the equipment.

In the course of conducting exercises to resolve interference problems, the spectrum manager may be required to enter user premises and inspect radio equipment to determine compliance with license conditions and technical standards and in some cases seize equipment. An important aspect of completing these tasks noted above is the requirement under law and regulation to establish the appropriate limits on regulatory powers and authorities and clearly establish the duties and obligations of the spectrum manager/inspector and protection of rights for the public under circumstances where inspection of property is necessary. There may be rare occasions when the user of a transmitter causing harmful interference is endangering the public in a persistent and willful manner and the reasonable course of action requires the spectrum manager to seize equipment preventing future endangerment.

Also, it is helpful to have an appropriate framework and process for responding to and managing complaints, for settling disputes, and resolving interference problems. Consideration needs to be given to penalties, remedies, enforcement and alternative dispute resolution (ADR) mechanisms for industry disputes with the aim of ensuring rapid resolution.

4.6. Flexibility in Spectrum Management

4.6.1. Spectrum Trading

Secondary trading of spectrum permits the purchaser to change the use to which the spectrum was initially put while maintaining the right to use it. This is viewed by many as the key step to be taken in the reform of spectrum management regulatory practice, capable of unlocking the potential of new technologies and of eliminating artificial scarcities of spectrum which find expression in inflated prices for spectrum-using services.

Once secondary trading is allowed, industry structure can be affected by mergers of companies or the direct transfer of spectrum ownership. There is a risk of a structure emerging which contains a monopoly or, more generally, a dominant firm or firms, which can set excessive prices. This problem can be combated by ordinary competition law where the law exists; for example a dominant position might be broken up or a merger disallowed. But it may also be necessary for the regulator to have the power to scrutinize and, if appropriate, prohibit certain spectrum trades.

A useful aid in dealing with problems of market power is to encourage co-operation between the spectrum regulator, with its technical knowledge, and the competition authority, which is skilled in market analysis. South Africa, for instance, has been successful in achieving this goal.

The issue here, as is so often the case in spectrum regulation, is a trade-off between the costs of *ex ante* scrutiny, which are incurred by firms and the regulator (and hence, ultimately by consumers of

spectrum-using services), and potential cost to consumers of abuses of market power, if a trade takes place which triggers that risk. The argument for *ex ante* scrutiny will be stronger if a) spectrum ownership is already concentrated, and b) ordinary competition law is non-existent, underdeveloped, or difficult to enforce.

If spectrum markets are to work properly, participants must have basic information about spectrum holdings adjacent to where they are considering buying licenses. Otherwise buyers will not appreciate the constraints relating to interference to which they will be subject. This raises problems of confidentiality – both commercial confidentiality and the need for secrecy where spectrum is used for security or defense purposes. For a variety of reasons concerned with the policing of interference as well as the policing of competition, the regulator will have to keep a register of spectrum use and license holdings. Much of this can be published, and its existence will be of great help to potential licensees seeking to find out who their spectrum neighbors would be if they offered a particular service in a particular frequency in a particular area.

Several countries have now had experience of secondary trading in spectrum licenses for a decade or more. These include countries in regions as diverse as North America, Australasia and Central America. It is thus possible to evaluate the experience of secondary trading (see Box 4.2).

The evidence suggests that spectrum turns over about as fast as commercial property; between 3 and 10% of licenses changing hands every year. The data suggest that licenses are held as a strategic asset (for use by the licensee) rather than for speculative purposes. A number of transactions are the consequence of mergers and acquisitions, and some are intra-group asset transfers. Changes of use are comparatively rare, but several big transactions have been of this kind, especially on the boundary between broadcasting and mobile communications.

Has trading with flexibility caused interference problems? Given the limited experience so far, it is too soon to say anything definitive on this matter. Clearly, interference problems still persist in many countries, but most of these are due to illegal transmissions, rather than the complicated effects of change of use following secondary trading. Nor is there evidence of firms trying to "corner the market" in particular frequency bands by license acquisition. Indeed, given that many countries where trading is allowed also plan to authorize flexibility, cornering the resulting fairly wide market for interchangeable spectrum will be difficult.

Where there is excess demand for licenses, they can be assigned by lot (i.e. by randomly choosing winners from all qualified license applicants). If the licenses are potentially valuable, thousands or even millions might apply.

Box 4.2 Check-list for Implementing Spectrum Markets

A summary of steps to be taken to introduce spectrum trading.

- The rights and obligations associated with a tradable license are sufficiently clear, in relation to such things as duration, area and interference restrictions that buyers know they are getting.
- Where the licensee can change the use to which the spectrum is put there must be a suitable regime in place to regulate interference (e.g., one which limits emissions at the boundary) to protect other licensees from changes.
- Potential traders must be able to acquire information from a public register about adjacent licensees (those in neighboring areas or bandwidths). This is necessary to allow them to evaluate the consequences of their trades accurately.
- To reduce transactions costs, there must be a simple and clear procedure from registering licensee changes with the spectrum regulator.
- Procedures for scrutiny and reaction by the regulator must be in place to prevent or avert the consequences of trades which confer high levels of market power on firms acquiring licenses.

4.6.2. Unlicensed Spectrum

Spectrum that is free from centralized control where anyone can transmit without a license while complying with rules that are designed to limit or avoid interference is sometimes referred to as license-exempt or unlicensed spectrum. Unlicensed spectrum was, until recently, of little interest. However, more recently it has been debated more widely, as a result of:

- Deployments of new technologies in the 2.4GHz band, particularly W-LANs have been commercially successful, leading many to ask whether further unlicensed allocations would result in more innovation and deployments.
- The development of ultra wide band (UWB) and the promise of software defined radio (SDR) have led some to question whether these

technologies can overcome historical problems with unlicensed spectrum.

The spectrum commons involves unlicensed spectrum although in practice what is referred to as a spectrum commons can have varying degrees of management. License-exempt bands, e.g., the industrial, scientific and medical (ISM) bands, are an example of a spectrum commons with some management in terms of power restrictions on individual users as applied in the United States under the FCC Part 15 rules. In Europe there is a further degree of control in that devices used for communication in these bands must conform to certain technology standards (i.e. ETSI approval). So far this approach has only been used in limited bands for short range applications. However, significant innovation has emerged in these bands (e.g., WiFi) which have led some to call for more spectrum to be managed similarly.

Broadly, the same history is true in all countries. In the 1920s, essentially all spectrum was unlicensed. The confusion and interference this caused, especially among broadcast stations led to a licensed approach being adopted in the 1930s, although some spectrum was still set aside for unlicensed use.

Over time, the main unlicensed bands were those designated as ISM. These were bands where there was non-communications use of spectrum, for example, for heating purposes. Because this use generated interference, the ISM bands were often made available for unlicensed usage.

In determining the most appropriate regulatory policy regarding unlicensed spectrum, it is necessary to determine:

- Whether there is spectrum that is currently not congested or can be expected to remain uncongested and so could become unlicensed.
- Whether there is spectrum that is congested, but only because of inefficient usage; and where a change in management policy to unlicensed usage will remove the congestion.

There are many factors that influence congestion. Some of these are caused by suboptimal allocation policies and can be expected to be gradually alleviated by the introduction of trading. Some are caused by allowing the use of equipment that is inefficient in its use of spectrum. The other factors influencing congestion are the bandwidth and time of transmissions. These mostly depend on the usage.

Having decided on the most likely use, spectrum should be subject to licensing where any of the following hold true:

1. The band is likely to be congested. Examples of such services are mobile cellular and broadcasting.
2. A guaranteed quality of service (QoS) is needed. This is the case, for example, with most public safety communications.
3. International treaty obligations provide restrictions that would be breached by operation on a license-exempt basis either now or at some known point in the future.

Without regulatory intervention, the problem of dealing with congestion can not be practically resolved. Equipment will only be made efficient to the extent that it is necessary for that piece of equipment to operate reliably and not for the greater good of all the users of the band.

Table 4.2 U.K. Unlicensed Bands

FREQUENCY BAND	APPLICATION
9 kHz to 30 MHz	Short Range Inductive Applications
27 MHz	Telemetry, Telecommand and Model Control
40 MHz	Telemetry, Telecommand and Model Control
49 MHz	General Purpose Low Power Devices
173 MHz	Alarms, Telemetry, Telecommand and Medical Applications
405 MHz	Ultra Low Power Medical Implants Devices
418 MHz	General Purpose Telemetry and Telecommand Applications
458 MHz	Alarms, Telemetry, Telecommand and Medical Applications
864 MHz	Cordless Audio Applications
868 MHz	Alarms, Telemetry and Telecommand Applications
2400 MHz	General Purpose Short Range Applications, including CCTV and RFID. Also used for WLANs including Bluetooth Applications
5.8 GHz	HyperLANs, General Purpose Short Range Applications, including Road Traffic and Transport Telematics
10.5 GHz	Movement Detection
24 GHz	Movement Detection
63 GHz	2nd Phase Road Traffic and Transport Telematics
76 GHz	Vehicle Radar Systems

In summary, many observers conclude that spectrum should be unlicensed if it were unlikely to be congested. Still, there is no definitive way to predict congestion. A judgment needs to be made on the basis of the frequency band, likely use and range. The range in turn depends on the use. Hence, a key stage in predicting the congestion likely in the band is determining the most likely use.

The Ofcom Spectrum Framework Review in 2004 examined the potential for greater sharing and use of License Exempt (LE) bands and determined that utilization of certain LE bands was less than optimal. For example, in the case of the 2.4 GHz License Exempt Band, utilization was in the order of 10%.

Table 4.2 shows the currently unlicensed bands in the United Kingdom.

4.6.3. The Digital Dividend

Switching from analog to digital terrestrial TV releases a significant amount of the radio spectrum that can be used for new uses. This so-called Digital Dividend arises because of the greater compression that is possible with digital signals. Past and current analog signals utilized the entirety of the radio spectrum; however, newer digital signals require less of the spectrum in order to provide the same services.

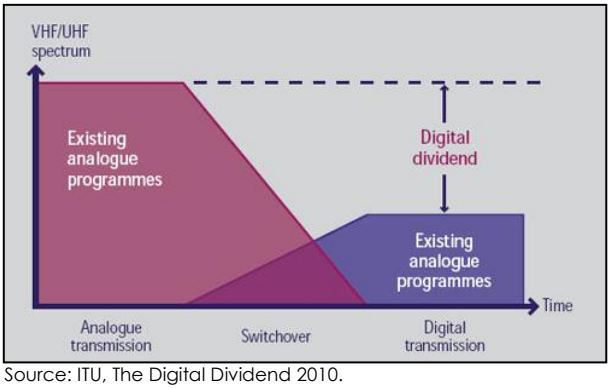
The switchover will therefore free up a significant amount of spectrum (primarily in the UHF band), creating a unique opportunity as a result of:

- superior propagation characteristics of the UHF band and the amount of spectrum that is potentially available;
- the wide range of potential uses of the spectrum; and,
- the potential role in creating economic growth and new employment opportunities.

What is the Digital Dividend?

Digital compression allows the transmission of several (up to eight, depending on the coding and modulation techniques) standard digital television channels in the radiofrequency spectrum previously used by a single analog channel. Typically, four or five terrestrial analog services in a given region will be digitized into a single digital television channel thereby considerably reducing the overall use of spectrum (see Figure 4.2). The gain could be even more substantial if more advanced standards are adopted (e.g., DVB-T2 for infrastructure and MPEG-4 for compression).

Figure 4.2 Digital Dividend Spectrum



Source: ITU, The Digital Dividend 2010.

Using the Digital Dividend

The Digital Dividend denotes a specific part of the spectrum that varies somewhat by country and region but broadly exists between 200MHz to 1GHz (see Figure 4.1). This range denotes a better-quality signal that requires less infrastructure while providing greater mobile coverage, particularly in rural areas, and at a lower cost. However, mobile coverage is just one potential benefit. Other potential uses include:

- New mobile services, with high quality video and interactive media delivered to handheld devices.
- Wireless broadband services, with high-speed data and voice services.
- Advanced business and broadcasting services, e.g., to support major sporting events.
- Additional television channels, including High Definition (HD) TV

Allocating the newly available spectrum has become an international issue and new services and technologies which is challenging policy makers. Achieving a fair and well-balanced reallocation of the spectrum between mobile broadband, broadcasting and ICT industries is necessary to ensure that society reaps the full social and economic benefits of the Digital Dividend.

Harmonization

The switch from analog to digital is happening throughout the world. While countries and regions have their own timetables for the conversion, there

is a general consensus concerning the necessity of the switch. (i.e. the United States completed switchover in June 2009; the switch should be complete throughout the European Union by the end of 2012; Japan by July 2011; Ghana: by 2013).

A major success at the ITU World Radiocommunication Conference in 2007 (WRC-07) was agreement on globally harmonized spectrum, including:

- 450−470 MHz band
- 698−862 MHz band in Region 2 and nine countries of Region 3
- 790−862 MHz band in Regions 1 and 3

The 2012 World Radiocommunication Conference (WRC-12) will discuss how mobile and other services can share the band 790-862 MHz in Regions 1 and 3, to ensure the adequate protection of services to which this frequency band is allocated.

The European Commission adopted a Decision in May 2010 establishing harmonized technical rules for EU Member States on the allocation of radio frequencies in the 800 MHz band that contribute to the deployment of high-speed wireless internet services by avoiding harmful interference. In several Member States the 800 MHz frequencies are being freed up as part of the Digital Dividend resulting from the switchover from analogue to digital television broadcasting. If Member States decide to change the existing frequency allocation (for broadcasting) they must immediately apply the harmonized technical rules laid down by the Decision to make these frequencies available to wireless broadband applications. The decision does not itself require Member States to make available the 790-862 MHz band for electronic communication services, although this is under consideration.

CHAPTER 5. FROM CAPACITY TO CONNECTIVITY: NETWORK ACCESS AND INTERCONNECTION

CHAPTER 5. FROM CAPACITY TO CONNECTIVITY: NETWORK ACCESS AND INTERCONNECTION

5.1. Introduction

Chapter 5 focuses on network access and interconnection as a basis for expanding connectivity. It explains why network access and interconnection are important and why they need to be regulated. Different forms of interconnection are defined and regulatory mechanisms such as unbundling and infrastructure sharing are examined. Interconnection pricing is discussed, including long run incremental cost modeling. The chapter also covers cross-border interconnection, the accounting rate system and international mobile roaming. It concludes with a look at new paradigms and challenges, such as the growing use of voice over IP.

5.2. Access and Interconnection

There are many situations in the ICT industry in which networks must be linked with each other in order to provide access to services for customers. This section first defines interconnection and then outlines the different forms it may take. The importance of interconnection and network access are then considered and the reasons why regulation of interconnection is sometimes necessary are explored.

5.2.1. Defining Interconnection?

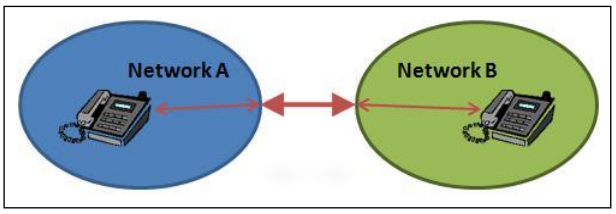
The World Trade Organization defines interconnection as:[10]

> 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, where specific commitments are undertaken.

As technology has changed and competition has intensified, many forms of interconnection have evolved. All involve the linking of networks to enable customers of one network to communicate with customers of another network or to have access to services offered by another network operator. Examples of these different forms of interconnection are described below and shown in Figures 5.1- 5.6 (source: ICT Regulation Toolkit):

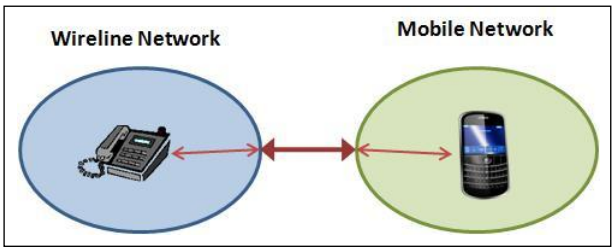
1. Two adjacent, non-competing telephone networks interconnect so that subscribers on one network can call those on the other (see Figure 5.1).

Figure 5.1 Adjacent Telephone Networks



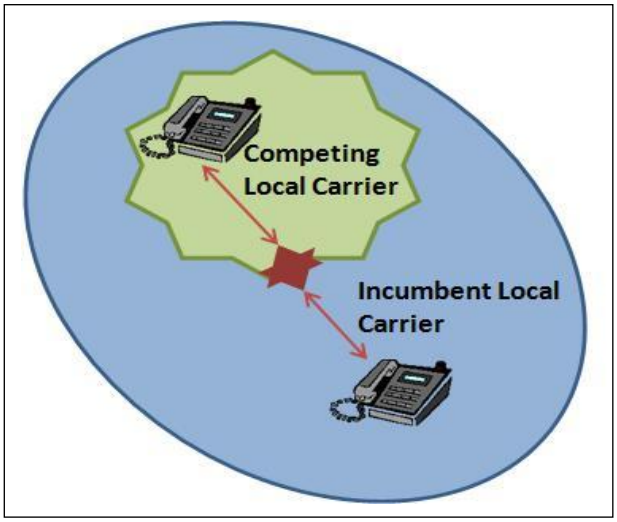
2. Traditional wireline telephone and new wireless mobile carriers interconnect so that subscribers of the traditional phone service can call wireless subscribers, and *vice versa* (see Figure 5.2).

Figure 5.2 Wireline Carrier and Mobile Carrier



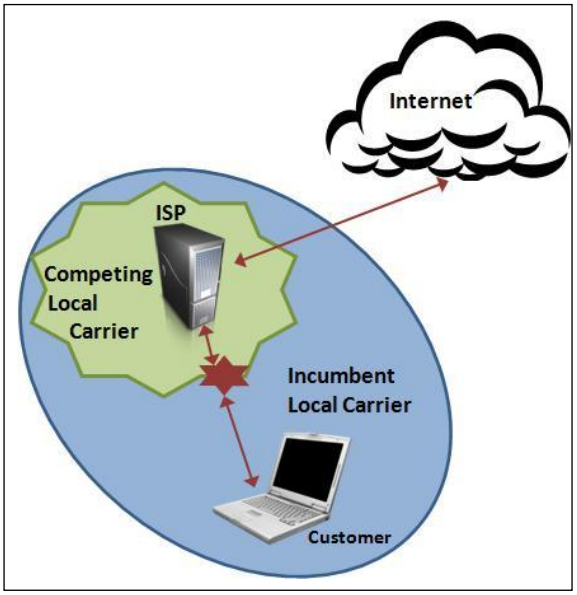
3. New competitive local telephone carriers interconnect with the incumbent carrier so they can attract subscribers in the common service territory, and enable those subscribers to call subscribers on the incumbent's network. Such competitive local carriers may also lease specific network elements from the incumbent (see Figure 5.3).

Figure 5.3 Competitive Local Carrier and Incumbent Location Carrier



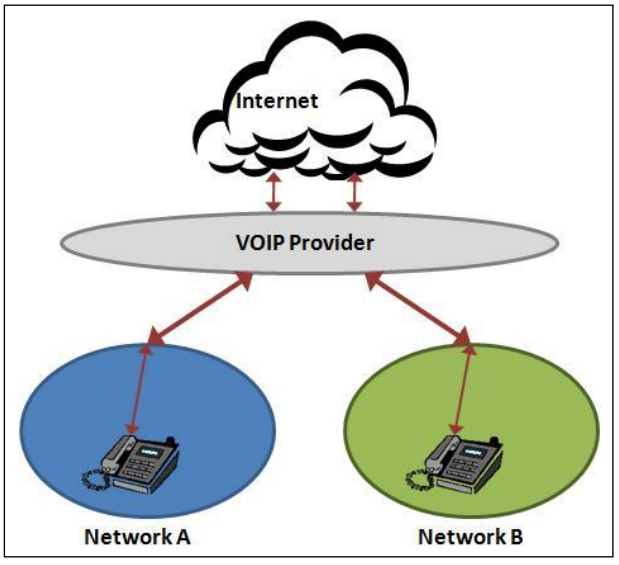
4. Customers of the incumbent telephone carrier make calls to their dial-up Internet Service Provider, which in turn is a customer of a competing local carrier (see Figure 5.4).

Figure 5.4 ISP Connected to a Competing Local Carrier



5. Firms offering a service in which part of the call is routed by Voice over Internet Protocol (VoIP) interconnect with traditional local service providers to complete the call (see Figure 5.5).

Figure 5.5 Competing Operator Routes Calls Using VoIP



Box 5.1 Interconnection Principles Contained in the WTO Regulation Reference Paper

This box outlines the principles applicable to interconnection that are contained in the World Trade Organization (WTO) Reference Paper (see Appendix A).

Section 2 of the Reference Paper addresses interconnection. Section 2.1 states that the interconnection provisions apply "to linking 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, where specific commitments are undertaken."

Section 2.2 of the Reference Paper states that interconnection with a major supplier must be "ensured at any technically feasible point in the network." This interconnection must be provided:

- on non-discriminatory terms, conditions (including technical standards and specifications), and rates;
- on a quality of service no less favorable than the major supplier provides for its own like services, the like services of its subsidiaries or other affiliates, or the like services provided to any other non-affiliated service supplier;
- in a timely fashion on terms, conditions (including technical standards and specifications), and cost-oriented rates that are transparent and reasonable having regard to economic feasibility;
- on a sufficiently unbundled basis so that the connecting supplier is not required to pay for network components or facilities that it does not require for the service it is purchasing; and
- upon request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of additional facilities necessary to accommodate the request.

Pursuant to section 2.3, the procedures for interconnecting to a major supplier must be made publicly available. In order to promote transparency, section 2.4 requires that major suppliers make either a reference interconnection offer or its interconnection agreements publicly available.

The provisions on interconnection also include requirements relating to dispute resolution. Section 2.5 provides that an interconnecting service supplier must have recourse to an independent domestic body to resolve disputes regarding appropriate terms, conditions, and rates for interconnection within a period of reasonable time.

5.2.2. The importance of access and interconnection

ICT service providers need access to networks owned by others in order to provide services to their customers. Without interconnection, a customer cannot call subscribers on other networks or access Internet content located on another network.

Thus, networks interconnect with each other for a number of reasons:

- To provide a service that is not economically feasible without interconnection, e.g., calls to customers on another operator's network.
- To increase profitability. Where interconnection increases the value of telecommunications services, or the range of services operators can provide, it can be in the mutual interest of the operators to interconnect.
- To expand or improve services that are valuable to customers.

Interconnection has been important for telecommunications providers since the invention of the telephone. Even before competition emerged, adjacent carriers interconnected with each so that their customers could make long distance and international calls.

With recent technological developments the range of services that depend on interconnection has increased. Interconnection is an essential element of local, long distance and international fixed voice calls, mobile voice and data services, satellite services, Internet access, e-mail and message services, broadband data transmission, and a wide range of multi-media services.

5.2.3. The Need for Regulation

Telecommunications operators will interconnect voluntarily in some circumstances. If two operators are not in direct competition with each other, then generally they will have an incentive to interconnect. This is because interconnection increases the value of a network to its subscribers, by increasing the number of people they can call and the range of ICT services they can access, the so-called network externalities argument.

Sometimes incumbent operators will have little incentive to allow access to their network, or to allow access on reasonable terms. Where the interconnection seeker is a potential competitor, an

incumbent may seek to limit competition, and preserve its market power, by:

- Refusing to interconnect,
- Offering interconnection at a price, or on other terms, that make it difficult for an efficient entrant to compete, or,
- Seeking to "sabotage" the entrant by providing a lower quality interconnection service to the entrant than the incumbent provides itself.

In these cases regulatory intervention is necessary. The motivation for interconnection regulation is that efficient competition in "downstream" markets would be difficult, or even impossible, unless entrants can access the incumbent's network at appropriate prices, terms and conditions.

For example, the European Union's 2009 *Better Regulation Directive*, which overhauled the 2002 Access Directive, empowers National Regulatory Authorities to impose on operators with significant market power obligations for access or interconnection in pursuit of competitive markets.

In any market, regulation needs to be able to adapt to changing circumstances. This is especially important in the ICT industry, where outdated regulation risks stifling market growth and innovation.

5.3. Forms of Interconnection

Here we introduce several key concepts in interconnection:

- One-way and two-way interconnection
- Unbundling, facilities sharing and co-location
- Asymmetric interconnection regulation.

5.3.1. One-way and two-way interconnection

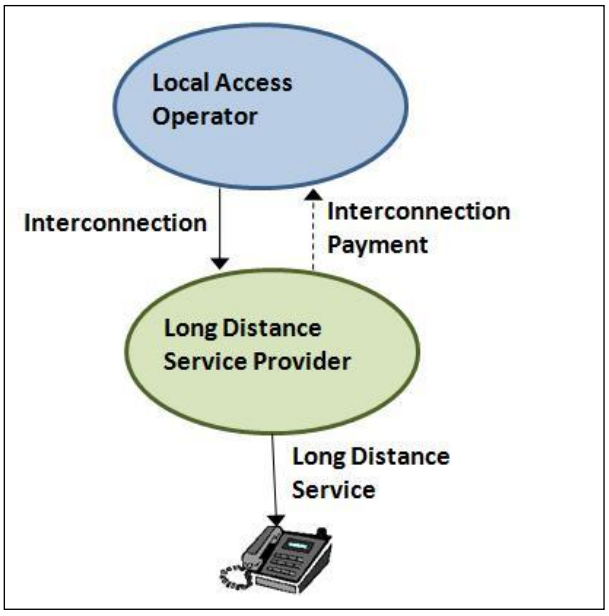
There are two broad forms of interconnection: one-way interconnection and two-way interconnection.

One-way and two-way interconnection can co-exist. For example, new entrants often obtain parts of their networks from the incumbent carrier (one-way interconnection), and then exchange traffic with the incumbent (two-way interconnection).

One-Way Interconnection

One service provider or carrier must obtain inputs from another carrier in order to offer services to its customers (see Figure 5.6. The carrier supplying the inputs may or may not compete with the firm purchasing the inputs.

Figure 5.6 One-Way Interconnection



Source: ICT Regulation Toolkit.

For example, prior to 1996, local exchange carriers in the United States were prohibited from offering long-distance services. Long-distance carriers such as AT&T, Sprint and MCI obtained access from these local exchange carriers, to offer long-distance services to customers on the local exchange network.

Payment for one-way interconnection is always from the interconnecting operator (in the example in Figure 5.6, the long-distance carrier) to the interconnection provider (the local exchange carrier).

Two-Way Interconnection

In two-way interconnection, two or more carriers must connect their facilities (networks) so that customers of one carrier can call customers served by other carriers, and *vice versa* (see Figure 5.7).

Two-way interconnection also occurs in other industries. For example, credit cards such as VISA and MasterCard are provided over interconnected networks of member banks and participating merchants. Cardholders, member banks and merchants pay fees to access a credit card network.

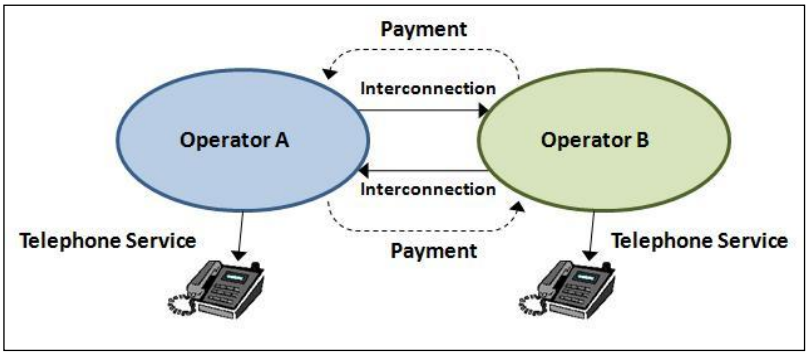
5.3.2. Asymmetric interconnection

Interconnection regulation can apply equally to all telecommunications carriers (symmetric regulation) or to incumbent carriers only (asymmetric regulation).

Asymmetric interconnection regulation is very common. The rationale for asymmetric regulation is to redress the consequences of market power. Asymmetric regulation does this by placing additional requirements on incumbent or dominant operators that might otherwise be able to prevent or deter competition.

For example, United States and Canadian regulators impose an interconnection obligation on all firms classed as telecommunications carriers. However, only incumbent firms are required to unbundle and share network components.

Figure 5.7 Two-Way Interconnection



Source: ICT Regulation Toolkit.

Asymmetric regulation can be useful in addressing existing imbalances in ICT markets. However, the need for asymmetric regulation should be kept under regular review. As market conditions change, new firms may enter the market, new competitive services may emerge, and market power can be eroded. Where this occurs, regulators need to reconsider the justification for asymmetric regulation and, if market power is no longer a concern, remove the additional requirements.

5.3.3. IP Interconnection

Traditional telecommunication operators are now moving beyond the public switched telephone network (PSTN) into IP-based, full-service networks, which are generally known as next-generation networks (NGNs). Telecommunication operators can use these NGNs to deliver a package of voice, data and video offerings, all using the same core network hardware.

Following the PSTN model, many operators want to control the entire network value chain – in other words, they want to build end-to-end networks, including trunking and access elements. This means that many NGNs are deployed with control and service-layer functions that resemble the closed systems of PSTN operations. These types of networks can be referred to as the closed network model.

Meanwhile, many Internet service providers (ISPs) are also building broadband, IP-based networks that allow them to compete head-on with telephone operators by offering their own packages of voice (often VoIP), video and data. The ISP model, however, more closely complements and resembles the open Internet, with the "intelligence" and control of the network decentralized and powered by intelligent terminal equipment (i.e. computers, handsets or set-top boxes). This model, which can be termed the open network model, can be viewed as simply providing a more powerful, digital on-ramp to the existing (and growing) global Internet.

Currently we are at an evolutionary stage that features both models:

- The operator-managed, closed network model, which is successor of the legacy, public-switched telephone network (PSTN); and
- The ISP-derived, decentralized, open network model, which is an improvement on the best-effort IP-based network.

For regulators this raises several questions. Can these different types of networks coexist? Can they

interconnect? How will they evolve? The answers to these questions are important because of the value that can be unlocked through interconnection and the resulting ubiquity of information and content. It will be crucial to avoid a situation in which people are stranded on legacy networks that can carry only voice – while high-value customers shift to broadband IP networks. Similarly, regulators will want to avoid a perpetual NGN monopoly operated by an incumbent that will not interconnect with, or provide access to, ISPs.

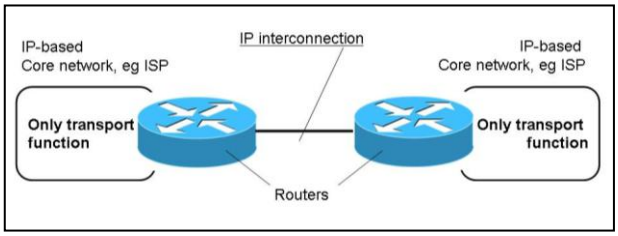
Interconnection between Best-Effort IP Networks

When describing interconnection between IP networks we naturally point to interconnection arrangements that are taking place in the Internet environment, where IP networks were first introduced and interconnected.

To visualize the interaction between various protocols in packet-switched networks (including IP networks), it is common to refer to a layered model.

This allows one to envision the operation of the protocols occurring within each layer, as well as the functions that occur at each layer. The TCP/IP suite of protocols is the most widely implemented among IP networks (see Figure 5.8). ISP networks are classical examples of IP networks that are based on the TCP/IP model.

Figure 5.8 Interconnection between Packet-Switched Networks



Source: GSR, Coexistence of Traditional and IP Interconnection, 2009.

Routers perform just a transport function, so interconnection between those network elements ensures connectivity between two networks, without any reference to the services that may be provided over the point of interconnection. Provision of IP interconnection, therefore, may be considered both "connectivity oriented" and "service-antagonistic". When negotiating IP interconnection, ISPs consider only transport specific performance objectives (for example, delay or packet/loss ratio). Service provision and connectivity are fully separated within the TCP/IP model – a separation that is easy to see in practical terms on the Internet. Because different services may be provided over IP-based networks, those networks are not considered service-specific and are usually referred to as open networks.

In contrast to open, IP-based networks, PSTN networks have service and transport layers that are closely linked. Here, interconnection is implemented with the idea of providing a particular service, such as voice telephony. PSTN networks, therefore, can be termed "service-specific" because they are designed to provide particular services. Compared with the Internet, independent introduction of third-party services to PSTN end users is difficult, if not impossible; hence, legacy telco networks are usually called closed networks.

Interconnection between IP-based and PSTN networks

With the emergence of Voice over IP (VoIP) service, IP-based network providers are now able to compete with telco operators in offering voice services. Because both telco and IP-based networks use different technologies, however, they cannot be interconnected directly. As of today, those networks are interconnected through two intermediate elements that ensure voice and signaling translation: media gateways (MGWs) and signaling gateways (SGWs). Both MGWs and SGWs are usually incorporated into one piece of equipment, often known as simply a gateway. Gateways are owned by one of the interconnected operators -- usually the operator of the IP-based network. The use of gateways has essentially resolved interoperability challenges, making interconnection between telcos and IP-based networks widespread.

5.3.4. Unbundling

In this section the question of network is explored and several key questions are addressed:

- What is unbundling?
- Why should regulators require unbundling?
- How much unbundling should be mandated?
- What are the costs and benefits of unbundling?

What is Unbundling?

Unbundling is the mandatory offering by network operators of specific elements of their network to other operators, on terms approved by a regulator or sanctioned by a court.

Unbundling goes further than imposing an obligation on incumbents to offer interconnection services to entrants. It requires the incumbent to allow entrants to lease certain individual building blocks that make up a telecommunications network.

Unbundling of network elements allows competing operators to enter the market and roll out services with considerably less sunk investment in some or all components of a competing network, e.g.:

- A new entrant might initially install switches in central business districts only, and lease those components of the incumbent carrier's network needed to directly serve customers in other areas, or
- An entrant might lease just those network elements needed to offer competing retail services (such as DSL services). In this way the entrant can offer competing services to customers without duplicating all components of the incumbent carrier's infrastructure, and without simply reselling the incumbent's service offering.

Unbundling usually requires facilities sharing or collocation, where the incumbent operator houses the communications equipment of competing operators to facilitate connectivity, or permits entrants to share infrastructure such as cell-site masts, cable ducts, or telephone poles. One example of facilities sharing is the policy adopted by the Malaysian Communications and Multimedia Commission, whereby operators granted 3G licenses have agreed to share their infrastructure with mobile virtual network operators. Infrastructure sharing is intended to facilitate improved coverage and service by allowing operators to share the risks of investment in emerging markets in the utilization of fixed network assets (see Chapter 5.3.5). Unsurprisingly, operators are reluctant to share network assets that they view as strategic.

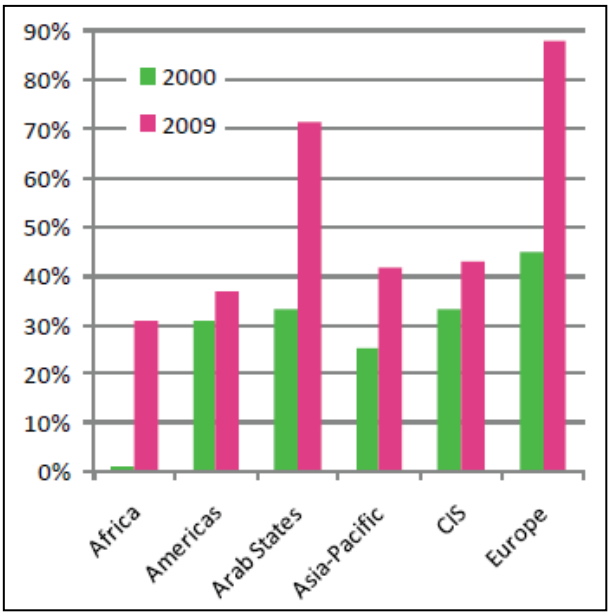
Nevertheless, countries that have opened up their basic service markets to competition tend to show higher broadband and Internet take-up. All regions have made progress in requiring unbundling with Europe and the Arab States leading the way (see Figure 5.9). In Europe, the countries with the fastest market growth are those that have effectively:

- Mandated unbundling (full unbundling, shared access, wholesale: bitstream and resale);
- Encouraged the provision of "naked DSL", as in the case of France; and
- Promoted alternative infrastructures, as in Denmark, Finland, the Netherlands and the United Kingdom.

Why Require Unbundling?

The rationale for unbundling is similar to that for interconnection regulation more generally. Some inputs are available only from certain network operators, and cannot easily be duplicated. Unless those inputs are available at appropriate prices, competition in downstream telecommunications markets would be difficult or impossible.

Figure 5.9 Requirements for Unbundled Access to the Local Loop



Source: ITU World Telecommunication/ICT Indicators database.

The emergence of competition from alternative technologies – such as wireless, cable telephony, and VoIP – is eroding this rationale for mandatory unbundling.

Unbundling can be an enormous task for regulators. The administrative costs of defining, and setting prices for, a range of network elements can be high. In addition, unbundling can impose high compliance costs on incumbent carriers. Regulators should carefully consider the merits of unbundling on a case-by-case basis, with a thorough assessment of the likely costs and benefits.

How Much Unbundling?

There are a range of options for unbundling interconnection services.

Under full **unbundling**, the incumbent must offer a separate fully unconditioned local loop service. This provides access to raw copper local loops, and subloops.

Under **shared access** the incumbent must provide access to the non-voice frequencies of a local loop and/or access to space within a main distribution frame where DSLAMs and similar types of equipment can be interconnected to the local loop.

Under **bitstream access for high-speed access** services, the incumbent must furnish and lease to other carriers links capable of providing high speed services.

The extent of unbundling has significant effects on the development and nature of telecommunications competition. If there is not enough unbundling, entry by efficient competitors may be inhibited. If there is too much unbundling:

- Entrants may focus on arbitrage opportunities, by obtaining services at attractive wholesale prices and reselling them to customers, instead of designing innovative product mixes that give customers greater choice
- Entrants may delay investing in infrastructure and focus instead on expanding re-bundled services as quickly as possible
- Incumbents may have fewer incentives to invest in unbundled parts of the network. This can lead to inadequate capacity, lower quality, and slower development of new technology (such as high capacity broadband).

Owing to the scale of the task, there has been a recent trend towards unbundling only those elements of a network that can be considered part of a natural monopoly. For example, In the United States, the Telecommunications Act of 1996 required all telecommunications carriers to interconnect to exchange traffic. The Federal Communications Commission's initial approach was to require incumbent local exchange carriers to unbundle extensively. It has since narrowed its approach to require unbundling of a more limited set of network elements. For example, incumbent local exchange carriers are no longer required to unbundle switching equipment (see Box 5.2).

Some jurisdictions require incumbent operators to only unbundle network components that are termed essential facilities, e.g., the Canadian Radio-television and Telecommunications Commission used the essential facilities approach when it required unbundling of local loops but not end-office switching, as switches were competitively supplied.

The ITU has developed guidelines for the West African Common Market that recommend that dominant operators (typically incumbent carriers with significant market power (SMP) should be required to provide new entrants with access to copper pairs (full local loop unbundling). The guidelines suggest that unbundling begin with shared access with full unbundling scheduled for a later stage. The guidelines also note that bitstream access may be an attractive option for ISPs because it does not require collocation.

Costs and Benefits of Unbundling

There is considerable debate over the costs and benefits of unbundling. Table 5.1 summarizes the potential costs and benefits, as put forward by regulators and incumbent carriers. The magnitude of these costs and benefits will vary depending on:

- The form of unbundling, and
- Whether regulated prices for unbundled network elements reflect economic costs.

Table 5.1 Benefits and Costs of Unbundling

BENEFITS	COSTS
Increases, and brings forward, entry by reducing entry costs Increases competition in the provision of services supported by the existing network Can bring forward the introduction of new services that rely on the incumbent's network technology (such as *DSL services*) and competition in those services	Potentially high administrative and compliance costs (costs increase with the extent of unbundling) May reduce incentives for incumbents to invest in new infrastructure. Enables incumbents to obtain legislative and regulatory relief, by making investment in NGN contingent on such relief May reduce incentives for entrants to invest in new infrastructure. Entrants may focus on reselling the incumbent's services, instead of designing innovative new service offerings

***Box 5.2** United States: Unbundling - Revised Rules for Unbundling, March 2005*

The FCC's original rules were the subject of ongoing litigation. After several court decisions that declared the FCC's unbundling rules inconsistent with the Telecommunications Act, in 2005 the FCC limited the number and types of elements that must be unbundled on a mandatory basis.

The new rules substantially reduced the unbundling obligations in several market segments, and adopt a more rigorous standard for determining when a requesting carrier is impaired. The new impairment standard focuses on the question of whether the absence of an unbundled element would impose a barrier to entry to an efficient competitor, which is large enough to make entry uneconomic.

In contrast to the original rules, the new rules severely reduced the number and types of elements that ILECs must unbundle on a mandatory basis. In particular, the FCC:

- Removed the mandatory requirement for ILECs to unbundle Fiber-to-the-Home (FTTH),
- Abolished line sharing as an unbundled element,
- Prohibited access to unbundled network elements (UNEs) for the exclusive service to mobile wireless services and long distance services, and
- Removed unbundled switching from the list of UNEs. This has the effect of removing the requirement that incumbents provide the UNE-P at TELRIC rates.

The most obvious effect of these changes is a substantial narrowing of the elements of the network subject to price regulation. This gives ILECs greater pricing flexibility. For example, ILECs now offer the equivalent of UNE-P at commercially negotiated rates.

The new rules also established a link between the duty to unbundle and whether alternative sources of supply are economically feasible. They do this by specifying a list of structural factors or impediments that regulators must consider when assessing whether a "reasonably efficient" competitor faces economic or operational impairment in a relevant market. These factors include scale economies, absolute cost advantages, sunk costs, first-mover advantages, and operational barriers within the control of the ILEC.

The new unbundling rules generally put an end to the initial country-wide unbundling rules for all network components in favor of more differentiated approach. Impairment analysis was to be done on a granular basis, i.e. taking into account market specific variation, such as disparities in customer classes, geography, service and the state of competitive deployment in the relevant geographic market. One important exception is the ordinary local loop, for which CLECs are generally viewed as impaired without access to such facilities.

Under the initial rules, impairments were restricted to the core services offered by CLECs in competition with ILECs. In contrast, the new impairment rules are applicable to any telecommunication service with the exception of mobile wireless services and long distance services. This change reflects the FCC's finding that workable competition has already developed in these markets, without access to unbundled network elements.

Sources: Vogelsang, 2005; Bauer, 2005.

Functional Separation

One possible safeguard is to require a "functional separation" for operators that are required to provide wholesale inputs to competitors. This means that separate business units with separate accounting are created for the firm's retail offerings and wholesale offerings. The wholesale business unit would sell to the retail business unit on the same terms and conditions as to competitors for the retail services. This idea could find application in situations where infrastructure competition is not likely to develop soon and, thus, the best hope for competition in the near term is service competition. The main advantage of a functional separation safeguard is that it would show clearly if the retail business unit was profitable while paying the interconnection or unbundled elements charges that its retail competitors must pay. However, it may be possible to achieve this by less dramatic means, through the use of accounting or imputation tests to see if retail services are profitable. A disadvantage of functional separation is that the wholesale entity charged with operating the actual infrastructure that all competitors are using may not perceive itself to have strong incentives to invest in greater coverage and better technologies. However, this disadvantage may come more from the requirement to share network elements with competitors and not necessarily so much from the separation requirement itself. Broadly speaking, functional separation should be viewed as a last resort owing to the complexity and high cost of implementation.

Less radical solutions include accounting separation and operational separation.

