International Telecommunication Union

Trends in Telecommunication Reform

Convergence and regulation

1999

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TRENDS IN TELECOMMUNICATION REFORM 1999

CONVERGENCE AND REGULATION

1999

INTERNATIONAL TELECOMMUNICATION UNION

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FOREWORD

We are pleased to present to you the second edition of the International Telecommunication Union's *Trends in Telecommunication Reform*. The theme of this year's report is Convergence and Regulation.

The first edition was published in 1998 to highlight the changes taking place in the telecommunications sector based primarily on the responses to the ITU annual regulatory survey. This year's report attempts to achieve the same set of aims. The difference this year is that the study has taken a detailed look at the impact of digital convergence on the reform of the telecommunications sector, in particular on national regulatory regimes.

To this end, the second edition has been arranged by key regulatory topics rather than, as in last year's edition, by region. In each chapter, the topic is first addressed from a classical telecommunications perspective, but with a specific focus on how convergence fits into, or even complicates the picture.

The closing years of the second millennium have been littered with buzzwords associated with convergence: Information Superhighway, Society and Age, Knowledge Worker and Economy, Multimedia, Digital Media and Interactive Media are just a few of them. But their meanings can be imprecise and open to vastly differing interpretations. There is no universally accepted definition of convergence itself, for example.

Perhaps this is because the process of convergence is only one stage in a transitional process from the industrial to the information age. Perhaps it is because it is not possible – or perhaps not sensible – to apply too precise a definition to such a dynamic process. Or perhaps it is simply that there are many forces vying for control of convergence – none of which fit happily with any of the other's definition.

Convergence can be defined as the provision of digital communication services – including text, data, image, and video – over existing infrastructure. Or as the development of new types of communication infrastructure capable of handling multimedia transmissions. Or as the enhancement of existing telecommunication services and technologies to provide new capabilities.

It can also be defined as the integration of technological, market and legal/regulatory functions across previously separated technologies, markets or politically-defined industry structures. In other words, digital convergence can be seen as the coming together of previously technologically and commercially distinct markets such as broadcasting, print publishing, cable television, fixed-wire voice telephony, and cellular-mobile and fixed-wireless access.

To complicate matters still further, many services and information sources that were traditionally controlled on a domestic level are being provided on a global basis, giving convergence an international component – one which is rising in importance.

Whatever definition of convergence is chosen, few would doubt that it is being driven by both technological innovations and consumer demand. Which one is the chicken and which the egg is open to further debate.

Convergence has been forecast since the early 1970s, but it has been a long time coming. Despite the widespread availability of digital communications technologies, the momentum behind convergence only really came about with the advent of a dominant single digital data communications standard, namely TCP/IP, the Internet protocol, which brought multimedia capabilities together in a single protocol. This is only now really beginning to bite.

There are several dimensions to convergence. There is a convergence of technologies, of services, of user perceptions, of markets, of firms. Convergence is changing the way we communicate, conduct business, shop, learn and entertain.

There is even a convergence of the way we regulate our industry. More and more of the world seems to be adopting open market principles when it comes to the management of telecommunication services. Less than a decade ago many voices could be heard arguing that telecommunications was a natural monopoly. Now those voices are very much the exception rather than the rule. Although most would still agree that some level of regulation is required to guarantee fairness and the provision of at least basic telecommunications to less commercially attractive groups.

Liberalization and privatization are the current vogue. Perhaps it is the inevitable recognition that you cannot control the uncontrollable. Perhaps it is a new conviction that market forces offer the best guarantees for efficient and economic service provision. Or perhaps it is a feeling that time is running out and that something dramatic has to be done if we are not going to fall irretrievably behind our neighbours.

Whatever the cause and whatever the definition, convergence at all levels is having an impact on the worlds of telecommunications, broadcasting and computing. An impact perhaps greater than any before. And an impact which will make itself felt in virtually all aspects of our lives in the new millennium.

This document attempts to analyze that impact, in the hope that a better understanding of it will help us make the most of what must surely be a unique set of opportunities to significantly improve life of people on this planet no matter where they live, or what they do in their daily activities.

This report has been prepared by the ITU Telecommunication Development Bureau and the Strategic Planning Unit. The authors have benefitted from comments and input from a range of people both within the ITU and in the wider telecommunication community. However, the views expressed in the report are those of the authors and do not necessarily reflect the opinions of the ITU or its membership.

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10 October 1999

This report has been prepared by a team led by Ben Petrazzini and Doreen Bogdan-Martin, supported by Nancy Sundberg. The team included the following experts: Arturo Briceño, William Melody, Claire Milne, Aileen Pisciotta, Dale Thompson and Ozlem Uzuner. The team was assisted by Julia Turrian. The regulatory tables were prepared by Nancy Sundberg and Phillip Trotter. The report was edited by Peter Purton and Marla Madison. The ITU's Publications Composition Department was responsible for production of the report. The cover was designed by Pierre Granier.

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ABBREVIATIONS and ACRONYMS

BCC	Business Cooperation Contract
BDT	Telecommunication Development Bureau
BOT	Build-Operate-Transfer
BTO	Build-Transfer-Operate
B/T	Build Transfer Arrangements
CATV	Cable Television
CLEC	Competitive Local Exchange Carrier
ccTLDs	Country Code Top-Level Domains
EDI	Electronic Data Interchange
EC	European Commission
EU	European Union
FDC	Fully Distributed Costs
FTP	File Transfer Protocol
DNS	Domain Name System
GATS	General Agreement on Trade in Services
GBT	Group on Basic Telecommunications (WTO)
GSM	Global System for Mobile communications
gTLDs	Generic Top-Level Domains
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunication Union
JOS	Joint-Operating Scheme
JV	Joint Venture
LECs	Local Exchange Carriers
LNP	Local Number Portability
LRAIC	Long Run Average Incremental Costs
MOU	Memorandum of Understanding
NP	Number Portability
NRA	National Regulatory Authority
OECD	Organisation for Economic Co-operation and Development
PC	Personal Computer
POI	Point of Interconnection
PSTN	Public Switched Telephone Network
PTO	Public Telecommunication Operator
PTT	Posts, Telephone and Telephone Administration
SADC	Southern Africa Development Community
SATCC	Southern Africa Transport and Communications Commission
TCP/IP	Transmission Control Protocol/Internet Protocol
UN	United Nations
USO	Universal Service Obligation
VANS	Value Added Network Services
VAS	Value Added Services
VSAT	Very Small Aperture Terminal
WTO	World Trade Organization

1 THE INSTITUTIONAL FRAMEWORK

"I am not an advocate for frequent and untried changes in laws and constitutions, but laws and institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths disclosed, and manners and opinions change with the change of circumstances, institutions must advance also, and keep pace with the times."[1]

– Thomas Jefferson to Samuel Kercheval, 1816.

This chapter looks at institutional reforms in the telecommunications sector. In particular, it assesses the effects of convergence on communications legislation and regulation, and regulatory institutions.

1.1 Legislative reforms

Since the beginning of the 1990s, more than one hundred and fifty countries have introduced new telecommunications legislation, or modified existing regulations. These legislative changes or reforms are often the first step towards implementing new policies. Legislative reform can be difficult because of legal complications or differing political views. Legislation, though, helps to set policies, making them easier to achieve. A sound legal framework provides stability and makes the sector attractive to investors.

Most types of legislative or regulatory changes can be grouped into two broad categories. The first category includes initiatives which pave the way for the introduction of competition in various market segments, the establishment of ea regulatory authority, or the privatization of the incumbent. The second category is a new category which has resulted from countries trying to find ways to accommodate convergence.

In the first category, the reforms in the past two years alone have been wide ranging. In 1998, Albania, Bulgaria, Burundi, the Dominican Republic, and Mauritius have all passed legislation that will lead to the creation of a separate regulator. Kenya's 1998 Communications Act was also very comprehensive. It separated post and telecommunications services, created Telecom Kenya Limited, and established a separate regulator. Thailand's 1999 Corporatization Law will allow government operators to become corporations.

There will be many more reforms of this kind in the near future. Malaysia's 1998 Communications and Multimedia Act may be, for the time being, a unique piece of legislation. But, perhaps also, a representative of the type of legislative reform to be enacted in any other country in the beginning of the next millennium. Malaysia's Act groups telecommunications, broadcasting and the computing industries into one industry with one regulator.[2] Another interesting example is Singapore's Electronic Transactions Act and Regulations. Falling under the mandate of Singapore's National Computer Board, The Act and Regulations provide a legal framework that will establish a reliable Certification Authority serving both the domestic and international markets. This should help to establish Singapore as a trusted hub for e-commerce (See Table 1.1).[3]

The reality is that there have been and will be many new legislative changes.[4] Technological developments are giving rise to the convergence of the telecommunications, broadcasting and IT industries. Advances in information and communications technology, particularly the advent of the Internet, have brought about new challenges in the regulatory regime.

One reason for these changes is that current regulations do not fit the new realities. These regulations are based on the idea that broadcasting, computing, and telecommunications are commercially distinct industries and thus should fall under separate regulatory regimes. However, the borders dividing these industries are disappearing, creating confusion on the part of both regulators and legislators.

1.1.1 Convergence regulation and rulings

Convergence is blurring traditional regulatory definitions and jurisdictional boundaries. Some countries have planned ahead, such as Canada, and others such as Malaysia and Singapore are gearing up.

Pressures for convergence in regulation are coming from the increasing overlap of telecommunications regulation with content or broadcasting regulation. These pressures will increase as both telephone and cable television operators begin to provide services previously offered by the other and as the Internet's video delivery capability improves.

Pioneering moves to incorporate convergence issues into regulation are coming from the Asia-Pacific region. In Malaysia, the legal basis for the telecommunications sector was laid out in the 1950 Telecommunications Act while the broadcasting industry was regulated by the recent 1998 Broadcasting Act. But soon after the Broadcasting Act was passed, it was repealed, as was the earlier 1950 Telecommunications Act, to be followed by the 1998 Communications and Multimedia Act. This new act facilitates the emergence of new technologies and services. It considers the telecommunications, broadcasting, and information technology industries as one. It also sets a regulatory

Table 1.1: Recent legislative and regulatory developments

Selected examples from end 1998-99

Country	*Year*	*Law*	*Brief description*
Albania	1998	Law Nos. 8287 and 8288	Amends the telecommunications law and establishes the Telecommunications Regulatory Authority.
Armenia	1998 1999	Telecommunication Law Ministry Decrees	Establishes a legal framework for telecommunications, including powers and responsibilities and the protection of those enjoying them. Also provides for rules on providing telephone services and licensing procedure.
Bulgaria	1998 1998	Telecommunication Law Media law	Provides for the creation of the State Telecommunications Commission and the National Radio and Television Council, governing the radio and television activities of Bulgaria.
Burundi	1998	Presidential Decree	Establishes an independent regulator.
Chad	1998	Law No. 009 on Telecommunications	Regulates telecommunications activities and prepares reform of the sector.
China	1997/ 98	Regulations	Covers radio television, and film. Provides interim provisions for the management of computer information networks; and on the security of computer networks and the Internet.
Dominican Republic	1998	Telecommunications Law	Liberalizes the market and creates a regulator.
India	1999	Telecommunications Policy	Separates the Department of Telecommunication from its licensing and policy functions and opens domestic long distance to competition as of 1 January 2000.
Ireland	1999	Broadcasting Bill	Includes provisions on infrastructure, digitization, content management, codes and standards. The bill provides for the establishment of a new broadcasting infrastructure and the establishment of a new commercial entity to operate and manage the transmission of digital terrestrial television services.
Kenya	1998	Kenya Communications Act	Separates postal and telecommunications service creating Telecom Kenya Limited and the Postal Corporation of Kenya and establishment of the Communications Commission of Kenya.
Lithuania	1998	Telecommunications Statute	Provides the basis for the regulation of telecommunications services. Establishes the Communications Regulation Service.
Malawi	1998	Communications Act, No. 41	Provides the basics for the regulation of telecommunications and broadcasting. Separates postal and telecommunications services creating Malawi Posts and Malawi Telecom. Allows privatization of Malawi Telecom. Establishes Malawi Communications Regulatory Authority (MACRA). Reconstitutes Malawi Broadcasting Corporation.
Malaysia	1998 1998	Communications and Multimedia Act Communications and Multimedia Commission Act	Establishes a regulatory framework in support of national policy objectives for the communications and multimedia industry. Also establishes the Communications and Multimedia Commission with powers to supervise and regulate the communications and multimedia activities, and to enforce the communications and multimedia laws.
Mauritius	1998 1998	Telecommunications Act Telecommunications Bill	Provides for the establishment and management of a Mauritius Telecommunications Authority and the setting up of a Telecommunications Advisory Council.

Table 1.1: Recent legislative and regulatory developments *(cont.)*

Selected examples from end 1998-99

Country	*Year*	*Law*	*Brief description*
Nigeria	1998	Wireless Telegraphy (Amendment) Decree No. 29	Transfers the power to regulate frequency spectrum at local and international levels to the NCC. It also regulates the sales and operation of wireless telegraphy equipment and ensures the competence of personnel.
Qatar	1998	Law No. 21	Transforms Qatar Telecom into a stock holding company.
Singapore	1998	Electronic Transactions Act	Enacts a commercial code to support e-commerce transactions, providing for a public key infrastructure, enabling electronic applications and licenses, and clarifying network service providers liability for third party content.
	1999	Electronic Transactions Regulations	Also creates a voluntary licensing scheme for Certification Authorities (CA). Stipulates the criteria for licensing and the operational requirements after obtaining a license.
Slovak Republic	1998	Act No. 52	Protection of personal data in information systems.
Thailand	1999	Corporatisation Law (passed July, 1999)	Allows State agencies to become private limited companies.
	1999	Frequency Bill (passed 1st reading on 7 April, 1999 – currently in Committee)	Also establishes a regulatory body to manage frequencies and negotiate concessions.
United Kingdom	1998	Competition Act	This is a general competition law based on Articles 85 & 86 of the EC treaty.
	1999	Licensing Directive	Provides for PTOs to be able to convey entertainment services (provision is regulated by the Independent Television Commission).

Source: ITU World Telecommunication Regulatory Database.

framework covering economics, technology, consumer protection and social regulation. The Act should help to establish Malaysia as a major hub for communications and multimedia information and content services. At the same time, Malaysia is hoping this law will help to promote a society where information-based services will provide the basis of continuing enhancements to quality of life and work, and to grow and nurture local information resources.

The Act covers all communications over electronic media, excluding print media. This is regulated by the Printing Presses and Publications Act. Activities and services regulated by the new Act include traditional broadcasting, telecommunications, and on-line services, including the facilities and networks used in providing such services, as well as the content that is supplied via the facilities and networks. It also requires all telephone operators to provide service in rural areas. The Communication and Multimedia Commission Act was the result of comprehensive studies on existing regulations and the impact of convergence. The new Act has been designed around the principles of transparency and clarity, less rather than more regulation and based on the concept of industry self-regulation.[5] (See section 1.3.2 and Box 1.2)

In India, the 1999 Telecommunication Policy also acknowledges the potential of convergence. Cable service providers with fixed telecommunications licenses will also be allowed to provide two-way voice and data communications.

In Singapore, a draft act is being proposed to merge the National Computer Board (NCB), the Telecommunications Authority of Singapore (TAS) and the technical aspects of the Singapore Broadcasting Authority (SBA). The NCB is responsible for information technology, master plans and computerizing the government. The tentative name for the new authority is the Information Technology and Telecommunication Authority. In the past, the NCB reported to the Ministry of Trade and Industry, and TAS reported to the Ministry of Communications. On 3 June 1999, the new Ministry of Information Technology and Communications was created. It is proposed that the NCB and TAS should report to the new Ministry.

In the Philippines, the government has proposed a draft convergence bill but it has been contested by telecommunications operators. This bill would enable broadcasting companies to provide telecommunications services. It does not however, change foreign ownership restrictions. Telecommunications

Box 1.1: Convergence of the telecommunications, media and information technology sectors and the implications for regulation – The EU debate

In December 1997 the Commission published a Green Paper on convergence of the telecommunications, media and information technology sectors and on the implications for regulation. The Green Paper launched a wide ranging public consultation which was completed in March 1999 by a Commission Report summarizing the results and drawing a number of conclusions.

The key messages that have emerged from this consultation are:

- The affirmation of the continuing need of regulation to meet a range of public interest objectives whilst recognizing the need to promote investment, in particular in new services.
- The need for transparency, clarity and proportionality with regard to rules and to distinguish between:
  - regulation imposing positive and negative obligations in the public interest,
  - sector-specific regulation complementing case-by-case application of competition rules,
  - promotional measures ensuring outcomes according to specific policy objectives.
- Separation of transport and content regulation, with recognition of the links between them for possible competition problems. This implies a more horizontal approach to regulation with:
  - homogenous treatment of all transport network infrastructure and associated services, irrespective of the types of services carried,
  - the need to ensure that content regulation is in accordance with the specific characteristics of given content services along with the public policy objectives associated with those services,
  - the need to ensure that content regulation addresses the special nature of the audio-visual sector, in particular through a vertical approach where necessary, building on current structures,
  - the application of an appropriate regulatory regime to new services, recognizing the uncertainties of the marketplace and the need for the large initial investments involved in their launch while at the same time maintaining adequate consumer safeguards.
- A balanced solution as to how public broadcasting can be best integrated into the new environment, which should:
  - respect Member State competence by defining the remit of public service broadcasting in accordance with Protocol 9 annexed to the Amsterdam Treaty,
  - encourage organizations vested with public broadcasting obligations to exploit new technologies and new ways of reaching their audiences,
  - require broadcasters to distinguish clearly between defined public broadcasting activities and activities lying in the competitive domain.
- To ensure the effective application of competition rules, to increase reliance on those rules, and the gradual phasing-out of sector-specific regulation, as the market becomes more competitive.
- Actions aimed at promoting premium European content.

The Commission now intends to develop proposals for action on regulatory reform. Such proposals will be underpinned by a coherent set of regulatory principles.

Following the approach emerging from this consultation, the proposals will cover:

- reforms in the regulation of infrastructure and associated services. These will be proposed as part of the 1999 Communications Review, a process already foreseen in current community telecommunications legislation,
- those in the regulation of content services will be covered either by adjustments to existing legislation at an appropriate time, or by the introduction of new measures.

Further action in both content and infrastructure is also foreseen.

Actions relating to content include:

- verification of the transposition and actual application by the Member States of the second Directive on Television without Frontiers,
- proposals on measures for the promotion, production and distribution of European works in the audio-visual sector (MEDIA III programme).

Actions relating to infrastructure include:

- report on the implementation of Directive 95/47/EC on the use of standards for the transmission of television signals and the verification of the transposition of this Directive by the Member States. Also the assessment of the need to amend the Directive,
- communication on the public consultation on the radio spectrum Green Paper.

Source: Commission Communication on the results of the public Consultation on the Convergence Green Paper COM (1999) 108 of 10.3.1999.

operators will still be restricted to a maximum of 40 per cent foreign ownership, while broadcasting companies will not be allowed to have any foreign ownership. This means that broadcasting companies could provide telecommunications services, but telecommunications operators that are not one hundred per cent locally owned will be restricted from providing broadcasting services.