One operator that has been required to implement functional separation is British Telecom with its Openreach subsidiary. Openreach's website describes the degree of separation it has from BT as follows:

- Separate disclosure of financial results
- No BT Group element to Openreach incentive plans
- Headquarters team in separate accommodation
- Introducing separate operational support systems
- Strict Code of Practice to be followed by all employees
- Strict rules about sharing information in an equivalent way with ALL Communications Providers
- Own identity (the Openreach wordmark)

5.3.5. Sharing Infrastructure

Infrastructure sharing is rapidly becoming an important means of promoting universal access to ICT networks and offering affordable broadband services by reducing construction costs. In light of under-developed markets and the high costs associated with network deployment, carefully crafted sharing policy measures can introduce new forms of competition into the market and stimulate demand for ICT services.

There are a number of concepts that are central to understanding the policy and regulatory framework governing sharing. These concepts include: passive and active infrastructure; essential (or bottleneck) facilities; and open access. This section provides a brief overview of these concepts.

Passive and Active Infrastructure

There are several different elements of ICT network infrastructure that can be shared (see Table 5.2). However, not all elements of the network infrastructure can or should be approached in the same manner. In order to develop frameworks for regulating the sharing of network infrastructure, it is helpful to conceptualize infrastructure as falling into two categories: passive and active infrastructure.

The easiest shorthand definitions of passive and active infrastructure are as follows:

- Passive infrastructure includes all the civil engineering and non-electronic elements of infrastructure, such as physical sites, poles and ducts (and also power supplies).
- Active infrastructure covers all the electronic telecommunication elements of infrastructure like lit fiber, access node switches, and broadband remote access servers.

Table 5.2 Passive and Active infrastructure Sharing – Examples

	FIBRE CORE NETWORKS	**MOBILE NETWORKS**
Passive Sharing	Poles, ducts, power supplies	Electrical cables, fiber optic cables, masts and pylons, physical space on the ground, towers, rooftops, or other premises, shelter and support cabinets, electrical power supply, air conditioning, alarm systems, and other equipment.
Active Sharing	Lit fiber, access node switches, broadband remote access servers	The Node-B (the base station next to an antenna), Radio Network Controller

Essential or Bottleneck Facilities

Essential facilities, or bottleneck facilities, are network elements or services that are provided exclusively or predominantly by a monopolist or a small number of suppliers and that cannot easily be replicated or substituted by competitors for economic or technical reasons. These types of facilities are critical inputs to retail service.

Open Access

Open Access means the creation of competition in all layers of the network, allowing a wide variety of

physical networks and applications to interact in an open architecture. Simply put, anyone can connect to anyone in a technology-neutral framework that encourages innovative, low-cost delivery to users. It encourages market entry from smaller, local companies and seeks to prevent any single entity from becoming dominant. Open access requires transparency to ensure fair trading within and between the layers, based on clear, comparative information on market prices and services.

Policy Issues

There are several policy issues associated with sharing. Some of the policy concerns relate to why sharing has become an important regulatory matter. These policy issues include:

- promoting rapid and efficient network deployment,
- the efficient rollout of next generation networks (NGNs), and,
- minimizing the environmental impact of ICT infrastructure and harmonizing network rollout with local land use planning.

Other policy issues relate to concerns about how sharing is implemented in the ICT sector. These policy issues include:

- preventing anti-competitive conduct,
- reducing wholesale interconnection and charges (which should in turn lead to lower retail usage charges), and,
- ensuring that sharing does not inhibit innovation in the ICT sector.

Promoting Rapid and Efficient Network Deployment

One of the most important policy concerns underlying the growing regulatory interest in sharing is the promotion of rapid and efficient network deployment. In many developing countries, the network in question is the mobile network, which is increasingly becoming the dominant form of infrastructure in these countries, as well as the backbone for the provision of universal access. In more developed and industrialized countries, the emphasis is on national broadband core and access networks and NGNs. Although the modes of sharing differ and although each network raises particular policy concerns, broadly speaking, sharing facilitates a rapid, less costly and less disruptive deployment of networks, whether the network is mobile, fixed broadband, or NGN.

Sharing helps to address three obstacles to efficient and timely network deployment: the high costs of network roll-out; restricted access to bottleneck facilities; and poor investment incentives, particularly in un-served or under-served areas.

Reducing the costs of network roll-out

Sharing can reduce the cost of network deployment. For example, in the case of mobile networks, civil engineering costs can mount up when the number of building sites is relatively high in the network roll-out. Site sharing allows operators to reduce their capital and operating expenditures. Lower site-development costs can pay dividends when they result in networks covering larger areas, increasing the likelihood of bringing wireless services to sparsely populated rural areas – and at more affordable prices.

Similarly, one of the most significant costs associated with the deployment of broadband fiber networks relates to the excavation of conduits and the installation of fiber for the access part of the network. This entails actual construction and installation costs as well as the cost of securing numerous permits such as digging permits and environmental permits. The shared use of ducts and poles, as well as other infrastructure, reduces an operator's physical deployment costs. Sharing is thus one dimension of creating an enabling environment for national core and access broadband networks.

Facilitating access to bottleneck facilities

The control of bottleneck facilities by a single dominant infrastructure operator tends to impede the development of new infrastructure, the expansion of competition, and market growth in general. The operator that controls these facilities (usually the incumbent) questions the commercial rationale for providing access to its infrastructure to its competitors. Mandated sharing of bottleneck facilities is a key strategy for opening up access to these facilities and thus for cultivating competition in downstream markets. Without mandated sharing, it is unlikely that incumbents would willingly offer access to their bottleneck facilities on commercially fair terms.

Low market investment

The high costs of deploying network infrastructure and low population density sometimes combine to impede investment in rolling out network services in rural and remote areas. In sparsely populated areas, the returns on investment in high capacity network

infrastructure are often too low to sustain commercial operations. Sharing can assist regulators and policy-makers address this problem in a number of ways.

First, as discussed above, sharing can reduce the cost of network deployment. Second, sharing can make a wider network roll-out more affordable which, in turn, creates a greater critical mass of users. In combination, the lower costs of network roll-out and the larger critical mass of users increase the return on expenditures, thereby generating incentives for investment. This is particularly critical when the costs of financing investment are high. In the case of un-served or under-served areas, policy-makers usually aim to create a greater critical mass of users by encouraging the roll-out of high-capacity, national infrastructure to a wider range of places than the market alone might initially sustain. Allowing two or more operators to share (and therefore to pay for access to) a common national infrastructure helps to finance a wider deployment, whereas traffic from a single operator would not sustain a widespread network.

Sharing, network deployment, and universal access

By facilitating quick and efficient network roll-out, sharing advances universal access policy objectives. In developing economies, sharing promotes network roll-out to un-served and under-served areas. In developed economies, sharing plays an important role in rolling out FTTx access and expanding broadband access to under-served areas, such as rural communities.

The Efficient Deployment of Next-Generation Networks

Sharing is increasingly playing a central role in the development and deployment of NGNs. The transition to an NGN environment requires significant investments as access providers and network operators must upgrade their equipment and build new network infrastructure (see Box 5.3). At the same time, convergence and the move to an IP-based network allow a variety of different types of services and applications to be provided over the same core and access infrastructure. Consequently, approaches to developing NGNs frequently feature the deployment of a single core network, with competition occurring in other layers of the network, such as the access, service, and application layers. Thus, these approaches typically are premised upon the sharing of the core NGN network infrastructure and often feature sharing at other levels as well.

Box 5.3 Deploying Open-Access NGNs in Singapore

Singapore is rolling out wired and wireless NGNs by creating national core networks that are operated by a single company but that are also open to access by operators and service providers active in other layers of the network. Singapore's strategic plan announced in 2006 (the Next Generation National Infocommunications Infrastructure or "Next Gen NII") involves the creation of a wired, open access, and carrier-neutral Next Generation National Broadband Network (Next Gen NBN) and an open-access Wireless Broadband Network (WBN). The Next Gen NBN and the WBN are to be built, owned, and operated by the private sector. The government has made clear that the operation of the Next Gen NBN and WBN will involve structural separation of the operator of the passive network infrastructure, the operator of the active network infrastructure, and the retail services provider. The government of Singapore has indicated that it will provide various amounts of funding to the operators of the passive and active infrastructure of the Next Gen NBN and WBN. The funding is intended to kick-start the project and to ensure that the ultra high-speed broadband service provided over these networks will be viable, affordable and sustainable in the long-term.

Source: ICT Regulation Toolkit.

5.3.6. Mobile Networks

In many countries, mobile interconnection is regulated and priced differently, depending on the form of interconnection. There are three broad forms of mobile interconnection:

- Fixed-to-mobile interconnection: A mobile network terminates a call from a fixed network. The call might originate from a local fixed operator, a domestic long-distance operator, or an international operator,
- Mobile-to-fixed interconnection: A mobile operator interconnects with a fixed network in order to complete calls for the mobile operator's customers. Again, the fixed network might be owned by a local fixed operator, a domestic long-distance operator, or an international operator,
- Mobile-to-mobile interconnection: A mobile operator interconnects with another mobile operator.

Mobile Termination Rates

There is no a unique treatment of mobile termination charges among countries. Some countries only regulate mobile termination charges for fixed-to-mobile calls. In other countries, mobile networks are required to apply a single regulated termination charge regardless of where the call originates.

Calling Party Pays

Under Calling Party Pays (CPP) the calling party, or the calling party's network, pays for the call. The recipient of the call pays nothing.

CPP is used in many countries to structure interconnection payments for fixed-to-mobile calls. Under the "old" CPP model, the mobile operator sets a fixed-to-mobile tariff. The fixed operator deducts specified charges from this fee (such as an origination charge, and billing and collection charges), and passes the balance of the call revenue to the mobile operator.

In recent years, some regulators have decided to regulate fixed-to-mobile tariffs, rather than leaving this to the mobile operator to determine. This generally reflects concerns that fixed-to-mobile tariffs are too high. This concern has also led regulators to control mobile termination charges.

Receiving Party Pays (Mobile Party Pays)

A minority of countries, predominately developed countries such as the United States, uses a system of receiving party pays or mobile party pays for interconnection with mobile operators. Under this system, the mobile user pays airtime on received calls as well as calls that user has initiated. This reduces the problem of setting interconnection charges to defining the costs of just the link between two networks, which generally is low and easily defined. Thus, countries using receiving party pays have largely avoided the problem of high mobile termination charges. This is a definite advantage of the receiving party pays system. Since a receiving party pays system requires the mobile user to pay directly for network usage on the mobile network, its main disadvantage is that it makes it difficult commercially to extend service to mobile users with low income levels, precisely where the calling party pays system has been most successful.

Regulation of Mobile Termination Rates

Regulation of fixed-to-mobile rates and/or mobile termination charges is usually justified on the basis that those prices are "too high" compared to a cost-based estimate, or to prices for outgoing mobile calls.

The premise is that mobile operators are able to sustain high fixed-to-mobile prices because they have market power in setting prices for fixed-to-mobile calls. This market power derives from the fact that the fixed subscriber who places a call to a mobile subscriber has no influence over which mobile network is used. Mobile subscribers make this decision when they decide to join a network. Under Calling Party Pays, mobile subscribers do not pay for fixed-to-mobile calls, so they may not take the price of these calls into account in selecting a network.

Many regulators now control mobile termination charges. There are several forms of such regulation:

- International benchmarking: In the absence of cost based data, regulators are increasingly relying on international benchmarking to set regulated mobile termination charges in their own countries,
- Rounding: Some regulators have introduced regulations requiring mobile operators to round each call to a lower unit of charging (for example rounding to the second when the charging unit is to the minute). The effect of this requirement is to reduce revenue from mobile termination,
- Cost-based termination charges: Regulators are increasingly pressuring operators to base mobile termination charges on long run incremental costs or fully allocated costs.

Other Pressures to Reduce Mobile Termination Rates

Market forces are also pushing down CPP rates and mobile termination charges. For example users are increasingly substituting mobile-to-mobile calls for fixed-to-mobile calls, creating additional pressure on mobile operators to reduce fixed-to-mobile rates and mobile termination charges.

United States' international carriers, supported by the United States government, are pressuring developing country operators to reduce international mobile termination rates. Because United States carriers are net exporters of telephone traffic to developing countries, a reduction in mobile termination charges would reduce their net interconnection payments to foreign operators.

5.3.7. Negotiating Agreements

To achieve successful interconnection, the following issues should be dealt with in the interconnection agreement or by rule or order from the regulatory authority:

Prices and adjustment of prices over time. This includes the initial level of interconnection charges, a definition of the currency in which interconnection charges are to be paid (this is especially complicated when retail prices are set in a local currency and interconnection is set in another currency), and how prices will adjust over the term of the agreement to account for exchange rate changes and inflation. The "ownership" of the call must be defined. For example, in mobile-to-fixed interconnection, one possible mode is for the call to be "owned" by the mobile operator, who sets the retail price and pays for interconnection and billing and collection to the fixed operator. Another mode would be for the call to be "owned" by the fixed operator, who would set the retail rate and pay the mobile operator an origination charge. Liability for bad debt and uncollectable bills should be defined.

Points of interconnection. The physical locations where interconnection will take place and the technical standards to be employed in the interconnection should be defined. A process for requesting and obtaining additional points of interconnection should be established. This is closely related to the issue of transport charges and traffic routing.

Transport (conveyance) charges and traffic routing. Some definition must be made for how calls will be routed. In other words, if there are multiple interconnection points defined, the proper routing and hand-off point for each type of call should be specified – otherwise, higher charges may apply to misrouted calls. The applicability of transport charges in the receiving network for calls that must be carried beyond the area local to the point of interconnection must be defined. If one carrier has requested interconnection in a particular area so as to avoid paying the receiving network for transport charges, and the interconnection point is not made available, sometimes a virtual point of interconnection is defined for that location whereby transport charges are not collected to bring calls to that area.

Frequently, incumbent operators prefer to offer as few as possible points of interconnection so as to maximize transport revenues. However, over time, entrants usually wish to build out their own networks and interconnect in more places so as to avoid paying the incumbent's transport charges.

Quality of service standards. Quality standards should be defined, particularly for time to provision circuits and for call blocking levels, and remedies should be specified should those standards not be met. Often, an incumbent provider will be required to provide at least as high a level of quality to interconnecting carriers as they provide to their own retail customers. Testing opportunities should be provided by each party.

Billing and collection. When and how to collect traffic data, when and how to exchange bills, and when and how to make payment should be specified. A process for reconciling traffic data and for making inquiries to the other party and for handling claims also should be incorporated. A procedure for resolving discrepancies is useful, which often involves seeking recourse to arbitration, the regulator, or to the courts.

Traffic measurement and settlement. Sometimes specific trunk groups are identified to carry different types of traffic so that each type of traffic can be billed for separately. However, these arrangements can be defeated and traffic could be disguised as the cheapest type of traffic. The responsibilities of each interconnecting operator to measure traffic need to be defined, as well as settlement procedures for when there are discrepancies over the amount of traffic measured. Obligations to cooperate in fraud detection and enforcement activities should be specified.

Numbering resources. Access of each operator to the country's numbering plan and numbering resources must be defined. It is particularly important that numbers be provided in a timely manner so that potential sales are not blocked. If number portability is to be part of the local regulatory regime, the terms of participation should be defined.

Forecasting network needs. Part of providing interconnection is having the available capacity to deliver and receive the traffic that flows between the interconnecting networks. To do so, a planning process must be followed between the interconnecting operators so that investment for additional capacity can be agreed, budgeted, and installed in time to meet the forecasted demand. Procedures to resolve differences over forecasts also must be defined as well as what constitutes a *bona fide* request for additional interconnection capacity.

At a minimum, a mutual obligation to notify the other party of network changes and upgrades well in advance is needed to avoid disadvantaging one competitor over another.

Access to customer information. By necessity, when completing calls and billing for them, interconnecting operators pass back and forth considerable information about each other's clients. Limits on the permitted uses of this information should be defined, particularly regarding the temptation to engage in marketing activities in approaching another operator's clients based on information obtained through interconnection activities. Safeguards are also necessary to protect customers' privacy.

5.4. Setting Interconnection Prices

5.4.1. Why is the Interconnection Price Important?

There is a consensus among economists and regulators that interconnection prices based on cost are most likely to lead to desirable outcomes. Measuring "cost" is challenging – there is no single correct interconnection price. However, if the interconnection price is set "too low":

- Inefficient competitors may enter the market,
- Entrants may look for opportunities to profit by purchasing services at low regulated prices and simply re-selling them, instead of developing innovative new product offerings, and
- Incumbent operators may not invest in the network or maintain its quality.

For many new entrants, interconnection is one of their largest costs. If the interconnection price is set "too high":

- It will deter entry by efficient competitors,
- In the case of two-way interconnection, carriers may concentrate on maximizing payments from other carriers, instead of focusing on providing services to retail customers, and
- Customers will be paying more than they need to.

Interconnection charges have generally been calculated by following either a paradigm of revenue sharing, or of interconnection usage charges. Revenue sharing means that the telecommunications operators involved in a call have agreed to share the revenues, on a percentage basis or some other agreed basis. They thus share the risk of billing disputes and bad debts. On the other hand, interconnection usage charges imply setting charges to compensate explicitly one operator for the costs imposed on them by the other operator's use of their network to originate or terminate a call. The operator paying the interconnection usage charge "owns" the call and takes the risk of disputed and unpaid charges. In addition, retail charges may be in one currency and interconnection usage charges may be in another.

Interconnection Pricing Objectives

Access and interconnection prices have several possible, not necessarily compatible, goals.

In general, interconnection prices should promote economic efficiency, of which there are three forms:

- Allocative efficiency requires that resources, products, and services are allocated to the person or persons who value them the most. For this to happen, consumers of final products or services (such as telephone calls to other customers) should pay prices that reflect the cost of the resources used to provide those products or services
- Productive efficiency requires that market participants use scarce resources as productively as possible. This means that the most efficient provider should not be precluded from serving customers, and
- Dynamic efficiency requires that all firms (entrants and incumbents) should have proper incentives to invest in technologies that reduce costs and/or expand product offerings.

Some countries have additional objectives telecommunications, such as:

- Actively promoting competition, by making it easy for new entrants to obtain interconnection. This sometimes takes the form of low interconnection prices, to encourage new entry
- Achieving universal service. Many jurisdictions have historically maintained charges for basic telephone services that are below cost. This is to encourage widespread subscribership. Recently, some countries have mandated high charges for call termination by wireless carriers. The aim is to keep charges to wireless subscribers low in order to encourage rapid uptake of wireless services.

Interconnection Pricing Principles

There is a general consensus that, where possible, interconnection prices should be based on the additional cost to the incumbent from providing interconnection services. However, it is difficult to strictly align prices with the cost of interconnection.

Broadly, three broad principles, or "pricing rules" are used to set interconnection prices:

- *Incremental cost pricing*. Interconnection prices are based on the forward looking, long-run incremental cost of providing interconnection (usually TSLRIC or TELRIC). Incremental costs are estimated using a suitable cost model.
- *Retail minus pricing*. This approach starts with the incumbent's retail price for the downstream service, and subtracts retail costs. The final interconnection price should also include any additional costs to the carrier that arise directly from providing interconnection services.

  The retail minus approach, or more formally, the Efficient Component Pricing Rule(ECPR) can be defined as:

  > Interconnection (Access) price = additional marginal cost of interconnection (access) + (Retail price – marginal cost of retail)

  The ECPR results in interconnection prices that are higher than incremental costs. ECPR prices incorporate the opportunity cost to the interconnection provider of customers lost to the entrant. This includes any contribution to shared and common costs and any foregone profits. For this reason, ECPR is controversial. Although it does encourage productive efficiency, it does not necessarily support the goal of allocative efficiency.
- *Bill and keep*. Bill and keep only applies to two-way interconnection. With bill and keep the calling party's network retains whatever revenue it raises through retail usage charges. Neither the calling nor receiving parties' networks pay each other – the interconnection charge is effectively zero. One advantage of a bill and keep policy is that it can be adopted quickly without the need to employ a cost analysis. This may be useful, for instance, in the case of a small, developing country needing an interim policy to facilitate interconnection between competitors while developing a policy based on cost analysis.

When the traffic exchanged between networks is roughly in balance, the net payments in either direction would be relatively small, approximating the result of a bill and keep regime. Accordingly, bill and keep has sometimes been limited to situations where such approximate traffic balance occurs, with positive payments to the terminating carrier when traffic is not reasonably balanced.

Specific pricing and charging considerations vary between one-way interconnection and two-way interconnection. The pricing principles in these cases derive from the general pricing principles already described.

Pricing Principles for One-Way Interconnection

The interconnection price should give the interconnection seeker incentives to purchase interconnection from the upstream carrier where this is the least cost option (for the economy as a whole). For this, interconnection prices should not exceed the cost of providing interconnection.

If the interconnection provider is vertically integrated, and competes with the interconnection seeker, then the interconnection price should be set so that the most efficient downstream provider has a legitimate opportunity to compete successfully. (For example, the combination of interconnection and retail prices should not result in a vertical price squeeze.)

Economic theory suggests that access prices can be set to offset imperfections in retail price levels, for example by:

- Setting access prices higher (or lower) than interconnection costs when retail prices are above (or below) cost, or
- Setting access prices below cost in order to offset market power in the downstream market (where market power would otherwise lead to downstream prices that are above cost)

Pricing Principles for Two-Way Interconnection

As already indicated, interconnection payments for two-way interconnection can be structured either as Calling party pays (CPP), Receiving party pays (RPP), or Bill and keep:

Models of two-way interconnection are very complex, and conclusions about how to charge for

two-way interconnection tend to be model-specific. Which approach is optimal depends on a range of factors, including:

- Assumptions about the distribution of the benefits from the call between the calling party and the call recipient,
- Whether or not traffic between the two interconnecting networks is approximately in balance, and
- Differences in costs between the two networks.

Trade-Offs in Regulating Interconnection Prices

Setting interconnection prices requires trade-offs between the complexity of pricing framework, its accuracy (how closely price tracks cost), and transaction costs for affected parties. Theoretically, optimal prices vary significantly depending on the assumptions made in the economic model.

Governments and regulators need to be pragmatic about interconnection regulation for three reasons:

- The direct regulatory costs of a detailed forward-looking cost regime may be significant: operators may hire engineers, economists and lawyers to put forward their views; the regulator must have enough resources to assess competing claims about cost; and there may be costly dispute resolution processes
- As regimes increase in complexity, operators and potential entrants are more likely to focus on arbitrage opportunities than ways to offer consumers genuinely new services
- There is no guarantee that detailed cost estimation approaches will be accurate.

5.4.2. Long-Run Incremental Cost Modeling

The economic cost of interconnection is generally the starting point in establishing economically efficient interconnection prices.

In many jurisdictions, regulators set interconnection prices based on long run incremental costs (LRIC). (Examples include Australia, the United Kingdom, the European Union, and the United States.) The most common form of LRIC is Total Service Long Run Incremental Cost (TSLRIC), known as Total Element Long Run Incremental Cost (TELRIC) in the United States.

There are numerous methods of estimating LRIC. Approaches to modeling LRIC can be broadly categorized as bottom-up and top-down modeling approaches. Bottom-up models include scorched earth or scorched node methods.

"Bottom-Up" Modeling

Bottom-up modeling uses detailed data to build a hypothetical network that can supply telecommunications services, including interconnection services. The costs of this network, including capital costs and operations and maintenance costs, are then allocated to all the services provided. Bottom-up modeling has the following steps:

Step 1: Define the services to be modeled (for example local access services). This step includes gathering data on the number and location of customers in the geographic area under consideration

Step 2: Determine the design of the network — what facilities are required to provide the service, and where should they be located? A PSTN generally includes: wires and support structures that connect customers to telephone switches (loop facilities); end-office and high-level switches; and facilities that connect the switches (transport)

Step 3: Determine the amount of each type of equipment needed to construct the network

Step 4: Estimate the costs of each element. For each type of equipment multiply the amount required by its unit prices to arrive at the total investment cost. (TSLRIC models usually use current "best-in-market" costs)

Step 5: Convert the total investment cost, for each network element, into an annual (or monthly) amount. This amount equals depreciation costs and cost of capital for the firm in question

Step 6: Estimate annual (or monthly) operations and maintenance costs and non-network costs. This includes direct out-of-pocket operating expenses associated with the investment and indirect expenses, such as corporate overheads

Step 7: Estimate total costs for each network element by adding the annual (monthly) amounts calculated in Steps 5 and 6

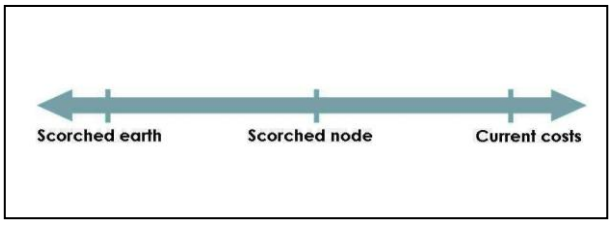
Step 8: Divide the total costs of each network element by the relevant cost-driver, to arrive at unit

costs. For example, use the number of lines to derive the unit costs for subscriber loops, or the number of minutes to derive unit switching costs.

"Scorched Earth" and "Scorched Node" Models

Designing the network to be modeled requires the regulator to make choices about how much optimization to include in the modeled network. These choices can be represented on a spectrum, as shown in Figure 5.10.

Figure 5.10 Approaches to Network Design in TSLRIC Models



Source: ICT Regulation Toolkit.

The scorched earth approach represents one extreme. It assumes that nothing is fixed, not even the location of the nodes. The scorched earth network is what an entrant would build if no network existed, based on the location of customers and forecasts of demand for services. This approach would give the lowest estimate of LRIC, because it removes all inefficiencies due to the historical development of the network.

At the other extreme, LRIC can be estimated from the current costs of the existing firm, using a top-down modeling approach. This will give the highest estimate of cost because it does not allow for optimization.

The "scorched node" approach to LRIC estimations represents a compromise between the two extremes. It assumes that the location of network nodes is fixed, and the operator can choose the best technology to configure the network around these nodes. Scorched node models are common internationally. Regulators in Australia, New Zealand, the United States, the United Kingdom, Austria, Switzerland, Denmark, the Netherlands, and Ireland have adopted the scorched node approach.

Regulators must make trade-offs between different objectives. Basing the estimate of LRIC on current costs would mean that entrants would pay more than the efficient costs, potentially reducing entry. Basing the estimate on a scorched earth approach is also problematic. It could deter the network operator from making investments that are efficient given the actual configuration of the network, since the scorched earth approach ignores the existing network configuration.

"Top-Down" Modeling

"Top-down" modeling attempts to measure LRIC starting from the firm's actual costs, as set out in its accounts. This method does not involve detailed network modeling. Instead, a top-down model separates the firm's assets and costs into service groups, and then adds the costs associated with interconnection to arrive at an estimate of LRIC. This usually involves the following five steps:

Step 1: Identify the firm's services and separate out interconnection services

Step 2: In the firm's accounts, identify and separate all costs and assets

Step 3: If a cost item or asset is attributable to only one service, allocate it to that service

Step 4: Use allocation rules to allocate shared and common costs between services

Step 5: Calculate LRIC for each service by adding up the costs allocated to that services, including an appropriate return on those assets allocated to the service.

"Top-down" modeling uses the firm's current operating costs and historic capital costs. These are not forward-looking costs. It is more difficult to take account of future changes in costs in a top-down approach than in a bottom-up approach that can incorporate explicit assumptions about technological change and its impact on the firm's choice of inputs.

It is possible to make adjustments to top-down approaches to remove inefficiencies in the firm's current network configuration and costs, but it is difficult to do so transparently. The incumbent firm will have more information about its historic performance and its accounts than the regulator or new entrants.

A comparison of the advantages and disadvantages of "Bottom-Up" and "Top-Down" Modeling approaches is shown in Table 5.3.

Table 5.3 Comparison of "Bottom-Up" and "Top-Down" Modeling

	BOTTOM-UP MODELS	TOP-DOWN MODELS
Advantages	Can model costs that an efficient entrant would face Flexible – can change assumptions readily Transparent – much of the information used is publicly available	Incorporate actual costs Useful for testing results from bottom-up model May be faster and less costly to implement, but this depends on how well categories in the financial accounts match the data required
Disadvantages	May optimize "too much" or omit costs. If this happens, the operator will be under-compensated and will reduce investment in the network Modeling of operating expenditure is usually based on simple margins instead of real-world costs Data needed for the model may not exist The modeling process can be time-consuming and expensive	Include the firm's actual costs, and so are likely to incorporate inefficiencies Less transparent – confidentiality issues mean other stakeholders may not have access to the information used The parties may dispute the cost allocation rules used (the rules used to allocate shared and common costs among specific services) Data may not exist in the required form

5.4.3. Benchmarking Interconnection Rates

Benchmarking has two main purposes in interconnection pricing. In situations where detailed cost models can be estimated, benchmarking can be used as a common sense check on the results of the modeling. Alternatively, benchmarking can be used directly to set interconnection prices.

Benchmarking is the process of establishing interconnection rates based on rates in other jurisdictions. For example, the rate charged to long distance carriers for terminating calls on a local network might be based on rates for this function in other jurisdictions.

Benchmarking can be useful to regulators if undertaken carefully. Undertaking a full forward-looking cost modeling exercise is challenging and time-consuming. In some markets the detailed information required may not be available. Regulators in many jurisdictions have used benchmarking to set initial interconnection rates (for example Botswana, New Zealand).

Where benchmarked rates allow competition to develop satisfactorily, rates based on benchmarking may be used for extended periods.

In a benchmarking exercise, adjustments need to be made for differences among jurisdictions, for example exchange rates, traffic patterns, or the cost of shipping network equipment.

5.5. Cross-border Interconnection

5.5.1. The Accounting Rate System

The accounting rate system was developed as a way to allocate revenue for international telephone services. The system is a series of arrangements between national operators in which the operators jointly provide international calls and divide the revenues from such calls between them.The accounting rate system provides a set of agreed prices for interconnection of international calls. The originating carrier charges the customer making the call a retail rate, and is charged the accounting rate for terminating the international call. As their name suggests, accounting rates do not always reflect costs.

If traffic flows along a route are balanced, the accounting rate system does not generate significant cash flows. However, for many less-developed countries, traffic on international routes is unbalanced — more calls are terminated in these countries than originate from them. As a result, the accounting rate system produced considerable revenue inflows to many less-developed countries.

Moving Away from Accounting Rates

The accounting rate system has come under pressure in recent years. The presence of competitive long distance providers has made it necessary for providers in other countries to deal with more than one correspondent. This has opened the gates to different arrangements, in search of lower prices.

Carriers can exploit numerous arbitrage opportunities to offer customers rates that are well below international accounting rates.

The system has also come under regulatory pressure. In 1997, the United States Federal Communications Commission acted to reduce these accounting rates by prohibiting United States-based carriers from paying rates above certain benchmark levels.

The accounting rate system has now been largely replaced by cross-border interconnection. Carriers directly negotiate rates to terminate traffic, in some cases with long-term contracts, in other cases on a short-term or spot basis. Electronic exchanges have emerged that enable trading of international voice, data, and mobile capacity. Arbinet is an example of such an exchange. Arbinet claims that a total of three billion minutes were bought and sold on its platform in the first quarter of 2010.

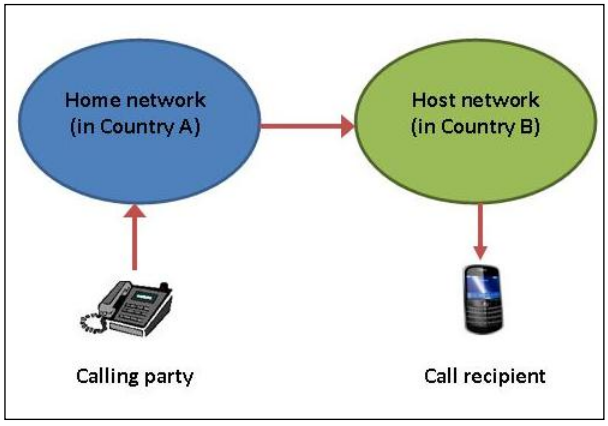
5.5.2. International Mobile Roaming

Roaming is the term used to describe the situation when a subscriber of one mobile operator's service travels outside that service area and obtains connectivity and service from another operator. Roaming can take place within a country or between countries, as long as it involves a customer of one operator being connected to the mobile network of another operator.

For example, roaming enables a subscriber of Cabo Verde Telecom in Cape Verde (which operates using GSM technology) to travel to Angola and obtain services from a GSM operator there.

Conceptually, roaming is similar to a call forwarding arrangement. Callers use their usual mobile phone number. The home network hands the call over to the host network, which passes the call to the customer's mobile phone (see Figure 5.11).

Figure 5.11 Mobile Roaming



Source: ICT Regulation Toolkit.

Roaming charges are generally much higher than termination charges within the home area. Customers often pay a monthly fee to be able to roam plus usage charges, the combination of which can be quite expensive.

For roaming to be possible, the customer's handset must be compatible with the host network. If the home operator and host operator use different technologies, roaming can only accomplished using a different handset when in the host operator's coverage area. This can be expensive and cumbersome.

Even if network technologies are compatible, roaming cannot occur until the operators have agreed on the terms and conditions for accepting each others' roaming traffic. "Roaming agreements" between the operators establish the commercial and technical basis for implementing roaming.

5.6. New Paradigms and New Challenges

The ICT sector is developing rapidly. Technological advances are making new services, and new modes of service deliver, possible. In the future, the Internet will be the primary medium through which converging voice and data services will flow. As a result, market structure, business models, and commercial arrangements for interconnection are changing, as explored in the sections below.

5.6.1. VoIP

Internet telephony, or "Voice over the Internet Protocol" (VoIP), is a category of services that enable users to make real time voice calls, transmitted over the Internet (rather than using traditional circuit switched telephone networks).

VoIP enables network operators, service providers, and consumers to make significant savings, by:

- Reducing the underlying costs of a telephone call. VoIP uses network resources much more efficiently than conventional telephone service, reducing the costs of providing a call (albeit with the loss of some call quality and service features), and,
- Creating opportunities for regulatory arbitrage that enable service providers and consumers to reduce or avoid call charges and/or regulatory fees.

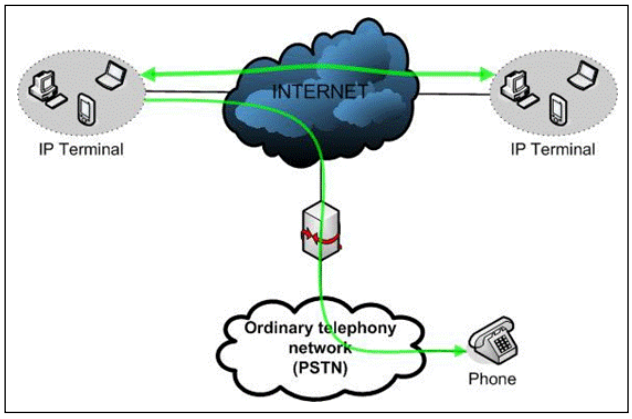
In 2010, the volume of VoIP traffic is growing rapidly and the potential exists for packet switched, Internet Protocol networking to become the primary medium for most voice and data services. The implications are that information services (including VoIP) will become the primary end user service provided by telecommunications networks.

Types of VoIP

VoIP services differ depending on whether (see Figure 5.11):

- the service provides a competitive alternative to conventional telephone services;
- a conventional telephone can transmit and receive calls;
- subscribers need to acquire and install additional equipment on their premises;
- traffic routes into or from the public switched telephone network (PSTN); and
- users pay for service.

Figure 5.12 Different kinds of VoIP



Source: ICT Regulation Toolkit.

Protocols that Support VoIP

VoIP uses a number of protocols to transmit voice calls using packet switching. The Internet Protocol (IP) is one of several processing standards for routing Internet traffic. IP ensures that traffic can reach the intended recipient even though it traverses different networks using different equipment.

Compression algorithms reduce the number of packets that must be transmitted by sampling the voice traffic and reconstructing a digital replica.

The Real Time Transport Protocol provides procedures for loading packet headers with routing, signaling, and identification information so that, for example, packets that arrive out of sequence can be rearranged.

The Session Initiation Protocol provides standardized call processing formats. This enables VoIP ventures to offer telephone service features from ringing and busy tones to call forwarding.

The Transmission Control Protocol manages the complete link of sender and recipient through different networks.

Comparison of VoIP and Conventional Telephony

A number of factors indicate that consumers increasingly view VoIP as "functionally equivalent" to conventional telephone service:

- Increasing numbers of consumers use VoIP as an alternative to conventional service. In making this choice, consumers are trading off a reduction in quality and some loss of features, for a lower price or for free.
- Improvements in VoIP service have reduced the difference in quality between VoIP and conventional service.
- Many carriers partially route calls over the Internet without their customers' knowledge. In many cases, consumers are unable to detect differences in quality between VoIP and conventional service.
- VoIP customers can now obtain a telephone number and receive calls originated on the PSTN.
- There is evidence that local exchange telephony subscriptions, total switched long distance minutes, and revenues for conventional dial-up services are declining. This suggests that many consumers are switching to VoIP. A number of other factors may also contribute to this trend, such as migration from wireline to wireless services; the proliferation of private-line and virtual private-line services that can access the PSTN; and the commingling of voice and data services on the same telecommunications link.

Arbitrage Opportunities in the ICT Sector

Traditional network operators often charge different interconnection rates, depending on the type of call

or type of service provider involved. Often this reflects differences in regulatory treatment between service providers. This creates opportunities for service providers to engage in arbitrage (either legally or illegally).

Arbitrage can cause marketplace distortions and reduce the effectiveness of regulation. If legislatures and regulators do not promptly adjust the regulatory policy that triggered such arbitrage, the impact on the market can be substantial.

Not all regulatory arbitrage strategies violate laws and regulations even though they deviate from regulatory intent, or exploit loopholes. Also, when network operators create arbitrage opportunities in the absence of a regulatory obligation, or if they fail to close a loophole quickly once it is detected, this may indicate that they themselves expect to benefit. Operators will tolerate some loss of revenue if it is outweighed by other benefits, such as regulatory relief or compensation.

Certain features of VoIP traffic create additional arbitrage opportunities. VoIP traffic can readily enter the Internet without traversing the PSTN. Opportunities also exist for terminating VoIP traffic without traversing the PSTN, or through undetected transit of the PSTN. Even when a PSTN operator is able to detect VoIP traffic, it may not be able to differentiate between local, domestic, and international VoIP calls for billing purposes.

Arbitrage may involve:

- qualifying services as long-haul transmission in order to avoid universal service surcharges,
- obscuring the origin of traffic to making international traffic appear domestic and long distance traffic appear local, in order to obtain the most favorable access price,
- characterizing traffic as local instead of long haul, to generate a reciprocal payment obligation (instead of a one-way access charge),
- distorting or obscuring the origin of traffic and the method of transmission to reduce or avoid charges imposed by another carrier for delivering the traffic to the intended recipient, and
- offering telecommunications services as ancillary to, or a minor transport element for, an enhanced information service.

A number of arbitrage strategies are sufficiently common that they warrant specific mention:

- grey market strategies
- leaky private branch exchanges (PBXs)
- resale of private lines
- international call reorigination (or "call-back")
- refiling, and
- routing calls over the Internet.

Implications of VoIP for Regulators

As VoIP becomes more similar to conventional telephony, VoIP providers will compete more directly with incumbent telecommunications operators. National legislatures and regulators will eventually have to decide what aspects of conventional telephony regulation should apply to VoIP service. Once a significant volume of telephone traffic is carried over Internet networks, the differences between VoIP and conventional traffic will have implications for universal service arrangements, telephone number management, public safety, and national security. For example, VoIP services are not available on a public, ubiquitous basis. In additional, they are generally unable to provide access to emergency service, or give location information in case of emergency.

VoIP presents a particularly compelling challenge to regulators. Decisions on the regulatory status, availability, and price of VoIP services will directly affect the economic viability and future regulatory status of incumbent operators.

VoIP has the potential to erode the market share and profitability of incumbents. VoIP services can traverse the telephone network without detection. Thus, even where regulators permit only limited or no VoIP services, incumbent operators will still face competition from this source. Incumbent operators may no longer be able to expect voice traffic to generate lucrative revenues and profits.

In response to this competitive pressure, incumbents may seek regulatory relief. For example, incumbent operators may approach regulators seeking:

- regulatory parity with new entrants, for example by removing asymmetric regulation not imposed on other operators; or
- protection from competition, for example, by banning or seeking to limit VoIP services.

Finally, regulators will have to consider how best to encourage incumbent operators to retrofit their existing networks and install new digital plant, optimized for switching and routing data (of which VoIP will be a significant component in the future).

Trends in VoIP Regulation

In many countries Internet telephony qualifies for streamlined regulation on grounds that it is an "enhanced," "value added," or information service (generally consistent with regulatory treatment of the Internet).

As VoIP becomes a closer substitute for conventional voice telephony, regulators may be less inclined to eliminate regulatory requirements. This is particularly the case where VoIP services are close substitutes for traditional telephony, for example where VoIP operators seek telephone number assignments and number portability.

Most countries that have developed a VoIP regulatory policy have adopted a light handed approach in general, and have targeted regulatory interventions to specific matters, such as access to telephone numbers, number portability, access to emergency services, universal service, and national security.

Differential Regulation of VoIP and Conventional Telephony

Many countries regulate information services and traditional telecommunications services differently.

Differential regulatory treatment creates opportunities for arbitrage. It also encourages incumbent network operators to:

- focus new investment on unregulated broadband networks, and
- migrate services (including voice telephony using VoIP) onto those new networks wherever possible.

This behavior achieves operational savings, and also qualifies voice telephony traffic for a lower level of regulation.

The result will be an increase in the volume of information services, and a reduction in the volume of voice telephony minutes of use that are subject to interconnection charges, or international accounting rate settlements. Network operators' traditional sources of revenues will erode, forcing regulators to rethink how network operators should be permitted to recover their costs.

Interconnection Pricing for VoIP

As network operators migrate to digital networks, voice services will become simply software applications riding over the network. Converging technologies and markets make conventional approaches to interconnection charging unsustainable.

Many technology forecasters predict that in the future voice telephony will migrate completely from circuit-switched telephony to VoIP. Once this happens, Internet interconnection and pricing models may replace the current arrangements. In the interim, VoIP network operators will need to interconnect with incumbent network operators' PSTNs. This section addresses:

- differences in cost recovery between the Internet and conventional telephony;
- interconnection models by Internet Service Providers (ISPs), namely peering and transit;
- implications of VoIP for interconnection pricing;
- pricing mechanisms for VoIP interconnection; and
- criteria for a new interconnection pricing regime.

Comparison of Telecommunications and Internet Cost Recovery

Cost recovery models in telecommunications and for the Internet differ substantially. As technologies and markets converge, these differences are creating opportunities for arbitrage. This section compares the cost recovery models for telecommunications and Internet interconnection.

Models for Internet Interconnection

ISPs use different models for interconnection pricing, depending on the specific characteristics of the ISPs concerned. Broadly, ISPs can either:

- enter into "peering" arrangements; or
- enter into a transit arrangement.

Implications of VoIP for Interconnection Pricing

Changes in how telecommunications services are delivered, including the emergence of VoIP, will have significant implications for interconnection pricing. In particular, the opportunities VoIP creates for arbitrage create pressures to:

- move toward cost-based pricing for interconnection (and other telecommunications services), and,
- adopt uniform charges for access, regardless of the type of call, type of service providers, or other call characteristics.

Cost-based Pricing

Traditionally, telecommunications prices have been designed to keep prices for access and "basic" local service low, at the expense of long-distance users. The resulting high long-distance prices have created numerous opportunities for arbitrage, which have placed downward pressure on prices.