The European Commission along with the OECD, is addressing the challenge of the next generation of telecommunications regulation. In December 1997, just weeks before the full liberalization of the telecommunications markets of the EU member states, the Commission issued a Green Paper on the convergence of the telecommunications, media, and information technology sectors. The paper devotes special attention to the implications that convergence has for regulation. (See Box 1.1) The main conclusions of the Commission's Green Paper included the need to:

- balance market rights with the public interest,
- provide investment incentives,
- separate transmission and content regulation,
- increase importance of competition rules versus sector specific rules.

The Green Paper recommends that there should be a homogeneous treatment of all transport network infrastructure and associated services, irrespective of the nature of the services carried. The Commission will draw from the results of the paper to prepare proposals for action as part of its 1999 Telecommunications Review.[6]

Some EU member states have already started to address convergence in their national legislation. In the United Kingdom, a major step in modernizing the United Kingdom's regulation to take account of convergence was the 1998 Competition Act. This Act, which enters into force in March 2000, provides a basis for the coherent treatment of competition across all sectors and for the rolling back of sector specific economic regulation in favour of a more horizontal approach.

In North America, both the United States and Canada have been carefully studying the situation. In the United States, telecommunications, cable, terrestrial broadcast and satellite broadcasting were regulated separately until the 1996 Telecommunications Act. The goal of the United States' 1996 Act was to let any communications business compete with any other business in any market. In Canada, the government issued a policy statement in 1996 on the convergence of broadcasting and telecommunications. This provided for a framework which allows fair competition between cable and telephone companies in their respective core businesses and increases the possible level of foreign ownership allowed. Telecommunications decision 94-19 established a broad regulatory framework for telecommunications and addressed convergence, competition and other related matters.[7]

In Africa, the fourteen member countries of the Southern Africa Development Community (SADC) adopted a model telecommunication bill and a model telecommunication policy in June 1998.[8] Both the model bill and the policy recognize that advanced telecommunications infrastructure, capable of delivering info-communication services, is a pre-requisite for economic growth. They also emphasize the role of info-communications in the next millennium and the inadequacy of info-communications capacity in many African countries. Two of the main policy objectives are to build a regional info-communications industry that is competitive and to create an environment for sustainable info-communications development. The sector will be restructured and consolidated by assigning clear responsibilities to Ministries, Regulators, and Operators. The regulator will enforce rules and laws within the info-communications industry, including responsibility for the regulation of the information and telecommunications industries. This may also include frequency allocation. Content will be addressed in the future. The member countries are being urged to adopt and implement the policy and bill as soon as possible.

In many developing countries with poor infrastructure and low telephone penetration, cable television is either unavailable or just beginning, and Internet development is slow. As a result, most of these countries have not yet faced the regulatory questions resulting from convergence.

1.2 The continued rise of regulators

As of August 1999, there were 84 separate regulators in ITU member states, nine of which have been established since the middle of 1998. This increases the percentage of ITU member states with separate regulators from 38 per cent in mid-1998 to 44 per cent in August 1999. Europe has the largest number of separate regulators, followed by the Americas and Africa. Another fifteen are expected by the end of 2000. With new privatizations and continued liberalization, and partly also because of the requirements posed by the World Trade Organization (WTO) reference paper on regulatory principles, the rise of separate regulators is expected to continue.

Until the early 1990s, the regulation of telecommunications services in most countries was not a priority, as the state-owned operator in many countries was under a self-regulation regime. With the rise of corporatizations and privatizations, the liberalization of various market segments, and the change in the nature of services offered, the need for an independent referee became urgent. Clear evidence of this is the fact that at the beginning of the 1990s there were only 10 regulators, while at the end of the 90s there are more than 80, with varying profiles and capabilities.

Convergence has had a significant impact on the structure and processes of regulation. Broadcasting and telecommunications regulation has in most countries been separate from one another. With the convergence of these media it becomes difficult to distinguish which category is regulated by the broadcasting authority and which is regulated by the telecommunications authority. This may be resolved by merging both authorities or through closer cooperation. However, convergence has still a long way to go in most countries and many of them will watch closely what others are doing before reforming their regulators.

Associations of regulators are also on the increase as a means of fostering the exchange of experiences and to improve regional and sub-regional coordination. Three examples are the Asean Telecommunications Regulators Council (ATRC), the Foro Latino americano de Entes Reguladores de Telecomunicaciones (REGULATEL) and the Telecommunications Regulators Association of Southern Africa (TRASA). ATRC is responsible for the discussion and coordination of all policy, strategic, and regulatory issues in telecommunications that are of mutual interest to the Telecommunication Administrations of the ASEAN countries. The Council identifies and promotes areas of potential cooperation and facilitates the exchange of information in these areas through activities such as seminars, training, and workshops.[9]

REGULATEL is a forum of thirteen regulators in Latin America. Its purpose is to facilitate the exchange of information on the framework and management of the regulator, the services and the markets of the member countries. It also promotes the harmonization of telecommunications regulation in order to contribute to regional integration and identify and defend regional interests.[10]

TRASA is charged with coordinating regulatory matters and exchanging ideas, views and experiences on all aspects of regulation of the telecommunications sector throughout the Southern Africa region. In particular, TRASA promotes the establishment and operation of efficient, adequate, and cost-effective telecommunications networks and services. It also facilitates a uniform level of understanding on regulatory matters and maximizes the utilization of scarce resources.[11]

1.2.1 The structure and financing of the new Authorities

The governing structure of the new separate regulators, despite significant national and regional diversity, seem to point to a new model for telecommunications regulatory bodies. Among the nine regulators created from July 1998 to August 1999, seven were established as collegiate bodies (e.g., a commission) composed of between five and eleven members. This emerging trend is in clear contrast with the approach mainly adopted prior to July 1998, in which the great majority of new separate regulators (70 per cent of them) were headed by a single person (e.g. a director general).

In most cases, newly separate regulators are financed in the same ways as previously established regulators. The main sources of funding come from license fees, government appropriation and spectrum fees, with greater emphasis on license and spectrum fees and less reliance on government appropriation.

In several countries – regardless of their stage of development – the members of the collegiate bodies (e.g., the Commissioners) are allowed to have other professional or electoral positions. In Switzerland, there are two separate regulators dealing with telecommunications. These are the Federal Communications Commission (COMCOM) and the Federal Office of Communications (OFCOM) which is also responsible for radio and television regulation. OFCOM employees and COMCOM commissioners are allowed to have other professional or electoral positions but are restricted from doing so in the telecommunications sector.

In Austria, Botswana, Sudan, Nepal and Namibia, Commissioners are employed on a part time basis. In Nepal, the five members of the Nepal Telecommunications Commission are appointed by the Cabinet for a period of five years and are employed part-time. They are allowed to have other professional or electoral positions. The Commission is funded by license fees, government appropriation and numbering fees.

In other countries, commissioners are employed full time and are allowed to carry on other activities only under special circumstances. In Malaysia, for example, the Communication and Multimedia Commission is composed of a Chairman, one member of the government and two to three non-government members. They are not allowed to hold another office or employment prior to Minister's written approval. They are appointed and report to the Minister for a period of two to five years. They can be re-elected but are not allowed to hold office for more than two consecutive terms.[12]

In Egypt, Peru and Portugal the period of appointment of Commissioners or the head of the regulatory body varies from three to five years. In Bulgaria, it is seven years.

All these new, separate, regulators are independent from the incumbent operator, but their independence from the sector ministry varies considerably from one country to another, even within the same region. In a majority of countries, the separate regulators have been established as independent bodies to the political power, reflecting the will to confer greater autonomy and independence to the regulatory authority to avoid possible lobbying and political influence. Nonetheless, the level of autonomy and its definition varies from one country to another, and most of these separate regulators report to the sector ministry, the legislative branch and/or the head of state. Only a few countries in Western Europe (e.g., France, Italy and Iceland) and Jordan in the Arab States reported having a complete degree of autonomy.

In a converging world, the structure, responsibility and functions of the separate regulators will dramatically change from the old models to new ones. In this rapidly evolving environment of converging technologies, services, ownership and regulation, autonomy and independence may become a major goal to ensure efficiency and the rapid diffusion of new services.

1.2.2 Regulatory functions

In virtually all countries, the regulator and/or the ministry (and in some cases the operator or other government bodies) is responsible for the following regulatory functions: numbering plan, tariff approval (and in some cases, tariff proposal), technical standards, interconnection rates, arbitration of disputes, frequency allocation, type approval, monitoring service quality and the establishment of licenses fees and licensing. In countries where no separate regulator exists, these responsibilities are mostly mandated to the ministry and/or split with the operators.

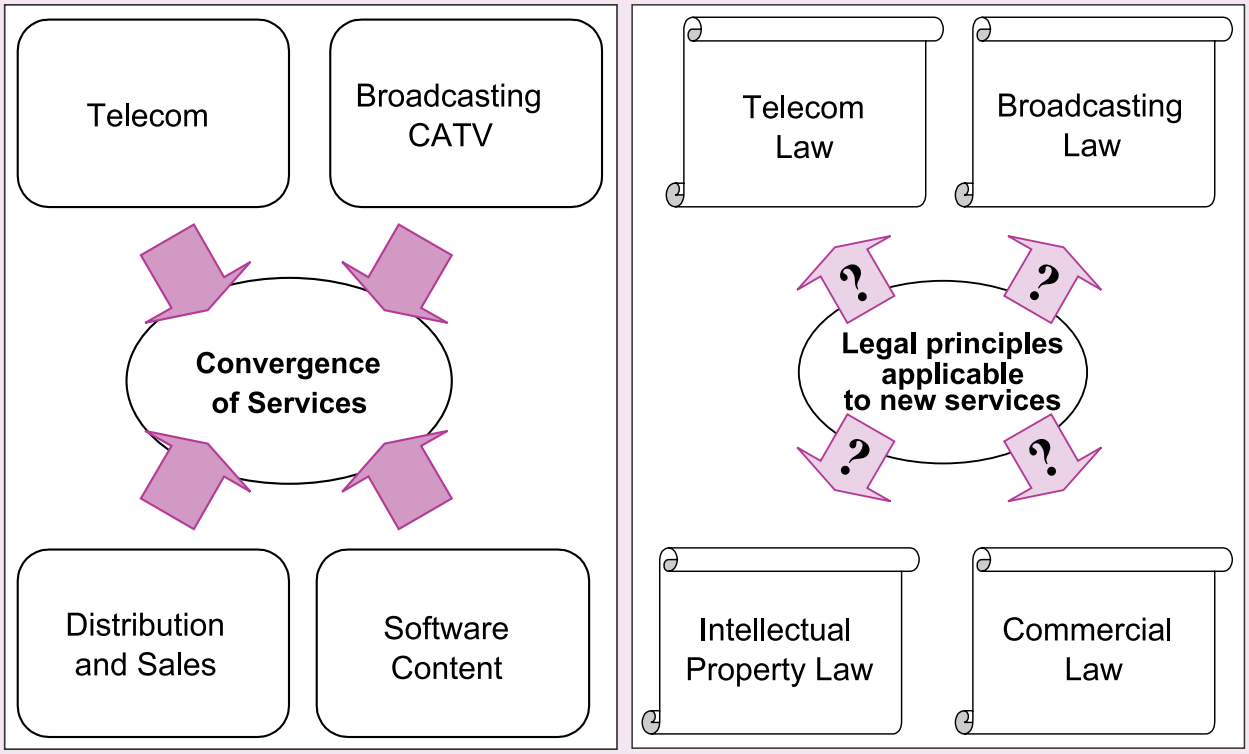
Table 1.2: New regulators, created 1998-99

Country	*Regulator*	*Year created*	*Structure*	*Functions*
Albania	Telecommunications Regulatory Entity	1998	Collegial body (5 members) reporting to the Legislative Branch, and Council of Ministers	Numbering, tariff approval, standards setting, dispute arbitration, frequency allocation, type approval, monitoring service quality, and license fees. (Cable TV licenses are awarded by the National Council of Radio and Television).
Bulgaria	State Telecommunications Commission	1998	Collegial body (5 members) reporting to the Ministry, Council of Ministers, and the National Radio and Television Council	Licensing (including radio and television, upon decision of the National Radio and Television Council), numbering, developing spectrum management policies for civil services, frequency coordination, standards.
Dominican Republic*	Instituto Dominicano de Telecomunicaciones	1998		
Egypt	Telecommunications Regulatory Authority	1998	Collegial body (11 members) reporting to the Ministry of Transport and Communications	Numbering, tariff approval, standards setting, frequency allocation, type approval, monitoring service quality, and license fees. (Cable TV licensed by the Broadcast and TV Union).
Greece	National Telecommunications Commission	1998	Collegial body (7 members) reporting to the Ministry of Transport and Communications	
Kenya	Communications Commission of Kenya	1999	Collegial body (11 members) reporting to the Ministry of Transport and Communications	Numbering, tariff approval, standards setting, interconnection rates, dispute arbitration, frequency allocation, type approval, monitoring service quality, and license fees.
Malawi	Malawi Communications Regulatory Authority	1998	Collegial body (7 members)	Numbering, tariff approval, standards setting, frequency allocation, type approval, monitoring service quality license fees and licensing.
Malaysia	Malaysian Communications and Multimedia Commission	1998	Collegial body (comprising a Chairman, 1 member representing the Government and not less than 2 but not more than 3 other members)	Advises on national policy, implements and enforces provisions of the communi-cations and multimedia laws and considers and recommends reforms to these laws, supervises and monitors communications and multimedia activities, encourages and promotes the development of the industry as well as self-regulation.
Romania*	National Agency for Communications and Information Technology	1998		

*Note:** These regulators are in the process of being established, no information concerning their structure and functioning is available at present. For a complete list of separate regulatory authorities, see Tables 1 and 2 on pages 133 and 197.

Source: ITU World Telecommunication Regulatory Database.

Figure 1.1: The convergence of services requires the adaptation of the regulatory framework



Source: ITU/BDT

In countries where a separate regulator exists, responsibilities are delegated from the ministry to the regulator. However, when it comes to the licensing of cable television, the responsibility is in some cases attributed to a ministry, a broadcasting agency or some other agency. In Albania, the National Council of Radio and Television is responsible for licensing cable television operators whereas in the Czech Republic it is the Council for TV and Radio Broadcasting. In Nigeria, it is the Broadcasting Authority and in Egypt, the Broadcasting & Television Union. (For further information on licensing, see Chapter 4).

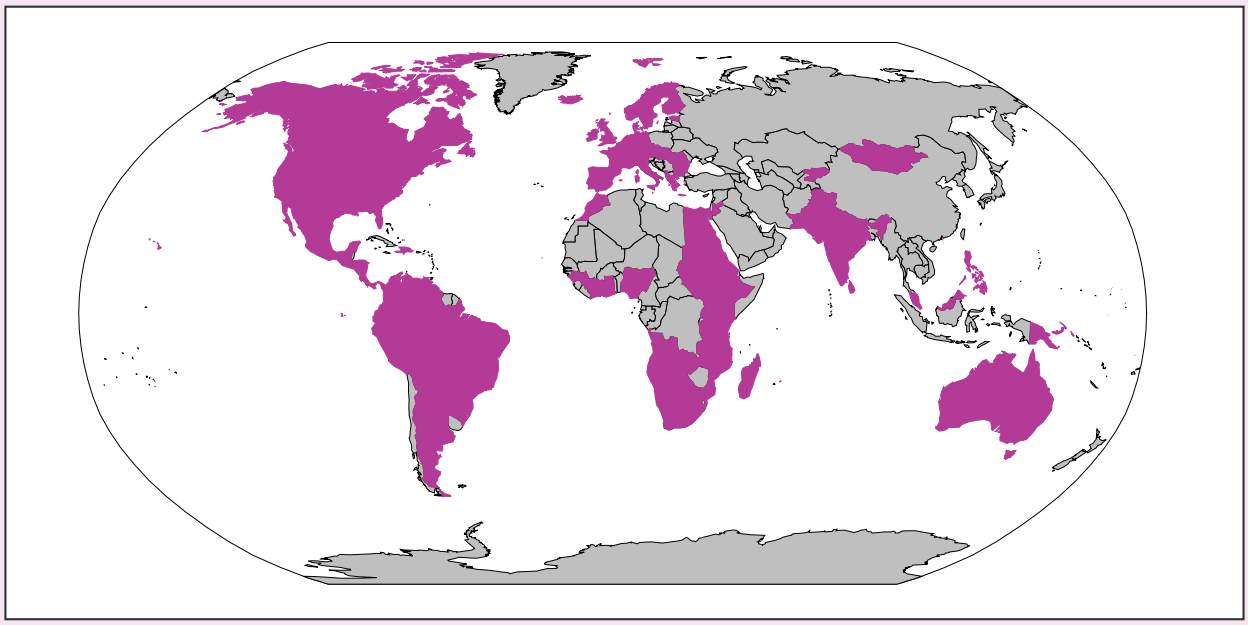
Regardless of the region, in most countries where a separate telecommunications regulator has been established, the authority has been given responsibility over Internet issues. However, in some countries, Internet issues are delegated to other institutions or even the incumbent operator (e.g. Sonatel in Central African Republic), a specific agency or association (e.g., Internet Service Providers Austria), or a different Ministry (e.g., Ministry of Science and Technology in Brazil).

In a majority of countries in **Africa**, the telecommunications ministry and/or the operator share, with the regulator, the responsibility over many regulatory issues. In Madagascar, for example, specific regulatory functions such as numbering plan, tariffs and interconnection rates are dealt with by both the operator and the regulator (the Office Malagasy d'Etudes et de Regulation des Télécommunications). In some countries, instead, the regulator assumes all regulatory functions. That is the case of the newly established Communication Commission of Kenya.

In the **Americas**, the degree of autonomy and functions of the separate regulators vary according to the country. In the majority of countries, the regulator plays a role in most regulatory issues such as in Mexico, Bolivia and Paraguay. In Brazil, Anatel, the regulator, has been given the mandate to oversee all the telecommunications regulatory functions. However, tariffs are dealt with by both the regulator and the operator and arbitration of disputes by the regulator and the courts. In Paraguay, the regulator, Conatel, oversees all regulatory functions except for tariff approval for which the President is responsible.

Although convergence has emerged as a major issue in the communication industry only in recent years, some countries like the United States and Canada had established as early as 1934 and 1976 respectively, a single regulatory authority responsible for all communications services. In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) is mandated to regulate telecommunications carriers, broadcasters including cable, radio, pay television, multi point distribution systems, subscription television and pay audio.[13] The CRTC is responsible for numbering plan, tariff approval, establishment of interconnection rates, arbitration of disputes, monitoring service quality and the licensing of international operators and cable television. The CRTC is also responsible for regulating the Internet. In the United States, the FCC oversees regulatory functions for all domestic and international telecommunications, cable television, radio and television broadcasting, amateur radio,

Figure 1.2: Separate regulators, August 1999



Note: The dark shading indicates that this country has a separate regulator.
Source: ITU World Telecommunication Regulatory Database.

equipment type approvals and spectrum management. However, licensing of basic cable television services is the responsibility of individual states.[14]

In the **Arab States**, existing regulators are becoming more independent. At the same time, the mandate of recently established regulators is increasing while the responsibilities of the ministry and operators are diminishing. In Egypt, the newly established Telecommunications Authority oversees most regulatory functions, including licensing and the Internet. The exceptions are tariff proposals and interconnection rates which are left to the operators and the arbitration of disputes which is left to the Ministry of Justice. In Sudan, the National Telecommunications Council oversees all the regulatory functions.