Recognizing that the traditional model is unsustainable and inefficient, many regulators are now moving towards a more cost-based model. This shift often involves a long transition period, to avoid significant immediate jumps in prices for basic service.

Generally, pricing reforms are accompanied by a shift to transparent funding of universal service obligations, through explicit charges to interconnecting service providers, or directly to end users.

Uniform Access Charges

It is common for network operators to charge different access prices depending on the type of call, the type of service providers, or the distance involved. This creates opportunities for arbitrage.

In many cases it makes more sense to move to a uniform charging regime. For example:

- Network operators, especially long-distance, average long- and short-haul traffic costs and charge a flat rate for calls (for example, a single per-minute rate for all calls in a wide geographic area – say, nationwide).
- "All You Can Eat" pricing – a flat monthly rate for unlimited local and long distance calls. This form of pricing is already standard for Internet access in many countries.
- If the cost of measuring the distance between the call originator and call recipient exceeds the cost difference in handling traffic of different distance, then network operators should not bother to do so. In this case, charges should not differ based on distance.

To move to a more sustainable charging regime, regulators will need to:

- eliminate regulatory asymmetries that treat similar services differently based on the technology used to provide the services (for example, VoIP or conventional voice service), or the type of provider;
- decide whether VoIP providers offering equivalent service to conventional voice telephony should pay the same charges and regulatory fees as other network operators.

Changes in technology and telecommunications network cost structures mean that per-minute pricing may become an inefficient cost recovery mechanism. As more services are delivered as packets over digital networks, minutes of use are no longer an important cost driver.

Technical developments are improving the ability of consumers to manage their own telecommunications services. As a result, the premise that the calling party is the sole cost causer may no longer be valid.

Pricing Mechanisms for VoIP Interconnection

This section discusses:

- the application of origination and termination payments to VoIP interconnection;
- cost drivers for VoIP;
- setting cost-based charges for VoIP interconnection; and
- reciprocal payment obligations between VoIP providers and conventional operators.

Application of Origination and Termination Payments to VoIP

VoIP providers require access to the PSTN to terminate calls to recipients who do not subscribe to the VoIP provider's service, and for some types of call originations. Such interconnection typically occurs between a VoIP operator's gateway and the PSTN operator's Tandem Switch closest to the call originator or recipient.

Cost Drivers for VoIP

Per-minute cost recovery has a number of weaknesses in a VoIP world. Call duration has no meaningful relationship to the costs of a VoIP call. Charging on a per-minute basis creates opportunities for VoIP operators to engage in regulatory arbitrage, or to avoid interconnection charges.

As VoIP traffic increases, interconnection charges based on bandwidth used would better reflect underlying cost drivers, and would be more consistent with economic efficiency.

Setting Cost-Based Charges for VoIP Interconnection

An interconnection pricing mechanism for VoIP services should reflect the costs of the local network assets used to provide VoIP. If interconnection prices reflect underlying costs and appropriate cost drivers, opportunities for arbitrage will decline. Similarly, where VoIP operators provide a service that is functionally equivalent to conventional telephony, treating VoIP providers in the same way as conventional service providers will remove arbitrage opportunities.

Reciprocal Payment Obligations

VoIP operators currently do not receive any compensation from PSTN operators for terminating calls that originate on the PSTN. If VoIP operators are treated in the same way as other service providers with respect to interconnection payments, then they should also have the same rights to compensation. That is, VoIP providers should also be entitled to reciprocal compensation for terminating calls that originate on the PSTN.

Criteria for a New Interconnection Regime

As more traffic migrates to VoIP, a new approach to interconnection pricing is needed. Any new approach to interconnection pricing should:

- encourage efficient competition and the efficient use of, and investment in, telecommunications networks,
- preserve the financial viability of universal service mechanisms (thus any proposal that would result in significant reductions in intercarrier payments should include a proposal to address the shortfall),
- treat technologies and competitors neutrally,
- allow innovation, and,
- minimize regulatory intervention and enforcement, consistent with the general trend toward less regulation wherever possible.

This implies treating VoIP providers that provide service over the PSTN in the same way as other telecommunications service providers, with respect to the following:

- *Interconnection charges*. VoIP providers should face the same payment obligations as other service providers that use equivalent facilities and services. Similarly, VoIP providers should be entitled to the same reciprocal termination payments from PSTN operators.
- *Regulatory fees*. Technology neutrality suggests that all providers (including VoIP providers) whose service accesses the PSTN should be subject to the same regulatory fees, including universal service contributions.
- *Other regulatory requirements*. Where feasible, VoIP providers should have similar obligations to other service providers that offer a functionally equivalent service (for example with respect to emergency services, or obligations to support law enforcement call intercepts).

VoIP Over Wireless Networks

Wireless networks will have a substantial impact on VoIP service development, particularly in developing countries.

As wireless and VoIP traffic increase, differences in the terms and conditions under which wireline, wireless and VoIP operators interconnect networks will create opportunities for arbitrage, and distort markets. Differences in call termination rates and interconnection arrangements can cause operators to adjust traffic flows to obtain the lowest possible rate, and to minimize regulatory fees.

5.6.2. Enhancing Public Safety

Emergency Telephone Service

Emergency telephone service is one of the most critical areas in which voice telephony remains the central and indispensible form of communication. Citizens facing emergencies – fire, health crises, accidents, crime, natural disasters – need to be able contact public safety authorities in real time, to explain their needs to a live respondent, and to receive help as quickly as possible. Most governments have established mandatory public

emergency telephone numbers that can be called from any phone, and policies for how telecom operators must treat calls to those numbers, as well as how officials should respond. There are some significant differences, however, in how effectively some of these policies are implemented, and new challenges that arise in the context of the changing technical and market status of voice telephone service.

In most countries, one or more standard, nationwide short number codes, of two or three digits, must be automatically routed over all networks to public safety or emergency offices, or to trained dispatchers who can both assist callers and contact appropriate authorities. In the European Union, most countries utilize 112 as the primary emergency number, with a variety of alternative numbers for specific needs. In the Americas, 911 is the most common emergency number, while 999 is used in much of Africa and Asia. However, there is no strong standardization outside of Europe, with many unique numbers, and some of two or even four digits. These numbers can typically be called without charge from public pay telephones, private landlines, mobile phones, and usually even VoIP services, although there are some limitations and challenges regarding some of these options (see below).

Mobile Emergency Service Issues

A number of specific issues have arisen around the use of mobile phones to access emergency services. Mobile phones present a variety of unique challenges, as they can be taken anywhere, including across national borders where emergency service numbers may differ, and they also typically require active SIM cards to function properly. Most phones also have keyboard locking options, which can become a hindrance in an urgent situation or when a caller must use another person's phone to place an emergency call.

Under international agreements, most GSM service providers have addressed many of these issues, at least in part, and it is important for regulators to ensure compliance and cooperation as part of emergency telephone service regulations. For example, mobile phones and SIM cards are typically programmed with the full list of standard emergency codes, and dialing any of these will route a call to local emergency services, regardless of the official code for that country. This ensures, for example, that foreign visitors who may be accustomed to different codes or have their home emergency numbers pre-programmed in their phones, will automatically reach assistance when calling those numbers. However, in countries where non-standard numbers may be used, especially two-digit codes, regulators should require operators to provide clear plans, including system tests, to assure that all phones and SIM cards will work properly with the system. The GSM network can also update the list of well-known emergency numbers when the phone registers to it.

Most GSM mobile phones can dial emergency calls even when the phone keyboard is locked, or an emergency number is entered instead of the phone's PIN. On some networks, a GSM phone can be used to make emergency calls even without a SIM card. However, some GSM networks, such as several in Latin America, will not accept emergency calls from phones without a SIM card, or even require a SIM card that has credit. In the United States, the FCC requires networks to route every mobile-phone and payphone 911 call to an emergency service call center, including phones that have never had service, or whose service has lapsed. Regulators should seek to harmonize access to emergency networks on GSM mobile phones, regardless of SIM card or credit status.

Identifying Caller Location

A vital component of the emergency service model is for responding authorities to be able to locate and reach the calling party as quickly as possible. To facilitate this goal, traditional emergency call services have been "enhanced" with location databases which can identify the physical address associated with a calling number, for example even if the calling party is cut off or unable to speak after the call is answered. These enhanced emergency services, however, were designed initially to work with traditional landlines, where addresses and phones were fixed. To obtain location identification for mobile phone users, and also for telephone calls placed via the Internet (VoIP calls), is significantly more difficult.

For mobile phones, the network is capable of identifying a caller's location to within a narrow radius, so the main challenge is ensuring that this information is coordinated with emergency networks in real time, whenever an emergency call is placed. For VoIP users, however, there is no inherent location data linked to network calls, and

only those subscribers who have obtained home or office based fixed VoIP service are likely to have an address associated with their telephone number. Many VoIP users, however, utilize the service from laptops or Internet cafés, of through VoIP-enabled smart phones and other devices, which provide no location signal, and could lead emergency response teams to lose vital time in reaching crises.

Technicians specializing in Internet architecture have begun to address this problem with VoIP. In January 2008, the Internet Engineering Task Force (IETF) issued a memo entitled "Requirements for emergency context resolution with Internet technologies".[11] The memo provides a standardized set of terminology, concepts, and target objectives for IP-based emergency calls, with particular emphasis on establishing criteria for cooperative relationships among multiple actors to ensure that emergency callers can be identified by location. These include ISPs, Internet Access Providers (IAPs), Applications Service Providers (ASPs), as well as emergency service offices. The Task Force proposed an architecture that maps Internet callers to locations via an emergency service "routing proxy", with a variety of specific protocols to be implemented. Regulators that authorize and oversee VoIP services should consider requiring formal adoption of these or similar measures, along with public notification of the potential risks in relying solely upon VoIP services, in case of emergency.

Finally, an even more basic challenge with respect to emergency telephone services and caller locations is the need to ensure that adequate public safety response capabilities are actually within reasonable distance of most areas, and that the calling system properly routes calls to the nearest response team once the location is identified. This can be a very big challenge in less developed and rural regions, where police, fire, ambulance, and other emergency resources are few and far between. In some cases, emergency calls may need to be routed initially to local government offices or other community locations where some type of authority is likely to be available, who can provide a first response while more distant resources are mobilized. Developing a comprehensive database and geographic routing system for emergency calls throughout the national territory should be a cooperative effort of regulators, public safety officials, local administrations, and telecommunications operators, and should be a priority effort wherever such systems are not adequately in place.

5.6.3. Other Challenges for Developing Countries

Establishing a regime to develop and implement interconnection rates, terms and conditions, and other provisions can place significant demands on a developing country's legal and administrative infrastructure. This section considers particular challenges that may be significant for developing country regulators.

Many of these challenges apply to all countries, but are more difficult in countries with weak legal systems or no tradition of decision-making by independent regulators.

Key challenges include:

- The physical state of telecommunications networks in developing countries;
- Transparency and access to information;
- Regulating state-owned operators;
- Free trade negotiations; and
- Dispute resolution.

Infrastructure Challenges

Compared to developed countries, ICT infrastructure in developing countries has a number of features that create both challenges and opportunities:

- Developing countries may not have extensive telephone network coverage, particularly outside main population centers.
- Wireless and mobile operators often play a significant role, particularly in rural and remote areas. Typically, wireless demand in developing countries exceeds wireline demand, sometimes by significant amounts.
- Fiber-optic systems are often not widely rolled-out (or not all fiber is "lit" with the necessary electronics). Customers may have limited or no access to broadband services, particularly in rural areas.
- The technology in use, and network architecture, are often outdated.

These factors create a number of challenges. In particular, significant investment may be needed to achieve universal access goals or to make broadband service widely available.

At the same time, developing countries that are designing interconnection regimes now have the opportunity to design better regulatory regimes. The fact that traditional wireline technologies are not deeply embedded in many developing countries enables regulators to implement interconnection policies that are more appropriate to wireless networks, VoIP, and other emerging technologies. For example:

- The prominence of per-minute rates is a product of wireline technology. Per-minute rates may be irrelevant, or even counterproductive, when applied to VoIP services.
- Policies seeking to "unbundle" network elements assume that the wireline incumbent enjoys a near monopoly position in the provision of critical ICT infrastructure. This assumption may not be valid in many developing countries.

The absence of a well-established interconnection regime may allow regulators in developing countries to bypass policies that are no longer appropriate, in favor of arrangements that are sustainable, minimize opportunities for arbitrage, and are more in line with emerging technologies.

Internet Exchange Points

Regional IXPs play an important role in reducing the costs of ISPs and encourage development of the Internet in developing countries. Here we discuss:

- the role of regional IXPs;
- ways to support the development of IXPs in developing countries; and
- the development of IXPs in Africa

Because the Internet offers access to content and users anywhere, each ISP has to secure network connections to all potential senders and recipients of content, or suffer competitively for the lack of global reach. Reciprocal interconnection – whether freely provisioned or provided for a fee – makes it possible for an ISP to access the entire global Internet "cloud" for its subscribers.

The Internet operates almost free of regulation, so large ISPs can largely dictate interconnection terms and conditions. ISPs in remote areas (including most developing countries) must meet the entire cost of accessing larger ISP networks, using expensive international satellite links or submarine cables.

In some cases, where there is no local or regional facility for the exchange of Internet traffic, developing country ISPs must pay for international transit facilities to deliver local traffic. This practice is known as "tromboning."

A key way to reduce Internet traffic costs for developing country ISPs is through the development of regional IXPs.

Supporting IXPs in Developing Countries

IXPs in developing countries are important for a number of reasons. They:

- enable efficient, cost effective management of Internet traffic,
- provide an interface between multiple ISPs, which. enables them to avoid tromboning local and regional traffic, and,
- should help stimulate market entry by new ISPs, web hosting and equipment co-location developers, and content creators.

Internet Exchange Points in Africa

Until recently, Africa was especially disadvantaged by the absence of IXPs. Compared to other continents, Africa had limited connectivity options and low initial traffic volumes. As a result, African ISPs often faced high transmission costs, even when routing local and regional traffic, due to the need to "trombone" traffic. Tromboning increases delays and can reduce the quality of the transmission.

In addition, African ISPs pay a substantial premium for overseas connections. International connectivity charges can be between 15 and 26 times greater than their equivalent local costs. In response to these pressures, IXPs are now emerging in Africa. Some examples include:

- Angola Internet Exchange (ANG-IX)
- Mozambique Internet Exchange (MOZ-IX)
- Internet Exchange Point of Nigeria (IXPN
- Johannesburg Internet Exchange (JINX)
- Tanzania Internet eXchange (TIX)

Transparency and Access to Information

In many developing countries, ensuring the transparency of interconnection arrangements and access to information are key challenges.

Transparency

Many countries require dominant operators to make the terms and conditions of interconnection transparent. In addition, the WTO requires Members to ensure that agreements or model interconnection offers of major suppliers are made public.

The objective of such transparency is generally to prevent dominant operators from discriminating between different competitors or otherwise acting to limit competition. Requiring operators to publish interconnection agreements enables regulators and other operators to monitor interconnection terms and agreements and to identify discriminatory or potentially anti-competitive behavior.

Transparency is also important in regulatory processes. For a regulator's decisions to be credible, the regulated firm and other stakeholders must have confidence in the decision-making process. Ways to achieve this include public consultation processes and requirements for regulators to publish the reasons for their decisions.

Regulatory transparency may be difficult to implement in countries with weak legal and administrative structures and that have no tradition of transparency. However, where an independent regulator has been recently established, there is an opportunity to introduce procedures for regulatory transparency.

Access to Information

In order to regulate effectively, a regulator needs access to detailed information about the regulated firm. For example, regulators often require detailed cost information and information on the regulated firm's cost of capital.

In many developing countries such detailed information is simply not available. The incumbent firm may not have sufficiently detailed network data to enable long run incremental cost modeling. Or the regulator may not have sufficient powers to require the regulated firm to provide the information.

Where this is the case alternative, less data-intensive approaches can be taken. These approaches include:

- Top down cost models: these models are based on the firm's existing financial accounts. The ITU's COSITU model is a top down cost model that has been designed for use in developing countries (see Box 5.4).
- International benchmarking: benchmarking can be used to estimate interconnection prices or individual inputs for costing exercises. (For example, COSITU provides benchmark data for the inputs needed to estimate cost of capital, where this information is not available).

Box 5.4 COSITU: Calculation of Costs, Tariffs and Rates for Telephone Services

The COSITU model permits network operators, service providers, regulators, and policy makers to calculate costs, taxes related to trade in international traffic, interconnection rates between local and international operators, and tariffs for national and international telephone services, both for fixed and mobile.

COSITU is based on enhanced fully distributed costing principles, as adopted in the ITU-T D series of recommendations. These can be viewed here (under "Recommendations", click on "D-series").

Various categories of fixed and mobile operators can use COSITU:

- Vertical operators managing international and national traffic with complete geographical coverage,
- National operators with urban and interurban area coverage,
- National operators with urban area coverage only.

In addition, regulators and public authorities in developing countries can use COSITU as a policy-making tool, to calculate costs, tariffs, and rates for telephone services.

COSITU can calculate cost-oriented tariffs for the following categories of telecommunication services:

- Urban,
- Interurban,
- International,
- Subregional, and
- Interconnection.

The model also allows users to:

- Simulate the effect on service tariffs of universal service or tariff rebalancing policies, and
- Calculate inefficiency costs, and
- Benchmark computed data.

Source: ITU, http://www.itu.int/ITU-D/finance/COSITU/index.html

5.7. Dispute Resolution

Disputes pertaining to access, interconnection, and other aspects of regulation are common in the ICT sector. This can stall the development of competition and the implementation of important

national policy goals for infrastructure and economic development.

Reliance on the courts to resolve disputes between telecommunications firms is costly and can involve substantial delays. For example, in New Zealand the first major interconnection dispute between the incumbent and a new entrant took over three years to resolve through the courts and even then failed to deliver a conclusive resolution.

Without a mechanism to resolve interconnection disputes quickly and effectively, innovation and competition in the sector will be threatened. Entrants will not commit resources unless they have confidence that their business will be viable and that they will be able to resolve any disputes in a timely fashion.

The Role of the Regulator

The World Trade Organization Agreement on Basic Telecommunications includes obligations relating to dispute resolution. Under the Agreement, Member countries must establish an independent domestic dispute resolution body, so that interconnection disputes can be settled within a reasonable period of time. This need not be the regulator, but it often is.

Often a regulator will require the development of a Reference Interconnection Offer (RIO) as part of opening the sector to competition. The RIO sets forth the terms and conditions for interconnection services, and prices, that a competing operator can choose to accept without further negotiations. The purpose is to avoid disputes and to shorten the entry time for a new competitor. The requirement to develop a RIO is most usually imposed on an operator that is deemed to be dominant or have significant market power (often the incumbent operator). A regulatory tool that accomplishes similar things is a "most favored nation" or nondiscrimination requirement, whereby any operator can choose to accept the terms and conditions that have previously been agreed or ordered to be in place for another competitor. Many countries have adopted either or both of these measures.

Challenges for the Regulator

Dispute resolution presents a number of challenges for regulators, including:

- Access to information: Operators usually have better information than the regulator on the details of interconnection disputes. This makes it difficult for the regulator to come to a decision and be confident that it is the best one.
- "Gaming" of the process: Either party may engage in anti-competitive gaming of the dispute resolution process. For example, an incumbent may use delaying tactics to draw out the proceedings, in order to delay competitive entry. Or an entrant may not accept a reasonable interconnection offer from the incumbent if it believes that it can persuade the regulator (or dispute resolution authority) to mandate more favorable terms.
- Capacity: Many countries face a shortage of people with the necessary legal, economic, and technical expertise to resolve interconnection disputes.

Ways to Strengthen Dispute Resolution Processes

Options to strengthen dispute resolution processes include:

Improve information available to the regulator

To enable the regulator to base its decision on better information:

- Ask parties to define areas of agreement and dispute and to provide information to clarify disputed issues;
- Require written submissions from operators on areas of dispute, supported by facts and research if necessary; and
- Allow others (for example customer groups and other service providers) to comment on areas of dispute.

Obtain Expert Assistance

To supplement the regulator's in-house capability by drawing on external expertise:

- Use external advisors (for example an experienced interconnection expert) to assist in resolving the dispute. The expert's role could include clarifying areas of agreement and dispute, identifying information needs, and providing advice.
- Consider appointing an independent mediator (or, if the parties agree, an arbitrator).

- Consult with other regulators on their approach in similar cases.
- Review decisions and interconnection agreements approved by other regulators.
- Use outside parties for informal mediation, arbitration, information gathering or other assistance. This can be particularly useful in countries where the regulator lacks the legal authority to resolve the dispute, or may be biased.

Improve Transparency

Making more information publicly available should cause parties to consider their positions more carefully:

- Make parties' submissions available for comment by other parties and the public, with summaries to protect confidential information; and
- Publish a draft decision and give parties to the dispute and others an opportunity to make written submissions on it

CHAPTER 6. FROM AVAILABILITY TO USE: UNIVERSAL ACCESS AND SERVICE

CHAPTER 6. FROM AVAILABILITY TO USE: UNIVERSAL ACCESS AND SERVICE

6.1. Introduction

Chapter 6 examines approaches to universal access and identifies global best practice. The chapter begins by underscoring the policy rationale for universal access and the need for intervention. It identifies the main access gaps and the scope of services to be considered. Different types of universal service regimes are described, including subsidies made available through universal service funds. The discussion takes into account the changing technological context, the pressures for reform and specific strategies for developing countries. It also highlights issues such as digital literacy and accessibility, which are seen as vital elements for moving beyond the mere availability of networks to their widespread adoption and use.

6.2. Trends and Approaches

Universal access and service has seen massive change prompted by privatization and liberalization of telecommunications in the developed world, and by innovative approaches employed by developing countries. The latter were faced with different challenges to achieve universal access and service (UAS), and in response developed new UAS models. Market liberalization and sector reform has not only changed the communications landscape dramatically, but has also resulted in innovative ways to promote and achieve UAS throughout the world. With a new service revolution looming – the broadband revolution –UAS will likely see another major shift in UAS models and approaches.

6.2.1. Definitions

The concepts of universal service (US) and universal access (UA) are distinct. US refers to service at the individual or household level, e.g., typically a telephone in each home. UA refers to a publicly shared level of service, e.g., through public payphones or Internet telecenters.

However, in more and more countries UA and US apply at the same time, and it therefore makes sense to use the generic term universal access and service (UAS). For example, in the past, developing

countries typically focused primarily on UA as that was the appropriate and most feasible target. However, since the maturation of mobile communications, which extended services further and lowered access barriers to take up, many developing countries may now also realistically target US for telephony, at least in many urban areas. At the same time their goal for the Internet is UA. Thus, their policy is no longer solely focused on UA but on both UA and US.

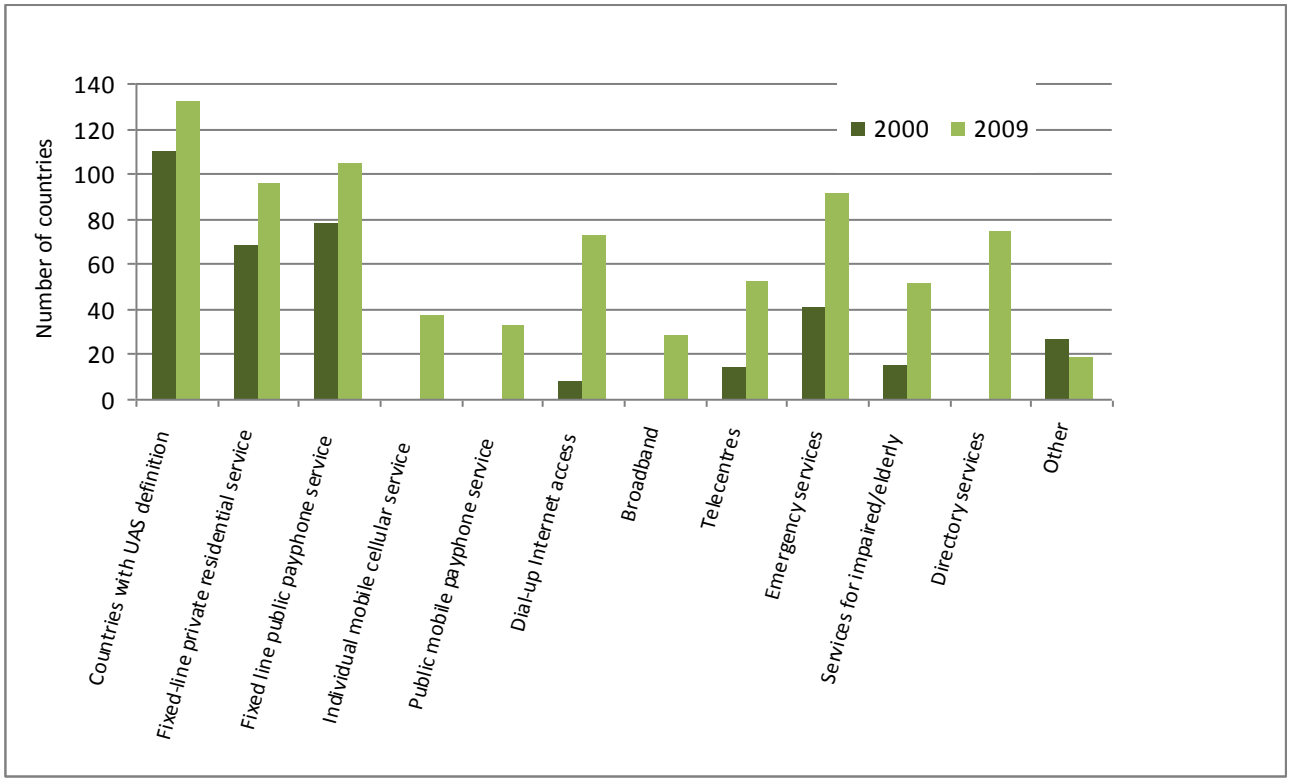
In the more developed world, which previously had only US policy goals, the onset of broadband has led to a redefinition of the term UA, i.e. the goal is universal access to broadband availability and affordability. It is often recognized that universal availability of broadband services may not necessarily yield universal service-like household penetration, though the provision of affordable access is an important goal.

As can be seen from in Figure 6.1, UAS policies and strategies go beyond telephony, and include at least data and Internet communications. Now policies increasingly look towards broadband communication.

Traditionally, broadcasting has not been a part of UAS, but is now regarded as part of ICTs, in particular as the underlying technologies and delivery mechanism for telecommunications and broadcasting are converging. However, media laws and policies have fundamentally different requirements, which go beyond affordable access and service, such as diversity and quality of content, pluralism and independent news reporting, etc. As a consequence, developing UAS requirements for broadcasting will break new ground.

Increasingly, UAS policy needs to be as forward-looking as possible and include broadband developments, the move towards a next-generation network (NGN) environment, and should address issues of convergence. The future challenges for policymakers are how to address the increased requirements and complexities of UAS while at the same time having UAS policies and programs that achieve their goals quickly and efficiently.

Figure 6.1 Universal Access/Service Definition, 2000-2009



Source: ITU World Telecommunication/ICT Indicators Database

6.2.2. Approaches

Widespread access to and diffusion of ICTs are highly desirable for social and economic reasons. Ensuring the full participation of all in the Information Society is a major policy goal, the implementation of which brings all the benefits and transformational opportunities of ICTs. For example, countries participating in WSIS set the ambitious goal of connecting all villages of the world to ICTs by 2015, including establishing community access points, and connecting universities, schools, libraries, post offices, health centers, and local governments. The EU has adopted the term "e-inclusion" to refer to full access and participation and is particularly conscious of the promises of new digital opportunities and the new risks of digital exclusion.

The WSIS target is one for universal access, which is appropriate for developing countries at this time. But as markets and technology unfold, the bar will continue to be set higher. This implies a periodic reconsideration of what types of service should be included in any definition of UAS (ranging from single line voice-grade, incrementally all the way to two-way broadband services) and at what cost to the consumer. Flowing from these issues are the mechanisms for both delivering and financing the desired level of service.

Consequently, in recent years experience has been accumulating in using different approaches in pursuit of UAS, including:

- Market based reforms
- Mandatory service obligations
- Leveraging new technologies, e.g., mobile
- Leveraging new business practices, e.g., pre-paid cards
- Cross subsidies
- Access deficit charges
- Universal Funds
- Public-private partnerships

6.3. Policy Rationale

6.3.1. Concepts and Definition

For ICTs, universal access (UA) and universal service (US) can largely be characterized by the availability, accessibility and affordability of telephony and the Internet, with increasing consideration of the inclusion of broadband and broadcasting.

The following definitions are used:

- Universal access (UA): ubiquitous access to the service e.g., at a public place, thus also called public, community or shared access.
- Universal service (US): every individual or household can have service, using it privately e.g., either at home or increasingly carried with the individual through wireless devices such as mobile phones or PDAs.
- Universal access and service (UAS): the generic term when referring to both UA and US or the general concept.

The three hallmarks of UA and US are:

- Availability: the service is available to inhabited parts of the country through public, community, shared or personal devices;
- Accessibility: all citizens can use the service, regardless of location, gender, disabilities and other personal characteristics; and
- Affordability: the service is affordable to all citizens.

These three aspects are relevant to both UA and US, but in different ways and to different degrees. Table 6.1 illustrates UA/US similarities and differences.

The following concepts are the steps in the progression of UA to US:

- Universal access: every person has affordable and reasonable public access to defined ICT services considered essential for social inclusion and economic development;
- Universal geographic coverage: 100 per cent of the population can obtain a defined ICT service provided that the user has the ability to pay for the service; and
- Universal service: 100 per cent of individuals or households can afford ICT services categorized as part of US, and a majority of the population subscribes to these services.

The concepts of UA and US are applicable to the following ICT services:

- Telephony (voice calls and text messages);
- Narrowband and broadband Internet;
- Radio and television broadcasting.

Table 6.1 Characteristics of Universal Access and Universal Service

ASPECT	UNIVERSAL ACCESS	UNIVERSAL SERVICE
Availability	*Focused coverage*	*Blanket coverage*
	Public access (e.g., at a payphone or telecenter)	*Private service on demand*
	Free emergency calls	*Free emergency calls*
Accessibility	*Walking distance, convenient locations and hours*	*Simple and speedy subscription*
	Inclusively designed premises (e.g., for wheelchair users); inclusively designed terminals or available assistance (e.g., for the blind or deaf)	Inclusively designed terminals and services (e.g., for blind or deaf people)
	Assistance from an attendant	Assistance through the terminal (e.g., by making calls or viewing help pages for the web)
	Adequate quality of service (e.g., having few failed call attempts)	Reasonable quality of service (e.g., having few dropped calls)
Affordability	Options of cash and card payment	Cost of average monthly usage is a small percentage of monthly GNI per capita
	Options of cash and card payment	Options of cash, card and electronic payment
	Payment per use (e.g., for a single call or message or an hour of Internet access)	Flat rate, bundles of services or low monthly subscription fee

Note: Essential characteristics are in italics, while desirable characteristics are not.

While broadcasting has traditionally not been a part of UAS policies, it is increasingly being considered due to the convergence of technologies and triple-play offers by service providers (e.g., cable TV operators that also provide telephone and Internet services). UAS policies that include broadcasting are emerging. This is especially the case in countries that have adopted a multi-sector regulator overseeing both telecommunications and broadcasting.

6.3.2. Rationale

ICTs are present in all sectors of the economy and are recognized as a pillar of modern society. No sector seems to work efficiently without them. Diverse sectors such as governance, education, health, business, finance and tourism are critically dependent upon information and communications. All countries, irrespective of economic status, must recognize the trend towards ubiquitous use of ICTs. This is why the term enabler is often used to describe ICTs.

The main arguments for a universal access and service (UAS) policy are the following:

- ICTs are social and economic enablers. ICTs are increasingly used in all sectors of economies. In many regions, economic activity is shifting away from agriculture and industry to services sectors and towards the new information economy and society. The ICT sector is considered to be a significant engine of growth for economies. Also, on the social side, ICTs facilitate many functions and improvements, including e-governance, distance education, e-health and database sharing across social service agencies.
- Supply and demand increases the importance of UAS policy. The increased supply of ICTs through rapid technological developments fuels the requirement for universal access (UA). Mobile phones, not too long ago considered luxury items, now provide the main access to voice service for the majority of people in many countries, making it more urgent that the population without access be provided with access to phone service. Similarly, for large parts of the population, work and life without the Internet is unthinkable, and ever more megabyte-rich applications will require increased broadband development. The more ICTs are used, the more there is a dependence upon them, which in turn makes it more essential that all citizens have access to ICTs.
- Market gaps can remain in place. While it has been demonstrated that market forces, after liberalization and sector reform, have had the greatest impact on improvement of UAS in many developing countries, for various reasons market gaps may remain in place. Some countries, for example, have exceptionally challenging geographic characteristics combined with extremely low population densities (e.g.,

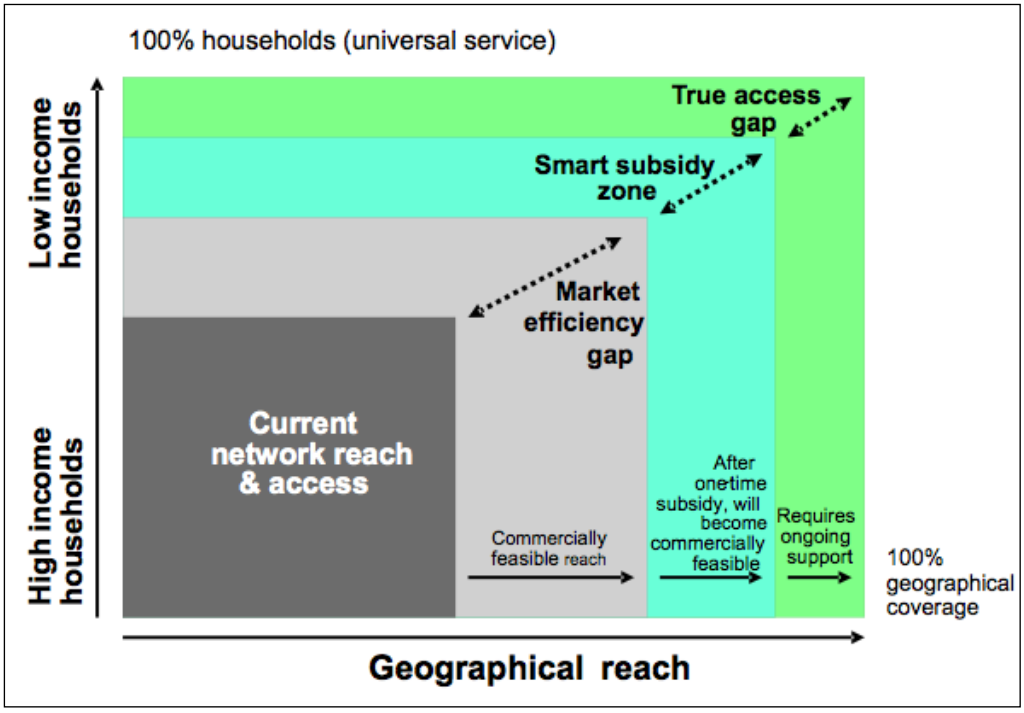
Mongolia and Botswana) or isolation (e.g., many islands in the Pacific region) or extreme poverty, which make UAS more challenging. In other countries, the market might be able to achieve UAS, but the timeframe in which this could be obtained, might be considered too long. In some places, the latter could apply to broadband development.

- Monitoring UAS and updating it. Constant change in technology, services, and pervasiveness of various ICT services, makes it necessary that the status of UAS should be monitored and policies continue to be updated and developed. Also, there are countries where the market can achieve UAS, but there is a need for public oversight to confirm that it has been achieved, to improve regulation, and to continually review the concept of what is considered UAS.

6.3.3. Access Gaps and Required Intervention

Three separate zones exist within the known access gap, namely the market efficiency gap, the smart subsidy zone and the true access gap, as illustrated in Figure 6.2. Each zone requires a distinct set of policies and strategies, which together yield an integrated universal access and service (UAS) program.

Figure 6.2 Universal Service: Distinctions Within the Access Gap



Source: Intelecon, 2009.

There are also two dimensions to the challenge of achieving UAS: these are poverty and high-cost areas. Poverty exists in both urban and rural areas, but the cost of addressing both poverty and high-cost areas together, as exists in many rural settings, is much higher. Providing access to the urban poor is well within the reach of the market.

The market efficiency gap is the gap between the service reach, which can be achieved in a fully liberalized and efficient market, and what is actually achieved by markets under existing conditions. This gap can be bridged through private service provision so long as the regulator and policymakers provide enabling regulation, ensure a level playing field among all market participants, and create a positive fiscal, business and investment climate. This allows operators and service providers to serve a much broader area and close the market efficiency gap. This frontier can be reached within the context of telecommunications sector reform and does not

require subsidies. Many countries are now doing well in bridging this gap through effective competitive service provision. The only issues to be addressed relate to how far the market can actually reach commercially, and how best to implement and sequence more pro-market conditions to reach the limits of the market.

The smart subsidy zone refers to rural or high cost areas, and low-income population groups that won't be reached by the market alone, even if it is an efficient market, or at least not for a long time to come. Targeted financial intervention beyond normal regulatory measures and incentives is required to provide services to these population groups and areas. A smart subsidy is the term used to describe a one-time subsidy that is designed to be results-oriented, does not distort the market, and encourages cost minimization and growth of the market. It helps to kick start a project or service, with the ultimate objective of the program becoming commercially viable, whereas without the subsidy investors might otherwise have been reluctant to invest. Investors' reluctance could be due to perceived risk or general lack of capital for the kind of service opportunities that are considered by government to be essential for socio-economic development. The important element of the smart subsidy zone is that the one-time subsidy to private sector providers will make the project commercially viable on an ongoing basis by filling the financial gap. This increases the operator's rate of return and reduces their risk. No further subsidies are needed if the service targets are realistic, and have a medium-term commercial viability in view. Targeted interventions are usually implemented using a Universal Access and Service Fund (UASF). The extent of the smart subsidy zone is sometimes hard to predict and can be a moving target, as it is not uncommon that operators exceed expectations.

The true access gap comprises areas or communications targets that are beyond commercial viability, even in instances where initial smart subsidies are given. Commercial sector operators or service providers serving these areas or population groups would need ongoing financial support, possibly in the form of operating subsidies (or end-user subsidies in the case of universal service). It is a political decision if and to what extent to subsidize ongoing service provision to areas and population groups that are beyond the limits of the smart subsidy zone and whether or not to use UASFs to finance such operations. However, even the true access gap can sometimes be bridged with innovative commercially related approaches. In some cases, true access gap areas can be combined with more profitable areas without need for ongoing subsidy. Also, in most countries, the true access gap may apply only to a small percentage of the total population.

In cases where the market is in fact achieving most UAS objectives, a degree of public oversight remains important. It can make progress more visible, highlight any deficiencies and provide a safety net for people with challenges, or places not otherwise served. Constant change in technology, services, and pervasiveness of various ICT services makes it necessary that the status of UAS should be monitored and policies continue to be updated and developed.

In all cases, it is important to work with the market as it develops. This involves, for example:

- Consulting industry and the wider public on the details of UAS policy and its implementation, and taking views expressed into account, especially those that rest on practical experience;
- Ensuring that all market participants have the opportunity to contribute to UAS goals, and receive appropriate recognition when they do so;
- Reviewing policies and practices regularly to keep pace with market and technological developments; and
- Wherever practicable, incorporating competitive mechanisms into the distribution of subsidies for UAS projects.

6.3.4. Scope

The services to be included in the scope of universal access and service (UAS) will change as technology and society change. Because of this, in 2002, the European Union (EU) built into the EU Universal Service Directive, a requirement that the scope of universal service (US) obligations be reviewed every three years. To be included in the scope of a UAS policy, a service has to satisfy two tests:

- In the light of social, economic and technological developments, has the ability to use the service become essential for social inclusion; and
- Are normal commercial forces unable to make the service available for all to use?

The EU reviewed the scope in 2006, specifically whether mobile telephony and broadband Internet were to be added. However, neither mobile telephony nor broadband Internet was added for the following reasons:

- Mobile telephony passed the first requirement – ability to use a mobile phone is now seen as essential for social inclusion in Europe – however, normal commercial forces had led to widespread availability and use of mobile phones, so the balance of opinion was that there was no need for regulatory intervention to achieve universal mobile service;
- Broadband Internet, on the other hand, failed the first test – well under half of European households subscribed to broadband Internet and so was not seen as essential for social inclusion. Therefore, the second test was not applied.

While advertised broadband speeds are high, the European Commission found that actual download speeds in 2004/05 were between 144 and 512 Kbps in rural areas and 1 Mbps in urban areas.

A second periodic review was carried out in 2008 which reaffirmed that, in the case of mobile telephony, overall the market provides access. However, in the case of broadband it was now thought that it was unlikely that the market would provide access within a reasonable period of time to the most isolated regions of the EU. The review noted that more and more social and economic transactions were taking place online with broadband Internet access becoming widely available. Finally, it noted that broadband was proving more and more of a necessity for accessing a whole range of services and therefore its impact on competitiveness and economic growth was gradually turning this infrastructure into an essential commodity. There was therefore an argument for strengthening EU and national strategies to provide access. Nevertheless, the review stopped short of recommending extending the coverage of US to include broadband.

Nevertheless, the EU has a clear policy goal of e-inclusion and broadband development, and is active in promoting and expanding broadband take-up and in providing access to above minimum download speed broadband also in rural areas for quality of life, social inclusion and economic-strategic reasons (see Box 6.1). The European Commission believes all Europeans need broadband access and its Digital Agenda underlines the importance of broadband deployment to promote social inclusion and competitiveness throughout the EU.

Box 6.1 Finland defines "Universal Service" to Include 1 Mbit Internet Connection

In October 2009, Finland was the first country to declare broadband Internet access a legal right –the definition of "universal service" was expanded to include access to a 1 Mbit Internet connection. As of July 1, 2010, universal service providers must be able to provide every permanent residence and business office with access to a reasonably priced and high-quality Internet connection with a download rate of at least 1 Mbps.

The decree allows for some variation in download speeds to accommodate services provided on mobile networks. The average download speed must be at least 75 percent of the required rate of 1 Mbps over a 24 hour period. In a four hour period, the average speed must be at least 59 percent of the required 1 Mbps download speed.

According to Laura Vilkkonen, the legislative counselor for the Ministry of Transport and Communications, the one-megabit mandate is only an intermediary step. By 2015, the goal is to have speeds that are 100 times faster (100 Mbps) for all in Finland. Vilkonen said, ""We think [broadband Internet access] is something you cannot live without in modern society. Like banking services or water or electricity, you need Internet connection." Vilkonen also commented that the decree is aimed at expanding and improving Internet access to rural areas since geographic challenges have limited access.

Source: Ministry of Transport and Communications (Finland).

For developing countries, modified forms of this general test regarding which services to include into the UAS scope might be employed. The main driver for UAS may be economic before social factors come to the fore, so policy makers in developing countries could ask the following questions:

- In light of economic, social, and technological developments, has the ability to use the service become essential for uniform countrywide economic development or social inclusion; and
- Are normal commercial forces unable to make the service available for all to use, within a timescale consistent with the contribution of the service that will meet the Millennium Development Goals?

6.4. Types of Universal Service Regimes

6.4.1. Traditional Approaches to Universal Service

Traditionally, before market opening, the incumbent operator, often government owned, had the obligations to provide universal service (USO). In a liberalizing market, imposing USOs on the incumbent operator alone is contrary to the objective of creating a level-playing field. However, shortly after market opening, developed countries often introduced administrative, non-competitive procedures for designating a company to fulfill a USO. These procedures are used where there is only one candidate capable of fulfilling the USO because new entrants are still far from national service provision. Typically, only an incumbent was considered capable as it often was already providing near-total fixed-line coverage.