In the **Asia-Pacific** region, regulators have similar mandates. However, this region is experiencing new challenges as new regulators are created, or are in the process of being established, resulting from the convergence of the broadcasting and telecommunications sectors. In Malaysia, the newly established Communications and Multimedia Commission is responsible for overseeing the new regulatory framework for the converging industries of telecommunications, broadcasting and online activities.[15] In addition to classical functions such as frequency spectrum, technical standards and licensing, the Commission's functions include content regulation. Singapore is likely to follow a similar model. As convergence increases, the regulation of content may become part of the mandate of the newly-converged regulator.[16]

Five new regulators have been established in **Europe** in the past year. Most of them have followed guidelines provided by the European Union in its various Directives. In some Eastern European countries, the ministry still oversees selected functions, such as in the Kyrgyz Republic, where the Ministry is responsible for technical standards and type approval. In other countries, such as Albania, the ministries have responsibility over most regulatory functions with the exception of establishment of interconnection rates. These are left to the operators.

Countries where the power and functions of the regulator are limited and the ministry, or in some cases even the operators, still retains the authority on major policy directives and decision-making, may be faced with power struggles as the issue of convergence arises.

1.3 Institutional convergence

Institutional convergence means literally the convergence (or merging) of institutions. Many regulators are being drawn into Internet and broadcasting issues, and as a consequence an institutional convergence of regulatory authorities is taking place. As Figure 1.1 demonstrates, the convergence of services and markets necessitates a convergence of laws, and this may also necessitate the convergence of institutions or at a minimum, coordination of mandates. Countries have essentially four choices in addressing convergence:

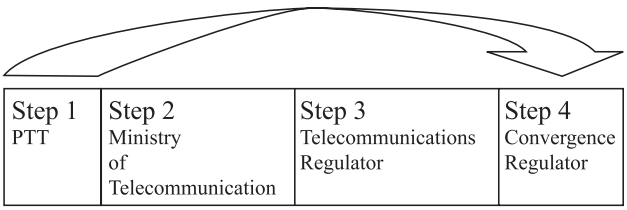
1) maintaining the status quo;
2) building on current structures;
3) developing a separate regulatory model for new activities, to co-exist with existing telecommunications and broadcasting regulation;
4) or progressively to introduce a new regulatory model to cover the entire range of existing and new services.[17]

Table 1.3: Old and new approaches: the search for the perfect recipe

Old approach	⇨	*New approach*
	Regulatory decision making	
Limited to partial	⇨	Active involvement
	Decision making style	
Not transparent	⇨	Participative, transparent, flexible
	Information disclosure	
Limited to confidential	⇨	Extensive, openly available
	Regulatory intervention	
Control	⇨	Oversee
	Measure of success	
Work process oriented	⇨	Industry development and growth

Source: Adapted from a speech of Cr. Syed Hussein Mohamed, Chairman, Malaysian Communications and Multimedia Commission.

Some new regulators have been able to benefit (or may soon benefit) from the experience of their older siblings by establishing a regulator that deals with these issues from the beginning. It is a sort of "leap frogging" which is often referred to in terms of the introduction of new services but which may now take place with regulators. While there is no set pattern to the establishment of a regulator nor to the transformation of the telecommunications sector, a country may be able to move from Step 1 to Step 4 in one go.



The United Kingdom's 1998 Green Paper on "Regulating Communications: approaching convergence in the information age" argues that the debate over convergence often pushes policy makers into having to choose between two visions – creating a new regulatory structure to avoid barriers to competition or maintaining the status quo because convergence has not really happened yet.[18]

In the United States, the FCC is considering the importance of an appropriate regulatory framework for convergence and looking perhaps to reorganize itself along functional lines. In other words, it is asking itself whether it should establish a new entity or reform the existing one.[19]

1.3.1 Including convergence functions in the telecommunications regulator

Some countries with established regulators have chosen to build on current structures rather than to set up new entities.

This case is exemplified by Australia where it was decided not to create a new regulator, or even a new model, but to merge certain aspects of existing regulatory authorities. The Australian Communications Authority (ACA) was established on 1 July 1997 by merging the Australian Telecommunications Authority (AUSTEL), without its competition regulation function, with the Spectrum Management Agency (SMA). The administration of competition regulation was transferred to the Australian Competition & Consumer Commission (ACCC). While the regulator is still responsible primarily for telecommunications, this merger was a first step in addressing convergence issues.

The ACA's major function is the regulation of telecommunications in accordance with the Telecommunications Act 1997 and the regulation of radiocommunications in accordance with the Radiocommunications Act 1992. The ACA is also responsible for many consumer matters, technical regulation and the management of the radio frequency spectrum. The new legislation introduced a more efficient, and less costly regime, geared to open competition in the provision of telecommunications services. The changes in technical regulation are designed to maintain a high level of integrity while introducing greater industry self-regulation, lowering administrative costs and allowing the market to determine technical network characteristics.

The goals of this new framework are to make Australia more internationally competitive, and to ensure that regional, rural and remote Australia has equitable access to the latest telecommunications and related services. The framework aims to "make available sufficient low-cost international telecommunications infrastructure to promote online activity and ensure that innovative new service companies stay in Australia."[20]

Canada is yet another example. The Canadian Radio-television and Telecommunications Commission is an

Box 1.2: Malaysia – a single converged multimedia and communications regulator

The Malaysian Communications and Multimedia Commission (MCMC) was formed on 1 November 1998 beginning its operations on 1 April 1999. The Commission is also charged with overseeing the new regulatory framework for the converging industries of telecommunications, broadcasting and on-line activities. The Commission reports to the Malaysian Telecommunications Ministry and may undertake a policy advisory role, while policy decision-making is vested with the Minister. The Minister may also give policy directions to the Commission.

The logo of the new Commission is shown here and comprises a transparent tetrahedron that encases a focused light, depicting the smooth transition of the three-multimedia platforms – telecommunications, broadcasting and information technology sectors into a single converged communications and multimedia industry. In the logo, the regulatory regime is represented by the four transparent equilateral triangles that symbolize fairness, equity, safety and transparency in exercising the four facets of regulation: economic, technical, social regulation and consumer protection.

The tetrahedron has four vertices and six edges, which sum to ten elements, each representing the ten national policy objectives and the ten functions of the Commission. The policy objectives are to:

- establish Malaysia as a global centre and hub for communications and multimedia,
- promote a civil society on a basis of information-based services,
- grow and nurture local content,
- regulate for the long-term benefit of the end-user,
- promote a high level of consumer confidence,
- ensure equitable provision of affordable services to all,
- create a robust applications environment for end-users,
- facilitate the efficient allocation of resources,
- promote the development of capabilities and skills within Malaysia's convergence industries and
- ensure information security and network reliability.

The Commission's first task is to draw up new rules and procedures in accordance with the Communications and Multimedia Act 1998.

Source: Malaysian Communications and Multimedia Commission http://www.cmc.gov.my/legisframe.htm.

independent authority responsible for supervising Canadian broadcasting and telecommunications. It evolved from a series of commissions, studies, hearings and legislation on the need to create an agency responsible for regulating broadcasting and telecommunications in Canada.[21] The Canadian Radio-television Commission (CRTC) was created in 1965 and became the Canadian Radio-television and Telecommunications Commission (also CRTC) in 1976. The regulator is governed by the Broadcasting Act of 1991 and the Telecommunications Act of 1993. The role of the CRTC is to help balance the cultural, social and economic goals of the legislation on broadcasting and telecommunications. While the CRTC is responsible for developing a framework for convergence, the Information Highway Advisory Council (IHAC) which reports to Industry Canada, is charged with mapping out an information highway policy.

1.3.2 New converged regulators

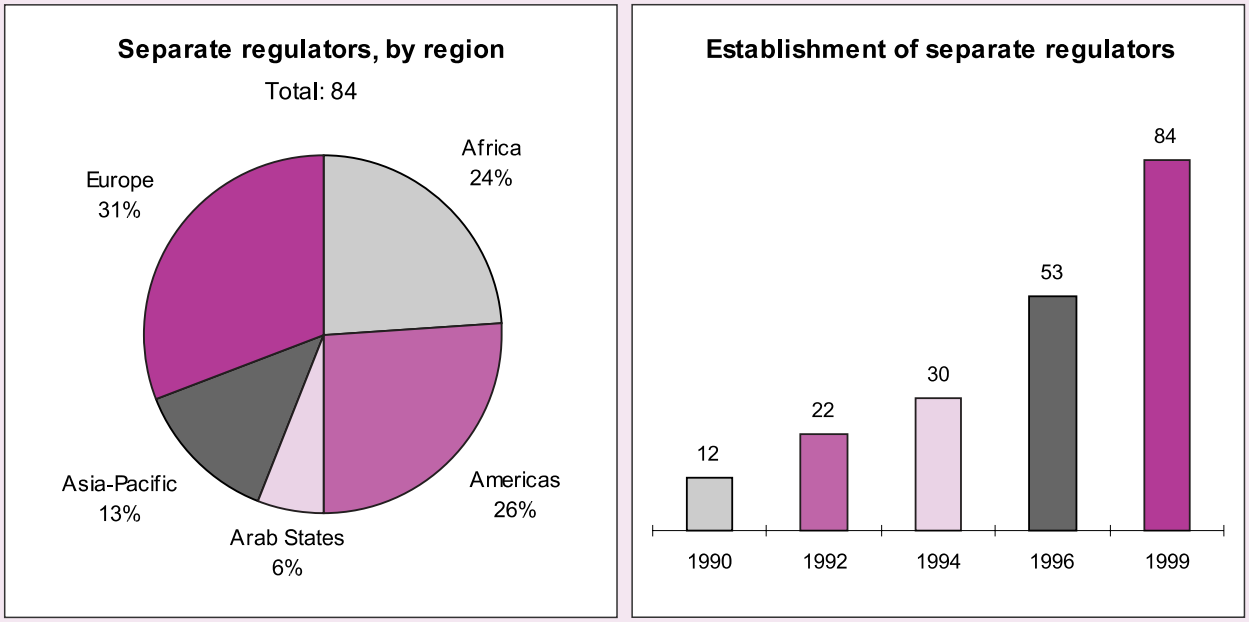
Some countries have already taken up the option for progressively introducing a new regulatory model to cover the whole range of existing and new telecommunications, broadcasting and Internet services.

In Asia, Malaysia and Singapore regulators have changed most. In Malaysia, a little over ten years ago, telecommunications services were provided by a government department that also acted as the regulator. In 1987, the government separated the operational and regulatory functions and created Telekom Malaysia Berhad as the operator (which was later privatized) and Jabatan Telekomunikasi Malaysia as the regulator. The Telecommunication Act of 1950 remained virtually intact until it was overhauled in 1998 by the Communications and Multimedia Act (CMA) and the Malaysian Communications and Multimedia Commission Act (MCMCA). Now the Malaysian Communications and Multimedia Commission is the sole regulatory authority for telecommunications, broadcasting and computing. (See Box 1.2)

In South Africa, the government is in the process of merging the Independent Broadcasting Authority (IBA) with the South African Telecommunication Regulatory Authority (SATRA). The merger is aimed at facilitating better coordination between two areas that were once considered separate. It should also encourage the development of more comprehensive policies and allow the new regulator a more complete look at the issues and technologies that are affecting convergence.

In some countries that have not previously had separate regulators, new regulators are being established to cover convergence issues. This is the "leap frog" approach mentioned

Figure 1.3: Booming growth of regulators, 1990-1999



Source: ITU/BDT Regulatory Database.

earlier. In Nepal, a separate regulator, the Nepal Telecommunication Authority (NTA), was set up in 1998 with responsibility for telecommunications, broadcasting, and cable television. The NTA reports to the Ministry of Information and Communications. In Romania, the Ministry of Communications was replaced by the National Agency of Communications and Information Technology in December 1998. In Malawi, the Malawi Communications Regulatory Authority was established, as a separate regulator, in 1998 to regulate broadcasting and telecommunications.

In the Gambia, the government has adopted a National Communications and Information Policy (NACIP) which sets out objectives, strategies and a regulatory framework. Part of this policy is to establish a Communications Regulatory Commission (CRC) which would be responsible for technical and economic regulation of telecommunications, broadcasting and the post – including information technology. The CRC will be responsible for licensing, spectrum allocation, managing the universal service fund, regulating and monitoring communications service providers through set license conditions, and codes of practice on programme content, advertising and sponsorship.[22]

Other countries are establishing single Ministries to deal with convergence and a new regulator may come later. Namibia's Ministry of Information and Broadcasting, China's Ministry of Information Industry and Singapore's Ministry of Communications and Information Technology are such examples.

In an effort to respond to the new regulatory requirements posed by convergence, China established the Ministry of Information Industry (MII) in 1998. The Telecommunications Administration Department was created within the Ministry to handle regulatory matters and oversee numbering, interconnection rates, dispute arbitration, type approval, license fees, and monitor service quality. The Department of Policy and Law, also within the Ministry, is responsible for overseeing the national information infrastructure policy.

In June 1999, the Ministry of Communications in Singapore was renamed the Ministry of Communications and Information Technology (MCIT). The government determined that giving MCIT the lead responsibility for information technology and telecommunications would improve policy coordination and implementation, and foster the integrated development and application of information technology. The National Computer Board (NCB) removed from the Ministry of Trade and Industry will be merged with the Telecommunications Authority of Singapore (TAS) to form a single new statutory board, the IT and Telecommunications Authority of Singapore (ITTA), covering both IT and telecommunications. Some technical aspects of broadcasting regulation will also be transferred from the Singapore Broadcasting Authority (SBA) to this new statutory board. NCB and TAS will work closely together pending the merger, which will be effected before the end of 1999.[23]

1.3.3 Cooperation among regulators

Convergence may often result in issues falling within the competence of more than one regulator. In the case of the United Kingdom, OFTEL authorizes the operation of telecommunications systems and services and the Independent Television Commission licenses content and delivery of broadcast messages. Telephony is regulated by OFTEL and television by the ITC. When it comes to broadcast entertainment services, the two entities need to cooperate.

In April 1998, the United Kingdom launched the Broadband Britain initiative which progressively lifts prohibitions placed on BT, the incumbent fixed-line operator, from providing broadcast entertainment services to residential customers over its own network. In April 1999, the ITC and OFTEL issued a joint consultation document on the bundling of television and telephony service by cable television operators to determine whether it is anti-competitive to refuse to supply either telephony or television separately where the services are sold as a bundle, and whether it is anti-competitive to offer telephony and/or television at less than the costs directly attributable to the relevant service. The joint consultation is an example of the growing cooperation between the ITC and OFTEL on converging services such as television and telephony.[24]

In Zambia, the Communications Authority was established in 1994 as a collegial body reporting to the Ministry of Communications and Transport. The Authority is responsible for numbering, standards, frequency allocation, type approval, service quality, and license fees. Most services are licensed by the authority except cable television which rests with the Ministry of Information and Broadcast. Should cable television operators offer telephony, or vice versa, cooperation between the two will be essential.

1.4 Challenges for the future

While the increase in regulators and legislative reform is certainly encouraging, new technologies and services are moving faster than the bodies that regulate them. Already regulatory uncertainty, some consumer protection legislation and outdated legislation may be hampering convergence. Access issues and the large investments needed for what may be uncertain demand may also be creating certain barriers.

Convergence is not a simple issue for telecommunications regulators. The challenge is to determine ways to regulate technologies that are continually evolving and more importantly to determine the role of the regulator in a converged sector. The challenge for regulators, as we enter the next millennium, is to develop consistent and relevant regulations which do not inhibit the growth of the sector, but rather encourage technological innovation.

Common themes for the regulatory framework of the future are that:

- the framework should be balanced, clear, consistent, predictable, comprehensive and transparent;
- it should ensure consistent regulatory treatment of essentially similar services;
- be technology and platform neutral (non-discriminatory);
- be pro-competitive;
- be flexible enough to adapt to new development (in technologies and services) and to reflect the different perspectives of both providers and consumers.[25]

The chapters that follow explore in more detail some of these issues and look at the ways in which convergence is affecting the various regulatory processes and procedures, as well as the modes in which countries are responding to such challenges.

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1 Thomas Jefferson was the third president of the United States. This statement has often been quoted in the context of telecommunication reform. It is certainly suited for the focus of this report: convergence and regulation.

2 See Malaysian Communications and Multimedia Commission at: http://www.cmc.gov.my.

3 See National Computer Board, http://ncb.gov.sg.

4 See Robert Pepper, FCC, Digital Convergence Competition and Regulatory Boundaries. See http://www.fcc.gov.

5 See Malaysian Communications and Multimedia Commission Act 1998 at: http://www.cmc.gov.my.

6 A plan was put forward in July 1999 by the new EC president Prodi to create a new directorate general (DG) to deal with the Information Society. It would replace DG XIII, formerly responsible for telecommunications, and will also include responsibility for industry – the old DG III – and enterprise.

7 See Canadian contribution to the APEC TEL WG meeting http://www.apec.org.sg/telewg/16tel/section-e/e-can.html.

8 See http://www.satcc.org/Telecomm/Telecoms.htm.

9 ATRC member countries are: Brunei Darussalam, Indonesia, Laos (Rep.), Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam. See http://203.127.83.132/tas/atrc/index.html.

10 See http://www.regulatel.org/.

11 See http://rtr.worldweb.net/trasa/index.htm.

12 See Malaysian Communications and Multimedia Commission Act 1998 at: http://www.cmc.gov.my.

13 See, the CRTC's Mandate at: http://www.crct.gc.ca/ENG/BACKGRND/Brochures/B29903e.htm.

14 See National Regulatory Authorities Worldwide, Espicom Telecommunications Intelligence, United Kingdom, 1998.

15 See Malaysian Communications and Multimedia Commission Web site at http://www.cmc.gov.my/comframe.htm.

16 The EC Green Paper consultation indicates this will likely not be the case in Europe for the time being.

17 The European Commission's 1997 Green Paper outlined options two to four. The Commission noted that the list is not comprehensive or closed. See http://wwwispo.cec.be/convergencegp.

18 Regulating Communications, Approaching convergence in the Information Age, Department of Trade and Industry. See http://www.dti.gov.uk/converg/.

19 The FCC Chairman stated "we can't rebuild an overloaded plane in flight by taking off two wings and the tail and moving the parts around before landing."

20 Address by Senator Richard Alston, Minister for Communications and the Arts, "New Telecommunications Era", 30 June 1997. See also *The Digital Economy* by Colin Tapscott.

21 See http://www.crtc.gc.ca/ENG/BACKGRND.

22 William, Joiner, Department of State, The Gambia, Contribution to the ITU Workshop on Telecommunication Reform. See http://www.itu.int/treg.

23 Press release from MITA 13 May 1999, Media Division, Ministry of Information and the Arts.

24 See http://www.itc.org.uk/news.

25 See http://dti.gov.uk/converg/D.

2 OPENING MARKETS TO COMPETITION

2.1 Global trends in market segments

The monopoly based system of service supply which has dominated the world's telecommunications markets for over three-quarters of a century, continues to decline in popularity. The opening up of the European telecommunications market and further liberalization in a number of markets around the world, has meant that competition is moving towards becoming the dominant mode of service supply.