Recognizing this likelihood, the EU requires USO designation procedures to be "efficient, objective, transparent and non-discriminatory…" but not necessarily competitive. Where an open tender is not used, the EU prefers the designation to be:

- Open, in the sense that both the specification of the obligation to be fulfilled and the proposal of the designated provider are publicly available;
- Subject to public consultation;
- Broken down into components (geographic or functional), so that more than one company can be designated; and
- Of moderate duration.

Some EU countries have opted to make the significant market power (SMP) operator in the retail access market the universal service (US) provider.

If a single operator bears the burden of USO in a liberalized market, the question arises of what compensation the operator receives for providing USO. In these circumstances, administrative procedures for allocating universal funding have been developed. Administrative procedures exist, for example, in the United States, Canada, Australia, and France. All procedures for administrative payment of compensation to operators are based on calculations of the costs that the company incurs in fulfilling USOs. Usually, these are net avoidable costs. "Net" means that the benefits that the company receives from fulfilling the obligation are subtracted from the costs. Benefits are, for example, revenues directly attributed to USO customers, inbound calls to USO customers, and intangible or intrinsic benefits such as ubiquitous presence, brand enhancement and corporate reputation. "Avoidable" means that costs will only be taken into account if they would not be incurred without the obligation.

Calculating relevant costs and benefits for USO funding purposes is a major undertaking. Cost calculations in telecommunications are never clear-cut, and include elements of judgment and attributions that are to some extent arbitrary and estimated. Because large inter-industry transfers may be involved, it is important to make these calculations as accurate as possible. The choice of the costing methodology to be used is important and ultimately must be practical and acceptable to all parties.

The countries mentioned in this section have elaborate cost models for USO costing, and they require specialized expertise to run them. These models also rely on the industry to provide well-founded data input. In turn, these data often require highly developed accounting systems that the companies would not put in place for purely commercial reasons. The difficulty of estimating costs acceptably is one reason why few regulators in Europe have implemented administrative funding of USO even though the Universal Service Directive allows them to do so if they judge that the cost has become an unfair burden on the designated provider. Similarly, Australia carried out a review in 2004 that led to a decision to base future US funding on estimates rather than on detailed modeling.

Some regulators have estimated that the intangible benefits of USO provision (such as brand recognition, positive publicity and marketing) are great enough to outweigh the tangible net costs. Typically, USO providers are incumbents with high market shares of the fixed line market (often well above 80 per cent). Since contributions to shared US funding are proportional to market share, the additional financial support that the US provider would receive is likely a small proportion of the calculated net loss. This may well be less than the overhead cost of running a shared fund, leaving aside the cost of calculating the amount of compensation that is due.

Recently, where mobile operators have secured a much larger share of the total market and reached

almost total ubiquity, the question of US is now subject to redefinition. Internet and broadband development also requires the redefinition of US and how to achieve it, probably requiring a competitive allocation. For this and other reasons, the old method of estimating the cost and allocating responsibility for USOs to operators remains an uninteresting proposition in most European countries and other advanced nations.

Consequently, with more mature liberalized markets, the EU is moving toward more competitive designation procedures led by new member states. For example, Estonia broke new ground in 2006 by being the first member state to designate through an open tender procedure an alternative operator as its US provider – the Finnish company Elisa, rather than the incumbent.

6.4.2. Competing for Subsidies and Funds

The first generation of emerging market Universal Access and Service Funds (UASFs) to distribute subsidies, based on the principle of competitive tendering, were established in Latin America in the 1990s. Competitive tenders are also called reverse auction or minimum-subsidy auction because the qualified bidder with the lowest request for a subsidy wins the tender. The first such competitions were held in 1995, soon after the establishment (in 1994) of Chile's Fondo de Desarrollo de las Telecomunicaciones.

The Chilean case, and ones that followed soon afterwards, were unique in the sense that they were also used as a one-stop mechanism to enable potential new entrants to compete with the incumbent operator for universal access (UA) licenses in areas that were poorly serviced but for which a subsidy was offered. The services provided were primarily fixed network payphones, using wireless access or satellite (VSAT) technologies, and were located in places that were at the time, far from areas expected to be serviced by mobile operators.

Following the Latin American experience, a second wave of UASFs occurred in Asia and Africa. Nepal (1998) and Uganda (2000) pioneered the concept in their region, and several others, including Mongolia, Pakistan, Botswana, Burkina Faso, Malawi, Nigeria and Mozambique, are following in their footsteps. This is often with technical assistance from the World Bank or other international donors. The UASF concept had spread to about 50 countries by end of 2009.

Many UASF initiatives are following Uganda's lead by holding technology neutral competitions that are increasingly being won by mobile operators with existing licenses. These UASFs, as well as the early Latin American funds, are also applying their resources to the financing of Internet Points of Presence (POPs) in rural districts, telecenters and cyber cafés, school connectivity, and other ICT initiatives.

Almost all such funds have been created in emerging markets and developing countries in the context of liberalized markets to provide financial assistance for the following:

- Meeting regional and rural service targets for telephony and Internet services;
- Supporting key users, such as rural schools and health clinics, to access the Internet;
- Supporting ICT projects by commercial and development organizations that provide national and local content, services and applications that stimulate Internet take-up and usage; and
- Supporting various activities related to regionally balanced network and service development, such as the creation of Internet Exchange Points (IXPs) and regional Internet points of presence (POPs).

UASFs are primarily:

- A means of financing – in the majority of cases financing comes from a percentage levy of operators revenue;
- An administrative, planning and management entity for UAS programs – UASFs and their programs are often managed by a specially created UASF unit within the regulator or even a separate entity outside of the regulator – this often includes certain management principles such as accountability, transparency and efficiency; and

A competitive mechanism to award a service contract to the commercial sector to provide UAS services in exchange for subsidies from the UASFs.

Sources of Financing

Most UASFs are financed mainly through annual operator levies although there are other sources, as follows:

1. Government general budget (in a small minority of cases, including one of the first funds, Chile's Fondo de Desarrollo de las Telecomunicaciones);
2. Industry levy, as a percentage of annual revenue, on certain classes of licensed operators;
3. Various other regulatory sources such as the proceeds of license competitions, frequency spectrum auctions and fees; and
4. Once-only contributions financed by loans or grants from international donors such as the World Bank that contribute seed finance to assist UASF start-up in the early years.

UASFs financed mainly by operator levies are independent of available government funding and are particularly attractive for low-income countries with limited resources and more pressing government budget priorities. However, countries with more resources could consider contributing some amount from the government budget to the UASF. After all, the UASF implements government policy. It is important though that the UASF remains independent from day to day politics to fulfill its long-term UAS objectives, and that it continues to focus on sustainable solutions with effective and cost-efficient private sector participation.

A strong argument can also be made that at least part of the proceeds of radio frequency auctions and license competitions should be used to source a UASF. Guatemala's FONDETEL used this financing approach. Auction proceeds are paid by various industry players for a national resource, the proceeds are often simply transferred to the government budget, but instead it might be more appropriate to use this money particularly for ICT development, such as to fund UAS or special measures for broadband development (e.g., increasing PC ownership or equipping schools with computer labs and broadband access).

A stronger case could be made that the funding should, if possible, be more balanced between the first three financing sources. Important though in all cases is the predictability, timing and the frequency of the funding to allow proper planning and constancy for the UAS implementation.

Planning and Management Entity for UAS Programs

Regardless of the financing sources, an instrument like the UASF is also an institutional vehicle to plan, administer, manage and implement UAS programs. Often the national regulatory authority has a specific department that manages the UASF on a day-to-day basis. The two main reasons for this are as follows:

1. The regulator will have a degree of independence from government and industry; and,
2. The regulator will have technical and regulatory expertise.

A UASF program will have a greater chance of success if the regulator has a strong reputation for independence and industry trust. This is even more important if the government still has an ownership stake in any of the operators.

Regardless of which entity is chosen as the UAS unit, key management principles that are required to ensure success and the financial integrity of UASFs include:

- Accountability;
- Transparency;
- Independent auditing, publication and annual reporting;
- Keeping administrative costs to a minimum; and,
- Efficient use of funds.

Another important element of UASF is effective oversight. It is best practice that the regulator provides the Secretariat expertise and everyday management under a special Management or Advisory Board which provides high-level strategic direction, approves major projects and fund disbursements, and monitors proper execution and financial integrity. Most UASFs have a Board functioning above the level of the senior executive. However the Board's role differs from country to country, depending on specific local factors. Options for UASF Boards are as follows:

- Direction or management – making executive decisions on a wide range of issues from hiring of senior managers to budgetary approval, approval of UAS program and projects, and the final award of subsidy contracts;

- Monitoring and oversight – ensuring that the decisions of the executive (whether named director, manager or administrator) and his/her management team are scrutinized on behalf of stakeholder interests; or,
- Consultative or advisory – requested to review proposed UAS programs and projects, executive decisions, provide expertise and advice which is published and requires a formal response by the UASF management unit.

Competitive Subsidy Allocation Mechanism and Smart Subsidy

A smart subsidy is a one-time and partial subsidy that can leverage additional commercial investment, and is minimized though a competitive procedure. The objective is to enable operators to bring a potentially loss-making or marginal project into a normal commercial rate of return. The mechanism of a smart subsidy competition is geared to the achievement of realistic universal access and service (UAS) objectives. UAS targets are realistic and feasible for the market if commercial operators, with some smart subsidy support, will be able to and will want to achieve them. The subsidy thus represents an amount that bridges the operator's financing gap. It could be viewed as support to offset capital investments, capitalized operating losses for the first few years, or a combination of both. The important concept here is that the subsidy is a once-only allocation which may be disbursed in tranches over a stipulated period of time (e.g., one to three years) corresponding to various output milestones, but is not open for renegotiation or longer term continuation.

Key advantages of UASFs include:

Transparency and Fairness

A UASF that adheres to best practice provides a transparent means of allocating subsidies for the achievement of service targets in commercially unviable areas. All operators and service providers pay into the fund in equal proportion to their revenues, making the cost of UAS shared equitably among operators. Technology neutral competitions allow all operators and service providers a fair chance to win a UAS subsidy competition. The alternative of mandating targets runs the risk that it would be difficult to allocate fair targets for different operators in a competitive market. It would require that the costs of the targets are established and then distributed proportionally among the industry.

The valuation of the contribution of each operator towards UAS would require the regulator to seek confidential financial information (revenue, capital and operating expenditure) from each operator. This would be akin to the administratively heavy approach taken in traditional price regulation.

Emphasis on innovation and least-cost solution

One of the key challenges is to properly establish the cost of UAS provision. This requires complicated cost models, well-developed internal accounting systems within operators, and may result in disputes. Another challenge is to use a system that encourages cost-minimization and innovation. UASFs using competitive subsidy bidding mechanism avoid detailed cost modeling but instead use simple cost models that help establish a maximum subsidy ceiling. By using a competitive process, there is an inbuilt incentive for least cost innovative solutions, as the bidder requiring the least amount of subsidy wins. However, it is important to note that the bidding process is not geared towards the cheapest solution but rather, as a first step, a bidder has to comply with specific corporate, financial and operational experience requirements and demonstrate that it can meet the service and quality specifications for the UAS provision.

UASFs Provide "Pay or Play" in Practice

With a UASF least subsidy tender, no operator is forced to participate in the competition. Thus operators who are not interested in serving rural areas or providing public access are free to opt out, though they do have to contribute to the fund. The UASF can be a way of requiring that the industry at large contributes to financing the achievement of UAS, while only operators interested in expanding to rural areas will tender for the subsidies. The successful operators will, in fact, have a portion of the funds they contributed and maybe more, returned to them.

UASFs Can Bring Finance into the Sector

UASFs present a mechanism for government, or donors such as the World Bank, to contribute financially to UAS in a liberalized market, without getting directly involved in less-efficient forms of project ownership or management, as in the monopoly era. This has resulted in a considerable amount of seed finance being contributed before the build-up of equity through operator contributions in some smaller markets.

The Public Interest is Explicitly Served

The process of good governance typically requires an explicit determination of objectives and targets, a process of consultation, buy-in by all stakeholders, and satisfaction by consumer representatives that various interests are balanced for the public good. This has been achieved reasonably well in the case of the best-practice UASFs currently in operation that held public tenders. It would be difficult to achieve the same level of confidence through a trade-off negotiation with operators, unless the UASF administration could clearly demonstrate the basis of the balance of interests and fairness achieved, with a high degree of transparency.

Challenges and Alternatives to UASFs

The increased use of UASFs and their experiences has also brought to the forefront some challenges of the UASF approach which can be summarized as follows:

- Some UASF funds have not been allocated in a technology neutral manner;
- Some UASFs are not managed in a transparent manner;
- The levies collected by some UASFs are directly fed into government budgets instead of being dedicated to projects in the ICT sector;
- Some UASFs have accumulated too much money and allocated too little; and,
- UAS program planning and implementation has sometimes been overtaken by market developments.

Some funds established before the mobile service explosion limited fund distribution to fixed-line operators while asking mobile and wireless operators to also contribute to the fund, which primarily benefited the government-owned incumbent operator. This was against the principle of technology neutrality, equity between contributors and eligible recipients of funds, and did not encourage cost minimization. Experiences highlight the importance of adhering to those key principles when operating a UASF program.

Also, some UASFs had only allocated a small portion of the funds for the implementation of UAS provision from what they had collected. Underneath this lie two problems:

- The percentage levy to be collected from operators was set too high, collecting more funds from the sector than the UASF was able to use and allocate, thus depriving the sector of important funds for commercial investments and expansion. This was sometimes caused by an under-estimation of market growth; and,
- The pace at which UAS programs were planned, projects designed and bidding processes implemented was sometimes too slow.

The latter point also relates to the fact that UAS program planning has in some instances been overtaken by market developments, especially the rapid spread of mobile coverage in many developing countries. Consequently, global experience with extending access and UAS policies is evolving and in recent years the following approaches have been implemented, either separately or in combination:

- Market based reforms
- Mandatory service obligations
- Leveraging new technologies, e.g., mobile services
- Leveraging new business practices, e.g., pre-paid cards
- Cross subsidies
- Access deficit charges
- Universal Funds
- Public-private partnerships

Of these, the most successful have been the market-based reforms associated with the liberalization of the mobile sector, supported by a stable regulatory environment and the subsequent exponential growth in customers in developing countries. These initiatives have allowed market forces to contribute fully and thereby close the "market gap". Regulators have used a variety of methods to achieve UAS through market forces, including regulatory reforms that create incentives for the private sector to extend universal access, establishing interconnection frameworks, flexible spectrum rules and other technology-neutral policies to encourage the entry and use of new and innovative technologies and provide a wider range of participants to achieve UAS goals. The remaining "access gap" can be categorized as:

- Communities that only require a targeted capital injection where future revenues will support

operational expenditure, often referred to as the "sustainability frontier" and

- Communities that require ongoing support for both capital and recurring expenditures.

The practice of ensuring universality by using cross subsidies between the different services of an operator (from international to local and/or access) to ensure affordability has been severely strained by the introduction of competition. Access deficit charges have also been found to be sub-optimal in competitive environments. In many jurisdictions, Universal Service Obligations (USO) are in place. The informational demands on regulators are considerable where a designated operator (frequently the incumbent) is reimbursed for the losses incurred or reported in the provision of UAS.

While UASFs are an important tool, they should not be solely relied on to achieve universality. Other mechanisms to be considered and adopted include direct state aid and public financing such as loan guarantees and public-private partnerships, as well as liberalizing the licensing and spectrum frameworks.

Where UASFs are used, they have proved effective when disbursement is coupled with competitive bidding or auctions for these financial incentives, requiring operators to compete for the minimum subsidies needed to fulfill the UAS target. Since subsidizing ICT projects carries certain risks such as market distortion, dependence on funding, fraud and abuse, favoritism and wasted resources, regulators have introduced "smart subsidies". Smart subsidies provide a one-time award geared towards obtaining results in areas where investors have been reluctant to invest, but will ultimately become commercially viable. Thus, the subsidy acts as more of a kick start to investment rather than as a crutch. The Dominican Republic provides an example of where a smart subsidy, known as an output-based aid (OBA) subsidy, has been used. The regulator conducted transparent, minimum subsidy auctions in which the winners receive the subsidies in phases over the course of the project rather than all at once. Thus, winners receive 20 percent upon signing the contract, 40 percent upon completion of the required installations and the remaining 40 percent in six month installments over a five-year period.

In some instances, subsidies have been provided directly to customers or to particular institutions, such as libraries, schools, and public tele-centers. Early, large-scale UAS projects were frequently undertaken on a top-down, supply-driven approach where a single provider, often the incumbent, was selected to provide a standard set of services, using a narrow set of technologies over a wide geographical area. The introduction of NGN-related technologies, such as Broadband Wireless Access (BWA) and Wi-Fi, has substantially reduced economies of scale in both the infrastructure and service segments. This has opened up the field to a wider range of small or local providers to expand universal access from a bottom-up, demand-driven approach.

The phenomenal spread of the Internet has had an impact on notions of universal service. In the 2002 Universal Service Directive, the EU included the concept of "Functional Internet Access" in the definition of universal service and is currently constructing a "future proof" regulatory environment. For example, in September 2009, the EU announced that it will inject EUR 1.02 billion into the European Agricultural Fund for Rural Development (EAFRD), part of which will be used to support investment in high-speed broadband to help ensure 100 percent coverage to EU citizens by 2010. As part of the EU's stimulus plan to secure investments in broadband deployment, Member States must ensure that provision of state aid is 1) granted out of state resources; 2) confers an economic advantage to businesses; 3) selectively targeting recipients and is not distorting or threatening to distort competition; and 4) affects intra-Community trade.

In a converged economic space of electronic communications, new forces have been set in motion. VoIP business models are leading to the erosion of revenues from voice services for operators, while the intensification of competition is hastening the transition to NGNs. While NGNs provide the opportunity for a much wider range of revenue-generating services, the platforms will be deployed on a commercial basis. It is quite possible that this deployment will follow the geographic and income-related distribution of computers in businesses and households. This implies that those locations currently underserved or benefiting from a UASF will not be among the first to be connected. Furthermore, given the shift in cost towards the user, when the cost of a computer is included, the concept of "affordability" must be re-examined. Clearly there will be an enhanced role for shared access and community-based initiatives.

There is growing interest in and experience of community-based projects to provide Internet services based on the "municipal open access model." A study by infoDev in 2006 found numerous examples of community-based projects, including the Myagdi, Kaski, and Parbat districts in north-west Nepal; the municipality of Pirai in the Rio de Janeiro state of Brazil; and the city governments of Philadelphia (U.S.) and Knysna (South Africa).

The debate over the role of broadband in universal service is underway around the world, such as Chile and India. In 2006, India was one of the first countries to include broadband in the UASF, which allows the fund to support broadband connectivity and mobile services in rural and remote areas. Convergence, facilitated by NGNs, raises the potential externalities by increasing the potential benefits to households of services if they had access to them. Convergence may possibly increase the sector base on which levies can be made for a UAS Fund while also raising specific regulatory issues related to universal service regarding voice quality, emergency services, and services for the disabled. Overall, policy makers should keep in mind that UAS requirements have expanded to include broadband due to the rise of NGNs and convergence. While market forces are dynamic, UAS policies should build on competition to encourage deployment to all.

Rural Broadband Development

Looking at the three components of UASFs – means of finance, institutional entity to plan and implement UAS programs, and the competitive smart subsidy mechanism – and taking into consideration the negative and positive experience of funds, for one of the main tasks ahead for UAS, rural broadband development, the following seems clear:

- It is necessary to limit the amount levied directly on operators as a percentage of revenues and at the same time to widen the pool of other financing sources. International experience indicates that no developing countries appear to have been able to disburse more than a maximum of 2 per cent of sector revenues in their UASF program. International experience also indicates that this figure should not be static but should be slightly flexible to reduce contributions over time as the market grows and UAS targets are progressively achieved. At the same time, considering the potential finance required for rural broadband development, it seems also crucial to widen the sources for financing the UASFs and include licensing and frequency auction proceeds (e.g., a certain percentage of the proceeds) and government sources to the pool for the UASF.
- Delays in allocating funds as well as delays in implementing programs both point to the requirement to increase capacity and efficiency of the organizations or departments charged with planning and implementing UAS programs.
- The competitive smart subsidy mechanism and co-operation with industry has proven very successful and should be maintained and could be incorporated into other approaches as well, such as selecting a private partner for public-private partnerships.

6.4.3. Non-government and Community Initiatives

Non-government organizations and local communities can play an important developmental role in universal access and service (UAS). They represent bottom-up rather than top-down policy driven initiatives and in many cases they have become significant contributors to the objective of reaching underserved populations and of bringing communications and improved livelihoods to the poorer segments of society. The focus on community involvement is typically more prominent with ICT and broadband initiatives.

Of particular note are the following models and experiences:

- Public private Partnerships (PPPs): The provision of UASF funding support on infrastructure projects is, arguably, a form of PPP. Even though the funding is levied from the industry, it can be seen as a specific-purpose tax and as such becomes state property. The government, through the UASF, allocates it to sector players, which sign special contracts with detailed obligations that they would not otherwise have. The retention of even partial ownership by the government is less important than its ability to play a role in directing the behavior of the operator. In the case of most UASF programs, the primary role for the host government (and/or regulator) is the analysis

and setting of direction as to which targets for infrastructure development shall constitute the minimum acceptable level of coverage in telephony and ICT access and service provision, and which areas will need financial assistance to meet targets. Other examples include developments where the government, through loans or grants from the World Bank, has provided seed finance for piloting (e.g., Mongolia and Mozambique), or to support the first round of universal access (UA) project tenders (e.g., Uganda and Mongolia).

- Micro-finance and entrepreneurial village phone initiatives – these are now well-known, not least because of the high profile Grameen Village Phone initiative in Bangladesh launched in 1997. The Grameen Bank provides impoverished village women with financial support to develop sustainable income generating activities. Female clients of the Grameen Bank who show the initiative to become local Village Phone Operators (VPOs), receive training and are loaned funds to purchase a mobile phone set-up (phone with special in-built pricing software) suitable for rural areas, as well as airtime credits. Through the network of VPOs, vending affordable airtime denominations and facilitating individual calls, residents have access to communications. In 2006, Muhammad Yunus, the founder of the bank, and the Grameen Bank itself, were jointly awarded the Nobel Peace Prize "for their efforts to create economic and social development from below". Similar initiatives have been replicated in many other countries. However, in Bangladesh itself, the increased mobile penetration and the large number of village phones itself is eroding the profitability of the model. It is likely that value-added services need to be added to the village phone concept to remain relevant and sustainable.
- Community networks are a recent trend, however there are a few established examples which demonstrate some success factors. Often, these examples are small-scale initiatives. Pre-conditions for success include the following:
  - A minimum critical size – for example, a typical community network based on WiFi technology requires a population of around 15,000 with annual income per person of US$500 to support itself. As technology costs reduce further, the size of population critical for success will also shrink. Still, many communities will be too small to support successful community networks;
  - Communal consciousness or some level of organization enabling the population to function as a community, express its shared needs, and act in its own interests is necessary for community networks to succeed;
  - Local leadership and, preferably, a core of committed people with a certain level of education and technical skills;
  - Access to external technical and managerial support, especially if these skills are lacking locally; and,
  - A supportive political and regulatory environment that promotes community networks.
- Internet public access, telecenters, and cyber cafés – there is a very wide range of sponsors of telecenters, of funding sources and organizational and management models; also, many telecenters have been established through UASF competitive tenders. It appears the models are more successful:
  - If there is a network of telecenters which works together;
  - If there is a financing model in place that secures ongoing sustainability (often the cost of maintaining, upgrading and replacing equipment is underestimated, while service revenues are over-estimated);
  - If services are tailored to local demand; and
  - If telecenters are operated either commercially by local entrepreneurs or at least adhere to a certain degree to commercial management practices.

  Gaining sufficient broadband quality is crucial so that Internet users have an Internet experience that is relevant, worthwhile and which will engender ongoing interest in ICT. This challenge led the planners of Uganda's rural communications development program to focus on providing broadband Internet Points of Presence in district centers, where demand is most likely to exist and key users might emerge, ahead of focusing on telecenters. In several

places, commercial cyber cafés emerged once broadband Internet access was made available. These businesses could provide the experience as well as technical resources to support community initiatives or assist vanguard institutions such as schools, hospitals, community broadcasters and government offices. The practice of focusing first on Internet POPs has now become standard practice in many of the new generation of Universal Access and Service Funds (UASF);

- Community radio or local radio - While there are no fixed definitions of what UAS means in the broadcasting field, there is a certain consensus on what its key dimensions are. These include local media, plurality and diversity. It is essential to ensure that all citizens have access to a local radio station as a forum for local debates, relevant information, and cultural expression. It is important that local media provide a diversity of content and plurality of information and opinions. Further, radio is a mass medium that promotes community interaction and social communication processes. Rural radio is not only important for UAS to broadcasting services, but it can also play an important role in spreading the benefits of Internet access. In many cases, successful use of the Internet for development requires community intermediaries that can overcome issues of pre-literacy, lack of ICT training and language barriers of the Internet. Local rural radio, which has Internet access, is emerging as one such successful intermediary because it is accessible, affordable and cheap to produce.
- Co-operatives - While only existing in a handful of countries, co-operatives are providing communications services in some rural and remote areas. Analyses of experiences to date show that co-operatives only thrive when certain conditions are in place and that the model is not applicable to every country or situation. However, there are considerations in the development community, whether co-operatives might be the model to deliver broadband to rural and poor areas. More piloting and experience with this approach needs to be gained to see if that is the case.
- Regional or rural operators - Reviewing the limited experience with regional or rural operators as a tool for UAS provision, also in light of possibly adopting a rural or regional licensing strategy for broadband development, the key findings are:
  - There is an inherent market tendency for rural or regional operators to become national operators, either by being bought by a national operator, or through their own drive to grow and become a national operator. It is possible that regional or rural operators might be a temporary phenomenon; and,
  - Introducing regional operators can be an effective tool for introducing new entrants and more competition. If a regional license is focused on areas that are less well served and coupled with the incentive of being converted into a national license within a reasonable time, it can have the triple results of: a) Increased service in previously un-served areas; b) Increased competition; and c) A period of time to prepare and adapt to increased competition for existing player(s).

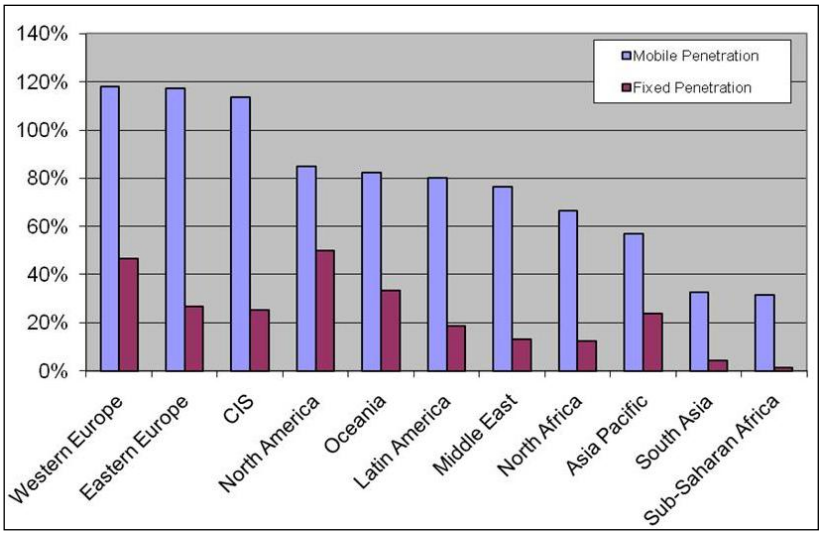
Community Involvement in UAS Projects

Communities have a role to play in UAS for the following reasons:

- Some available low-cost communications technologies can work on a neighborhood scale and are not too technically demanding, e.g., WiFi and VoIP, with free and open source software (FOSS);
- There is a recognition of the critical role local leaders have in tailoring ICT facilities and services to local needs as well as the importance of community ownership of ICT programs, which is vital in working towards sustainability;
- Communities have a growing awareness that poverty is a complex phenomenon, stemming from a lack of political power as much as from a lack of money, and that grass-roots initiatives, which build local competence and confidence, contribute significantly to poverty relief; and

There is a rising popularity of multi-stakeholder partnerships, in which the public sector, the private sector and other interested parties work together, each contributing finance, skills or other resources. For best results, end-user communities should usually be development partners.

Figure 6.3 Fixed and Mobile Penetration, 2008



Source: ITU World Telecommunication/ICT Indicators database.

6.5. Reforming Universal Access

6.5.1. Changing Contexts and Trends

The following are major trends that challenge and shape UAS policy development.

Much More Ambitious Goals

Technology change and market growth have lowered costs to the level where universal access (UA) to voice services has been achieved or is soon achievable for most developing countries, and a degree of use is affordable for almost all citizens. Many developing countries can now set their sights on universal service (US) goals for telephony, see Figure 6.3 (subscription penetration translates into a higher household penetration). UA for Internet has already been part of many UAS policies, but now the new frontier is setting the goal of achieving access for all to broadband services. Access alone is not sufficient; the capacity and speed is important and will have to be continually improved. Telecommunications markets are dynamic; new technologies are constantly emerging, and new services rapidly become popular and then indispensable. Therefore, universal access and service (UAS) aspirations will continue to rise over time.

A Wider Array of Models and Approaches for UAS

Since liberalization, many developing countries have introduced UAS policies and programs and there is a wider array of models, experience and best practices to build upon. With the advent of broadband, new ideas and models are emerging and are piloted and implemented to achieve rural broadband access. Existing UAS models need to be reviewed regarding their applicability and, as required, adapted.

Most models recognize the importance of understanding and incorporating market forces into their approaches. Many UAS models are working with the commercial sector and use competitive approaches where appropriate.

Greater Interest in Reaching the Poor by Commercial Companies

Probably brought on by declining growth opportunities in traditional markets as they mature and saturate, there is a general trend for many operators and service providers to focus their attention also on the still unreached markets. In addition, Corporate Social Responsibility (CSR) programs, base of pyramid marketing and concepts of social investing, contribute to the interest in serving the poor.

Complex Interactions with Other Policies

ICTs support many applications and services and influence the performance of many other sectors. Consequently UAS policies should ideally be designed in co-ordination with, or at least with consideration of, other government policies, including those for computer applications, health, education, government, and rural livelihoods

(including electricity, infrastructure, etc.). Countries require overarching national ICT policies that address the sectors impacted by ICT and outline ICT development in all sectors of the economy and society. UAS policies are typically a sub-policy to the national ICT policy with the focus on areas and services that cannot be reached by the market alone. However, UAS policies aimed at increasing telecommunications infrastructure and access should not be impeded if other sectors are slower.

6.5.2. Technologies for UAS

Developments in technology affect the cost, acceptability and feasibility of services and have a direct impact on universal access and service (UAS). Because technological developments influence regulators' expectations and users' technology preferences, minimum requirements for and expectations of UAS increase over time.

UAS policy needs to be resilient and forward looking as it takes emerging technologies into account, but it should aim to be technologically neutral. Regulators should be informed observers regarding technologies, but they need to allow UAS providers to choose which technologies are cost effective.

As an overall principle, it is important to note that technologies are neither isolated from market, nor solely the determining factor in successful service provision. Country by country, whether a particular technology is an appropriate solution for UAS and rural areas, and for low income people, depends strongly on these market factors:

- Competition (the market position of the providers, their service packages and pricing strategy);
- Demand and affordability;
- Customer density; and
- End user terminal distribution and availability.

Such factors should not be overridden by governmental preferences; technological choice should be left to service providers and the regulator should focus on providing equal opportunity for participants.

These trends create a new ICT network paradigm for the Information Society and imply that there is a need for UAS policy interventions to encourage network and service build-out in directions that are regionally balanced and ubiquitous. However, just as the mobile revolution has driven progress in achieving UAS for telephony, it would be advisable for regulators to give high regard to fundamental market developments taking place in the broadband field also.

In summary, policy makers and regulators need to recognize the following:

- The requirement for UAS has moved from pure telephony to include broadband (thereby allowing access to different types of content and ICT applications);
- The trends in Internet and IP development, NGNs and convergence are giving impetus to the emergence of a "broadband revolution". Commercial and market forces in this development promise to be just as dynamic as those which drove the mobile revolution;
- UAS policy needs to harness the principles of competitive market regulation and technological openness/neutrality to encourage the most economic and sustainable deployment from among the plethora of technologies available for ICT.

6.6. Strategies for Developing Economies

6.6.1. Developing UAS policy

Developing a universal access and service (UAS) policy begins with these essential questions:

- Who is the lead ministry or entity developing the UAS policy;
- What is the main purpose for developing the UAS policy? (e.g., social harmony/ regional balance; economic growth; global competitiveness; reduction in rural to urban migration; poverty reduction); and
- What are the aspirations of the UAS (e.g., there can be different emphases on telephony, Internet and broadband – depending on UAS goals already achieved).

Steps in Developing UAS Policy

There are several stages and procedural elements involved in developing UAS policy:

1. Sector review – Establishing the current status quo, barriers to growth, potential solutions and UAS strategic options;
2. Policy formulation – Setting specific objectives, time-bound targets and strategies to achieve those goals;
3. Regulatory measures – Their priority over other government interventions and their ability to reduce costs of implementing the UAS policy;
4. Financial analysis – Identifying the required financial resources to implement the policy;
5. Economic appraisal of UAS options - Using strategic socio-economic considerations for policy development, and micro-economic analysis to decide on priorities and sequence within a UAS program; and
6. Consultation – Several stages of consultation with various stakeholder groups to solicit input, feedback and develop broad buy-in.

Objectives, Targets and Strategy

Decisions on the following key questions need to be made after the sector review process has provided a foundation of data, analysis and initial viewpoints from various stakeholders:

- Which services (e.g., telephony, Internet, broadband but also directory assistance and access to emergency numbers) should be included into the universal access and service scope
- Which specific targets for each of the services should be set;
- What main groups should be targeted (e.g., rural population, urban poor, people living in socio-economic depressed areas);
- What other special targets are advisable e.g., schools, libraries, hospitals, etc.);
- What timeframe should be set for certain targets to be achieved and what timeframe will the UAS policy cover;
- What approach should be used and which strategies employed, covering:
  - Estimating cost of achieving set targets and whether public funding (subsidies) is required;
  - Who will provide the funding and how is it collected;
  - Who will deliver the services (e.g., operators and service providers, NGOs, entrepreneurs, etc.); and
  - How will those entities be selected.
- Future proofing: How will the policy be adjusted to reflect market changes over time? Targets need to be feasible, as well as forward-looking and future-proof, so that they remain valid and appropriate during the lifetime of the policy and are not superseded by market developments. Most policies are designed for a five to ten year horizon, while a UAS program sets targets for one to three years. The policy itself should allow for a process of review and update so that it may adjust targets.
- Who is going to take the lead in the implementation (including coordination and monitoring) of the UAS policy?

Who Should Develop and Draft UAS Policy?

Typically, a UAS policy is developed by the ministry responsible for communications (or in countries without a ministry by the entity responsible for communications), often with the regulator's significant input or maybe even with the regulator's drafting of the policy.

Ministries other than the one responsible for telecommunications and ICT (e.g., education, science and technology, economic planning, finance, municipal and local government) are also considered to be stakeholders. For example, one or more might have a seat on the Board of the Universal Access and Service Fund (UASF). However, their involvement in the UAS policy development and drafting is usually one of contribution to a consultation process rather than as an actual sponsor of the policy.

Consultation can be considered a mandatory part of UAS policy development and leads to better results. The telecommunications and ICT industry, as well as non-government organizations (NGOs), should also be part of the UAS consultation process.

Who Implements UAS Policy?

UAS policy may be implemented by: the country's National Regulatory Authority (NRA), the ministry responsible for telecommunications and ICT or an independent agency. Each is considered below.

Regulator

Many countries opt to have the independent NRA responsible. This is a sound approach because:

- The regulator typically has the required industry sector expertise, and skilled technical, economic and financial staff;
- The regulator has a degree of independence and is perceived to be one step removed from politics; and
- The regulator has established relationship and credibility with industry, often the main partner in the implementation of UAS policy.

There is a trend towards multi-sector regulation, including broadcasting. Under this scenario, the same reasons apply for it being responsible for UAS implementation.

Ministry

In a number of countries, the ministry responsible for communications implements UAS policy (e.g., Colombia, Guatemala, Peru and India where the ministry manages the UASF). This has the apparent advantage that the agency responsible for policy is taking responsibility to carry it out. However, a possible disadvantage is that since the UAS policies sometimes include special financing instruments (e.g., a UASF) for which the main contributors are the industry (either through a levy or use of frequency receipts), government is not perceived as being far enough removed to be an independent administrator of the finances, especially if the government has any ownership interest in the industry.

Box 6.2 UAS Policy of the Republic of Ghana

Ghana's UAS policy is defined in the section entitled Universal Access to Communications, under the National Telecommunications Policy 2004.

Policy Objectives

The policy seeks to achieve universal access and universal service for telecommunications throughout all regions and communities, and to achieve a universal service penetration of 25 per cent of the total population, and of 10 per cent in rural areas, by the year 2010.

A particular focus is set on improving the access to telecommunications in schools, health facilities, and community centers.

Policy Targets

The universal access target for Ghana is to ensure availability, through broad geographic coverage, of community-based broadband services to include voice, data, and Internet services, and to include local content, and community radio and government services. These services and content must be of high quality and available, affordable for all citizens.

The establishment of multi-purpose telecenters or community media centers in underserved locations is a priority, and so the projects that specifically target such needs shall be given a priority (for instance, through the funding mechanism).

The universal service target (to be simultaneously achieved) is to ensure service and content availability to households or individuals as above, except that this may also include traditional telephony services in addition to broadband.

Approach and Financial Mechanism

Every licensed or authorized operator in Ghana is required to contribute, on an annual basis, to the Ghana Investment Fund for Telecommunications (GIFTEL). GIFTEL shall facilitate a partial investment funding for eligible projects in under-served areas. Eligibility is largely based on those policy targets set out above, and funding shall be made on a non-discriminatory basis.

GIFTEL funding is allocated on a competitive basis through an open bidding process. Funds will not be allocated to those locations where commercially viable services are available.

Funds allocated through GIFTEL will only be provided based on the successful assessment of a plan's long-term financial sustainability. This assessment shall reflect how inclusive the plan is with regard to local stakeholders, and in particular for those who are at a disadvantage.

Specific obligations may be placed on licensed operators in order to help facilitate the policy objectives; this may include specific interconnection responsibilities.

Source: ICT Regulation Toolkit.

Independent UAS Agency

A few countries have opted to establish a separate agency. South Africa, Pakistan, Ghana (see Box 6.2) as well as the United States and Canada have established separate UAS agencies. Peru and Nigeria have independent banks or trusts as the financial managers for a UASF, even though the regulator in Nigeria has the planning and secretariat role while the Peruvian fund is under the Ministry for Transport and Communications.

While a completely separate agency elevates the status of UAS and creates at least the appearance of even greater independence, it may come at a higher cost as well as with increased complexities of co-ordination.

Policy Documents

A UAS policy should adhere to policy formulation standards, processes and formats. Although these may be unique to each individual country, as a general guide the following elements are usefully addressed in the policy:

- Introduction and background;
- Status of the telecommunications and ICT sector;
- Vision, policy direction and objectives;
- Key challenges and barriers (e.g., regulatory issues);
- Strategic mechanisms for the implementation and funding of UAS;
- Implementation arrangements;
- Principles of operation of the chosen instrument(s), for example:
  - Universal Access and Service Fund (UASF);
  - Mandatory service obligations issued with new licenses;
  - Competing for subsidies;
  - Regional operators;
  - Infrastructure sharing;
- Monitoring, evaluation and review.

Financial Considerations and Analysis

Policy development should consider the desired outcome and the available financial resources in order to arrive at a feasible strategy. Countries benefit from having realistic objectives and targets that can be financed without strain, and which they have the capacity to manage.

If policy makers set UAS goals and targets that are too ambitious to achieve, e.g., would cost perhaps 5 per cent or more of the sector's annual revenues to subsidize, it might be unrealistic to set these goals. But a program that costs only 1 per cent of the sector's revenues is more realistic, as long as the program administrator (e.g., the UASF) has the necessary management and staff to ably administer the projects.

The three main questions related to finance in UAS policy are:

- What is a financially feasible UAS policy, i.e. what is the limit?
- Where should the financial resources for a UAS program come from; and
- How much finance is required to implement the desired UAS policy and program strategy?

Finance to Implement UAS Programs

Typically, the amount of finance a UAS program requires is estimated in the context of appropriate operator levies. There are two ways to estimate the appropriate level of UASF contributions:

1. Policy-driven approach – Determine what scale of subsidy program would be required to meet the country's policy objectives and time-bound universal access and service (US) targets. The total cost and subsidy estimates are compared to the total sector revenues. The percentage of total sector gross or net revenues calculated by this method becomes the high level estimate; or
2. Market-driven approach – Determine from a survey or assessment of operator and other stakeholder opinions, as well as from international benchmarks, what operators would accept or could afford as a reasonable contribution. Then develop the UASF program to match this.

The actual amounts required from the industry will vary depending on other existing financing sources available, such as government budget allocations, proceeds from licensing and spectrum auctions and development partners.

Economic Appraisal of UAS Options

Detailed economic analysis is typically undertaken during the development of UAS programs, often to determine project priorities, and is less important at the UAS policy development stage. However, broad economic considerations are important in the policy formulation. Countries develop UAS policies based on the premise that access to basic and advanced telecommunications and ICT services have a wide-ranging socio-economic rationale. This recognizes the importance of telephony and ICTs as enablers of growth and equality in the country, and competitiveness on the world stage. However, some projects may deliver different types and levels of benefit more than others, or deliver the benefit in different parts of the country, all of which are reasons why the selection of UAS programs and projects need to be made carefully and priorities set for available options.

Agencies that implement UAS need to consider and analyze the economic impact and relative value of UAS strategic options, programs or projects, make selections or set priorities in the context of national economic growth, developmental impact (including poverty alleviation), commercial viability, regional balance and related economic concerns. For instance, it may be that a competitive mobile market might be the best way to deliver UAS objectives (see Box 6.3). Key factors to be considered in the implementation stage of UAS policy include:

- The total population reached by each project or potential investment;
- The expected impact and poverty reduction effects, compared to the vision and objectives;
- The regional benefits and equalization in socio-economic terms;
- The commercial viability and sustainability of a program;
- Leveraging of private participation;
- The subsidy cost per beneficiary; and
- The benefit to cost ratio.

Legal Modifications and Regulations

Once a universal access and service (UAS) policy is developed, legal modifications and further regulations are often required for implementation. Typical issues that need to be addressed are:

- The legal basis for the chosen financing instrument: collecting a UAS levy from operators and service providers (licensees), using frequency and license auctions proceeds to finance UAS, developing a new licensing regime with attached UAS requirements, or infrastructure sharing, or any other chosen instrument;
- The legal instruments to apply selected financing or implementation mechanisms (e.g., set up of a UASF, authorize its management and fund disbursement, new licensing regimes and draft licenses);
- Detailed guidelines on UAS policy implementation, UASF objectives or objectives of any other chosen UAS strategy; and
- Detailed regulations, guidelines and principles of the UASF management and operation, if a UASF was chosen.

The precise amount of legal revision that is required, or additional regulation to be implemented, may vary significantly from country to country.