OECD member states have progressed further than others in allowing competition in their national markets. During 1998, a further 19 per cent of access lines within the OECD area became open to full competition. With this move, 96 per cent of the OECD market, on the basis of telecommunication revenues, was, at the beginning of 1999, open to unrestricted competition. Only six OECD member states, Czech Republic, Greece, Hungary, Poland, Portugal, and Turkey, maintained entry restrictions in certain segments of the market. They have, however, committed to allowing unrestricted competition in the coming years.[1]

In the developing world, market liberalization is expanding in a consistent and sustained way. In Africa, for example, Uganda opened basic services to full competition, while the Democratic Republic of Congo and Madagascar shifted from a duopoly to full competition. Three other countries in the continent, Eritrea, Kenya, and Nigeria, are planning to do so in the next two years. In the Americas, Brazil and Suriname opened basic services to full competition, while Peru shifted from a duopoly to competition. Argentina, Venezuela, Bolivia, and Costa Rica plan to open their basic service market to full, international competition before the end of 2001. In the Arab States, Sudan opened basic services to competition and Kuwait plans to do so in the near future.

In Asia, the Republic of Korea shifted from a duopoly to competition in the provision of basic services and some newly industrialized countries, like Singapore, are planning to open the market sometime in 2000. Kazakhstan shifted from a monopoly in national long distance and a duopoly in international services to full competition in both. Finally, in Europe, the Czech Republic and Croatia plan to follow suit sometime between 2000 and 2001 (see Table 2.1).

Cellular communications along with the provision of Internet services and cable television remain the most competitive markets. In 1999, more than 66 per cent of the global cellular market, 85% of the cable television and 80 per cent of the Internet markets, measured in terms of the number of countries, were open to competition. Basic services, however, with 73 per cent of the markets still maintaining a monopoly, remains a fairly closed segment of the global telecommunications market (see Figure 2.1).

In both the cellular and the Internet markets, however, consumers were not necessarily gaining in terms of lower prices, the full benefits often associated with competition. In cellular services, for example, the absence of certain regulatory measures, such as mobile number portability, is leading to less

Table 2.1: Opening up of basic services

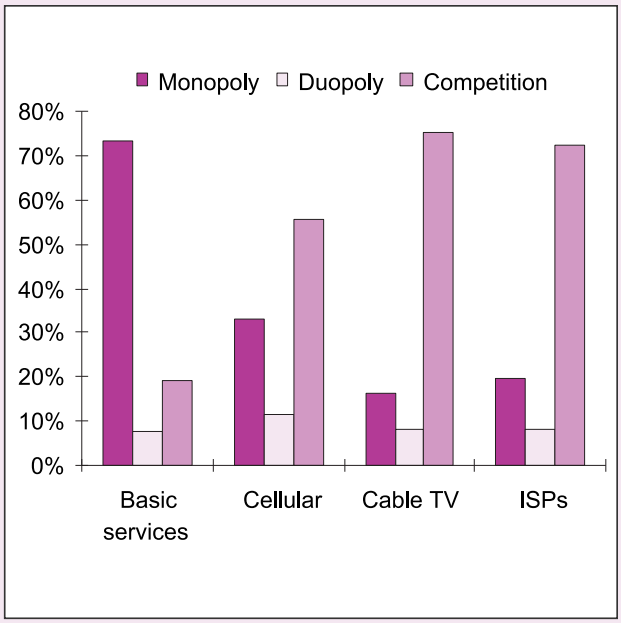
Opening basic services in selected countries, 1998/99 to 2001

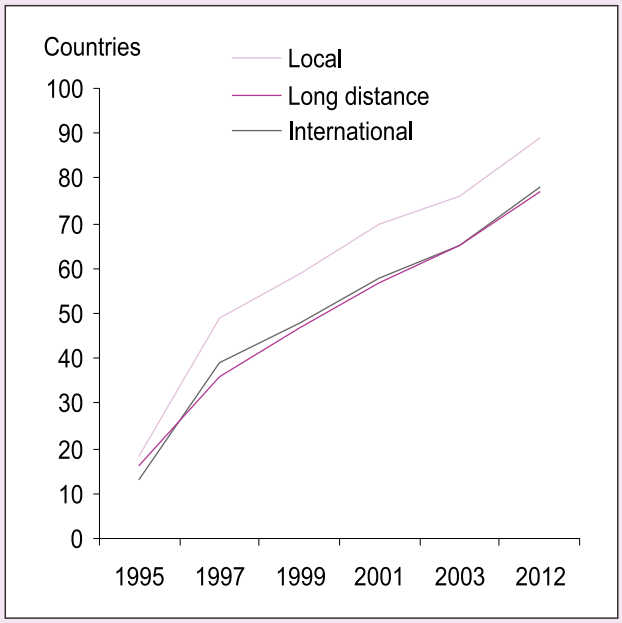
Opened in 1998/99	*Shifted from duopoly to full competition 1998/99*	*Competition planned (date)*
Uganda Brazil Suriname Sudan (local, long distance) EU countries (except Greece, Ireland and Portugal) Switzerland Norway	Congo (Dem. Rep.) Madagascar Peru Korea Rep. Kazakhstan (long distance and int.)	Argentina (11/2000) Bolivia (long distance and int., 11/2001) Venezuela (10/2000) Costa Rica (2000 or 2001) Eritrea (2000 or 2001) Greece (12/2000) Ireland (1/2000) Kenya (local, 2000 or 2001) Nigeria (2000 or 2001) Kuwait (2000 or 2001) Portugal (1/2000) Singapore (5/2000) Czech Rep. (after 2000) Croatia (2000 or 2001)

Source: ITU World Telecommunication Regulatory Database and WTO.

Figure 2.1: Increasingly competitive, but still fairly closed

Competition on cellular, leased lines, Internet, and CATV services, worldwide, 1999 (left hand chart). Growth of competition in local, long distance and international services, worldwide, 1995-2005 (right hand chart).





Note: Percentages based on 188 ITU member states.
Source: ITU World Telecommunication Regulatory Database and WTO.

than effective competition. In Internet markets across the globe, but mainly in developing countries, despite widespread competition among Internet Service Providers (ISPs), prices to end users remain considerably high due to the lack of, or deficient, competition in leased line supply.

In the wake of digital convergence, where telecommunications, computing, and broadcasting technologies are coming together, it is interesting to see that some of the broadcasting technologies more prone to converge with telecommunications and computing, like cable television (CATV), are in most parts of the world, open to the entry of other CATV providers. Only 17 per cent of the countries in the world retained a monopoly in CATV.

2.1.1 Competition in basic services

In spite of the sustained growth of competition across the globe in the past years, monopoly arrangements remained during 1998/99 the dominant mode of service supply in basic telecommunications. If one is to consider the large number of liberalization measures announced, and those committed to under the World Trade Organization Agreement on Basic Telecommunication Services, it is reasonable to expect that, by the beginning of the next century, the balance might turn in favour of open markets.

There is, however, some variation in the degree of openness across market segments and a wide variation across regions. In 1999, local services, for example, were the segment of the basic services market more receptive to competition (see Figure 2.2, right hand chart).[2] Some 32 per cent of countries in the world have allowed competitive entry into that segment of the market. In the national long distance and international services market the number of countries allowing competition drops to 26 per cent.[3]

This is in part due to the fact that a number of developing countries allow competition in their local basic services but keep a monopoly in the more profitable long distance and international services. The logic behind this market reform strategy is quite simple. Network expansion is more difficult in the local loop. Long distance and international services, due to their relatively inelastic demand, allow for higher prices and profits.

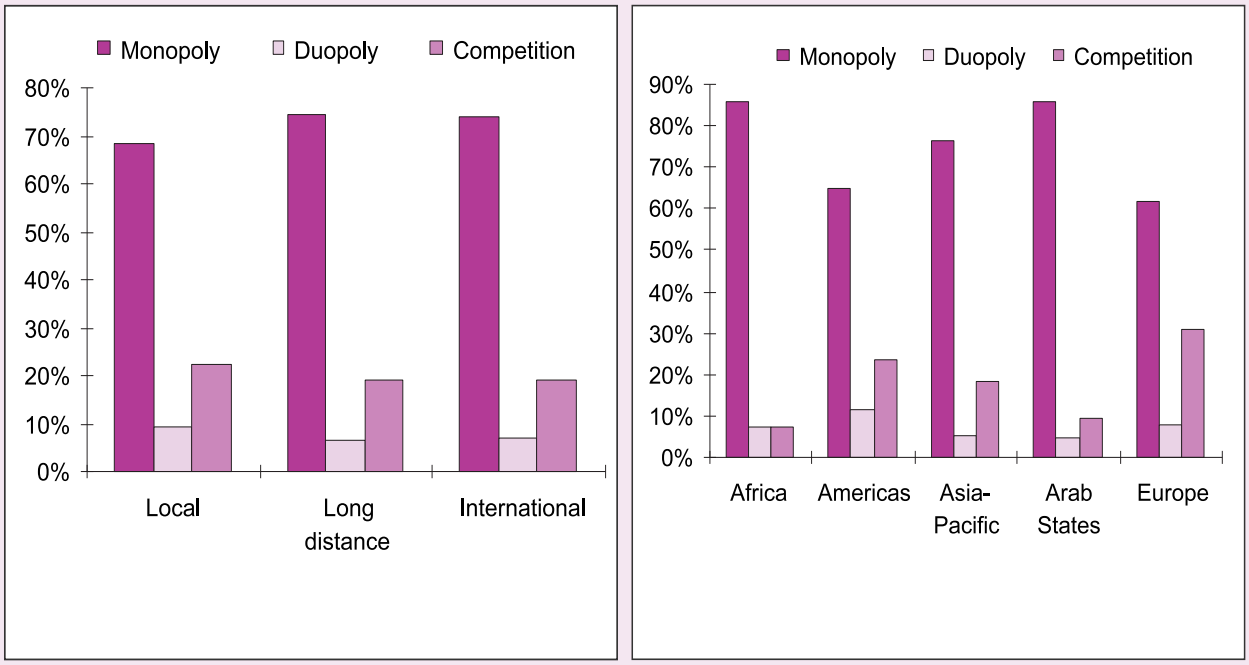
By opening the local loop to competition, countries in the developing world are hoping to attract private capital to share the burden of building infrastructure at the local level, while keeping the large revenues from national long distance and international services that allow them to subsidize local loop development. Given the past history of slow growth of local infrastructure in most developing nations, observers are wondering whether this strategy of service segment cross-subsidy is a sound one.