Box 6.3 Faster Commercial Expansion than UASF Implementation Pace

In Uganda, as well as in Nigeria, Mozambique, South Africa and many other countries, mobile network development has outpaced the regulator's ability to promote universal access and service (UAS). For example, due to funding and tender delays, half of the communities slated for subsidy in Uganda under the first Rural Communications Development Fund (RCDF) tender had already been reached by the leading GSM operators before tender award had been made. As well, the highly successful Village Phone model of public access had already been rolled out to more than 4,000 villages. Happily, this actually enabled the leading operator to bid the lowest subsidy and saved the World Bank (and ultimately the RCDF) almost 40 per cent of the predicted subsidy. However, because of political instability and insurgency in the north of the country, the RCDF program had an important and relevant role to play in areas not yet served commercially.

Thus there are lessons to be learned which have shown that in many cases, the administration of a Universal Access and Service Fund (UASF) may not be sufficiently agile to actually keep ahead of the market and distribute subsidies to the most appropriate areas. This emphasizes the need for regulators and fund administrators to work closer with operators and include their roll-out plans more strongly into UAS program planning, make special efforts to avoid areas that will be served commercially through normal market forces, and focus on the removal of hurdles to market efficiency.

Source: ICT Regulation Toolkit.

6.7. Digital Literacy and e-Inclusion

It is increasingly important that everyone has the support, confidence, skills and equipment to allow them to use the internet and participate in the digital economy. Unless they are able to get online, many will be unable to access the public services, information and entertainment that are a growing feature of everyday life across the world.

Access to the internet has therefore become essential for citizens to play a full part in society. Research in 2009 by PricewaterhouseCoopers showed that those without the internet are already disadvantaged. In the United Kingdom, on average people who use the internet saved £560 a year by shopping and paying bills online and people with basic IT skills earn up to 10% more than their offline counterparts.

In future, UAS may become a question of "e-inclusion", which is the goal of the European Union (EU) declared in the Riga Ministerial Declaration. e-inclusion means both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on participation of all individuals and communities in all aspects of the information society. e-inclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion.

The Riga declaration recognizes the social consequences of lacking access to ICTs when ICTs have become engrained in all parts of the economy, public and personal life. It stresses actions in the following areas:

- Improve digital literacy and competences;
- Reduce geographical digital divides;
- Use ICT to promote cultural diversity;
- Promote inclusive e-government;
- Use ICT to address the needs of older workers and elderly people; and
- Enhance e-accessibility and ICT usability for people of all abilities, gender and social standing.

E-inclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion. The European Union's Digital Agenda proposes a series of measures to promote take-up of digital technologies by potentially disadvantaged groups, such as elderly, less-literate, low-income persons. Improving access for people with disabilities is another of the policy actions set by the Digital Agenda.

The main reasons why people do not use the internet are increasingly well understood. Europe's *Digital Competitiveness Report* has shown that the main reason for not having internet in the home is the perceived lack of need (38%). Costs for equipment (25%) and access (21%) remain barriers, as do lack of skills (24%). Worries about security and privacy (5%) and physical disability (2%) are less frequently barriers, although they may be significant for some people. Research by Fresh Minds in the United Kingdom has shown that internet non-users are more likely to be poor, to be female, be retired or elderly, have low educational qualifications, or be on welfare benefits.

Developing countries have not yet reached the levels of dependence on ICTs that are current in the EU, but the concept of e-inclusion holds a broader relevance and illustrates the direction of change expected over the next decade.

Many countries have put in place programs in an attempt to improve digital literacy and get more people online. Access to a personal computer (PC) has been identified in many developing countries as being a key part of national digital access programs. For instance, Algeria, the Arab Republic of Egypt, Malaysia, Nigeria and Tunisia have active programs designed to enhance the availability and use of PCs. Both Egypt and Malaysia uses incentives to progress the uptake of PCs - and internet penetration and use - amongst both general and specifically targeted populaces. There are related penetration targets that are generally published by each country, and early indications show that there have been improvements in these rates. In general, the programs rely on financial incentives such as the provision of easy, secure and/or favorable financing terms, lower than market costs, and tax exemptions.

For instance, in 2002 Egypt introduced the PC for Every Home Initiative through its Egypt PC 2010 – Nation Online program. This aimed to reach three million families by the end of 2010 with a particular focus on those with lower incomes. This would represent coverage of over 25% of Egyptian families. This public-private partnership arrangement includes major international ICT companies including Microsoft, Intel, AMD and Via

Technologies. This cooperation is accredited with realizing discounts of up to 50% on the price of hardware, with three categories of PCs provided and a monthly installment program offered.

The Egyptian program, renamed Egypt PC 2010 – Nation Online, has also had improvements made to it that include the introduction of electronic payment, a dedicated call centre service, extended PC warranties, and the provision of loans through normal credit banking procedures.

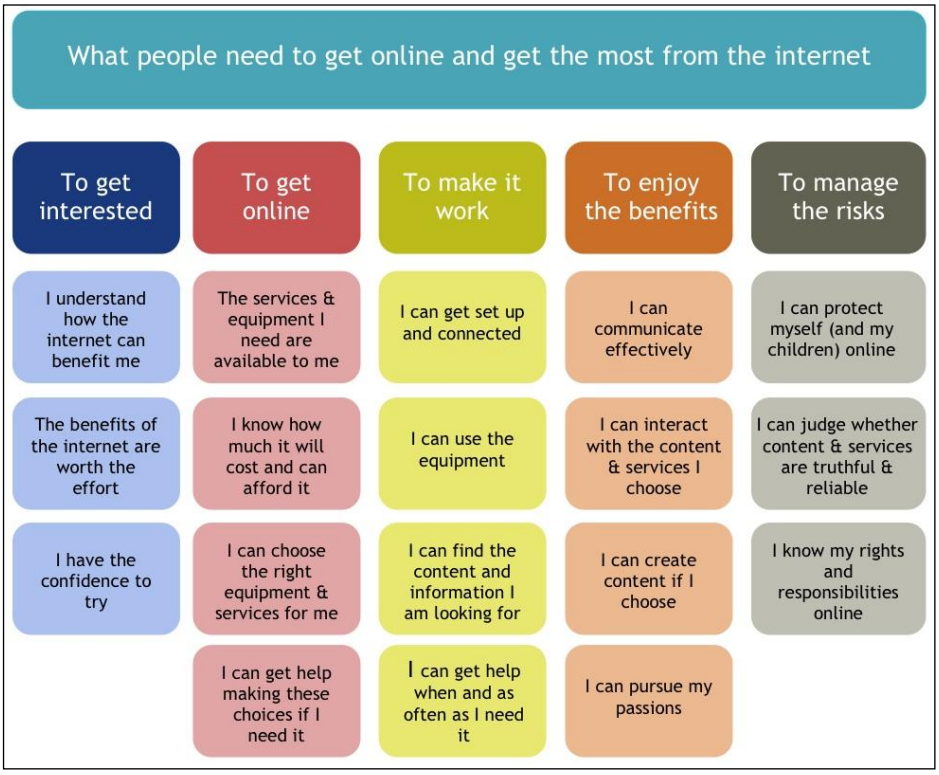
The Malaysian government announced in its 2008 Budget that it has targeted an increase in the broadband penetration rate to 50 percent of households by 2010 (up from twelve percent in September 2007). In order to help achieve this penetration and make certain that broadband is in fact used, both import and sales taxes will be made exempt from broadband equipment and from consumer access devices (e.g., PCs). Further, a tax deduction scheme will be put in place for employers and employees on the purchase of new computers and the payment of broadband subscription fees.

The United Kingdom is perhaps one of the most advanced countries in its policy of digital inclusion. Like many others it has been attempting to get more people online for several years through its network of U.K. Online Centers. New impetus was given in 2009 with the *Digital Britain Report* focusing on digital participation rather than digital literacy. Digital participation is defined as:

> Increasing the reach, breadth and depth of digital technology use across all sections of society, to maximize digital participation and the economic and social benefits it can bring.

Five stages in the digital participation journey were identified (see Figure 6.4).

Figure 6.4 The U.K. Consumer Framework for Digital Participation



Source: Communications Consumer Panel, United Kingdom.

The report announced the establishment of the Digital Participation Consortium, made up of over 65 representatives from industry and the third sector, and chaired by the communications regulator Ofcom. The subsequent National Plan for Digital Participation, published in March 2010, set a target for a 60% reduction in the 12.5 million people in the United Kingdom who are not currently online, with

older people and the less well off a particular focus. To help achieve this reduction the consortium will lead a social marketing campaign and distribute funding for projects to help people get interested in and learn to use the internet.

The views and experiences of consumers are at the heart of the United Kingdom's approach. By putting consumers first, the framework will enable policy makers and service deliverers to:

- Highlight the particular needs of different groups: different groups of people need different things to help them get online and get the most out of the internet.
- Identify gaps and overlaps in current provision: there are lots of different digital participation projects and initiatives being delivered by many different organizations across the country.
- Target new provision: identifying the particular needs of different groups and gaps in current provision will enable new activity to be targeted in a way that achieves the maximum impact with the available resources.

Assess progress: the Framework can be used to assess progress and evaluate activity and initiatives against how well they meet consumers' needs.

CHAPTER 7. A DIGITAL FUTURE: REGULATORY CHALLENGES IN A BRAVE NEW WORLD

CHAPTER 7. A DIGITAL FUTURE: REGULATORY CHALLENGES IN A BRAVE NEW WORLD

7.1. Introduction

Human communication has changed immeasurably in less than a generation. Today's children are born into a world in which their means and opportunities to connect with each other and to share information would have been unimaginable to their own grandparents - even their parents. Whether it's called the Digital Age, the Information Society, or the Digital Economy, we are witnessing a fundamental transformation of the most basic relationships among individuals, governments, and cultures. This new era brings with it limitless possibilities for humankind to realize new achievements, harnessing the powers of information and communication for the betterment of the planet. But it also presents new and unfamiliar challenges, and the risk that these technologies of enlightenment could be turned to darker purposes.

In this environment, the role of communications regulation is changing fundamentally as well, but it remains critical to the prospects of realizing the most ambitious goals for ICT-driven development. Indeed, it is due to the strong successes of regulatory authorities, *inter alia*, in their implementation of many of the traditional and innovative practices highlighted in the foregoing chapters of this book, that the current ICT revolution has taken off with such force. As the next generation comes of age in a world saturated with interconnected devices and infinite information resources, their aspirations to take advantage of these media to enhance the fortunes of the global society they will inherit will be heavily influenced by the policy and regulatory landscape that governs them. This chapter thus introduces some of the most prominent new regulatory challenges arising in the context of this transformative digital communications age.

7.2. Convergence, Ubiquity, and Web 2.0

The communications world is vastly different than even a decade ago and continues to evolve rapidly. The greatest forces for change are convergence of media, increasing ubiquity of connections, and the interactive, user-generated nature of the new paradigm.

7.2.1. Convergence of Communications Media: The Future Has Arrived

The concept of "convergence" in the world of communications has been anticipated, forecast, planned, and discussed for several decades - always with the implication that convergence is "on the way" and when it arrives, the traditionally distinct realms of media, technologies and networks will ultimately blend into a seamless and interchangeable whole.[12] As we enter the second decade of the new millennium, it is safe to say that this long-awaited era of convergence has at last arrived in full force.

Over time, the idea of convergence has taken on multiple and overlapping meanings, reflecting different perspectives of the traditional communications landscape. In fact, a variety of interrelated phenomena have been converging at the same time:[13]

- *Computing and Communications*: The merger of IT with C to yield the integrated world of ICT is ultimately at the core of all convergence trends. For more than two decades, the processing power and storage capacity of integrated circuits has been multiplying endlessly, while becoming deeply interwoven with the exponentially growing transmission capabilities of global telecommunications networks. The marriage of the two previously discrete fields is what has made possible the instantaneous sharing of limitless data in any form, in any location around the world.

- *Voice and Data*: Once distinct services and even networks, there is now virtually no distinction as to how most voice and data signals are carried from end-to-end throughout telecommunications links. Not only do nearly all networks now ubiquitously employ digital switching and transmission, but voice calls are also increasingly processed over IP packet-switched systems. In effect, only the end users themselves know whether they are talking or sending data files.

- *Wires and Waves:* Wireline and wireless networks remain separate in only limited ways; most services involve some combination of both. Telecommunications operators deploy terrestrial fixed cables (copper or fiber) where it makes technical and economic sense, and utilize a variety of radio-based connections, from microwave to satellite, for other segments of their networks. This extends all the way to customer premises equipment, where users often prefer cordless handsets attached to wireline public switched networks, as well as in-home or corporate WiFi local area data networks. The chief distinction from a technical and regulatory point of view remains the need to allocate frequencies for wireless segments and minimize interference.

- *Broadcasting and Telecommunications*: Broadcast television and radio developed separately from point-to-point telecommunications, often with separate regulatory regimes. They are increasingly integrated: cable and satellite TV are becoming the dominant media by which audiences receive television signals, and IPTV is right behind them; Internet and satellite radio are also widely utilized. Frequency allocations for broadcasting are being reassigned to allow more efficient use of spectrum for digital broadband transmissions. Ironically, some broadcast signals are returning indirectly to the airwaves in this manner: as they are transmitted from their original source onto the Internet, then accessed by users via wireless mobile devices.

- *Conduit and Content:* The traditional separation of broadcasting from telephony also yielded distinct approaches to regulation of communications content. Television and radio stations were subject to public oversight of their programming, but monitoring the content of voice telephone calls required a special permit to eavesdrop, usually only granted to law enforcement agencies and national security services. Telephone networks were "common carriers," or merely conduit for the signals sent over them. In the converged environment, all networks carry an indistinguishable mix of messages, from voice to data to audio and video.

- *Corporations and Networks:* Convergence is naturally also reflected in the strategic maneuvers of the corporate interests that inevitably vie for control of each new popular manifestation of consumer demand for communications. Both within countries and across national boundaries, media and network ownership is heavily concentrated among a core

of mega-corporations (e.g., AT&T, NTT, Deutsche Telekom, Vodafone, Microsoft, Intel, Samsung, Sony, etc.), which are likely to consolidate further as the industry matures worldwide. Such corporate convergence and market consolidation will be a key trend to watch in the years ahead.

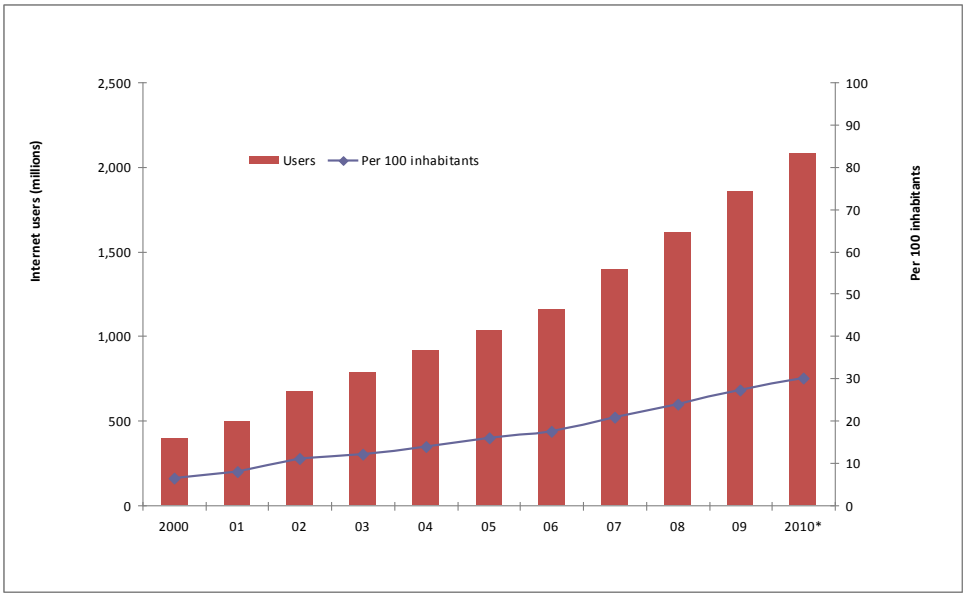
The practical impacts of all these converging trends are limitless, and have created both challenges and opportunities for industry planners, consumers, and governments alike. Today, there are no longer isolated and independent service markets for any and all kinds of communication. Customers can watch television on their MP3 players, access e-mail from their iPads, chat online while playing video games, conduct telephone conversations via their laptops, listen to radio through their cable TV, upload photos and videos directly from their digital cameras. They can do all of the above and more while working, travelling, or sitting in a park. And these options will only continue to expand in the years ahead.

For those concerned with regulation of the increasingly wide ICT universe, convergence implies a certain fundamental realignment of perspective. It means that regimes and rules once applied separately to broadcasters and telephone companies, to mobile networks and landlines, to content providers and common carriers, all must be revisited, and often themselves merged into a new, integrated regulatory framework. Some of the imperatives arising from this new perspective have been noted in the previous chapters of this *Handbook*: on licensing, competition, spectrum regulation, and the like. Looking ahead, it is clear that regulatory functions and objectives will have to take into account a variety of new issues resulting from convergence, as well. This will demand both new resources and new ideas, which recognize that a new communications era is most definitely upon us.

7.2.2. Ubiquity: Mass Communication for the Masses

While communications networks, media, and devices have been converging, they have also been spreading: blanketing nearly the entire planet, multiplying exponentially, finding their way into the homes and hands of millions more people every year. The raw numbers speak for themselves.

Figure 7.1 Global numbers of Internet users, total and per 100 inhabitants 2000-2010



Source: ITU World Telecommunication/ICT Indicators Database.

There are now at least 70 countries, many of them developing ones, in which the number of mobile phones in circulation (or more accurately SIM cards) exceeds the entire population. As at end 2009, more

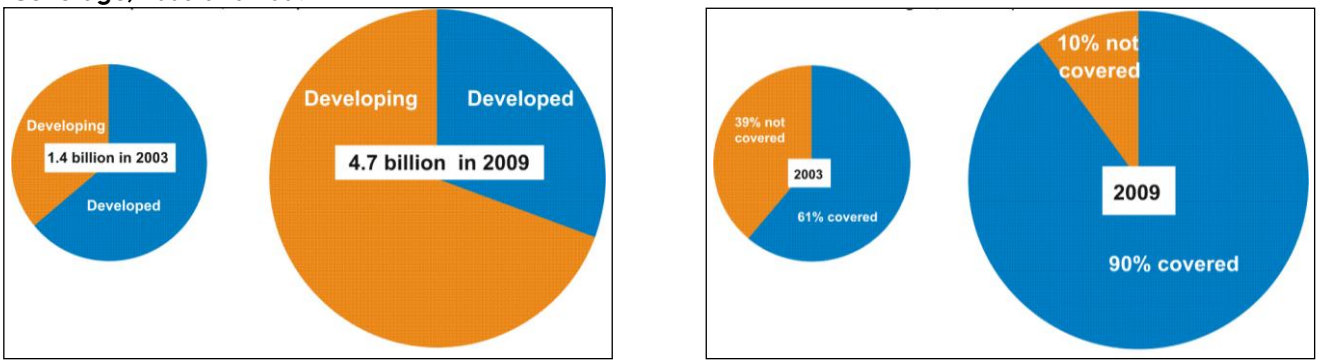
than a quarter of the world's population was using the Internet (see Figure 7.1). There are over 200-million registered domain names, and about 100-million active web sites, containing more than 20-billion individual web pages.[14] The volumes of traffic and data transmitted continue to increase steadily, regardless of economic conditions. The most popular web sites – Google, Yahoo, Facebook, Windows Live/MSN, YouTube, China's Baidu and QQ services – all have users or visitors counted in the hundreds of millions. During the 2010 FIFA World Cup in South Africa, Internet traffic to news-oriented web sites worldwide peaked at over 10 million visits per minute.[15]

Information Wealth

At the high end of the economic scale, in OECD countries and among the wealthier segments of nearly every society, individual citizens are becoming almost permanently connected. They utilize PCs on their office and school networks, while carrying WiFi-enabled laptops to every meeting, classroom, and coffee shop, listening to their iPods and perusing their e-Book readers on the train and bus, or else navigating their cars with smart GPS devices, then returning home to their personal PCs and in-house broadband networks, 500-channel digital television services, online video game systems, and satellite radio receivers, all the while talking, texting, e-mailing, surfing, and posting via their always-on mobile smart phones. The term "ATAWAD" has been coined for this growing trend of digital ubiquity: Any Time, Any Where, Any Device.

But extensive levels of connectivity are penetrating well beyond the elites, to moderate and lower income households, farther and farther out from cosmopolitan centers, and most especially among younger age groups, in nearly every region, country, and culture. Mobile phones have been the leading wave in this rising tide; the combined innovations of pre-paid calling cards, calling-party-pays pricing schemes, and SMS texting, together with the convenience of mobility and shrinking size and cost of handsets, created a perfect industry storm that was largely unanticipated, particularly in the less developed corners of the world. According to the ITU, at the start of 2010, there were over 4.6 billion mobile phones in the world and the overwhelming majority of the growth in recent years has been in developing countries (see Figure 7.2):[16]

Figure 7.2 Global Mobile Cellular Subscriptions by Development Status, and Global Population Mobile Cellular Coverage, 2003 and 2009



Source: ITU World Telecommunications /ICT Indicators database.

Regulators have greatly assisted this growth by opening the newly lucrative cellular markets to multiple independent competitors, who have rushed to invest in infrastructure and networks in even the lowest-end economies, while also bringing in much needed employment and tax revenues. In the process, Universal Service policies and funding (see Chapter 6) have also taken on new significance: rather than merely delivering minimal public phone service to remote villages as emergency connections of last resort, public authorities are now realistically looking to reduce or eliminate altogether the Digital Divide between rich and poor, urban and rural, information saturated and information starved. The widening expectation is that, in the foreseeable future, nearly all humankind will be connected to one another via multiple and ubiquitous electronic communication networks.

Indeed, connections are even extending beyond humans, to include inanimate objects as well. The

emergence of an "Internet of Things" is among the most recent trends.[17] By attaching radio-frequency identification (RFID) tags to virtually any consumer purchase or possession, the nature, location, status of these objects can be tracked and analyzed automatically and in real-time. RFIDs are already used extensively in retail stores for inventory and sales, but this concept implies that objects will remain online permanently. Household appliances can be remotely managed; supplies of home essentials can be monitored and even automatically re-ordered; everything's location and operating status can be tracked; and the history, source, and ownership of objects can be readily identified from its electronic signature. An entire inventory of a person's life might eventually be digitally catalogued for all time.

The Regulatory Imperative

The implications of this immense growth for governments, and especially regulators, are profound. Increasing success in the quest for universal communication means that the scope and impacts of communications services are increasingly significant throughout society. The numbers of people affected by each decision, each new policy, each bold initiative or grave misstep are consistently growing, and the reach of those decisions into their daily lives, their jobs, their social and cultural and political experiences, is ever more extensive.

The role of ICTs in national and local economies naturally has expanded dramatically too, both in terms of the total amounts of money spent on equipment and services, as well as the dependence of companies and employees upon these technologies. Any shift in fees or taxes, any new restriction or prohibition, any investigation or intervention, carries potential consequences that could ripple throughout the economy, for better or worse.

In effect, the role of communications regulatory authorities, whether by design or not, has been elevated into the nerve center of public policy, simply by virtue of the public's insatiable demand for unlimited opportunities to communicate. The pressure on those with day-to-day responsibility to oversee the smooth functioning of the industry has thus increased by orders of magnitude. Any service outages, for example, or perceived poor quality of service, are more likely to galvanize public dissatisfaction with both operators and those that regulate them. Instances of objectionable content or scams or other online controversies will, rightly or wrongly, often be laid at regulators' doorsteps. Moreover, other political powers, as far up as Presidents and Prime Ministers, will be drawn into disputes and crises that might once have stayed well out of their range of vision, simply because of the sheer numbers of citizens affected by ICT developments. The jobs of regulators have never been more challenging, or more important.

7.2.3. The Rise of Social Networking and Web 2.0

One of the overriding features of the digital economy is that it is also an age of democratization: an era in which the masses have a greater voice than ever before in history.

It is sometimes forgotten that the World Wide Web, and even the Internet itself, was not created from the R&D budget of any commercial enterprise. While the technology of the Internet was driven by defense research and public funding, most of the innovations that transformed it from an academic and scientific endeavor into a global communications phenomenon were pioneered by disparate, self-motivated users of the original system. Hypertext transfer protocol (http), hypertext markup language (HTML), and the original Web browsers in the early 1990s, were developed by users for their own experimental (and non-commercial) purposes. That these developments caught on and forged a truly worldwide revolution was as much accidental as intentional.

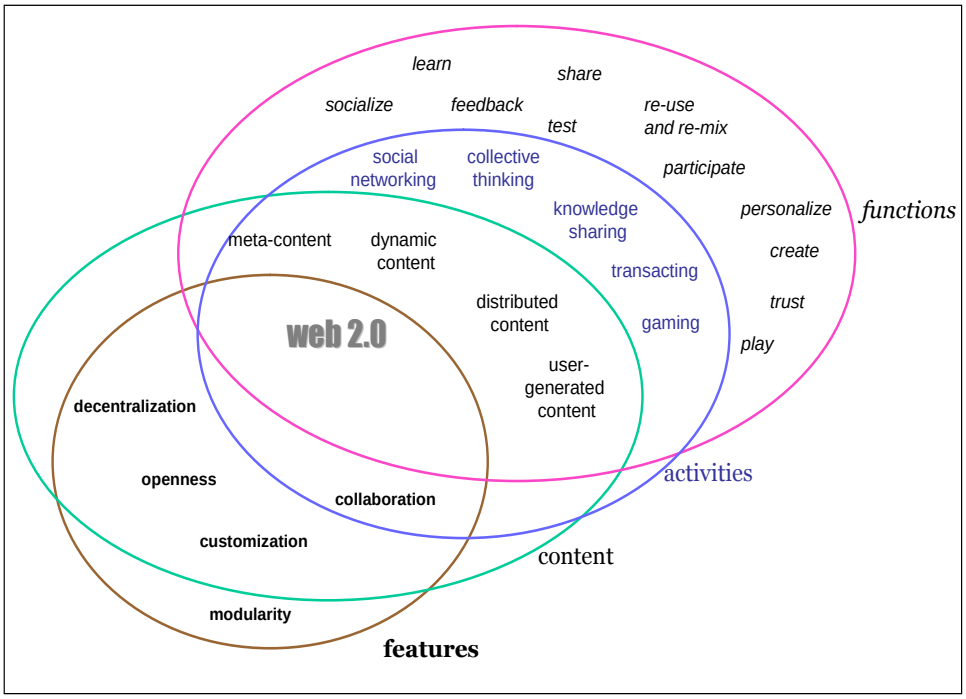
The Next Generation

In recent years, Internet enthusiasts have begun to describe the emergence of "Web 2.0," a term that implies a second generation of the Web's evolution – a more participatory network in which end-users take on a much more important role (See Figure 7.3). In this iteration, the decentralized global Internet has become even more decentralized: peer-to-peer communication and data sharing far outweigh top-down information delivery; the Web is everywhere, and everyone is the Web.

The "killer app" of this latest phase of the Internet is arguably social networking.[18] The core concept involves web-based services that allow individual users to create their own virtual biographies and diaries, and thereby to link themselves electronically with countless digital companions throughout

cyberspace. In just a few years' time, the Internet has become thoroughly dominated by these interactive, user-focused sites. By far the most successful service in this genre – and indeed on the Internet as a whole – is Facebook, the site that claims over a half billion members around the world, who constantly update their status, friends, photos, likes, and interests on a daily, even hourly basis. In terms of traffic generated, it is rivaled by YouTube, in which users themselves are also the main generators (or at least disseminators) of content. Both these applications are now driving mobile Internet traffic as well.

Figure 7.3 The Workings of Web 2.0



Source: Srivastava, 2009.

Among the countless other global sites offering similar services are such leading alternatives as MySpace (allowing multimedia user profiles), Twitter (immensely successful focus on short status messages, or "tweets"), LinkedIn (concentrating on business and job profiles), Ning (a shared web development site), hi5 (very successful in Asia), and several sites competing to dominate the vast Chinese social networking market: QQ, RenRen, 51, Baidu, and others. A special category of social networking sites are dating and marriage services, which abound in nearly every society, helping millions prospective lovers to find one another through photos, text, videos, and chatting features.

The simple concept of having users themselves create the content of an information or entertainment service, thus both minimizing costs and engaging users in the active development of the service, has also expanded far beyond the pure social networking model. There is a wide and growing array of media that now follow the same path of bottom-up, populist content sharing, many of which have risen to be among the most popular features available:

- *Multimedia Sharing:* Sites that allow users to upload and share photos, music, and especially video, showcasing their own creations or interests. By far the leader in this group is YouTube, which hosts over 120-million video clips, from archival to esoteric to amusing to political and even commercial scenes.
- *Weblogs*: Personal and community diaries, universally known as "Blogs", which typically involve commentary and discussion on topics of interest to the blog host, with user feedback and debate. The largest blogs, which cover politics, industry, entertainment, and other popular

subjects, draw thousands of visitors and comments every day from around the world.

- *"Wiki" Media:* A Wiki is a format for interactive user-based editing of online documents. In addition to posting new material, contributors are encouraged to review and revise others' previous posts, in a collective editorial process. The dominant forum of this kind is Wikipedia, the immense non-profit Internet encyclopedia with more than 10-million entries in dozens of languages, all user-generated and user-edited.[19]

- *Chat, Voice, Video:* Some of the most common activity on the Internet involves old-fashioned person-to-person conversations. Chat and Messenger services such as MSN and Yahoo! Messenger allow users to chat together or in small groups in real time. Skype, on of the first successful VoIP services, highlights free PC-to-PC voice telephone calls. All of these services now permit video calling as well, using low cost webcams.

- *Interactive Online Games:* Playing games on the Internet may be the single most popular activity among the younger generation (and many not so young), who represent the largest growth segment of the digital culture. Although most game structures and engines are created by programmers, many of the most successful involve "role playing" by users, who invent their own characters and interact with other online players across the virtual world. The largest community to date of these Massively Multiplayer Online Role Playing Games (MMORPGs) is for *World of Warcraft*, a fantasy game which had reached over 12-million paying subscribers by October 2010.[20]

- *Virtual Selling and Shopping:* Users have also become digital shop owners. The virtual marketplace pioneered by eBay, through which anyone can sell almost anything via a simple auction or direct sale, has been adopted by a variety of other, more traditional Internet retailers such as Amazon.com. This trend of micro e-commerce has encouraged millions of small entrepreneurs in dozens of countries.

- *Reality TV, Talk Radio:* Reflecting the populist trends in cyberspace, traditional broadcast television and radio have also brought users (audience) more into their programming. "Reality" television programs have become a dominant genre, including talent contests among amateur performers, with audiences voting for their favorites, as well as wide variety of other formats which showcase the lives and challenges of "real" people. On radio, the spread of mobile phones has pushed the "talk" format to new heights, as listeners can call to express their views on sports, politics, and current events, wherever and whenever they get the urge to talk.

Network Effects

One significant impact of exploding user demand to produce and display their own content has been exponentially increasing demand for bandwidth and data storage. The most appealing aspects of social networking involve sharing images, sounds, voices, and videos: the full scope of one's virtual identity. As this phenomenon continues to spread via multiple overlapping and converged media networks and devices, worldwide requirements for digital capacity will continue to mushroom without limit, placing recurring pressures upon service providers and technology suppliers to keep pace.

The most fundamental effects of this new era of human interaction, however, will be far more difficult to measure or predict. We have entered an epoch in which physical and authoritative boundaries on information sharing are no longer relevant, in which non-hierarchical knowledge diffusion is becoming the dominant paradigm. In the early 1960s, the father of media analysis, Marshall McLuhan, defined the concept of the "Global Village," to represent the impact of mass media in bringing disparate cultures together into a common worldview. The reach of technological development since McLuhan's time has only intensified this effect, linking the consciousness of billions of individuals, allowing their thoughts, ideas, beliefs, experiences, and collective wisdom to be shared universally, and democratically.

7.2.4. Self-Regulation and Netiquette

In a world where every user is also a provider of information, where does the responsibility fall to regulate, and otherwise oversee all of this multilateral communication? Public authorities, of course, will always have a key role to play in setting boundaries and responding to the most serious and far-reaching challenges, as the further sections of

this chapter describe. But in the most practical sense, a large portion of the converged, ubiquitous, user-dominated communications universe actually functions rather effectively through self-regulation: of the users, by the users.[21]

On one level, self-regulation takes place within the management of the business entities that facilitate unfettered user interaction. Given that commercial success in these realms depends primarily on popularity and reputations, which can spread and change like wildfire in cyberspace, most not operations are acutely sensitive to prevailing customer attitudes, and are often prepared to adjust their practices based upon popular opinion. As huge as it is, Facebook has more than once backtracked on attempted policy changes regarding customer privacy in response to outcry from users. Service providers also may work voluntarily with law enforcement and regulatory authorities to address public interest concerns, even if they are not legally bound to do so. Several U.S. telephone operators controversially cooperated with Bush administration wiretapping and data access requests in the post-9/11 period. And the large online classified advertising service Craigslist agreed to cut back on "erotic services" (i.e. prostitution) ads, following high-profile abuse and murder cases.

Netiquette

Even more prevalent, however, has been the emergence of unofficial, collective standards of conduct, and mechanisms for enforcing them, throughout broad segments of the user-dominated online world. In effect, a form of frontier democracy has taken hold, defined and constantly modified by the implied consensus of countless millions of activist users, for their own self-interest: to enhance the quality of their virtual lives. Sometimes known as "netiquette," or community moderation, the terms and methods of this self-governance may vary from site to site depending on the nature of the service and its most enthusiastic participants.[22] One generally common feature is to allow participants to rate or vote on each others' contributions, which yields relatively democratic rankings of the most appealing inputs, while downgrading and even censoring the most disapproved content. This type of rating system is used by all kinds of blogs, movie and book review sites, travel and tourism portals, as well as a preponderance of news media, which invite commentary on published stories from virtually any reader (often with a result of thousands of flame-filled epithets). The Internet has sometimes been compared with the "wild west", and it is nowhere more vigilante than in the shootouts over community rated online content.

Just the FAQs

The Internet has also evolved an unprecedented system for distilling facts from fiction, or at least for giving users the greatest possible basis for deciding for themselves what to accept as "truth". It is the ultimate realization of the concept of the "marketplace of ideas," which has motivated philosophers from Socrates to John Milton to Thomas Jefferson and John Stuart Mill. Although the Internet is overflowing with wild claims, conspiracy theories, and unending debates on virtually every subject, no assertion of any interest goes unchallenged by other, competing viewpoints. In all serious forums, there is a general requirement to substantiate most factual claims with supporting documentation (typically in the form of hyperlinks to outside, trusted sources), and a broad philosophy prevails that, as Carl Sagan once said, "extraordinary claims require extraordinary evidence". For every urban legend, for every persistent "meme" (an idea that takes on a life of its own), there are innumerable investigations seeking to verify or debunk the underlying myths.

By the same token, the Web offers limitless sources of information for those in search of answers or advice, again with the aid of self-regulation to help the most useful data to rise to the top. There are innumerable web sites whose mission is to provide information on every conceivable topic, typically for no charge. In addition to the intelligent search functions of Google and other search engines, and the rigorously moderated fact mine of Wikipedia, there are How To, Ask, Answer, How Things Work, Infoplease, AskMe, AskDeb, Mahalo, and hundreds of other locations where users both ask the questions and provide the answers to a limitless range of factual, self-help, research, trivia, and basic knowledge queries. At a somewhat more professional level, numerous sites also invite lawyers, doctors, designers, tax accountants, and other specialists to provide advice (albeit without liability) on generic and user-specific topics in their fields. In nearly all cases, users have the opportunity to rate, rank, and respond to the information given through these channels, again allowing the most effective and valuable (usually) to penetrate to the surface.

New Gatekeepers?

Despite the decentralized, populist self-regulation of the Web 2.0 era, there are nevertheless reasons to remain vigilant against the emergence of new types of bottlenecks and gatekeepers, which could skew the control of information away from the user masses. As some Internet business models prove overwhelmingly successful, their ability to dictate the means by which users can access and share information could rise above those users' ability to maintain control even of their own virtual identities. A Facebook or a Google, for example, could systematically promote or exclude certain viewpoints, vested interests, or especially competitors, with little recourse beyond vociferous protest for their dependent customers. Similarly, technology and network gateways may re-emerge, in the form of those who dominate the development of operating systems, programming code, even end-user equipment. The debate over net neutrality (see Chapter 7.5) represents one legitimate area of concern about vertical integration, even in this era of decentralization.

Self-regulation, therefore, will always need to be complemented and reinforced by public sector regulation: not to reclaim dominance by the state from the will of the masses, but to ensure that the masses are continually able to express their will as robustly as possible.

7.3. Regulating Digital Content

Regulation of content in the digital world is a new challenge not typically part of the traditional telecommunications regulator's role, typically limited to broadcasting and print in the past. Most agree that some limits are necessary, but defining and enforcing them are huge challenges.

7.3.1. First Principles: How Much Freedom of Expression?

In the case of the fundamental practices of human communication, the world's governments have long acknowledged that free expression and access to information are among the most basic rights that all societies and persons should share. Article 19 of the United Nations *Universal Declaration of Human Rights* states:

> Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

The World Summit on the Information Society reaffirmed these rights in 2003 and 2005, and added further principles relevant to modern digital communications:

> Communication is a fundamental social process, a basic human need and the foundation of all social organization. It is central to the Information Society. Everyone, everywhere should have the opportunity to participate and no one should be excluded from the benefits the Information Society offers.

These principles actually imply several related practical rights for citizens:

- Freedom to speak what they believe, publicly, without fear of reprisal;
- Freedom to write and publish their opinions without censorship;
- Freedom to communicate with anyone, by any means, anytime;
- Opportunity and ability to access any information, to learn and gain knowledge from any source;
- Right to know: access to government information files.

Nevertheless, all societies place some limits on citizens' rights to free expression and information, and the challenge to define the proper place for those limits is one of the critical issues of the new communications era.

Technologies of Freedom

One of the most prominent early analysts of social transformations in the information society, Ithiel de Sola Pool (who first coined the term "convergence"), raised important concerns about the regulatory limitations that might be placed on new communications technologies:

> The onus is on us to determine whether free societies in the twenty-first century will conduct electronic communication under the conditions of freedom established for the domain of print through centuries of struggle, or whether that great achievement will become lost in a confusion about new technologies.[23]

The revolution in ICT since the early 1990s has dramatically surpassed anything that even de Sola Pool anticipated, and the potential effects on social and political freedom and democracy are proving vastly more significant. In many respects, the forces

unleashed by the Internet and other new media have allowed greater freedom of expression across a wider expanse of human society than was ever possible in previous eras.

From another perspective, it is also clear that openness, free expression, and democratic choice have a strongly positive impact on economic and social opportunity and development, including development of the ICT sector itself. In countries where the ICT industry has been encouraged to grow and diversify through relatively unrestrained competition and open-ended market entry, the industry and the national economy have thrived. The examples of Facebook, Google, Yahoo, and other open forums that encourage nearly all forms of expression demonstrate the economic value and social popularity of limitless communication in virtually any society. The explosion of mobile phone usage – voice, text, and images – and the revenues generated by these services, reinforce the fundamental observation that communication has tremendous value to all people, everywhere. The more they are able to take advantage of the technologies of freedom, the more they seek and embrace them.

Freedom of Information

Beyond freedom to express oneself and to access all forms of information and communication, there is a particular class of freedom of information that is centrally important to civil liberties advocates. This is the citizens' "right to know" about information obtained and held by their own government in a democratic society. This right implies several obligations on the part of governments: that they maintain and make available all relevant information (aside from that classified for legitimate national security or privacy purposes); that they provide such information upon request to citizens, journalists, and other interested parties, in formats and within time frames that are reasonable; and that they take pro-active measures to inform and assist citizens with obtaining such information. Numerous governments and international bodies have endorsed this principle of information access by citizens. The United Nations Special Rapporteur on Freedom of Opinion and Expression, for example, issued a report expressing the view that the human rights provision "imposes a positive obligation on States to ensure access to information, particularly with regard to information held by Government in all types of storage and retrieval systems - including film, microfiche, electronic capacities, video and photographs…".[24]

A highly controversial recent example of this issue occurred in 2010 when the self-designated international "whistle-blower" organization, Wikileaks, which takes an aggressive stance in favor of full disclosure of government secrets, managed to obtain thousands of pages of classified U.S. Pentagon documents concerning the conflict in Afghanistan. The U.S. government and many of its allies denounced the leak of these materials in terms as strong as were used during the Vietnam era, when publication of the Pentagon Papers raised some of the same vital questions. Defenders of the revelations of government secrets during wartime, then and now, claimed that citizens' right to know is, if anything, more essential with respect to decisions about war and peace than any other subject. In practical terms, the documents' publication mainly served to refuel the already intense global debate, across all media forums, concerning the war, the clash of cultures, democracy, and technology.

7.3.2. The New Age of Broadcasting: The End of Scarcity?

Broadcasting of information and entertainment via radio and television has been the foundation of modern mass communication for nearly a century – and often the center of controversy over content regulation. For much of the broadcasting era, the majority of countries tended to tightly control messages and images sent over the public airwaves. This was most often accomplished through direct state ownership of broadcast stations, whose programming was either implicitly or explicitly guided by political considerations above all else. Such state-run broadcasting services, many of which continue their mission to this day, may be quasi-independent in their editorial discretion and essentially benevolent in operating philosophy, but it is difficult to escape perceptions, and often reality, of propaganda when a government ultimately monopolizes the mass media.

Spectrum as a Scarce Resource

Still, even in those societies where private commercial broadcast outlets are allowed and encouraged, regulations governing radio and TV content have been commonplace throughout the history of the medium. Such regulation has been justified by physics. The scarce resource of the spectrum has been widely considered to belong to all

the people of each society, to be utilized for their collective benefit (See Chapter 4). Calculating this benefit is a matter of balancing socio-political and economic considerations. In practice, it has meant everything from children's educational programming to scientific documentaries to international news reporting to daily prayer recitals, depending upon the country. At the same time, governments have sought to restrict broadcasting of what they view as undesirable content, recognizing that anything sent over the airwaves can be received by anyone, including impressionable children, disgruntled citizens, and influential power-brokers.

The key question for the new world of converged and unlimited media is whether broadcasting still merits its special regulatory status. The laws of physics haven't changed. However, the unique role of broadcast signals is rapidly disappearing amidst the deluge of alternative content sources and transmission media. This is especially true of television, since radio broadcasting retains a somewhat more unique place as the primary (but not exclusive) mobile mass medium, particularly for hundreds of millions of automobile drivers. Broadcast TV stations, however, are becoming indistinguishable from – and often integrated with – countless other video-based media sources. The number of viewers who still rely solely or primarily upon over-the-air signals for their electronic information and entertainment is dwindling fast: already a small minority in most of the developed world, and limited mainly to rural audiences in most developing countries. This lifeline status for rural broadcasting certainly merits maintaining support to continue sending signals to these communities, but may not justify an entirely distinct regulatory structure, especially regarding broadcasting content.

Harmonizing Broadcasting Regulation

If broadcast programming should no longer be subject to separate regulation, the key question is: should traditional regulation of TV and radio stations be extended to audio-visual content on other media, or should existing regulations be removed or streamlined to fit broadcasters within the more open-ended regimes applied to other 21st century networks?

Some relics of the broadcasting era would be difficult or impossible to apply to the Internet, cable and satellite TV, etc. These include, for example, "fairness and equal time" provisions, which try to mandate balanced coverage of alternative political views: there is no way to measure or otherwise evaluate the infinite mix of political expression in cyberspace. Similarly, TV and radio have often been subject to diversity and domestic content obligations: neither is practical, nor necessary, in the digital content world, although there should be nothing wrong, in principle, with a government helping to support production of material that it views as socially desirable. Restrictions on "indecent" or other objectionable content may also be next to impossible to apply outside of the traditional broadcasting realm.

On the other hand, it is possible to consider developing a standardized regime to apply across all forms of audio-visual media that are distributed to the public, regardless of the source of transmission or means of access. This is what the European Union has introduced, through its *Audio-Visual Media Services Directive* (AVMSD),[25] which provides for coordinated legislation throughout the EU on a range of AV media issues, applying both to traditional broadcasting as well as to AV signals distributed through other means (See Box 7.1).

7.3.3. What to Regulate: The Dark Side of the Web

Every leap forward in our ability to communicate with each other, to share information and ideas, has inevitably been accompanied by advanced methods of deception, exploitation, and abuse, pioneered by the darker elements of every society. One glaring drawback of the ubiquity and dominance of digital ICTs is that the newest waves of such unfortunate practices are vastly easier to create and disseminate, and vastly more difficult to hide from the most vulnerable targets (see Figure 7.4).

Some of the most destructive digital content is unique to the cyber world: viruses and worms and spam and malware, which infest and depend upon the digital code itself; these are addressed in Chapter 7.7.3. Other nefarious content, however, is as old as papyrus. Societies have been wrestling with the challenge of drawing boundaries and enforcing collective standards of morality and propriety around various forms of human indulgence for millennia. Now in the digital era, it increasingly falls to regulators to carry on this often futile quest.

Box 7.1 Key Provisions of EU Audio-Visual Media Services Directive

Technological neutrality: Applies to all AV content regardless of medium, but distinguishes between *linear* (broadcast) and *non-linear* (on-demand) programming.

Prohibition of incitement to hatred: Authorities must ensure that AV content does not contain incitements to hatred toward persons based on race, sex, religion or nationality; this applies to content provided within the EU as well as delivered from outside, such as via satellite.

Commercial communications: There are a variety of protections regarding commercial advertising within AV content, such as requirements that actions such a product placement and sponsorship be recognizable and not subliminal or surreptitious, not promote discrimination or unhealthy behavior (tobacco and prescription medications are specifically forbidden).

Protection of minors: Differential rules regarding content which might "seriously impair the physical, mental or moral development" of children (banned from broadcast, restricted with on-demand services), and which is "likely to impair" minors (restricted on broadcast, not regulated in on-demand). Programming which falls into these categories expressly includes pornography and gratuitous violence.

Accessibility for people with disabilities: AV services must take measures to ensure their programming is accessible by visually and hearing impaired persons.

Major events: Broadcasters generally cannot obtain exclusive control over transmission of "major events" (sport championships, coronations, inaugurations, etc.), which would prevent large segments of the public from watching them.

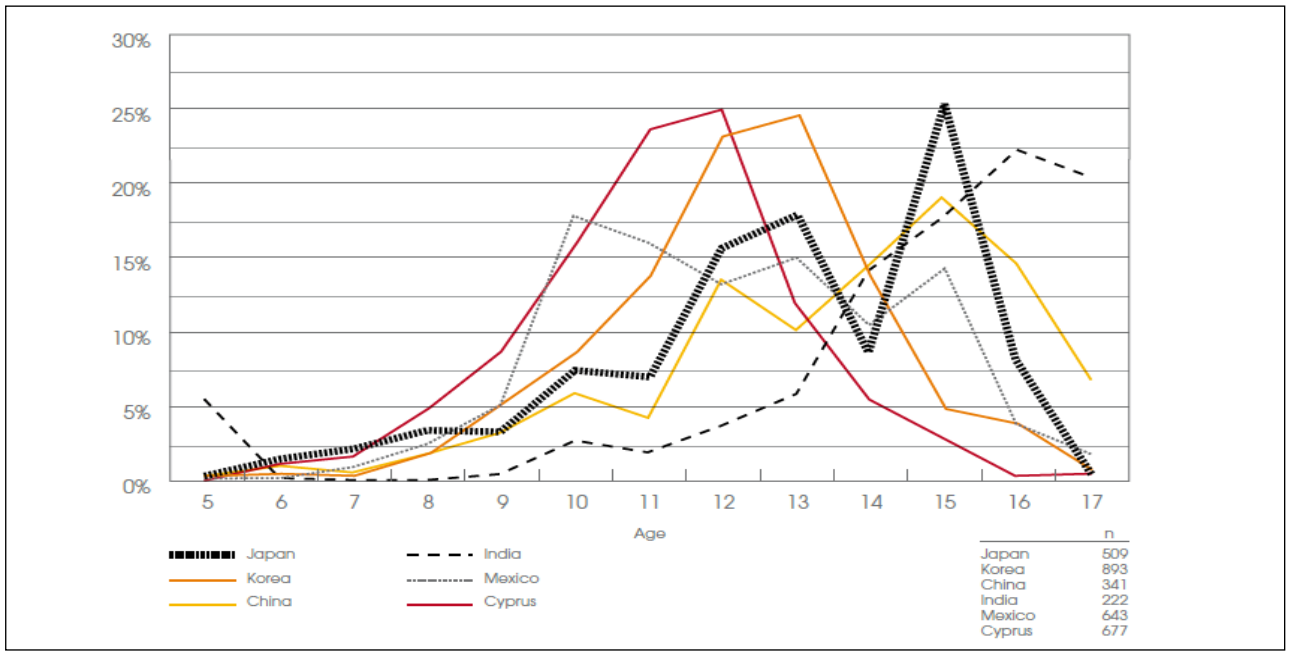
Promotion and distribution of European Works: EU broadcasters and other AV media outlets must help promote and distribute European Works, i.e. programming developed by Europeans, through various proactive means.

Source ICT Regulation Toolkit.

This is an area, however, where it is extremely difficult to define any kind of international consensus as to the appropriate limits of free expression. Different cultures, and hence different governments, exhibit widely varying degrees of sensitivity to certain types of dubious activities. It is safe to say, however, that large segments of most populations are at least uncomfortable with some of the most extreme examples of disreputable digital content. Among the most widespread of these challenges are the following:

- *Pornography, Cyber Sex:* Absolutely forbidden in some countries, utterly unrestricted in others, controversial regardless, the vast digital sex industry somehow generates many billions of dollars in revenue worldwide each year. Measures to at least quarantine online porn – e.g., through a .xxx top-level domain – have to date proven ineffective, leaving government authorities, school administrators, and parents to resort to filtering and monitoring techniques (see 7.3.4), also with limited effectiveness.
- *Hate Speech, Incitement to Violence:* Even more difficult to define and problematic to restrict in a democratic society, there are nevertheless myriad cases where governments have determined that various forms of hate-mongering, incitements to violence, conspiracy and criminal or gang related communications should be restrained by law. This category can also include incitements to rebellion or sedition against the state, an area that is difficult to segregate from legitimate political dissent.
- *Gambling:* Another highly controversial, and popular, online pastime, Internet-based gambling is banned or heavily regulated in many countries as either immoral, potentially corrupt, and/or economically damaging. Off-shore gambling sites continue to thrive, however, through hosts that are based in countries with less to lose and much to gain (in tax revenues) from the practice. Although it is technically illegal for citizens of many countries to utilize these foreign digital casinos, this is another area that is virtually impossible to police effectively.
- *Child Exploitation:* Virtually every civilized society agrees that abuse and exploitation of children is unacceptable and should generally not be protected even by free speech principles. This includes child pornography, even where adult pornography is tolerated, and any other coercion or misuse of children's images or identities that may compromise their safety, development, or innocence. In the Internet world, further protections are also needed to shield children from predators who may contact them through deceptive enticements in online forums. For many governments and law enforcement agencies, this area may represent the highest priority of prevention, investigation, and prosecution, given the vulnerability of the victims and the scope of the perceived risk they face.

Figure 7.4 Starting Ages of Having a Mobile Phone



Source: GSMA and NTTDOCOMO, 2010.

- *Cyber Stalking:* Many authorities have begun to recognize cyber stalking as a new and very real threat to Internet users, especially the young, the mentally ill, and other vulnerable groups. Cyber stalking occurs when one or more antagonists deliberately and aggressively harasses a victim through a combination of public media, for purposes of intimidation, vengeance, outright hatred, or mere amusement. Actions can include continuously posting abusive comments on social networks; posting compromising photographs (real or altered); circulating SMS and images; sending repeated insulting or threatening e-mails and voice messages; and spreading malicious rumors through a variety of media, among many other examples. There have been several high-profile cases of cyber stalking victims committing suicide, and other grave effects, sufficient to compel legislators and regulators to identify this new form of harassment as needing special attention.
- *Fraud, Scams:* The realm of e-commerce requires its own set of extensive legal and regulatory requirements, adapting the complex systems developed over centuries for traditional commerce. One area of particular concern is the proliferation of outright fraudulent practices and scams perpetrated on the Internet, via e-mail, and even through telephone services. There are countless examples of false web sites set up to sell non-existent products and services to unsuspecting customers, as well as other schemes such as pyramid or Ponzi style multi-level, get-rich-quick deceptions. Ubiquitous spam, of course, is a worldwide scourge (see Chapter 7.7.3). In many cases, these scams may be difficult to identify until after people have been defrauded, and the international nature of the Internet makes it vastly more difficult to track down perpetrators. At least in some cases, however – such as the ever-present and painfully obvious Nigerian 419 scam[26] – it would seem that more aggressive cooperation and intervention on an international scale should be able to clamp down strongly on these most predatory and ultimately amateur of swindles.

Each of these areas of potential abuse can require an entire body of legislation, case law, regulations, enforcement standards, and intervention criteria, and there will always be countless borderline cases that

test the underlying assumptions and objectives of such rules. Attempting to draw fine lines around human behavior has never been an easy task.

7.3.4. How (and Whom) to Regulate: Challenges of Policing Cyberspace

When policy makers decide that restrictions, obligations, and sanctions should be established relative to various forms of digital content, they need to take into account the practical options for enforcing these mandates. The truth is that, in the highly advanced technological landscape of computer software and telecommunications networking, there are few effective options for restraining certain specific types of transmissions, and none that can be even close to 100% reliable. Not only are these measures seeking to identify and segregate a tiny fraction of bytes out of trillions being sent and received every day, but they are seeking to penetrate the messages, web surfing, and communication habits of potentially millions of private citizens, to modify and inhibit their personal behaviors. The more successful the communications revolution in a given society, the harder it is for government, or anyone, to control how that revolution plays out in the lives and perceptions of the people, for better or worse.

Prior Restraint, Censorship

In societies with strong free expression rights, the practice of "prior restraint" represents the most extreme form of intervention against any potential speech or publication, and most the difficult to justify legally. Prior restraint is tantamount to outright censorship, before the fact: i.e. preventing a speaker from speaking at all, when the subject matter is anticipated to be prohibited.

In the case of the Internet, it may be impossible to literally prevent the creation of objectionable content, but the closest equivalent of prior restraint is to block users from accessing such content. This can only be accomplished by a system of filtering web access, which requires placing such filters strategically within the network of web servers that connect a given group of users to the Internet. Such a system is relatively straightforward, for example, for a school or a business or government office, which utilizes a local area network and a single server behind a firewall, through which all connections must pass. The filtering system can be installed on this server, containing algorithms for preventing access to designated web sites, e.g., those with obscene or hate-filled content. The difficulty, of course, is defining and identifying the prohibited content, and maintaining up-to-date registers of URLs that are to be censored.

When applied at a country-wide level, this challenge is far greater, as the filters must be applied simultaneously to all web servers of all Internet Service Providers. This requires a degree of state control over the country's entire Internet industry, whether through enforced cooperation of commercial ISPs, or even direct state monopoly ownership of the ISP sector. While such a policy can be relatively effective in limiting public access to outlawed web content, much of the material will still inevitably slip through – while some inoffensive content will be accidentally blocked as well – and the required development, maintenance, and control of ISP web filtering imposes substantial costs on the industry. Nevertheless, this method of Internet censorship is applied with considerable effect in many countries, especially to restrict access to pornographic sites, among other objectives.

Investigation, Deletion, Prosecution

An alternative to prior restraint and filtering is for authorities to approach the problem of illicit digital content in the same manner as other lawbreaking activity: investigate alleged violations, intervene and stop (delete) the prohibited action, arrest and prosecute the perpetrators. Although this approach will undoubtedly allow a much larger amount of unwanted content to be accessible, ideally the threat of prosecution will deter most potential violators.

A critical aspect of this form of enforcement is to identify the appropriate persons or companies to hold accountable for the offensive material. Should ISPs that host web sites which contain illegal content be responsible for policing their servers? Should open forum and social networking services exercise censorship over their users? Or should only the individual poster or commenter, possibly likely hiding behind an anonymous ID, be liable for his or her words and actions? And should ISPs and providers of services such as Facebook be obligated to help law enforcement root out offenders, by providing access to identifying source code and addresses?

The greatest difficulty with this method, however, is that there are no national jurisdictional boundaries, and much of the most objectionable material is likely to be hosted on servers outside of the countries

whose laws prohibit it. International cooperation can help with the most egregious abuses, but there is unlikely to be a strong consensus on banning and eradicating most categories of purportedly offensive content, because national definitions of what constitutes offensive content differ and are often culturally specific.

Cooperation

Another alternative approach, and preferable where possible, is to encourage cooperation between information service providers, government authorities, and citizens themselves, to police and uncover illicit and harmful media content. In some cases, this may require a degree of public pressure and negotiation. This was the case with the classified advertising service Craigslist, which finally agreed to remove its "erotic services" listings, which had become a *de facto* forum for prostitution, only after extensive negative publicity and pressure from police and politicians. In the case of cyber stalking, some jurisdictions have passed legislation to require authorities, such as school administrations, to report and investigate allegations of harassment and stalking when they learn of them. In all cases, however, the challenge remains difficult, both to identify where the line should be drawn between acceptable and unacceptable content in a free and democratic society, and to devise effective and non-excessive means to prevent and eradicate the worst offenses. Again, the international nature of these networks requires global cooperation on the most egregious and widespread abuses, which implies participation among governments, law enforcement, corporations, and even users themselves.

7.4. Balancing Intellectual Property Rights

"Intellectual Property" (IP) refers to the intangible value of products that emerge from the creative human mind. Governments have recognized a need to protect the rights of those who create from those who merely copy or steal for more than a century. In the digital age, there are difficult balances to strike between ensuring those rights when electronic copying is easy, while many of the owners of IP are among the most powerful corporations in the world.

7.4.1. Copyright Protection: Combating Piracy on the Digital Seas

The global markets for computer software, film and television recordings, computer and video games, and recorded music are almost immeasurably vast. Estimates vary widely as to the overall size of these markets, but annual global revenues are at least in the range of $300-billion for software, $50-billion (and growing) for electronic games, $25-billion for home video, and $15-billion (and shrinking) for recorded music (CDs plus downloads), or close to $400-billion worldwide each year. [27] Such a huge treasure chest would not likely escape the notice of thieves and pirates in any era, but in the digital age, the opportunities to steal and profit from these forms of intellectual property are unprecedented.

Throughout modern commercial history, the creative segments of society – those who write books, compose music, and produce original designs of all kinds – have been protected under the legal principles attached to intellectual property: copyright, patents, trademarks, etc. These principles state that creators own their original works, and are allowed to sell and market them exclusively as they see fit, and that unauthorized parties cannot reproduce or forge and sell copies of such works without compensating the original source. In the computer era, these protections extend to authors of software programs and operating systems, as well as to the electronic versions of all traditional and new media. Unfortunately, in a world where the technology to make virtual exact copies of any digital file is within the hands of the simplest computer user, maintaining these principles has become one of the most difficult challenges of all.

Losses due to Piracy

The value of industry losses resulting from digital piracy is itself a matter of considerable controversy, but by any measure the sums are immense. While it is possible to estimate the order of magnitude of unlicensed software and unauthorized copies of media in use in various countries, it is far more difficult to determine how many of these pirate versions would actually have been sold if the users had to pay full retail prices. This is especially the case with the lowest income countries, where piracy is most widespread in terms of the percentage of illicit versus authentic uses. Unless rights owners were to offer their products for a fraction of their prevailing international prices, it is likely that most private users, and even most companies and governments in these countries (which also frequently use pirated software) would be unable to purchase more than a fraction of the material that they currently obtain through the black market.

With these caveats in mind, the international software industry estimates that the value of its losses from digital piracy are in the range of $50-billion per year.[28] According to industry claims, there are more than 25 countries in which over 80% of the software in use is unlicensed or unauthorized, and in countries such as Bangladesh, Georgia, Moldova, and Zimbabwe, the proportion is claimed to be over 90%. Clearly, the incentives and resources needed to enforce the copyright laws that are usually on the books in many of these countries are not very high, especially in comparison with the perceived value that many users and governments receive from not paying market prices for software. Even in the most developed countries, however, illegal software copying is commonplace, and the economic impacts can be greater, as manufacturers and retail sales outlets lose customers to pirates. Estimates of losses for other media such as DVDs and video games are even harder to come by; by one measure, there are 600-million pirated DVDs in circulation in India alone.[29] There is no other illicit enterprise in the world of anywhere near the same magnitude.

Critics of the software giants such as Microsoft, IBM, and Oracle, as well as game makers Nintendo, Electronic Arts, and others, claim that these companies drastically overprice their products and thereby drive users toward piracy. Some activists have taken strong political stands against the increasing global dominance of such firms, highlighted by the formation of the Pirate Party in Sweden in 2006, and similar parties in other countries, which favor extensive reform of copyright and patent laws to allow more widespread (non-commercial) sharing of copyrighted material, as well as strong measures to protect citizen privacy and open access to government files. In 2009, the Swedish Pirate Party had gained such prominence that it gained two seats in the European Parliament elections. It also became the host site for the servers of Wikileaks, the international group dedicated to exposing government secrets.

International Law

Piracy has always been fundamentally an international challenge, far more so in today's information society. All software markets are global in nature, and the Internet permits instant access to and transfer of any files, anywhere. In theory, a cartel of digital thieves, decoders, copiers, and distributors could be based across dozens of countries, and could conduct most of their operations without ever meeting in person. Indeed, a large amount of illicit software exchange does take place through services such as Warez and a variety of BitTorrent and peer-to-peer sharing sites. Many of these services tend to be driven less by profit motives than by the ideologies behind electronic file sharing and open source software (see next section). On the other hand, there are also many subscription and purchase-based sites that will provide low-priced downloads of pirated software.

A large portion of the for-profit piracy market, however, involves sales of physical media: counterfeit copies of DVDs, packaged operating system and applications software, video game discs, and the like. Often these are produced by small distributors in open "grey market" shops in locations where enforcement of IPR laws is lax at best: retail customers may browse catalogues of movies, music, and software, place an order, and simply wait while the illegal copies are burned to discs from the master files. Those master copies, however, and many thousands of mass-produced counterfeit discs, are made in a smaller number of major pirating factory locations, run by well-organized and sophisticated operations, unknown to or left alone by authorities in discreet locations in Brazil, China, India and the Russian Federation, and a number of other countries.

Governments and international organizations have developed strong agreements as to the need to address intellectual property rights violations, and these have been embodied in a series of treaties as well as national legislation around the world. These agreements date as far back as 1886, when the Berne Convention first established reciprocal copyright protection among major European nations; this was followed by a wider agreement in 1952, including the United States and most of Latin America, known as the Universal Copyright Convention. In 1967, the United Nations established the World Intellectual Property Organization (WIPO) as a specialized agency to coordinate international policies on IPR.

WIPO's stated mission is to develop "a balanced and accessible international intellectual property system, which rewards creativity, stimulates innovation and contributes to economic development while safeguarding the public interest." It is responsible for administering dozens of international treaties, and has taken the lead in drafting legislative language and proposals for

national governments to adopt in pursuing a standardized global approach to copyright issues, among others, including the WIPO Copyright Treaty. This treaty has been reinforced through global trade negotiations under the World Trade Organization (WTO), resulting in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which provides a detailed set of conditions and responsibilities for member states to adopt to protect copyright and other intellectual property within their borders, and cooperatively across borders.

Many governments have thus adopted, in whole or in part, the main provisions of the WIPO and TRIPS directives, creating an increasingly harmonized international regime for defining and protecting intellectual property rights. In some countries, legislation has expanded upon the WIPO standards to add further clarity and specificity of rights and obligations. The United States Digital Millennium Copyright Act, for example, incorporates liability limitations on ISPs and online service providers, allowing them to block suspected copyright infringements upon demand by rights holders, and granting immunity if they follow the law's provisions, even where violations ultimately occur.

The EU has adopted the WIPO standards in its *Copyright Directive*, and similar liability protection in its *Electronic Commerce Directive*. However, there have been strong differences of opinion among members of the European Parliament over how to strengthen anti-piracy laws and regulations. The more stringent proposals would adopt a so-called "Three Strikes" rule, which has already been controversially passed in France.[30] This approach calls for cutting off the Internet connections of users who are caught illegally downloading copyrighted content three times, for as much as a year. Opponents have argued that such disconnection is extreme, and that in the current era Internet access is a fundamental human right. Alternative proposals would focus on web sites from which such downloading occurs, allowing judges to shut them down if they are proven to facilitate copyright violations.

Industry Policing Efforts

To a great extent, the private software and entertainment industries themselves have taken the lead in trying to control and reduce digital piracy, using both technology and litigation, including financial and investigative resources that most government enforcement authorities would never be able to allocate to this type of crime. Technological barriers to illegal copying have included various forms of encryption and Digital Rights Management (DRM) mechanisms, which can prevent at least the most widespread and amateur attempts at piracy, but have often been easily bypassed by organized media copying experts.

Across the industry, all of the major corporate players have taken strong steps and allocated substantial funds to press the fight against piracy losses. Several industry associations have taken lead roles in this quest at the national and global levels:

- The Business Software Alliance (BSA) is the largest and most international IT industry group, with policy, legal and/or educational programs in 80 countries. While several of BSA's initiatives are global in scope, most of its policy, legal, and educational efforts are led and conducted at the national level, with a growing emphasis on emerging economies. The BSA employs a range of programs to further the anti-piracy objectives of its members, including:
  - Investigation and enforcement of allegations of copyright violation and software piracy, including filing lawsuits;
  - Online tracking of Internet sites containing pirated software;
  - Software Asset Management (SAM), which assists companies in complying with software licenses;
  - Education initiatives to publicize and raise awareness concerning software piracy.
- Business Action to Stop Counterfeiting and Piracy (BASCAP), an agency of the International Chamber of Commerce. BASCAP takes international initiatives to connect companies and pool resources to address counterfeiting and piracy issues in multiple industries. It also lobbies governments to establish and enforce intellectual property rights laws.
- The Recording Industry Association of America (RIAA), which has taken the lead role in combating unauthorized digital music downloads and file sharing (see Chapter 7.4.2).

These and other industry enforcers, out of their own self interest and of necessity given the scope and complexity of the digital piracy problem, will have to remain on the front lines of this struggle, and themselves become vulnerable to hacking or denial of service attacks. It is their profits that are mostly at stake, while governments are in the uncomfortable position, in many cases, of seeking to balance the need to enforce the law with the cold realities of a very widespread set of practices that often arguably benefit their own populations more than they may harm the domestic economy.

7.4.2. Digital File Sharing: Peer-to-Peer Rights and Wrongs

The objections to outright theft and resale of copyrighted material are relatively easy to grasp, and the economic harm to rights holders, while debatable in magnitude, is certainly very real. The realm of digital file sharing, by comparison, is not so easily navigated.

Copying and sharing of popular media, especially music recordings, has been a common practice since the introduction of cassette tape recorders. With the introduction of digital audio tape (DAT), the U.S. recording industry persuaded its Congress to adopt the *Audio Home Recording Act* in 1992, which established a number of legal precedents for the copyright issues of the emerging digital era. Among other provisions, the law required manufacturers of DAT devices to include specific copy protection technology, and also mandated an implicit royalty payment be charged for each DAT tape sold, with funds going to the recording industry, on the presumption that at least some of the purchases were being used in place of new recording sales. The Act also included new protections, however, for private users who record audio tapes for their own, non-commercial purposes.

The File Sharing Boom

The practice of digital file sharing is also well established, dating to the earliest days of the Internet, when BBS and UseNet bulletin board users would post digital copies of their music collections for free download by like-minded fans. With the arrival of the iPod and MP3 formats of digital music, together with the spread of home PCs and broadband Internet connections, this fringe activity became mainstream, and created huge new challenges for the recording industry. Since a peak of almost $40-billion worldwide in 1999, recorded music sales declined by nearly 50%, with much of the loss ostensibly attributed to file sharing and/or direct piracy.[31] In the U.S., revenue from music sales and licensing dropped to $6.3 billion in 2009, from a total of $14.6 billion a decade earlier.

When first introduced, peer-to-peer digital music sharing was a uniquely imaginative invention, expressly designed to circumvent any claim of outright piracy by any organization, i.e. direct copying and distribution (for profit) of CDs and song files. The original service, Napster, in 1999 pioneered the innovative concept of facilitating direct sharing of MP3 music files by linking individual users' PCs to each other over the Napster network. Napster's main function was simply to permit members to search among the song lists of other members for recordings they wanted, then make the connection between the two for the duration of the download. In effect, each song transfer was a private non-paying transaction between two anonymous fans.

Immediately in Napster's wake, a number of other peer-to-peer file sharing services sprang up – Kazaa (which went on to become the foundation of Skype), Gnutella, Grokster, Morpheus, LimeWire, BitTorrent, Vuze, The Pirate Bay and many others – sending shock waves through the music recording industry, as hundreds of millions of users suddenly began exchanging digital music recordings for free, and revenues from CD sales plummeted. The ambiguous legal status of these unprecedented services has made it difficult for regulators, legislators, lawyers and courts to determine exactly how to respond: technically, individual users were simply trading personally owned files, and in many cases they were merely downloading digital copies of songs that they had already purchased in other formats (see Figure 7.5). But the reality was that a worldwide wave of free music access had been unleashed, with uncounted millions of copyrighted recordings landing on the hard drives and MP3 players of millions of users, and none of them paying royalties to artists or the music industry.

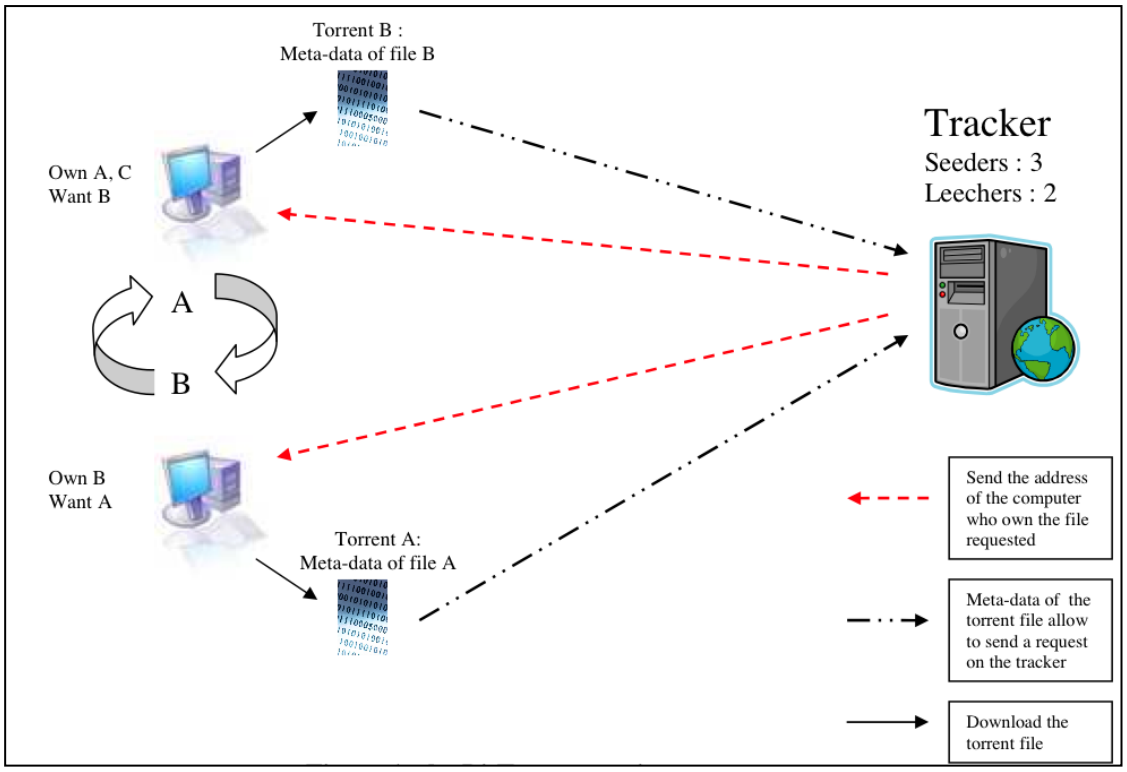
Industry Responses to File Sharing

As file sharing became a global phenomenon among music enthusiasts (and began spreading further, to sharing television shows, movies, and software as well), its methods and principles came under closer scrutiny. Ultimately, the established music business fought back, notably the Recording Industry

Association of America (RIAA) and its member recording companies. Beginning in 2001, the industry chose to file suit under existing copyright laws in the U.S., the U.K., Australia, and other jurisdictions against file sharing operations, and court rulings ultimately supported the contention that peer-to-peer file sharing, even where no money changes hands, is illegal and that services that actively encourage and facilitate such sharing can be liable for substantial damages. As a result of these lawsuits, Napster and other peer-to-peer networks were forced to cease operations, or transform themselves into paid subscription, royalty-paying online music services.

The problem of digital file sharing, however, was not at all eradicated as a result of these initial high-profile lawsuits, as new services continued to come online, not always in jurisdictions where the industry could readily shut them down. The RIAA introduced a second, more controversial tactic of pursuing individual users who had downloaded unauthorized recordings, winning and negotiating a number of litigations that resulted in fines of tens or hundreds of thousands of dollars. The industry's goal has been to intimidate illicit file downloaders, although critics have argued that the punishments are out of proportion to the crime, and have not had a material effect on sharing as a whole.

Figure 7.5 The BitTorrent Environment



Source: Dejean, Penard and Suire, 2010.

The industry's efforts are also hampered by disparities in laws and enforcement across different countries, which have created a safe haven for many digital sharing sites and users. In Spain, for example, a court ruled in early 2010 that file sharing peer-to-peer networks do not violate the country's IP laws, [32]effectively legalizing file sharing that had already been widespread; not coincidentally, Spain's market for official music sales, including opportunities for new recording artists, has plunged. Mexico, Italy, and other countries with less aggressive or non-existent file-sharing restrictions have seen similar declines in revenue from authorized music sales.

The Ongoing Challenge

Ultimately, the shifting trends in the music industry, and across electronic entertainment in general, imply that an entirely new paradigm for marketing, sales, and business strategy is emerging, which amounts to a philosophy of "if you can't beat them, join them". In February 2010, Apple reached the ten billionth legal, paid-for download from its iTunes Store, a

service which generated about U.S.$ 1 billion in 2009.[33] Still, file sharing and illicit copying and downloading remain rampant, as the music industry seeks to adapt to a new business model, which will undoubtedly involve continuing battles over copyright violation.

For governments, regulators, and law enforcement, the ongoing peer-to-peer sharing challenge represents a headache and a question about priorities. With industry forces taking the lead to try to disable the practice through litigation and their own investigations, public authorities with limited resources have to assess how much attention they should pay to this form of illicit activity. Some newer laws and regulations have attempted to place added responsibility on intermediary operators, such as Internet Service Providers. France and Ireland have sought to adopt the "Three Strikes" provisions that would go as far as to disconnect the Internet connections of repeat offenders of digital file sharing restrictions, and the European Parliament has wrestled with similar proposal. The Republic of Korea and other countries have adopted similar policies in recent years. Regulators can augment these provisions by establishing fines and other sanctions for licensed telecommunications operators and service providers that knowingly permit the hosting of illegal file transfer services, and potentially requiring disclosure of traffic data in instances of alleged abuses. But to date all measures have taken barely a small bite out of a worldwide practice that shows few signs of subsiding in the foreseeable future.

7.4.3. Consumer as Creator: Fair Use, Creative Commons

The flip side of defining boundaries and mechanisms to prevent harmful copyright violation is determining what constitutes acceptable, even beneficial, re-use of protected content. If the purpose of IPR restrictions is to ensure that creators – artists, authors, programmers, and the companies that back them – are appropriately compensated for their original works, then it generally follows that uses of those works which don't harm the learning potential of creators – and which may even actually help them – should not be unduly prohibited.

User-Created Content

Such may be the case with a wide variety of popular, creative activities that imaginative individuals in the digital age have introduced, spawning whole new forms of derivative art and entertainment (see Figure 7.6). One of the earliest examples was in the early hip-hop music movement of the 1980s, wherein artists included "samples" of others' recordings for background and rhythm effects; this was done on a fairly unrestricted basis until hip-hop and rap music gained mainstream popularity, whereupon recording industry attorneys began to require copyright compensation for music sampling.

With the proliferation of broadband Internet and user-originated content, new forms of sampling and adaptation of existing content are rampant. YouTube, for example, is overflowing with home-made videos that utilize technically copyrighted background music or video clips as creative fodder (notwithstanding the site's stated rules against copyright infringement). Parodies and re-imagination of popular books, movies, and other works are a favorite hobby of innumerable amateur authors and artists. The site FanFiction.net, for example, hosts several million fan-created stories based on thousands of well-known novels, films, television series, and *manga/anime* cartoons – there are nearly 500,000 variations on the Harry Potter books alone.[34] Moreover, virtually every successful production of popular entertainment soon generates multiple unofficial fan web sites (sometimes before the work is even released), which incorporate imagery, video and sound clips, text, character names, and all manner of original material copied from official sources.

Technically, nearly all of these activities constitute unauthorized use of protected material. In a few exceptional cases, authors and rights holders have in fact chosen to shut down sites that they deemed might be encroaching upon potential earnings from their own online projects, or that they perceived detracted from or demeaned their original work. But in the many cases, artists have recognized that these types of creative imitation often represent the highest form of flattery, and provide favorable publicity as well.

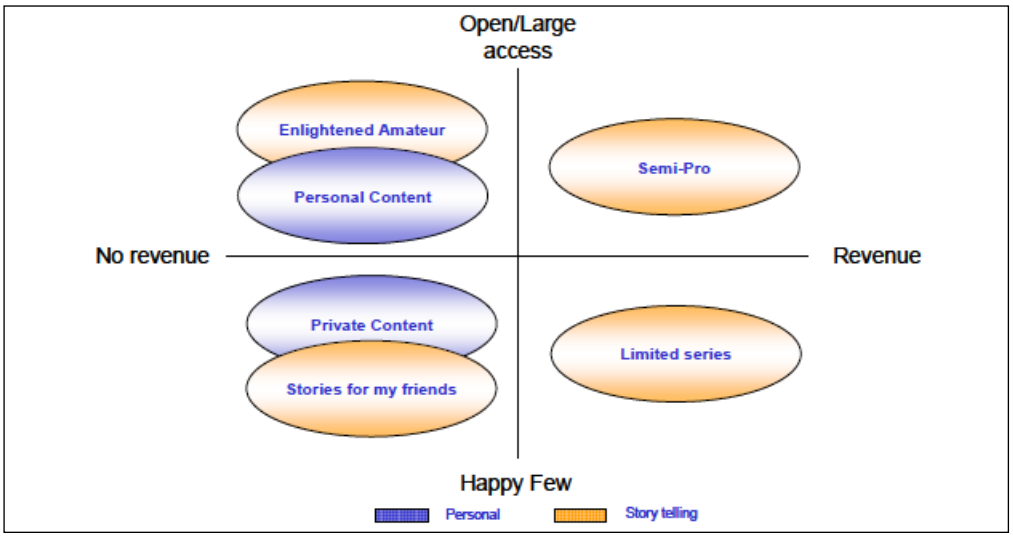
Fair Use Principles

In general, over the history of copyright law, the concept of "fair use" has evolved, to define the boundaries between acceptable adaptation or citation of protected works and copyright violation. Standards adopted under U.S. law and court rulings, which have been mirrored in a number of other countries, embrace the principle that portions of

copyrighted works may be reproduced for a variety of legitimate reasons, including criticism, comment, news reporting, teaching, scholarship, and research.

There is a four-part general test to help determine what constitutes fair use:

Figure 7.6 Main Characteristics of User Created Content Categories



Source: EU, User-Created-Content: Supporting a Participative Information Society, 2008.

1. The purpose and character of the use, including whether such use is of commercial nature or is for nonprofit educational purposes;
2. The nature of the copyrighted work (e.g., fact vs. fiction);
3. The amount and substantiality of the portion used in relation to the copyrighted work as a whole;
4. The effect of the use upon the potential market for, or value of, the copyrighted work.

On the Internet, the fair use doctrine has become problematic for some news reporting organizations, for example: when unaffiliated sites can quote even small headlines and highlights of news reports, this may be all the information that rapidly surfing users need to keep up with current events. Hence, they may not "click through" the link to the original source, which will thus receive less traffic (and advertising revenue) for its original content.

Lawmakers have attempted to define the boundaries of fair use, and liability, for borrowed online content, with some difficulty. The U.S. *Digital Millennium Copyright Act* was amended to include a key *Online Copyright Infringement Liability Limitation Act*, which created what has become known as "safe harbor" for web intermediaries that allow others to post material which may be found to violate copyright. Under this provision, user-focused sites such as YouTube, Wikipedia, and Facebook are not liable for the postings of their members where copyrights may be infringed. The giant media conglomerate Viacom attempted to sue YouTube for $1-billion in damages due to countless unauthorized postings of Viacom-held intellectual property (video clips from TV shows, etc.) on the site, but lost the case (pending appeal) due to this safe harbor provision.[35]

Another significant response to the challenge of balancing IPR with the public's creative and imitative impulses is the non-profit organization Creative Commons. Founded in 2001, its purpose is to provide creators and would-be imitators with alternative licenses allowing free use of copyrighted works. Creative Commons licenses can be adopted by rights holders according to their preferred degree of permissible use: e.g., allowing any use with attribution, allowing only non-commercial use, or allowing only exact replicas without derivative uses. Wikipedia, for example, offers all of its content under a blanket Creative Commons license.

7.5. Neutrality of Access

The principle of "neutrality" has begun to take on central importance in the constant evolving and expanding ICT world. It is linked to the notions of democracy, populism, and decentralization that are hallmarks of the digital era: the idea that neither governments, companies, nor other gatekeepers should be able to dictate how anyone utilizes these technologies.

7.5.1. Net Neutrality: Clash of the Titans

The inevitable tendency among corporate strategists to seek competitive advantage and financial gain through market manipulation has raised alarm among a wide coalition of advocates for consumer rights, free speech, and Information Society principles of openness and equity. The ideal that proponents collectively advocate has been labeled "net neutrality". The basic concept is that the Internet should remain free of any discrimination or barriers among classes of users, or of information stored and transmitted on the Internet. In practice, this implies that all Internet users should be allowed to access all online sites and data and services, with no differences in quality or pricing dependent on their choices. Network operators that connect customers to the Internet would be treated the same as traditional Common Carriers, with no right to impose differential treatment for various forms of usage or content.

Opposing Views

Neutrality is not only a slogan of free speech philosophers and consumer representatives, however, it is also the preferred policy of many large corporate interests, especially software and applications providers, from Yahoo! and Amazon to eBay and Microsoft. These content providers share the concerns of net neutrality advocates that their services could be discriminated against by large access network providers, which may have affiliations with competing content services.

Aligned against this coalition, however, are many of the largest network operators, including telecommunications giants, cable TV providers, and some ISPs. These companies want to maintain maximum flexibility to configure their services to their greatest competitive and financial advantage. Also, given the high growth rates for bandwidth heavy applications, network providers argue that they have a legitimate need to manage their capacity, especially on wireless broadband networks where traffic congestion, particularly in high-demand urban areas, is a very real concern. There is also an ideological component to opposition to net neutrality regulations, a sense of rights of ownership, and resentment that companies which have not invested directly in network infrastructure should not be able to benefit so liberally from others' investment. There is also a basic principle concerning freedom from government interference in the marketplace which guides many political opponents.

Some of the prospective alterations in established Internet business practices that net neutrality advocates oppose, and that have been at least contemplated among some network operators, include various forms of multi-tiered, usage-based pricing, in which user payments would be roughly linked to the amount of data they download and upload, as many cell phone data plans already charge. Also, vertically integrated or affiliated network and media corporations could institute preferential pricing and/or differential access speed and quality, for web sites and services they control and profit from, as compared with competitors' sites and the broad Internet as a whole. More ominous still, and the worst fear of free speech advocates, some corporations that may have certain political leanings and vested interests, could attempt to skew the information content received by their subscribers, in direct contravention of the basic principles of free exchange of ideas.

A different business model that has also been proposed by some providers would involve the establishment of separate, proprietary access networks for certain types of customers. For example, larger corporate users might pay premium prices to receive the highest speed connections, both at the customer premises and in terms of server capacity and throughput. The corollary to such a plan, however, would imply that the lowest paying, average consumer would receive the poorest quality connections, resulting in a de facto tiered, price discrimination scheme.

Policy Initiatives

The most prominent policy issues arising from this debate tend to fall into two main categories. One is whether network operators should be able to introduce pricing schemes that are linked to customer usage levels in general: i.e. to charge more

for higher bandwidth consumption, which would seem to have a basis in the economics of network operations. The second set of issues relate to whether operators can discriminate among different classes of content on their networks, apart from the capacity that such content consumes. Although both issues raise a range of concerns and debate, it is the second, content discrimination, which has been the primary focus of net neutrality policy initiatives to date.

In 2008, the U.S. Federal Communications Commission attempted to order Comcast, a cable TV and Internet access provider, to cease blocking or downgrading certain users' access to some high capacity peer-to-peer download services. There was no attempt to impose capacity charges or separate pricing tiers, and other high capacity usage, such as video streaming or VoIP, was not treated similarly. On the surface, it appeared that Comcast was simply trying to discourage peer-to-peer file sharing itself, although it had no specific policy to do so. The FCC's ruling, however, was subsequently struck down on appeal in court, leaving U.S. law undecided as to the FCC's authority to implement net neutrality regulations.[36]

In mid-2010, two major U.S.-based players, Verizon Communications, a network operator, and Google, an applications provider and Net neutrality supporter, collaborated on a proposed "compromise" policy on certain aspects of the Net neutrality issue. Their proposal would endorse basic non-discrimination principles as proposed by the FCC, preventing carriers from favoring or degrading certain classes of user or content. However, these principles would apply to existing Internet access and content, but would permit access providers to develop "new" services, which could be priced differently from basic access. This approach would also allow operators to sell dedicated network capacity to high priority users, for purposes of accessing these new service offerings. Also, the joint proposal would not apply to wireless broadband networks, which the companies asserted were still evolving and should not be constrained by these principles, other than transparency. As of late 2010, the FCC and the Congress had wrestled with the issue for several years, and continued its efforts to balance competing corporate and political pressures, without clear resolution.

The European Commission has suggested a number of policy distinctions to clarify the degree of neutrality required of network operators and ISPs. For example, traffic management and product differentiation by operators and ISPs, are considered acceptable practices, but customers should be informed in advance of any limitations or distinctions in the level of service they will receive. On the other hand, the Commission has indicated that unequal discrimination between similarly situated customers or services should not be allowed. As of mid-2010, the European Commission had launched consultations to obtain wider input on these and other issues, before considering whether to adopt specific net neutrality related regulations.[37]

Several other governments have also wrestled with this issue, but few have codified rules that formally guarantee – or not – any particular model of net neutrality. On the other hand, outside of various isolated disputes, there have not to date been major re-pricing initiatives by broadband access networks to introduce tiered or measured services, nor substantial anti-competitive quality of service discrimination. But the debate has become a central issue in Internet regulation and even political campaigns, and promises to gain force as network capacity usage and related competitive interests continue to grow.

The issue may be of particular concern in relatively smaller, emerging economies where Internet access and usage are still low, but likely to grow substantially in the coming years. In many of these countries, there will not be a wide scope of competition among either network operators or content providers, and other interests may also seek to gain a stake in controlling the gateways to the online world. As the debates among industry giants play out on the world stage, regulators in these developing economies should follow them closely.

7.5.2. Technology and Service Neutrality: Avoiding Picking Winners

Neutrality also arises as an issue in a variety of other contexts where governments and regulators have important roles to play. In such a highly competitive and lucrative industry as ICT, each decision by a public authority carries the potential to help or harm major stakeholders.

The goal of government should be to ensure that all participants in the sector have an equal and unbiased opportunity to succeed on the merits of their products and services, with a minimum of

favoritism. This is especially important to prevent any perception (or reality) of corruption influencing public policy toward the industry. The fast changing nature of ICT technology and markets also suggests that regulators should avoid, to the extent possible, trying to dictate which specific technical platforms or architectures should be deployed, and allowing the greatest possible flexibility for industry innovation and evolution.

Public Choices

Government decisions can influence ICT industry competitive outcomes in several different areas. These include the following:

- *State Ownership:* In countries where at least some national telecommunications operators remain under state ownership, even though the may be managed autonomously, it is almost inevitable that these operators will receive favorable treatment in many cases. While the rationale for such preference may be that the state operators serve the public interest, the inefficiencies and market distortions that arise are quite likely to outweigh the net benefits, especially when compared with the positive impacts of open competition and innovation. While this justification for private, open market entry in telecommunications has prevailed for several decades, it is even stronger in the broadband digital era, when competing forces are driving rapid change throughout the industry, and no single dominant operator is likely to be able to be able to stay out in front of every trend.

- *Licensing:* Licensing decisions almost by definition involve choosing winners among potentially competing players, especially where a limited number of licenses are granted to provide, say, cellular mobile services, or to utilize scarce spectrum. In the era of convergence, however, there is less reason to retain traditional distinctions between types of licenses (mobile, fixed, etc.), and more reason to allow unrestrained market entry by a significant number of integrated, multi-service telecommunications operators. As discussed in Chapter 3, many countries are moving to provide unified licenses, which permit licensees to offer a full range of services, via any technology platform. The main limitation involves the need to allocate finite spectrum among different uses in a rational manner, but even with this constraint it is possible to support a growing number of market participants without direct specification of their technology or market focus.

- *Subsidies:* Where public policies determine that certain ICT services or user groups merit subsidy funding support – for example, universal service programs, or stimulus type investment – the principle of technological neutrality is again critical. In some countries, subsidies are available to promote ICT access, and they are often distributed through a form of competitive tender (see Chapter 6). When specifying the services and facilities to be delivered under such mechanisms, it is important to allow maximum flexibility among competing technologies: for example, satellite, landline, WiMax, or 3G, all of which might be capable of bringing adequate network access to remote areas. If subsidy administrators were to design projects so that only one type of network could comply with the requirements, this could again constrain market development and potentially lock in outdated technologies for many users and geographic areas.

- *Procurement:* Governments utilize extensive amount of information technology resources and IT-enabled services for their own day-to-day operations, especially as widespread e-government systems come online. This requires public procurement of equipment and software which must meet detailed and standardized specifications, and which can amount to huge sales for any IT supplier. Ideally, such procurements will maintain competitive balance between multiple vendors and systems, especially for computer hardware that may be relatively interchangeable among multiple brand names. However, in the case of software operating systems, application packages, and custom solutions, strict interoperability and ease of use are vital requirements. Again, given the size of typical purchases, governments have been forced into the position of influencing industry outcomes through their decisions.

  In some countries, advocates of free and open-source software have succeeded in persuading national governments to promote the cause of

unlicensed open source software by establishing this standard throughout public offices. Partly in response to this trend, market leaders such as Microsoft have in some cases offered highly discounted government-wide licenses for their own product packages. Ultimately, effective and convenient operability and value for cost should probably be the primary motivation behind public IT procurements, but in this sector it is always difficult to avoid getting in the middle of competitive and even ideological battles.

- *Public Networks:* Beyond IT software and equipment, e-government policies also usually involve establishing physical or virtual networks, connecting schools, health facilities, government offices, and the like. Operation of these networks is typically outsourced to established or specialized telecom providers. When developing these contracts, public authorities should focus on their functional needs as opposed to specific technical solutions (e.g., by specifying minimum transmission capacity rather than, say a fiber optic network). Competitive bids for these public networks that are based on maximum technological neutrality are likely to be most cost-effective, and will encourage more creative solutions, while avoiding favoritism toward specific vendors.

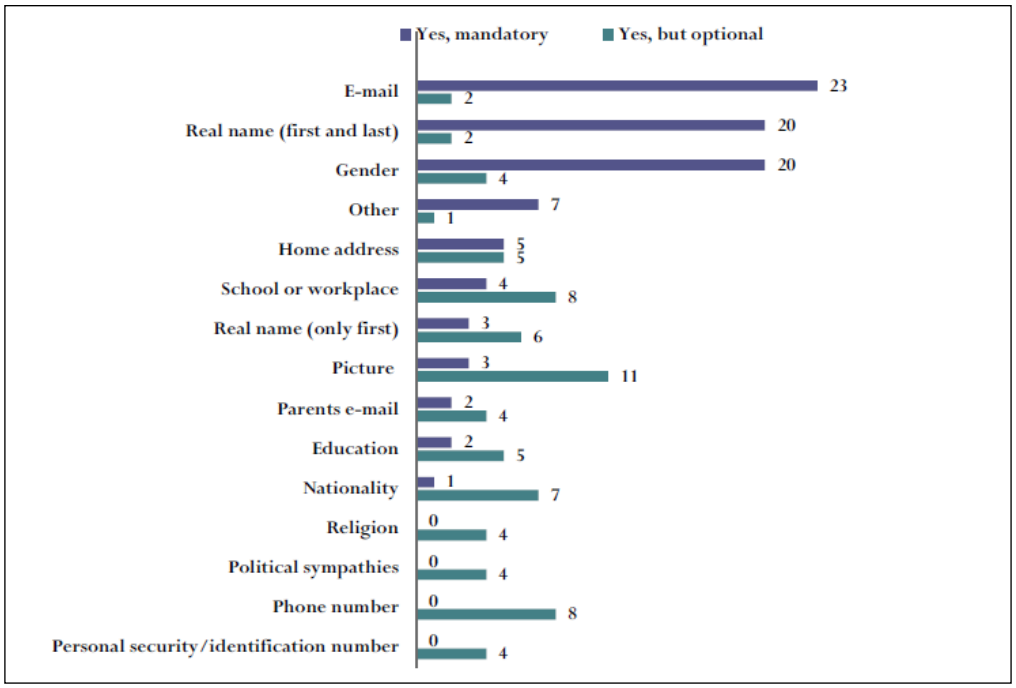
7.6. Protecting Privacy

The digital age has created massive new challenges to protect individual privacy and personal as well as commercial proprietary information. Regulators are now coming to terms with the magnitude of the problem and trying to forge workable solutions.

7.6.1. Protecting consumers in the commercial digital space

Protection of consumer privacy in the context of commercial relationships in the digital world is an extremely difficult issue. By the nature of electronic networks, it is a simple, virtually automatic task for operators of any web site or ISP to track and compile endless amounts of data on users of their systems: who visits what web sites, what people search for, what they purchase, how much they spend, and of course inordinate amounts of personal details, names, addresses, credit card numbers, etc (see Figure 7.7). From a business point of view, such information is a gold mine, which can help to refine marketing campaigns, target potential customers, and save costs at the same time.

Figure 7.7 Personal Information Typically Requested When Creating a Profile



Source: EU, Evaluation of the Implementation of the Safer Social Networking Principles for the EU, 2010.

For consumers, however, the idea that faceless corporations are collecting detailed databases on their identities and online activities is, in most societies, a disturbing prospect at best. Most people don't want to be bothered, targeted, or especially spammed by commercial interests, and they are usually sensitive to the possibility of anyone knowing their most intimate habits, interests, and secrets. This has given rise to new levels of privacy concerns and risks in the digital environment.

Vulnerability of Personal Data

There are a wide range of situations and practices that can raise commercial privacy concerns for consumers. Some may be more problematic in terms of risks and the degree of exposure that users may face, while others may primarily be annoying or time-consuming. Depending on circumstances, some instances of companies utilizing private consumer data for commercial purposes may not be entirely objectionable to many citizens, especially where this is done in a transparent and approved manner. The following examples highlight some of the many categories of privacy concerns in the digital era.

- *Online:* Wandering through the Internet, one leaves digital tracks virtually everywhere, some more obvious than others. True privacy online is probably impossible, but some situations are especially risky for unsuspecting users. Entering one's credit card number to make an online purchase places some of the most sensitive data into the infinite depths of the Internet. Countless web services request identifying information from their users. Some companies utilize "opt-in" practices, which require users to actively agree to have their data shared with others, while many will only safeguard such data if users explicitly ask. Many web sites also install "cookies" on one's personal computer, which retain identifying data for each site visited. Both social networking and even e-mail expose one's personal data to unlimited outside locations.
- *Telephone:* Use of the fixed-line telephone, as well as newer mobile and smart phones, also invokes a great many privacy concerns, some new and some which have been troubling consumers and lawmakers for decades. Telemarketing is both well established, and widely disliked. Many governments have introduced mandatory "do not call" lists, which certified telemarketers must respect or face legal damages. Millions of people depend on mobile and smart phones for much more than calls: they are address books, appointment calendars, cameras, repositories of hundreds of text messages, and links to social networks, e-mail, even GPS locations. They are also very easy to lose or to steal. Moreover, cell phone signals are far easier than landlines to monitor and trace, by both legal and illegal electronic eavesdropping. Most telephone systems now routinely deliver the Caller ID of each caller, and policies are often required to allow for blocking this information.
- *Workplace:* Privacy issues relating to use of ICTs in places of employment raise a unique set of concerns, requiring a delicate balance between employer and employee rights. When hiring new personnel or reviewing employee performance, employers often seek revealing background information, through a variety of channels. When on the job, many workers utilize office computers to access the Internet and send personal e-mail. In general, there is no presumption of personal privacy for employee communications conducted via company computers and networks.
- *Daily Life:* There are countless other situations in the average daily lives of citizens in which they may provide sensitive data that could well end up in compromised databases. The widespread use of credit and debit cards, together with digital cash registers, RFID scanners, and computerized inventories, allows stores and banks to track nearly every purchase a person makes. Health and medical records are potentially accessible through a diverse number of channels: doctors' offices, hospitals, health and life insurance companies, public health offices, and more. Joining a political or hobby club, getting a library card, signing up for a contest or promotion, volunteering for charity work: all are likely to add to one's electronic profile, for better or worse.

Privacy Protection Policies

There are widely varying legal approaches to privacy and data protection in different countries and regions, and this is an area of law and regulation that

continues to evolve as the challenges and conditions of data use and international communications evolve. Possibly the most extensive policy regime on these issues has been developed by the European Union, through its Data Protection Directive (1998). These Directives are critically important because they affect not only all Member States of the EU, but by law they also extend to all countries and companies that do business with Europeans. The key elements of the EU Data Protection Directive are set out in Box 7.2.

By contrast, data privacy protection policies in the United States have been considerably less comprehensive and coherent. Although privacy law has a long history in the U.S., it has evolved through a patchwork of separate legislation and court rulings addressing specific areas of concern, such as financial services, credit and debt records, health information, and a variety of more recent mandates in the context of the Internet and data communications. No single authority or set of rules uniformly applies to all personal data processing, as with the EU. This has led to conflicts between the U.S. and the EU, given the strict rules in the *Data Protection Directive* concerning transfer of data to countries with fewer protections, as the U.S. regime has been considered to be less protective in some cases.

Box 7.2 Key Elements of EU Data Protection Directive

Definitions: Defines "Data Controllers" (anyone who has control over any person's private data); "Data Subjects" (anyone whose personal data is utilized); and "data processing" (collection, storage, and disclosure of data).

Principles: Data must be collected only for explicit and legitimate purposes; must be relevant and not excessive, accurate and up to date; data subjects must be aware of and able to obtain any data about them, and to correct errors. Each state must establish a supervisory authority to oversee data protection.

Limitations: Data controllers can only process data under certain conditions: if the data subject has unambiguously given consent; if it is necessary under a contract, required by legal obligation, or where other legitimate interests are involved.

Sensitive Data: Especially sensitive data about persons include their race or ethnic origin, political or religious views, health, sexual preference, and union membership. More strict rules apply to processing such sensitive data, which must normally require the subject's consent.

Data Transfers: Companies are not allowed to transfer data outside of the EU to any country where data protections are not equivalent to those in the Directive; however, foreign companies can go beyond their country's laws by signing binding contracts with EU companies that incorporate stricter data protection standards.

Source: European Commission.

Numerous other countries have enacted privacy laws, many of them predating the explosion of digital and online databases and transactions, which have been subject to review and potential updating. The Australian Law Reform Commission, for example, recommended in 2008 a comprehensive overhaul of Australia's existing *Privacy Act,* and the government accepted and began work on implementing most of these reforms in 2009. Many countries, however, especially in the developing world, have very few legislative or regulatory protections of consumer privacy rights, and even fewer resources to enforce whatever rules they do have. As a result, many such countries are likely to encounter problems in international trade relations, for example with companies in the EU, as well as with their own citizens, as ICTs and e-commerce continue to expand and diversify.

Identity Theft

One of the greatest concerns in the area of privacy protection and international cooperation on cybercrime involves identity theft. Quite simply, identity theft is a form of virtual impersonation, in which one party utilizes the personal data of another, without knowledge or authorization, to obtain benefits or information that should only be available to the original person. The most common and harmful actions of identity thieves are typically to access financial information, funds, and credit through stolen credit card numbers, bank accounts, and other highly sensitive and valuable data. By far the most common recognized instances of identity

theft have involved illicit use of stolen or unauthorized credit cards.

Although financial motives are likely the most prevalent, there can be others motivations for identity theft, which rely upon different types of personal information. For example, a person may steal another's medical records in order to obtain prescription drugs; illegal immigrants may use black market ID materials to enter a country or gain employment; and spies and terrorists may advance their causes by utilizing innocents' identifying data in a variety of circumstances. In all cases, the impact on victims whose data may be compromised can be devastating, and may required very costly and time-consuming efforts to regain their good name and standing.

Identity thieves may obtain critical information on others through a host of methods, from simple to highly sophisticated. Some may involve intercepting people's mail or digging through their trash to obtain identifying information and credit card or bank numbers. In the online world, a prevalent practice is known as "phishing," in which unknowing consumers are enticed to visit a deceptive website, which asks them to fill in personal information under false pretenses – e.g., replicating the website of a bank or store with which the person may have an account, and requesting that he or she "verify" personal data. Some of these techniques can be highly effective, by employing virtually identical web pages and convincing communications methods, such as personalized e-mails. To combat phishing, many organizations inform their customers that they will never ask for such data in e-mail or other correspondence, and also send out alerts when fraudulent initiatives are discovered.

Box 7.3 Google Street View: Are Public Streets Private?

One indication of the fast changing nature of technology and privacy involves Google's "Street View" service. In connection with Google Maps, the company's popular mapping and GPS service, Google has also included street level photographs of major routes in countless cities, to help with navigation. To some citizens and governments, these often close-up views of private homes and streets offer too much of a peak into personal and private lives. It also emerged that Google obtained a vast amount of WiFi data from WiFi receivers in its Street View vehicles. Google also admitted that it intercepted and stored WiFi transmission data, including email passwords and email content.

Governments in Greece and the Czech Republic have imposed bans on Street View photos, while at least 18 other countries have launched investigations into the service, e.g.:

- Connecticut Attorney General Richard Blumenthal announced in July 2010 that 38 states and the District of Columbia are seeking additional information about Google's collection of WiFi data from private, residential computer networks. Blumenthal also sent a letter to Google, asking for information about Google's packet-sniffing software, the testing and review procedures, and the internal investigation of the code that "accidentally" recorded unencrypted WiFi traffic in 30 countries over a three-year period.
- In the U.K., London's Metropolitan Police Service is reviewing a criminal complaint filed against Google. The complaint was brought by London-based Privacy International under two U.K. laws: the Regulation of Investigatory Powers Act and the Wireless Telegraphy Act.
- The French National Commission on Computing and Liberty (CNIL) released preliminary results of the Google Street View investigation in France. According to the CNIL, Google "saved passwords for access to mailboxes" and obtained content of electronic messages. The CNIL is pursuing the investigation to determine whether Google engaged in "unfair and unlawful collection of data" as well as "invasion of privacy and individual liberties."
- The Chief of the FCC's Consumer and Governmental Affairs Bureau warned consumers that Google's "behavior" raises important privacy concerns and said that the collection of WiFi data, "whether intentional or not . . . clearly infringes on consumer privacy."

Source: Electronic Privacy Information Center.

In many countries, identity theft for purposes of defrauding another or gaining illicit financial benefits are covered under traditional criminal fraud statutes, but such crimes are also being taken into consideration under data protection laws as well. The United States passed the *Identity Theft Deterrence Act* in 2003, which makes the possession of any "means of identification" to "knowingly transfer, possess, or use without lawful authority" a federal crime, as well as unlawful possession of identification documents. The government has also directed financial institutions to collaborate in developing identity theft detection and prevention measures.

Another key question that needs to be addressed by such laws is the liability for financial losses that may

result, for example if funds are fraudulently withdrawn from a bank account or if a stolen credit card is used for a purchase. In Sweden, for example, where banks and stores are obligated to verify the identity of a customer, if they fail to do so these institutions are liable for the cost of any fraudulent transactions. In other cases, credit card companies may bear limited liability, but this may depend upon the customer notifying the card issuer of the lost or stolen card within a certain time period. For consumers in some jurisdictions, however, nearly all the risk is on the individual, and victims of identity theft can potentially lose most or all of their assets without recompense.

Aside from stopping these crimes and restoring victims' privacy and reputations, another important goal of law enforcement is to monitor and expose organized rings of data thieves, by tracing individual cases to their source. Because these criminals can be based anywhere in the world, and identity theft is an inherently global problem, international cooperation among governments, institutions, and law enforcement is crucial to reducing the scope and impact of these practices.

7.6.2. Curtailing Big Brother: Protecting Citizen Privacy

In many countries, citizens may have as much reason to be concerned about government intrusion on their privacy as from commercial entities. Rights and laws relating to basic principles of privacy differ widely among societies (e.g., the "right to be left alone"). This is partly due to differing state interests in monitoring and maintaining information about citizens. This debate then spills over into policies on national security. In the ubiquitous digital age, this long-standing conflict between civil liberties and government scrutiny takes on even greater urgency.

Government Databases

Governments have always inevitably gathered vast amounts of information about all their citizens. In the digital age, this information can be stored, sorted, distributed, examined, cross-referenced, and utilized in countless ways that are far more extensive than was ever possible in the era of paper, typewriters, and photocopies (let alone pen and ink). Democratic societies that may have, in the past, established reasonable protections and limitations on use and misuse of private citizen information by government authorities have been forced to revisit the principles and practices of nearly all public agencies, to adopt new rules of behavior for everyone from senior administrators to filing (or data entry) clerks.

To some extent, government databases do require sharing and cross-referencing of certain private information, to help improve efficiency of numerous bureaucratic processes. It makes sense, for example, for automobile registries to be linked with traffic enforcement databases, for real estate deeds and property tax records to be connected, and so forth. In the United States, where access to firearms is widely available, considerable controversy arose over the introduction of "background checks" on gun purchasers, requiring both a brief waiting period and a mandatory check of national criminal databases before guns can be sold. Shared access to public database records is especially needed for criminal investigations, and most national data privacy laws include a variety of exceptions and exemptions for law enforcement and national security.

But there are also important limitations in many laws regarding the scope of government access to and use of the private personal data of citizens without their knowledge and consent. Many countries issue national identification numbers (e.g., social security numbers) to each citizen at birth or upon legal immigration, and these ID numbers may be tied to dozens of records stored within disparate databases of various national or provincial/state authorities. As a general principle, most of these records must typically remain private and for the internal use of each agency that maintains them, and may not be shared or disclosed to outsiders without the subject's consent. Also, disclosure laws typically require that citizens be able to obtain copies of virtually all information that is kept about them, from public school records to tax files. There are, however, a number of areas where information is routinely made available for public access by anyone, especially those records which involve public proceedings such as court hearings, as well as information such as birth, death, and marriage certificates and property ownership deeds.

The EU *Data Protection Directive* applies to government agencies in most respects as well as commercial enterprises. Government agencies are "data controllers" with respect to the information that they obtain from citizens for any purpose, and so are similarly restricted from misusing, disclosing, or sharing such data according to the mandates of the Directive.

Electronic Democracy

Data protection and other privacy (and disclosure) issues also arise in connection with the increasing digitalization of democratic political processes and activities Politics requires an extensive degree of communication between candidates and voters, and the new era of technology is becoming fertile ground for innovative fund raising, public relations, advertising, activism, polling, and numerous other communications-intensive political endeavors. As with government's role in general, however, citizens in most democratic societies have a right and an expectation to be shielded from excessive invasions of their personal privacy by politicians, to know what is going on behind the scenes, and most of all to be sure that their personal electronic choices are safe, fair, and private.

Some of the most important privacy and data protection issues relating to electronic democracy policies fall into the following categories:

- *Campaigning:* In tight campaigns, candidates have been known to utilize technology to virtually harass potential voters: by placing automated telephone calls to every known number, for example, multiple times per day. Unlike commercial telemarketing, these may not be subject to strict limitations, due to free speech concerns. The same may be true of excessive e-mails, not to mention advertisements, as well as endless polling of public opinion. Of greater concern is the need to ensure openness and honesty in all communications, especially where information may be circulated that can include false rumors or unproven claims. Wherever official campaign staff and affiliates are involved in publicity or information dissemination, either in favor of one candidate or against another, laws should require strict disclosure of the source and support for any such activities. This is distinct from the unaffiliated activism of private citizens, who should have more freedom to express their views without interference or restraint.

- *Financing:* Strong campaign finance disclosure and limitation laws have been introduced in a number of countries, although many other democratic regimes have far less protection or openness with respect to the funding of political activities. The most open requirements obligate any citizens, organizations, or companies that donate to or otherwise financially support a candidate to reveal their support clearly, and for candidates to file regular reports that are available to the public for easy review. There is generally no right, in these circumstances, to privately or secretly underwrite a political campaign.

- *Voting:* Perhaps the greatest fear among privacy advocates in relation to electronic democracy involves the risk that electronic voting itself may be subject to corruption. More and more governments are adopting advanced, computerized voting machines, which expedite the voting and vote-counting process, but have created strong concerns that the resulting databases could be manipulated by hackers or infiltrators, rendering results suspect. Voters also need to be certain that their private selections in the voting booth will remain secret: one of the most fundamental tenets of electoral democracy, which could be at greater risk where electronic processing of votes predominates.

7.7. Cybersecurity Concerns

The digital age has brought with it an entirely new class of security concerns, for governments, companies, and individuals. Our growing dependence on ICTs has meant that our public and private networks have become critical and increasingly vulnerable infrastructure. The reality is that any weakness or attack, no matter how small, can have large global consequences. And the interests of security must be weighed against the liberty of citizens and the need for reasonable restraints on interference with private communications.[38]

7.7.1. Virtual Vulnerability: Security of Networks and Infrastructure

The technological revolutions of the digital age have arrived at a time when historical patterns of international conflict and rivalries have also undergone dramatic changes. While the prospect of all-out military battles between massive national armies has diminished greatly since the end of the Cold War, a new era has emerged in which malicious terrorism is becoming the leading worldwide threat to peace. At the same time, there continue to be numerous regional conflicts and hostile regimes, requiring the world community to be continuously alert for potential trouble. These developments

have placed ICT infrastructure and services at the very core of national security concerns, requiring a re-assessment of the scope of defense and intelligence policies.

Emerging security threats

The role of digital communications in both fostering and preventing security threats in this environment is extensive. Virtually all actors, from state security systems to terrorist organizations employ the full range of advanced networked technologies to collect and share intelligence, to conduct espionage, to maintain contact among personnel, and to spread their messages. From the point of view of threat prevention and response, however, one of the greatest concerns is the vulnerability these very communications resources to attack and disruption. It is an immeasurable challenge, as a virtual assault could come from anywhere at any time, from invisible sources, aimed at any of a million at-risk and critical targets.

The areas of virtual vulnerability are many. In the months leading up to January 1, 2000, there were widespread concerns that the so-called "Y2K bug" would disable essential systems that depended upon computers throughout the world; while those fears proved overblown, they highlighted the vast interdependence of computerized infrastructure and facilities, which could be harmed through targeted cyberattack. These could include electrical grids, telecommunications networks, government and commercial databases, financial institutions, and military networks, among others. One of the most common forms of cyber assault is a "distributed denial of service" (DDOS) attack, in which hundreds or thousands of computers under the control of the infiltrator transmit uninterrupted signals toward a web site or other online network; the resulting overload of traffic effectively crashes the site, making it unable to function properly. Similar attacks can employ specialized viruses, or even direct takeover of the command functions of a targeted system.

The level of threat in all of these areas is very real, and to some extent not even very new. Various forms of electronic espionage and sabotage have been attempted since the dawn of computers and modern telecommunications. In some way, cyber espionage is the ideal form of infiltration, since classified information and national security can be compromised by foreign entities over a long distance, without spies in harm's way. There have been a number of clandestine incidents that have come to light over the years, raising alarms that even greater risks may be forthcoming.

As for true cyberterrorism, i.e. destructive acts by non-state actors on a large scale aimed at core infrastructure, there have been fewer significant publicized incidents to date. One prominent case occurred in 2007, numerous sites in Estonia came under large-scale distributed denial-of-service attacks, which resulted in the temporary disabling of most Estonian government ministry networks as well as those of two major banks.[39]

Responses. Whether defending against organized cyber terrorists, state-sponsored cyber warfare attacks, or rogue hackers, governments are recognizing the need to devote substantial resources to this evolving area of threats. A range of responses have been attempted and suggested. Until recently, the most common deterrent for cyber attacks has been "passive defenses", such as firewalls and other physical and virtual blocks against electronic intrusion. These approaches, however, can be increasingly vulnerable as they do not typically evolve as quickly as expert hackers are able to thwart them.

Another potential strategy in reflects the Cold War tactic of nuclear deterrence, by developing a response capability which can turn cyber attacks back on the attacking party. The main problem here, however, is not determining where a cyber attack comes from, but specifically whether it was the work of a government, a military organization, a corporation, terrorists, or individual hackers. In fact, governments may employ private proxies, even based in different countries, to carry out attacks. Without the ability to accurately identify the source, cyber retaliation could be fruitless or counter-productive.

Recently, more focus has been placed on developing multilateral international approaches to deterring cyber warfare or terrorism. Several key states, including Russia, China, the United States, and India, have entered into negotiations through the United Nations to develop an international treaty on cyber security, based on Russian proposals to establish common principles and standards for such the use of electronic "weapons" and protection of critical infrastructure from infiltration and attack. There have even been proposals that Russia and the North Atlantic Treaty Organization (NATO) should

engage in joint simulated "cyber war games", to help plan for responses to potential emergencies or misunderstandings, among other potential cooperative actions. The International Telecommunication Union has also taken a leading role through its *Global Cybersecurity Agenda* (GCA) (see Box 7.5).

Box 7.4 The ITU Global Cybersecurity Agenda (GCA)

Launched in 2007, the ITU Global Cybersecurity Agenda is a framework for international cooperation aimed at enhancing confidence and security in the information society. GCA focuses on building partnership and collaboration involved in detecting, preventing, and overcoming cyber threats.

GCA has established five "pillars" or Work Areas of cooperation and initiatives:

1. Legal Measures
2. Technical and Procedural Measures
3. Organizational Structures
4. Capacity Building
5. International Cooperation

The GCA has fostered initiatives such as Child Online Protection and through its partnership with IMPACT and with the support of leading global players is currently deploying cybersecurity solutions to countries around the world.

Source: ITU.

The most critical component of any response to cyber threats, however, is human resources. Dealing with this class of highly sophisticated and constantly evolving electronic interaction requires trained specialists, and many of them, focusing their efforts on different types of risks and scenarios. By some estimates, national security teams require a force the equivalent of an entire army regiment, some 20,000 to 30,000 specialists, to mount a comprehensive cyber defense.[40] Yet most governments employ a small fraction of such a force, and training in cyber security is a field that has yet to reach levels adequate to meet the risks of the 21st century.

7.7.2. National Security and Civil Rights: What Should be the Boundaries?

Rising fears concerning both cyber attacks and many other forms of security risks have led many governments to revisit their options for investigating their own citizens and non-citizen residents. In the wake of the 9/11 attacks on the United States and multiple other terror incidents around the world, a very intense debate over the delicate balance between civil liberties and national security has been engaged among nearly all democratic societies. The magnitude of potential threats is matched by the scope of potential government intrusion into private lives, and each country must decide how much risk versus how much infringement on freedom it is willing to tolerate.

Electronic Surveillance

Since the earliest use of telegraph and telephone communications, regimes have sought to intercept such connections to eavesdrop upon enemies, spies, criminals, and nefarious conspiracies of all kinds. With much more widespread use of both landline and mobile telephones, including massive growth in international telephony, this avenue of surveillance has only increased in importance. There are two general ways, in theory, in which security officials can seek to identify threats and obtain intelligence through real-time monitoring of electronic communications: (1) by randomly monitoring large volumes of voice traffic in hopes of catching snippets of suspicious conversations; or (2) through targeted eavesdropping of selected suspects (or profiled persons). Both approaches are widely utilized, and both are controversial.

As a general rule, most countries' surveillance laws require officials to obtain a court warrant or similar authorization, based on some degree of probably cause, to institute targeted wiretapping or electronic eavesdropping against individuals or groups. The key questions involve what scope such authorizations should be able to encompass, with what limitations? Some of the important details to be resolved include:

- What evidence authorities must present to justify establish cause for a surveillance warrant?
- How long the warrant should be in force?
- How easily, and on what basis, a warrant should be renewable?
- How much time should be allowed for a warrant request to be reviewed?
- How many persons, or how wide a scope of an organization, can be covered based on uncertain evidence?

- And perhaps most important: under what special, emergency circumstances can authorities proceed with electronic surveillance *without* a warrant?

The U.S. Patriot Act, signed into law scarcely one month after the Sept. 11, 2001 terror attacks, resulting in fewer restrictions on American law enforcement agencies' authority to conduct investigations of a wide range of potential suspects. It specifically amended the existing Foreign Intelligence Surveillance Act (FISA), which addresses how electronic surveillance may be conducted on foreign powers or their agents, but not domestic citizens. Although FISA still required warrants for such eavesdropping, a scandal arose in 2005 when it was learned that the Bush Administration had secretly authorized extensive interception of both foreign and domestic communications for several years, without obtaining warrants. Although the program was subsequently stopped, in reauthorizing the Act in 2008, the U.S. Congress granted retroactive immunity to telecommunications companies that had cooperated with the illegal warrantless wiretapping activities, adding to public displeasure among many citizens.

Box 7.5 Mobile SIM Card Registration

Another recent step taken by many governments has been to require that all cellular mobile telephone users register their SIM cards in a national database. Countries such as Ghana, Nigeria, Zimbabwe, and others where these policies have been instituted have far more mobile phone users than landline subscribers, but standard pre-paid mobile services don't normally require any form of identification or registration. Government security officials have proposed SIM card registration as a means to reinforce their investigatory and research functions, by associating names, addresses, and other information with each cell phone. Implementation of these policies has proven difficult, however, and governments have had to postpone shut-off deadlines for mobile customers that failed to register, while the logistics of the system have been ironed out. Many customers have objected to having to provide their personal information under such programs, and have expressed concern that the registration is part of a broader government goal to eavesdrop on private citizens.

Source: AudienceScapes, 2010.

A different objection arose in Italy in 2010, when the government actually proposed cutting back on the uses of wiretapping. Italy has had one of the less restrictive regimes governing wiretaps and eavesdropping by both police and private entities, which has led to as many as 100,000 wiretaps per year, compared with only a few thousand in the U.S. and Britain. As both law enforcement and the national media had come to rely upon this particular method of discreet information gathering, proposals to curtail wiretapping warrants met with protests by both groups, including a general strike in which nearly all national media shut themselves down for a day.

Access to Data

In an era where a large and growing proportion of global communication involves means other than voice conversations, where myriad forms of information can be exchanged across limitless electronic data channels, security authorities confront an expanding scope of targets to investigate for evidence of crimes and threats. The bulk of contacts among many subversive or criminal organizations most likely involve some combination of e-mail, SMS or text messages, chat rooms, coded web postings, and other modern innovations. Such surreptitious uses of multiple digital channels are all the more necessary, and convenient, for organizations that operate across borders and among many discreet locations.

The need to locate, uncover, monitor, decipher, and evaluate all the varied possible communications mechanisms of potential adversaries places law enforcement and national security forces squarely in the center of the debates over civil liberties in the information society. Almost any form of cyber investigation will inevitably involve accessing private data of entirely innocent average citizens. Again, the challenge is to determine the appropriate balance: the most reasonable, effective, and practical limitations on officials' authority to obtain and examine private data, and the rights of all citizens to expect that their personal information and communications will remain out of reach, by even the police or security apparatus.

The most common manner for officials to obtain access to data communications requires ISPs and other network and service providers to grant access to actual server databases, either through direct transmission links or through copies of data files. Either step is a serious intrusion and one that many companies are reluctant to accept. Again, the challenge becomes the scope of the government's case as to the urgency and value of such an investigation, as against the rights of both the data owner or controller, and its customers. At a minimum, court warrants authorizing such access

need to be narrowly tailored to protect innocents' data, and to avoid massive increases in public control of private information.

Box 7.6 The Blackberry Controversy

In 2010, several governments, including the United Arab Emirates, India, and Saudi Arabia, threatened to block use of the secure network of Canada's Research in Motion (RIM), the company that produced the popular Blackberry smart phones, widely utilized by corporate customers in particular. Security officials in these countries, where perceived threats of subversive and terrorist activities are very high, insisted upon gaining the ability to obtain access to encrypted Blackberry-originated e-mails, calls, text messages, and the like. While offering to cooperate, RIM objected that its entire business model depends upon offer secure communications to corporate customers, and even the company itself was not able to access and decode its customers' encrypted transmissions.

This standoff led to threats that the governments would block all transmissions utilizing the Blackberry system, potentially eliminating their service altogether and forcing hundreds of thousands of customers to switch to different service providers and/or new, non-encrypted devices. As of late 2010, the parties were seeking to negotiate a mutual agreement, while the security officials were looking at expanding their access demands to Google, Yahoo, and other multinational providers of personal e-mail services. The problem with this type of conflict between security and civil liberties lies partly in the nature of modern communication technologies themselves.

While it is theoretically possible for any network to capture and retain virtually all digital messages that pass through its servers, most operators do not actively monitor and retain such information willingly. For one thing, the storage capacity required to keep indefinitely all data files transmitted through a broadband network with millions of users would soon become astronomical, especially as users send more multimedia messages, and the costs of such capacity could become prohibitive. Also, the nature of encryption protocols is such that, as RIM indicated, they are not intended to be accessible by intermediary parties, and these might have to be entirely rewritten, or abandoned, to comply fully with security access demands. These problems are of course compounded by the objections of users over having their private messages exposed to government scrutiny. The impact of such policies could therefore be as significant in commercial and economic terms as in the political and civil liberties realms.

Source: England, 2010.

7.7.3. The War Against Malware

As networks expand, the volumes of malicious, destructive, and exploitative uses of ICTs are also multiplying exponentially. Regulatory authorities are on the front line of the battle against these abuses, which are among the most pervasive and potentially damaging challenges of the digital era. The risks are especially great for the most vulnerable victims - new and inexperienced users, children and teenagers.

The Danger of Viruses

Computer viruses represent a unique and unprecedented form of malevolent activity. A virus is a software program designed to invade and infect computers, servers, or networks, causing whatever harmful or innocuous effects its designer chooses, while replicating itself and traveling over the Internet or any private networks it infiltrates by attaching to e-mails or other transmission vehicles, unbeknownst to the users who receive and re-send it. These are typically highly complex programs, which require considerable expertise, and much time and effort, to design and disseminate successfully.

What is unusual about most viruses is that they are not typically intended for any financial or political purpose: the anonymous authors gain nothing material for their work, whether a virus is restricted to a small number of PCs or spreads around the world disabling hundreds of thousands. The apparent motivation for most virus writers is simply a demonstration of their code writing skills. The most effective viruses can result in many millions of dollars in damages and lost productivity.

In response, the antivirus software business has become one of the most lucrative markets in the software industry. According to Gartner, several billion dollars in antivirus packages and update subscriptions are sold each year. There is a very disturbing symbiotic relationship between the hidden, vigilante hackers who create viruses and the responsible, concerned antivirus companies who try to stop them. In fact, the more effective and widespread a virus is, the more valuable it is to the anti-virus industry: every time there's a global alert about a new killer virus scare, the sales of antivirus software and upgrades skyrocket. Not many major businesses are entirely dependent for their existence and prosperity upon the independent, voluntary, and uncompensated actions of anonymous outsiders. Antivirus firms even employ ex-virus writers as some of their most valuable counter-programmers.

In most countries, laws and prosecution relating to computer viruses are covered under more general cyber security and data protection statutes. When a virus causes damage or disruption to personal, corporate, or government computer systems, the creators can be liable for both criminal and civil prosecution.

But legal precedents are not widely established, and juries and judges can face challenges in determining exactly the nature of the crime committed, or the magnitude of damages. In 2002, the creator of the notorious "Melissa" virus, which had infected untold thousands of computers in 1999, pleaded guilty in U.S. federal court to charges relating to the scope of damages caused, and was sentenced to twenty months in prison.[41] However, the author of a copycat virus which was built on the same code as Melissa, known as the "ILOVEYOU" virus, received no prosecution or punishment, although his identity was known almost immediately. This was because this virus was created by a programmer in the Philippines, and upon discovery of the source of the virus, Filipino law enforcement determined that there was no existing law that applied to such an action, if it did not specifically involve fraud or theft.[42]

It is evident that global cooperation and harmonization of laws, investigation, prevention, and enforcement regarding malicious computer viruses must be a high priority. Since viruses are increasingly used as part of cyber crime and other potential cyber threats, electronic epidemics (such as worms and spyware) require concerted action by both governments and businesses in the public interest.

Cost and Impact of Spam

Unlike pure viruses, unsolicited bulk commercial messages, or "spam", are decidedly aimed at profiteering above all. This scourge, which exemplifies some of the worst impulses of unrestrained commercialism, affects every last user of e-mail, which means virtually every Internet user in the world. Infinite sales pitches for Swiss watches, university diplomas, prescription drugs (such as Viagra), fake lottery winnings, sex sites, and innumerable invites to share the hidden wealth of some late African official pass through cyberspace every minute of every day. Estimates of the magnitude of spam messages can only be approximate, but by any measure they comprise more bits, by far, than all other e-mail traffic combined.

This does not mean, of course, that the number of "spammers" (people who deliberately create and circulate commercial con messages) are also in the millions or billions. On the contrary, in general, most spam originates from a relatively small number of sources. A single amateur self-promoting marketer can send thousands, even millions, of messages to unlimited recipients, with access to a simple program and readily available e-mail address lists. While many ISPs will block transmission of bulk messages to more than a certain number of addresses, there are many programs and packages that can get around such limitations. No one knows how many spammers there are, where they are, or how many messages they send, but the impact is astronomically disproportionate to their numbers and their efforts.

The impact of spam on the global Internet is also difficult to measure, but is undeniably large. To maintain adequate service quality, ISPs and mail hosts must invest in huge levels of extra transmission and storage capacity. The costs to block and delete spam are equally burdensome. And the costs borne by users, in lost time and inconvenience, not to mention the losses of those who fall victim to e-mail scams, only compound the injustices caused by those who infest the world with spam at almost no cost to themselves. Spam is also directly linked to "phishing", whereby entities attempt to acquire sensitive information from users such as passwords and credit card details by masquerading as trustworthy entities. This can lead to even more harmful crimes like identity fraud and theft.

The front line in the battle against spam is primarily manned by private sector companies. ISPs, major software companies such as Mozilla and Microsoft, and e-mail hosting services such as MSN, Yahoo! and Google have all invested heavily in developing spam filtering technologies. These filters reside on e-mail servers and seek to identify and quarantine spam messages, while passing through authentic e-mails. It's an inexact science, but there are few practical alternatives. These companies recognize their self-interest in fighting spam. Only the extensive investment in spam filters, which reduces the number of unsolicited messages actually received by most typical users to a small fraction of those actually sent toward their inboxes, prevents this epidemic from overwhelming consumers. Without effective filtering, the impact of having to sift through dozens or even hundreds of spam e-mails per day to locate the handful of legitimate messages might degrade the online experience to such an extent that demand may even decline.

Meanwhile, governments and law enforcement have taken on the task of seeking out the worst offenders, trying to reduce spam at the source. The challenge of legislating against unsolicited commercial e-mail is difficult. In principle, the goal is to prohibit massive bulk transmission of unsolicited commercial messages, but defining those terms in legally defensible language, and distinguishing spam from legitimate commercial advertising, requires drawing many fine lines. Nevertheless, dozens of governments have reacted to the spam plague by adopting a range of measures to criminalize this particular form of mass solicitation. ITU conducted a comprehensive survey of anti-spam legislation worldwide in 2007-2008, identifying more than two dozen countries where laws have been adopted, but with widely varying terms and conditions.[43]

The evolution of anti-spam law in Russia is a representative example.[44] Prior to 2006, intervention and enforcement against spammers required patching together a series of disjointed existing laws and codes of conduct. While the Russian Federation Constitution guarantees all citizens the right to communicate in any way they choose, federal law stipulated that citizens also had the right to "refuse reception" of messages. The national ISP association, meanwhile, established its own code of conduct, which stated that "bulk distribution of messages by means of e-mail and other means of personal information interchange" which are transmitted against the "obvious and unambiguously expressed initiative of addressees" is prohibited, and companies that violate this rule can be disconnected. A separate federal law against false advertising also applied to spam that could be shown to be fraudulent. In 2006, new federal legislation was proposed, to prohibit sending of any commercial messages without the recipient's consent, an approach which was problematically broad. Instead, more succinct, if difficult to interpret language was suggested:

> Creation and transmission of electronic or postal messages for an unidentified list of users of communication services is inadmissible.

While anti-spam laws target spammers, an alternative approach is the establishment of enforceable codes of conduct for ISPs, enforced by regulators. Such a system of 'managed self-regulation' would require ISPs to prohibit their customers from using that ISP as a source for spamming and related bad acts, such as spoofing and phishing, and not to enter into peering arrangements with ISPs that do not uphold similar codes of conduct. Rather than continue to rely upon chasing individual spammers, regulators in the most resource-constrained countries in particular would be more likely to succeed by working with and through the ISPs that are closer to the source of the problem, to their customers, and to the technology in question. The regulator's job would be to ensure that ISPs within their jurisdiction adopt adequate codes of conduct and then to enforce adherence to those codes.

While some ISPs can be expected to resist even such light-handed regulation, the advantage is that it places all ISPs on a level playing field. Under current practices, responsible ISPs find themselves bearing the brunt of the costs of spam. This explains why some ISPs have begun suing spammers for damages, an option that may not be available in all jurisdictions. The goal of managed self-regulation is to reduce spam in a way that protects responsible ISPs. ISPs that implement responsible, effective anti-spam measures should be rewarded for their good behavior. One means of rewarding those responsible ISPs is for regulators to hold their irresponsible competitors accountable. Regulators can also make consumers aware of the good works of the best ISPs, for example, by certifying ISPs that enforce their codes of conduct and allowing such ISPs to use the regulator certification in their advertising.

As with many other telecommunication-related policy issue that are salient across national borders, the importance of consistency, shared strategic approaches and international cooperation is paramount. International cooperation is needed because perpetrators can be located in almost any remote corner of the world, while the victims are spread out across the planet. ITU has again taken a leading role, coordinating policy initiatives and providing a range of information resources for government agencies and corporate members. The OECD created a Task Force on Spam and produced an "Anti-Spam Toolkit" of recommended policies and measures.[45] In 2004, a group of 27 countries and government agencies established the London Action Plan, a cooperative agenda for sharing information and coordinating policies against spam.[46] Still more cooperation is needed, especially among less developed countries where the illusory allure of instant riches will continue to grow in

appeal as the ICT phenomenon continues to transform their societies.

7.8. Green ICT

As ICTs have emerged as the dominant means of human communication and a central source of globalization, their impact and role in the environment is starting to take center stage. Regulatory authorities can cooperate to help minimize negative impacts and promote the positive benefits that ICTs can contribute.

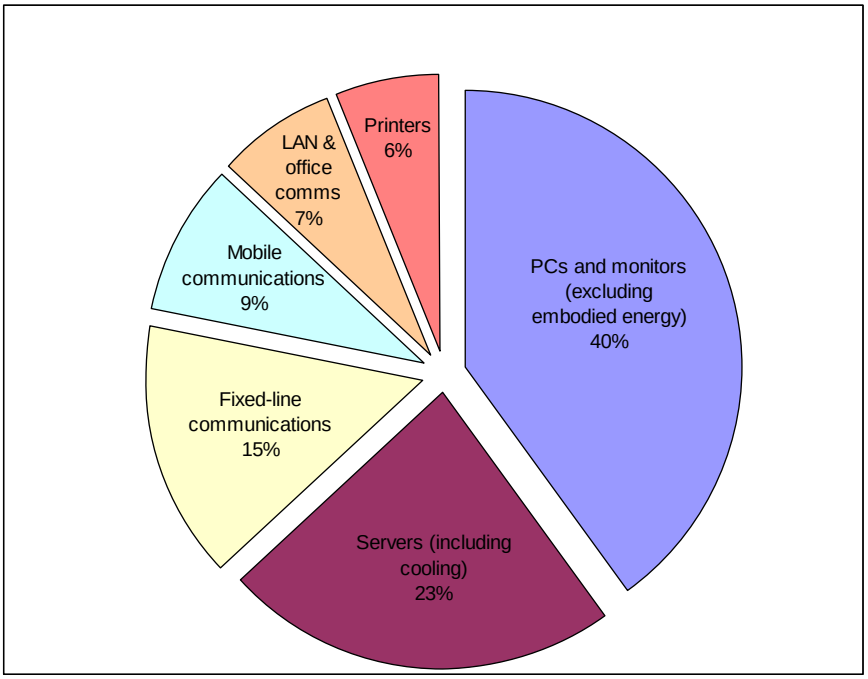
7.8.1. The Nexus Between Communication and Conservation

Environmental concerns, including climate change, represent some of the most serious global challenges of the 21st century. Advanced information and communications technologies can contribute significantly both to the problems and to the solutions. As a growing, energy-intensive, ubiquitous industry, ICTs have a strong impact on the environment in virtually every country. At the same time, as a field driven by innovation and competition, these technologies present a variety of opportunities to engineer Green alternatives to traditional modes of operation. And ICTs can play a vital role in helping to facilitate research, analysis, awareness raising, and cooperation to address critical environmental issues.

The Environmental Footprint of ICT

ICTs utilize a tremendous amount of energy in the aggregate. From the factories that manufacture equipment, to the permanently running transmission networks, to the servers, computers, phones, video displays, and more that all depend upon electricity (or rechargeable batteries), the Information Age is also a highly energy dependent age. As of 2010, ITU estimated that as much as 2.0 to 2.5% of global greenhouse gas emissions were attributable to ICTs. According to an earlier 2007 study, the largest contribution to the ICT footprint was PCs and monitors (40%), with servers next (23%). While mobile telephony accounted for only 9% of the total, this level has undoubtedly been growing in both absolute and relative terms (see Figure 7.8).

Figure 7.8 Estimated Distribution of Global CO2 Emissions from ICTs



Source: Adapted from Gartner, 2007.

To some extent, the energy utilized to power communications may be offset by energy savings in other respects. In particular, there are many instances where extensive use of ICT resources can have a direct impact in reducing energy use and

emissions from transportation: by facilitating long distance contacts through e-mail, telephone, and even video conferencing. The Global eSustainability Initiative (GeSI), a lobbyist group on behalf of the industry, estimates that the savings in emissions of greenhouse gases (i.e. mitigation effect) that can be achieved through the application of ICTs exceeds their direct negative impact five-fold. The precise degree of the impact is open to question.

Nevertheless, as ICT demand and utilization continues to expand, the net adverse impact of this sector on climate change and the environment in general is likely to increase steadily, unless strong measures are taken to alter the ICT energy equation. Some companies have taken leading steps, in cooperation with governments and environmental groups, to set examples of Green operating philosophies. One example is the web portal company Yahoo!, which announced in 2007 that it would implement "carbon neutral" practices in its operations. In 2010, Yahoo! announced plans for its new data center in New York, which was granted $9.9 million by the U.S. Department of Energy to implement energy-efficient plans, including use of wind and hydropower and specialized building design to increase natural cooling of the company's servers.

Mitigating Environmental Effects

There are many ways in which ICTs can directly or indirectly serve a positive role in promoting environmental objectives. Some of these may be within the authority of regulators and other policy entities to influence, whether through negotiations, laws, or economic incentives. Green awareness and energy efficiency initiatives such as Yahoo's program can create favorable publicity among customers and activists, whereas companies that may exhibit less responsible practices should be prepared for criticism and possible market consequences. As more is learned about the options for reducing energy consumption, pollution, radiation, and other hazards, public authorities may consider incorporating green ICT mandates in new or revised licenses and regulations.

As ICT networks extend farther into remote rural areas, there are new challenges concerning access to electric power, but also new opportunities to introduce renewable, efficient alternatives. In many such locations, operators utilize solar energy panels for cell sites and satellite receivers, for example. While these may be the only available option in many cases, they also tend to be far more expensive than attaching to an available electrical grid. Regulators and public subsidy programs should take account of the environmental benefits of solar and other low emission power sources, and should be prepared to endorse or compensate such initiatives wherever possible.

Further environmentally responsible policies can be adopted at every level of the manufacturing and delivery of ICT products and services. In the process of obtaining the raw materials needed for most electronic equipment, appropriate mining practices should be adopted, in line with sustainability and certification principles that have been adopted by many such operations. In factories and assembly plants, energy efficient and low emissions machinery should be employed. Land use policies, cell tower construction, data processing centers, and even retail sales outlets, the benefits of Green conscious approaches to doing business can have a strong influence on the overall impact of the sector. For instance, NGNs are expected to reduce energy consumption by 40 per cent compared with today's PSTN.

From another perspective, ICTs can serve the cause of environmental sustainability and mitigating impacts of climate change by serving the very purpose for which they are deployed. Advanced ICT systems, for example, have become critical to the measurement and monitoring of global temperatures and natural disasters, helping scientists to evaluate and anticipate impacts of shifting climate conditions. And of course, ICTs can be an extremely effective and influential partner in the movement to spread awareness of environmental concerns and to mobilize responses.

Finally, addressing these planet-wide challenges depends most of all upon collaboration among many stakeholders and experts, across multiple industries. As the ICT and environmental fields have both been following critical paths of development in recent years, there have been increasing opportunities for collaboration on research, policy, and technological initiatives. Especially in the realm of climate change, organizations on the ICT side have taken a significant lead in pursuing such cooperative endeavors. These include, among numerous others:

- *ITU and Climate Change:* A major initiative by the ITU to address the global impacts of ICTs on

climate change, and forge international cooperation on research and innovative solutions;

- *info*Dev *and DFID Climate Technology Program:* A joint initiative to provide seed money for innovative pilot projects utilizing advanced technologies to evaluate creative solutions to environmental challenges, by creating a series of climate technology centers as incubators for small businesses;
- *The Global e-Sustainability Initiative (GeSI),* a non-profit ICT industry cooperative organization which conducts research, publishes studies, and brings together multiple stakeholders to explore sustainable and environmentally appropriate industry practices.

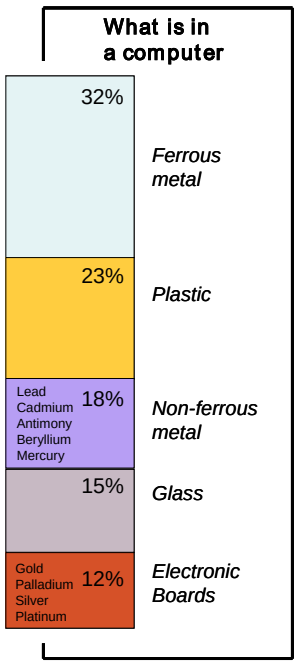
7.8.2. Cyber Waste, Digital Trash

While energy use and conservation are a central issue during the life-cycle of all ICT products and services, and equally important problem, which is growing rapidly, is what happens to these products once their useful lives are over. In recent years, the explosive growth in this sector, together with the inherent trends of frequent equipment upgrades and obsolescence, have led to dramatically increasing levels of cyber waste (or "e-waste"): discarded phones, computers, printers, and other digital trash, which not only cannot biodegrade but is generally hazardous to the environment.

Hazardous E-Waste

Hundreds of millions of used (and recently purchased) mobile phones are discarded every year around the world. Millions of cathode ray tube (CRT) monitors, printers and print cartridges, as well as PCs, LCD televisions and laptops, and an unimaginable number of batteries of all kinds are thrown away, to be replaced by newly manufactured substitutes. Nearly all of these products contain one or more hazardous materials in significant quantities: copper, silver, gold, palladium, platinum, lead, nickel cadmium, lithium, and mercury (see Figure 7.9). If these materials enter the soil and groundwater by being buried in landfills, they can create real and lasting health risks for local populations. For environmentalists and policy makers already struggling with excess industrial waste and pollution, this new source of cumbersome and poisonous refuse is a crisis in the making.

Figure 7.9 What is in a Computer?



Source: United Nations Environment Program.

Addressing this problem requires coordinated efforts on the part of government, industry, and consumers. Multinational ICT corporations bear a large portion of responsibility to create more sustainable products, utilizing a minimum of hazardous materials and allowing for longer useful lives rather than planned obsolescence. Consumers need to educate themselves about proper maintenance, recycling, and disposal methods, as well as the environmental impacts of the upgrade and throw-away mindset. And governments from the national to local levels, as well as international organizations, need to provide guidance and resources to both require and encourage proper recycling and safe disposal of ICT waste.

Recycling in particular is a critical component of the measures needed to combat e-waste. Many used items such as mobile phones and computers cannot always be easily recycled directly for reuse or refurbishing, and with dropping prices the markets for second-hand equipment are small. But many of the internal materials, including rare and hazardous metals, can be recycled and utilized in the manufacture of new ICT products. However, extracting these resources from discarded cyber trash can be a costly and complex process, not necessarily more cost-effective than using newly

mined materials. Government and industry cooperation can help reduce these costs and ensure sector-wide compliance with recycling mandates.

A number of government agencies, including several in less developed economies in Africa, for example, have taken initiatives to define e-waste disposal and recycling requirements and procedures. Africa has become a dumping ground in some areas for international e-waste, and so these issues are becoming even more acute in this region. In Kenya, the Kenya ICT Action Network (KICTANeT) organized a study supported by Hewlett Packard (HP), the Digital Solidarity Fund (DSF) and the Swiss Institute for Materials Science and Technology (EMPA), to examine the extent of e-waste and methods of treating it in Kenya, and develop a roadmap of policy responses.[47]

In 2010, the Nigerian government proposed issuing strong regulations governing the treatment of e-waste in the country, which has become one of Africa's largest cyber dumping grounds. The regulations would empower the government to investigate and prevent illegal waste dumping, including inspecting imported equipment to determine if it may be actually for sale and use, or is merely intended to be disposed illegally within Nigeria.

In Brazil, *info*Dev is working with the Department of Science and Technology to study best practice in the field of handling e-waste and to develop a national policy.

7.9. Regulation in a Global Era

Although regulators typically still function under national governments and legislation, the boundaries within which communications services are provided are increasingly artificial. Regional and global cooperation on most issues will become a growing challenge as the industry continues to expand and consolidate.

7.9.1. Cross Border Governance

One of the common themes throughout nearly all the new and changing regulatory trends arising due to the convergence and expansion of digital communications technologies is globalization. ICTs are perhaps the most central force driving the globalization of markets and integration of economies worldwide, and consequently the policy issues they raise are increasingly global in nature. Vast amounts of traffic and information passing across borders every day, through links and landing points which in principle connect one national network to another, but which are effectively invisible to users. Mobile services in particular are impossible to contain within artificial boundaries, and users often roam onto networks of neighboring countries. Many of the corporations that own and invest in telecommunications networks often own multiple licenses within a region, and some are looking to integrate services among markets. Technology has moved beyond national boundaries, and regulation must follow.

Regional and Global Cooperation

International cooperation has been a critical feature of the telecommunications industry since the earliest days of the telegraph. The ITU was founded in 1865 to facilitate and oversee international agreements on the development and use of the telegraph. As first telephony and especially wireless communication became prominent, the need for multilateral coordination grew even more essential, as radio signals don't stop at national boundaries, and intricate agreements were needed to minimize interference and assure compatibility among equipment and networks. Because most services were provided through state PTTs, these agreements involved government-to-government treaties. But as the telecommunications sector has moved to a privatized, competitive, globalized model, cooperation among governments has focused more on harmonizing regulatory practices.

In this context, ITU has continued to play the leading role, with 192 Member States and over 700 additional Sector Members and Associates. While continuing to coordinate worldwide utilization of radio spectrum and communications satellites and establishment of common technical standards for industry evolution, ITU has also established itself as a focal point for supporting governments and regulators in the developing world in particular. The ITU Telecommunications Development Bureau (ITU-D or BDT) is one of the three Sectors within ITU, along with Radiocommunication (ITU-R) and Telecommunication Standardization (ITU-T). As detailed throughout this chapter, ITU has established working groups, programs, and studies on nearly every major issue confronting telecommunications regulators and policymakers in the digital era. ITU also organizes worldwide and regional exhibitions, forums, and publications, including the ITU Telecom events, as well as the

annual Global Symposium for Regulators (GSR), which brings together regulatory officials and experts from scores of countries to address the prevailing issues confronting the sector in detailed and in-depth collective discussions.

Many other international organizations are also actively involved in promoting global cooperation on telecommunications regulatory policies. The World Bank has been among the most prominent in financing and advocating the transformation of ICT policy regimes while supporting establishment and capacity building for regulators around the world.

The Information for Development Program (*info*Dev) is a multi-agency partnership based within the World Bank, with a primary focus on helping to increase access to information infrastructure, applications and services, and supporting private sector ICT innovators and entrepreneurs. Among other activities, *info*Dev provides technical and financial support to improve regulatory and policy frameworks, increase capacity for design, implementation and monitoring/evaluation of ICT programs and projects, and to scale up successful pilot projects to increase their impact and sustainability. This work has included providing some of the most extensive information to regulatory authorities, in both printed and online formats. In 2000, *info*Dev published the first edition of the *Telecommunications Regulation Handbook* (ed. H. Intven) in order to provide a one-stop reference manual for the growing number of telecommunication regulatory agencies being formed around the world. More recently, jointly with the World Bank and ITU, it developed and sponsored the online *ICT Regulation Toolkit* on which the present *Handbook* is based.

During 2010, *info*Dev launched a project with partners entitled the Broadband Strategies Toolkit, which is likely to evolve into a similar body of knowledge for the promotion, regulation and universalization of broadband networks.

Several other United Nations agencies contribute expertise, research, funding, and program initiatives to global ICT policy deliberations: the UN Development Program (UNDP), Educational, Scientific, and Cultural Organization (UNESCO), Conference on Trade and Development (UNCTAD), and Commission on Science and Technology for Development (CSTD), among others. Many other development finance institutions and agencies also contribute significantly to policy reforms and regulatory strengthening in ICTs. They include the major regional development banks – the European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB), InterAmerican Development Bank (IDB), and African Development Bank (ADB) – as well as national development agencies, such as the U.S. Agency for International Development (USAID), Canadian International Development Research Centre (IDRC), Japan International Cooperation Agency (JICA), and many more.

Also gaining in importance are regional regulatory associations and other multilateral institutions, which bring together officials from multiple countries to share information, coordinate policies, and advocate for the mutual interest of their members. These include Regulatel, the Latin American regulators association; the Communications Regulators' Association of Southern Africa (CRASA), the Economic Community of West African States (ECOWAS), the Arab Regulators Network (AREGNET), and the Eastern Caribbean Telecommunications Authority (ECTEL). Of course the European Commission and European Parliament take the lead in setting policy for the countries of the European Union. The Organisation for Economic Cooperation and Development (OECD) has established a Committee for Information, Computer and Communications Policy (ICCP), which undertakes a variety of studies and maintains international databases of ICT trends and policies. The Asia-Pacific Telecommunity (APT) is a focal point for ICT development initiatives for its 34 member countries. The Commonwealth Telecommunications Organisation (CTO) provides a variety of services in support of its members' telecommunications development policy needs. The Association for Progressive Communications (APC) is a global network of civil society organizations focused on enabling opportunity for developing countries through ICTs, with emphasis on policy, women's networking, and capacity building.

Representatives of all these groups, along with most of the world's governments and ICT companies came together in 2003 and 2005 to convene the World Summit on the Information Society (WSIS), a United Nations sponsored and ITU hosted worldwide event. Recognizing the increasing importance of ICTs and the need for high-level focus on shared policy perspectives and development objectives, the Summit participants

prepared first the Geneva Declaration of Principles and Plan of Action (2003), followed by the Tunis Agenda for the Information Society (2005), which identified a range of critical issues for the world community to address, particularly with respect to Financial Mechanisms to support ICT development, as well as Internet Governance (see below). Subsequent to the World Summit, the participants agreed that there should be ongoing follow-up and implementation activities, which have continued under the auspices of the UNCTAD, UNESCO, UNDP, and ITU.

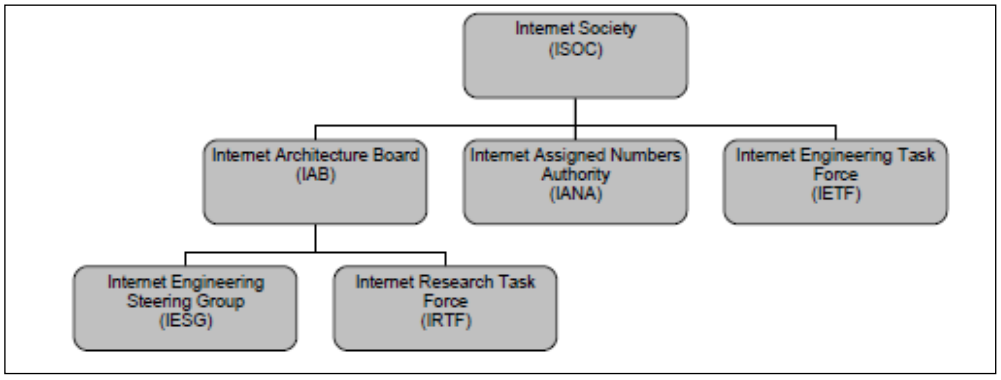
Internet Governance

One of the most vital new areas of international cooperation, and a key theme of the WSIS, is Internet governance: the policies and institutions that manage the day-to-day functioning of the global Internet, and its ongoing evolution. The globalization of ICTs and the central place of the Internet in nearly every society has given rise to increasing calls for changes to the historically United States-centric mechanisms which continue to dominate much of the Internet's oversight.

Because the Internet emerged from an unplanned and disjointed sequence of events, but was initially underwritten and operated by the U.S. Defense Department's ARPANET and later the National Science Foundation's NSFNET, most of the basic protocols and technical standards that still govern the Internet's operations were introduced and long controlled by the United States government. This control extended to the creation and financing, for example, of the Internet Engineering Task Force (IETF) in 1986, the informal Internet Assigned Numbers Authority (IANA) since 1988, and IANA's formal successor, the Internet Corporation for Assigned Names and Numbers (ICANN) beginning in 1998, all initially under U.S. government contracts.

The current institutional structure of Internet governance arose with the establishment of the Internet Society (ISOC) in 1992, which was organized outside of any official government agency, with membership open to any individual, organization, company, or agency with an interest in contributing to the Internet's development (see Figure 7.10). Over time, the ISOC has absorbed other organizations, including the IETF and the IANA (see diagram). However, the IANA's critical function of controlling naming and numbering conventions – the assignment of top-level domains among countries and ultimately the distribution of web addresses and associated URL numbering has remained with ICANN (which continues to administer IANA).

Figure 7.10 Internet Architecture Organizations



Source: ITU, The Future Internet, 2009.

This status quo, among other related issues, was central to the discussions and negotiations of the WSIS. Representatives of a majority of the world's governments as well as many international civil society organizations, took the view that governance of the global Internet should be permanently removed from the influence and control of any one government (the United States), and made the collective responsibility of a neutral international forum. The U.S. government has resisted this change, while proposing that ICANN should operate on an essentially autonomous basis as a non-

profit corporation. Coming out of the World Summit, negotiators did not agree to alter the role of ICANN for the present, but did establish a Working Group on Internet Governance, which went on to create the Internet Governance Forum (IGF) in 2006. The IGF is now responsible for convening multi-stakeholder meetings, discussions, and studies on the issues raised by the WSIS regarding Internet governance (most recently in Lithuania in September 2010, where its initial five year mandate was renewed) and to propose options for a way forward.

Innovative technological advances are having a revolutionary impact on the ICT sector and the economy as whole, requiring that all players (equipment manufacturers, operators, service providers, policy makers, regulators, and even users) reassess their traditional knowledge and decision-making models. In particular, traditional telecommunication regulators must respond to these fast-paced changes in order to enable their economies to thrive while protecting the public interest. For this, global cooperation will remain as vital as local innovation for years to come.

7.9.2. Cooperation across Sectors and Boundaries

The ICT sector is highly dynamic and rapidly changing. Therefore, making predictions of what is to come in the next decade is difficult. The deployment and take-up of ICTs, however, is happening at a faster pace than ever before, particularly with regard to developing countries and the use of mobile services and applications. This all creates further challenges for authorities. Nevertheless, market and regulatory trends over the past few years demonstrate increased competition in ICT markets and evidence a continued and deepening path of convergence both within ICT sector as well as with other sectors of the economy. As such, the following conclusions can be drawn:

- As markets become more competitive, regulators will need to shift to a more targeted approach towards intervention in the sector, withdrawing ex ante regulation where it is no longer warranted, and transitioning towards ex post rules. Development of strong competencies in the economic and legal techniques and methodologies for competitive analysis will be a critical input for regulators going forward. This will be particularly pressing in countries where competition law and authorities have traditionally been lacking or have had a very limited scope of action. Accordingly, ICT regulators should engage in capacity building initiatives to develop the necessary institutional know-how and make efforts to increase cooperation with competition authorities where possible.
- Continued convergence within the ICT sector will present regulators with new challenges associated with vertical and horizontal integration of on-line services and applications. New players are progressively developing novel equipment, devices, services and applications that have the potential of altering the ICT competitive landscape. However, when facing the challenges posed by nascent services and applications, regulators should exercise caution to avoid stifling innovation and investment. A light-hand approach is often-times the right regulatory response under these circumstances and may contribute to create the appropriate enabling environment for innovative services and applications to develop.
- Expansion of ICTs into our everyday activities will demand ICT regulators to increase their cooperation with different cross-sector regulators and policymakers, including in areas such as law enforcement, education, banking, health and the environment. Increase coordination of policies and initiatives in these areas, and likely many other, will be critical within the coming decade to harness the potential efficiencies that ICTs can bring to consumer and the society at large.

GLOSSARY

2G: Second-generation mobile network or service. Generic name for second generation networks, for example GSM.

3G: Third-generation mobile network or service. Generic name for third-generation networks or services under the IMT-2000 banner, for example W-CDMA and CDMA2000 1x.

3GPP: Third Generation Partnership Project. A cooperation between regional standards bodies to ensure global interworking for 3G systems.

4G:Fourth-generation mobile network or service. Mobile broadband standard offering both mobility and very high bandwidth.

ADSL: Asymmetric digital subscriber line. A technology that enables high-speed data services to be delivered over twisted pair copper cable, typically with a download speed in excess of 256 kbit/s, but with a lower upload speed. Corresponds to ITU Recommendation (standard) ITU-T G.992.1.

Analogue: Transmission of voice and images using electrical signals. Analogue mobile cellular systems include AMPS, NMT and TACS.

ARPU: Average Revenue Per User. Usually expressed per month but also per year.

Bandwidth: The range of frequencies available to be occupied by signals. In analogue systems it is measured in terms of Hertz (Hz) and in digital systems in bit/s per second (bit/s). The higher the bandwidth, the greater the amount of information that can be transmitted in a given time. High bandwidth channels are referred to as broadband which typically means 1.5/2.0 Mbit/s or higher.

Bill and Keep: In contrast to CPNP, this term denotes an interconnection arrangement in which the carriers exchange traffic on a negotiated basis, generally without paying interconnection charges. Each carrier bills its own customers for the traffic and keeps the resulting revenue. Also known as "sender keeps all" interconnection.

Bit (binary digit): A bit is the primary unit of electronic, digital data. Written in base-2, binary language as a "1" or a "0".

Bit/s: Bits per second. Measurement of the transmission speed of units of data (bits) over a network. Also kbit/s: kilobits (1'000) per second; Mbit/s: megabits (1'000'000) per second, and Gbit/s: Gigabits (1'000'000'000) per second.

Bit-stream access: A form of network unbundling. With bit‑stream access, the incumbent maintains management control over the physical line. Unlike full unbundling and line sharing, access seekers can only supply the services that the incumbent designates.

Blog: Blog is short for weblog. A weblog is a journal (or newsletter) that is frequently updated and intended for general public consumption.

Bluetooth: A radio technology that enables the transmission of signals over short distances between mobile phones, computers and other devices. It is typically used to replace cable connections.

Broadband: Broadband is defined, for the purposes of this report, as internet access with a minimum capacity of greater or equal to 256 kbit/s in one or both directions (see Technical notes). Fixed broadband is implemented through technologies such as digital subscriber line (DSL), cable modem, fiber to the home (FTTH), metro ethernet, wireless local area networks (WLAN) etc. Mobile broadband is implemented through technologies such as wideband CDMA, HSDPA, CDMA 1x EV-DO, etc.

Broadcast: Point-to-multipoint video transmitted only once over the entire service area.

Browser: Application that retrieves WWW documents specified by URLs from an HTTP server on the internet. Displays the retrieved documents according to the Hyptertext Markup Language (HTML).

Byte: (1) A set of bits that represent a single character. A byte is composed of 8 bits. (2) A bit string that is operated upon as a unit and the size of

which is independent of redundancy or framing techniques.

CAGR: Compound annual growth rate. See the Technical notes.

Cable modem: A technology that allows high-speed interactive services, including internet access, to be delivered over a cable TV network.

Calling Party's Network Pays (CPNP): in a CPNP regime, the call receiver's provider levies some predetermined charge per minute on the call originator's provider for termination, while the call receiver's operator pays nothing.

CDMA: Code division multiple access. A technology for digital transmission of radio signals based on spread spectrum techniques where each voice or data call uses the whole radio band and is assigned a unique code.

CDMA2000: Code division multiple access 2000. A third-generation digital cellular standard under the IMT-2000 banner, first deployed in the Republic of Korea, includes CDMA2000 1x and 1xEV-DO (Evolution, Data Optimized).

Cellular: A mobile telephone service provided by a network of base stations, each of which covers one geographic cell within the total cellular system service area.

Circuit-switched connection: A temporary connection that is established on request between two or more stations in order to allow the exclusive use of that connection until it is released. At present, most voice networks are based on circuit-switching, whereas the internet is packet-based. See also Packet-based.

Collocation: Facility-sharing in which the incumbent operator houses communications equipment of competitive operators to facilitate connectivity to end users.

Competitive Local Exchange Carrier (CLEC): A network operator or carrier – often a new market entrant – that provides local telephony in competition with the incumbent carrier.

COSITU: ITU model for the calculation of costs, tariffs, and rates for telephone services

Coverage: Refers to the range of a mobile cellular network, measured in terms of geographic coverage (the percentage of the territorial area covered by mobile cellular) or population coverage (the percentage of the population within range of a mobile cellular network).

Digital: Representation of voice or other information using digits 0 and 1. The digits are transmitted as a series of pulses. Digital networks allow for higher capacity, greater functionality and improved quality.

Distributed Denial of Service (DDoS): An attack on a computer system or network that causes a loss of service to users, typically the loss of network connectivity and services, by consuming the bandwidth of the victim network or overloading the computational resources of the victim system through a system of computers, which are usually zombie computers compromised by viruses or Trojan horse programs.

DSL: Digital subscriber line. DSL is a technology for bringing high-bandwidth information to homes and small businesses over ordinary copper telephone lines. See also xDSL, which refers to different variations of DSL, such as ADSL, HDSL, and RADSL.

E-commerce: Electronic commerce. Term used to describe transactions that take place online where the buyer and seller are remote from each other.

Encryption: The process of converting plain text into code to secure information from being read by unauthorized persons or those without special computing knowledge.

Fixed line: A physical line connecting the subscriber to the telephone exchange. Typically, fixed-line network is used to refer to the PSTN (see below) to distinguish it from mobile networks.

Frequency: The rate at which an electrical current alternates, usually measured in Hertz (see Hz). It is also used to refer to a location on the radio frequency spectrum, such as 800, 900 or 1'800 MHz.

FTTx: generally refers to broadband tele-communications systems based on fiber-optic cables directly to the homes or business.

GATS: General Agreement on Trade in Services

GDP: Gross domestic product. The market value of all final goods and services produced within a nation in a given time period.

GNI: Gross national income. The market value of all final goods and services produced in a nation's economy, including goods and services produced

abroad. GNI in constant prices, differs from GNP in that it also includes a terms of trade adjustment; and gross capital formation which includes a third category of capital formation: net acquisition of valuables.

GNP: Gross national product. The market value of all final goods and services produced in a nation's economy, including goods and services produced abroad.

GPRS: General Packet Radio Service. It refers to a standard for wireless communications that supports a wide range of bandwidths. It runs at speeds up to 115 kilobits per second and is particularly suited for sending and receiving small bursts of data, such as e-mail and Web browsing, as well as large volumes of data.

GPS: Global positioning system. Refers to a "constellation" of 24 "Navstar" satellites, launched initially by the United States Department of Defense, that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy ranges from 10 to 100 m for most equipment.

GSM: Global System for Mobile communications. European-developed digital mobile cellular standard. The most widespread 2G digital mobile cellular standard, available in over 170 countries worldwide.

Host: Any computer that can function as the beginning and end point of data transfers. Each internet host has a unique internet address (IP address) associated with a domain name.

HTML: Hypertext Markup Language. A Hypertext document format used on the World Wide Web. Mark-up languages for translating Web content onto mobile phones include cHTML, WML and xHTML.

HSDPA: High-Speed Downlink Packet Access. An enhancement protocol to W-CDMA networks that allows a higher data capacity in the down link up to 14.4Mbit/s.

HSUPA: High-Speed Uplink Packet Access. An enhancement protocol to W-CDMA networks that allows a higher data capacity in the up link up to 5.76 Mbit/s.

HTTP: Hypertext Transfer Protocol. Hypertext is any text that cross-references other textual information with hyperlinks.

Hz: Hertz. The frequency measurement unit equal to one cycle per second.

IM: Instant Messaging. It refers to programs such as AOL Instant Messenger and ICQ that allow users to exchange messages with other users over the internet with a maximum delay of one or two seconds at peak times.

IMS: IP Multimedia Subsystem. Framework originally developed by the 3rd Generation Partnership Projects (3GPP and 3GPP2) for their third generation mobile networks.

IMT-2000: International Mobile Telecommunications-2000. Third-generation (3G) "family" of mobile cellular standards approved by ITU.

IP Telephony: internet protocol telephony. IP telephony is used as a generic term for the conveyance of voice, fax and related services, partially or wholly over packet-based, IP-based networks. See also VoIP and Voice over broadband.

Internet Exchange Point (IXP): A central location where multiple Internet Service Providers can interconnect their networks and exchange IP traffic.

IPv4: Internet protocol version 4. The version of IP in common use today.

IPv6: Internet protocol version 6. The emerging standard, which aims to rectify some of the problems seen with IPv4, in particular the shortage of address space.

IPTV: The generic term describes a system where a digital television service is delivered using the Internet Protocol over a network infrastructure.

ITU: International Telecommunication Union. The United Nations specialized agency for telecommunications.

LAN: Local area network. A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings. However, one LAN can be connected to other LANs over any distance via telephone lines and radio waves. A system of LANs connected in this way is called a wide-area network (WAN).

LBS: Location-based services. LBS make use of information on the location of a mobile device and user, and can exploit a number of technologies for the geographic location of a user. Some of these technologies are embedded in the networks and others in the handsets themselves. Location capability is already available to some level of accuracy (approx. 150 m) for most users of cellular

networks. Increased accuracy can become available through location technologies such as GPS.

LLU: Local loop unbundling. The process of requiring incumbent operators to open the last mile of their legacy networks to competitors. Similar reference to ULL (unbundled local loop).

Long Run Average Incremental Costs (LRAIC): A costing model based on LRIC analysis, in which the total traffic costs for both interconnecting carriers are divided by the total demand, rather than assigning unique costs to each operator.

Main telephone line: Telephone line connecting a subscriber to the telephone exchange equipment. This term is synonymous with the term "fixed line'.

MMS: Multimedia Message Service. MMS will provide more sophisticated mobile messaging than SMS or EMS. A global standard for messaging, MMS will enable users to send and receive messages with formatted text, graphics, audio and video clips. Unlike SMS and most EMS, it will not be limited to 160-characters per message.

Mobile virtual network operator (MVNO): A company that does not own a licensed frequency spectrum, but resells wireless services under their own brand name, using the network of another mobile phone operator.

National Regulatory Authority (NRA): The regulatory agency or official at the central or federal government level that is charged with implementing and enforcing telecommunication rules and regulations.

NGN: Next generation networks. These are packet-based networks in which service-related functions are independent from underlying transport- related technologies. They are able to provide telecommunication services and make use of multiple broadband transport technologies.

Number portability: The ability of a customer to transfer an account from one service provider to another without requiring a change in number. Other forms of portability allow end users to change residence or subscribe to a new form of service (e.g., ISDN) while retaining the same telephone number for their main telephone line.

P2P: Peer to peer. P2P refers to networks that facilitate direct connections among individual nodes rather than through a centralized server. However, many famous P2P networks, such as "Napster", actually relied on a central server to connect users. Other networks (such as "Gnutella") offer true peer-to-peer, decentralized connections.

Packet: Block or grouping of data that is treated as a single unit within a communication network.

Packet-based: Message-delivery technique in which packets are relayed through stations in a network. See also Circuit-switched connection.

PDA: Personal digital assistant. A generic term for handheld devices that combine computing and possibly communication functions.

Penetration: A measurement of access to telecommunications, normally calculated by dividing the number of subscribers to a particular service by the population and multiplying by 100. Also referred to as teledensity (for fixed-line networks) or mobile density (for cellular ones), or total teledensity (fixed and mobile combined).

PPP: Purchasing power parity. An exchange rate that reflects how many goods and services can be purchased within a country taking into account different price levels and cost of living across countries.

RFID: Radio frequency identification. A system of radio tagging that provides identification data for goods in order to make them traceable. Typically used by manufacturers to make goods such as clothing items traceable without having to read bar code data for individual items.

Server: (1) A host computer on a network that sends stored information in response to requests or queries. (2) The term server is also used to refer to the soft- ware that makes the process of serving information possible.

SIM: Subscriber identity module (card). A small printed circuit board inserted into a GSM-based mobile phone. It includes subscriber details, security information and a memory for a personal directory of numbers. This information can be retained by subscribers when changing handsets.

SMS: Short Message Service. A service available on digital networks, typically enabling messages with up to 160 characters to be sent or received via the message centre of a network operator to a subscriber's mobile phone.

Spectrum: The radio frequency spectrum of hertzian waves used as a transmission medium for

cellular radio, radiopaging, satellite communication, over-the-air broadcasting and other services.

TD-SCDMA: Time Division Synchronous Code Division Multiple Access. A third-generation mobile standard under the IMT-2000 project. It uses spread spectrum CDMA technology in the TDD technique.

Teledensity: Number of main telephone lines per 100 inhabitants within a geographical area. Effective teledensity reports fixed-line teledensity or mobile density—whichever is higher—in a particular geographical region. See Penetration and Total teledensity.

Total teledensity: Sum of the number of fixed lines and mobile phone subscribers per 100 inhabitants. (See Technical notes). See Penetration.

Universal Access: Refers to reasonable telecommunication access for all. Includes universal service for those that can afford individual telephone service and widespread provision of public telephones within a reasonable distance of others.

UWB: Ultra-Wide Band. Wireless communications technology that can currently transmit data at speeds between 40 to 60 megabits per second and eventually up to 1 gigabit per second. It uses ultra-low power radio signals.

VoIP: Voice over IP. The generic term used to describe the techniques used to carry voice traffic over IP (see also IP telephony).

W-CDMA: Wideband code division multiple access. A third-generation mobile standard under the IMT-2000 banner, first deployed in Japan. Known as UMTS in Europe. See also CDMA.

Wi-Fi: Wireless fidelity. A mark of interoperability among devices adhering to the 802.11b specification for Wireless LANs from the Institute of Electrical and Electronics Engineers (IEEE). However, the term WiFi is sometimes mistakenly used as a generic term for wireless LAN.

WiMAX: Fixed wireless standard IEEE 802.16 that allows for long-range wireless communication at 70 Mbit/s over 50 km. It can be used as a backbone internet connection to rural areas.

Wireless: Generic term for mobile communication services which do not use fixed-line networks for direct access to the subscriber.

WLAN: Wireless local area network. Also known as Wireless LAN or Radio LAN. A wireless network whereby a user can connect to a local area network (LAN) through a wireless (radio) connection, as an alternative to a wired local area network. The most popular standard for wireless LANs is the IEEE 802.11 series.

WLL: Wireless local loop. Typically a phone network that relies on wireless technologies to provide the last km connection between the telecommunication central office and the end- user.

WMAN: Wireless Metropolitan Access Network. Refers to a wireless communications network that covers a geographic area, such as a city or suburb.

WSIS: The United Nations World Summit on the Information Society. The first phase of WSIS took place in Geneva (hosted by the Government of Switzerland) from 10 to 12 December 2003. The second phase will take place in Tunis (hosted by the Government of Tunisia), from 16 to 18 November 2005.

WWW: World Wide Web. (1) Technically refers to the hypertext servers (HTTP servers) which are the servers that allow text, graphics, and sound files to be mixed together. (2) Loosely refers to all types of resources that can be accessed.

xDSL: While DSL stands for digital subscriber line, xDSL is the general representation for various types of digital subscriber line technology, such as ADSL (asynchronous digital subscriber line), such as VDSL (very high-speed digital subscriber line).

APPENDIX A. WORLD TRADE ORGANIZATION REFERENCE PAPER ON BASIC TELECOMMUNICATIONS

World Trade Organization Reference Paper on Basic Telecommunications

Annex to the Fourth Protocol to the GATS Agreement, the "Agreement on Basic Telecommunications" negotiated under the auspices of the World Trade Organization in February 1997, which came into effect on 1 January 1998.

This reference paper forms part of the commitments of the original 69 signatories to the Agreement on Basic Telecommunications. Several signatories committed to somewhat different wording. Others have subsequently committed to implement the regulatory framework set out in the Reference Paper.

REFERENCE PAPER

Scope

The following are definitions and principles on the regulatory framework for the basic telecommunications services.

Definitions

Users mean service consumers and service suppliers.

Essential facilities mean facilities of a public telecommunications transport network or service that

(a) are exclusively or predominantly provided by a single or limited number of suppliers; and

(b) cannot feasibly be economically or technically substituted in order to provide a service.

A major supplier is a supplier which has the ability to materially affect the terms of participation (having regard to price and supply) in the relevant market for basic telecommunications services as a result of:

(a) control over essential facilities; or

(b) use of its position in the market.

1. Competitive safeguards

1.1 Prevention of anti-competitive practices in telecommunications

Appropriate measures shall be maintained for the purpose of preventing suppliers who, alone or together, are a major supplier from engaging in or continuing anti-competitive practices.

1.2 Safeguards

The anti-competitive practices referred to above shall include in particular:

(a) engaging in anti-competitive cross-subsidization;

(b) using information obtained from competitors with anti-competitive results; and

(c) not making available to other services suppliers on a timely basis technical information about essential facilities and commercially relevant information which are necessary for them to provide services.

2. Interconnection

2.1 This section applies to 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, where specific commitments are undertaken.

2.2 Interconnection to be ensured

Interconnection with a major supplier will be ensured at any technically feasible point in the network. Such interconnection is provided:

> (a) under non-discriminatory terms, conditions (including technical standards and specifications) and rates and of a quality no less favorable than that provided for its own like services or for like services of non-affiliated service suppliers or for its subsidiaries or other affiliates;
>
> (b) in a timely fashion, on terms, conditions (including technical standards and specifications) and cost-oriented rates that are transparent, reasonable, having regard to economic feasibility, and sufficiently unbundled so that the supplier need not pay for network components or facilities that it does not require for the service to be provided; and
>
> (c) upon request, at points in addition to the network termination points offered to the majority of users, subject to charges that reflect the cost of construction of necessary additional facilities.

2.3 Public availability of the procedures for interconnection negotiations

The procedures applicable for interconnection to a major supplier will be made publicly available.

2.4 Transparency of interconnection arrangements

It is ensured that a major supplier will make publicly available either its interconnection agreements or a reference interconnection offer.

2.5 Interconnection: dispute settlement

A service supplier requesting interconnection with a major supplier will have recourse, either:

> (a) at any time or
>
> (b) after a reasonable period of time which has been made publicly known to an independent domestic body, which may be a regulatory body as referred to in paragraph 5 below, to resolve disputes regarding appropriate terms, conditions and rates for interconnection within a reasonable period of time, to the extent that these have not been established previously.

3. Universal service

Any Member has the right to define the kind of universal service obligation it wishes to maintain. Such obligations will not be regarded as anti-competitive per se, provided they are administered in a transparent, non-discriminatory and competitively neutral manner and are not more burdensome than necessary for the kind of universal service defined by the Member.

4. Public availability of licensing criteria

Where a licence is required, the following will be made publicly available:

> (a) all the licensing criteria and the period of time normally required to reach a decision concerning an application for a licence and
>
> (b) the terms and conditions of individual licences.

The reasons for the denial of a licence will be made known to the applicant upon request.

5. Independent regulators

The regulatory body is separate from, and not accountable to, any supplier of basic telecommunications services. The decisions of and the procedures used by regulators shall be impartial with respect to all market participants.

6. Allocation and use of scarce resources

Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely, transparent and non-discriminatory manner. The current state of allocated frequency bands will be made publicly available, but detailed identification of frequencies allocated for specific government uses is not required.

Source: http://www.wto.org/english/news_e/pres97_e/refpap-e.htm

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