The variation in the degree of openness of basic services across regions is much wider than currently exists amongst market segments (see Figure 2.2, left hand chart).

With the opening of most EU markets to competition during 1998, **Europe** became the region with the most liberal regime in basic services. In mid 1999, 25 of the 53 countries that

Figure 2.2: The long reign of monopoly

Competition in basic services by market segment, 1999 (left hand chart); and competition in basic services, by region, 1999 (right hand chart).



Source: ITU World Telecommunication Regulatory Database.

constitute the European region had opened their local services market. With 61 per cent of European countries retaining a monopoly in international services and 65 per cent holding the same market structure in national long distance, this segment of the market remained fairly closed, but still quite open by international standards.

Asia and the **Americas** are following Europe in the move towards open markets. In local services, 38 per cent of countries in the Americas and 32 per cent in Asia allowed some competition. The degree of access to competition drops when it comes to national long distance (33 per cent in the Americas and 24 per cent in Asia) and international services (32 per cent in the Americas and 24 per cent in Asia).

Africa is experiencing a considerable move towards more open markets. Given the current commitments and reform plans in Southern Africa, the continent is set to become a leader in liberalization in the next few years. Countries like Ghana, Democratic Republic of Congo, Madagascar, Nigeria, and Uganda moved from a monopoly to either a duopoly scheme or full competition in some or all basic services. In spite of this trend, the region remains for the moment, a closed marketplace in basic services: some form of competition is allowed in only 15 per cent of African countries.

The **Arab States** remain fairly closed by world standards. Only one of the surveyed countries, Sudan, opened its local services market in the past year, while Kuwait allowed competition in its international service market. This raises the number of countries allowing competition in local and long distance services to three, while international service competition is allowed in only two countries of the region.

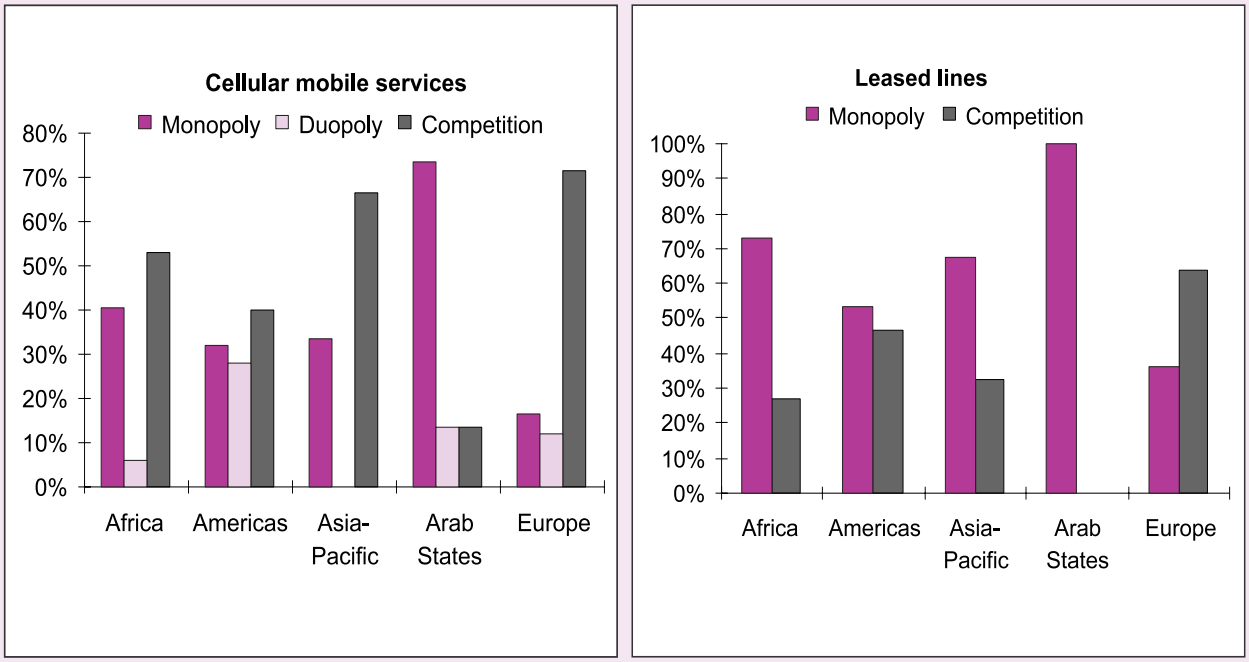
However, the overall effect of competition in basic services remains a positive one. The impact of market liberalization in long distance services of Brazil is one of the most recent successes in this regard. On 3 July 1999, the Brazilian administration opened the national long distance market allowing competition between the country's three regional operators and Embratel – the former monopoly operator. In an immediate reaction to the regulatory change, some of its competitors have dropped their prices by 50 per cent. The market is expected to grow by 14 per cent during 1999.[4]

2.1.2 Competition in cellular services

In the early days of cellular mobile services, most incumbent carriers did not see it as a threat to their core business-basic voice wireline services. Mobile services were, and it was understood in those days that it would remain for a long time, a service for the elite. Growth expectations were low. Some estimates in the early 1990s forecast an annual growth of 15 per cent for the first half of the 1990s. Companies producing mobile handsets estimated a global market of only 100 million users by the year 2000. The reality, however, was different. Annual growth in the first half of the 1990s stood at 48.8 per cent and the number of users currently estimated for the year 2000 stands at around four times the figure originally forecast by the handset manufacturers.

Figure 2.3: How much competition?

Competition in cellular services, by region, 1999 (left hand chart). Competition in leased lines, by region, 1999.



Source: ITU World Telecommunication Regulatory Database.

Low growth expectations and a profile of marginal service led to a low level of resistance from incumbents to a rapid opening of cellular markets worldwide. When compared with basic services, cellular stands today as a highly competitive segment of the telecommunications market. Some 66 per cent of the surveyed countries allow competition in their cellular markets. In 55 per cent of these, there are three or more cellular operators providing services.

But, there are many differences in the degree of competition amongst the regions. Europe and the Arab States are, perhaps, two extremes of the spectrum. In Europe, 84 per cent of countries allow competition while in the Arab States only 27 per cent of the countries do.[5] Between these two extremes stand the other three regions of the world, with competition being allowed in 68 per cent of countries in the Americas, 67 per cent of the Asian-Pacific countries and in 59 per cent of African countries.[6]

2.1.3 Leased lines

Monopoly arrangements still dominate 60 per cent of the leased line markets around the world, with some regions, like the Arab States, still keeping 100 per cent of their markets under monopoly control.

From a regional perspective, with 64 per cent of the countries allowing competition, the 53 countries included in the European region constitute the most liberal part of the world. From a national perspective, instead, competition seems to be more widespread in the United States than in most other countries of the world. A comparison with some European markets, for example, shows that the monthly price of 1 Mbit/s of capacity between New York and Chicago (more than 1 000 kilometres apart) is 13.5 times lower than the price for the same capacity between Zurich and Frankfurt (less than 300 kilometres apart).[7]

Competition in leased lines has brought down prices in a sustained and significant fashion in the last couple of years. During 1998, for example, the price of a 2 Mbit/s line between London and Paris dropped by 75 per cent due to the entry of competitive service providers between the two cities. In Sweden, competition has also reduced leased line prices by some 70 per cent. But, as highlighted by a recent OECD study on the leased line market: "the dramatic falls in leased line pricing is only evident in those market segments where *infrastructure* competition exists".

In spite of this sharp decline of prices in several OECD member country routes it seems that, given the wide range of tariffs offered in the leased line market, there is still considerable margin for further and deeper falls in current prices (see Box 2.1).[8] If that is the case for OECD markets, there is certainly potential for large price reductions in other parts of the world. In Africa and Asia, for example, 73 and 68 per cent respectively of the countries in each region retained a monopoly in the supply of leased lines.

Box 2.1: The wild range of leased line prices

Extracts from the 1999 OECD report Building Infrastructure Capacity for Electronic Commerce: Leased Line Developments and Pricing.

"In October 1998 if Reuters leased a 2 Mbit/s circuit at the standard published rate of BT and France Telecom, between their premises in Paris and London, it would cost US$ 40 000 per month. As Reuters is a large customer, a substantial discount would have brought this down to around US$ 20 000. The company might also lease this capacity from a new pan-European network provider at a discounted rate of around US$ 13 000 per month. In February 1999, more radically, Reuters could have leased this capacity from a bandwidth exchange for around US$ 3 000 to US$ 4 000 (the latter price including leased line tails).[9] Furthermore, they could purchase, and own, the capacity for around US$ 400 per month (the latter price excluding tails but around US$ 1 000 with tails)."

2.1.4 Competition in Internet and other value added services

In terms of the degree of competition allowed, Internet services are ahead of all other market segments. Some 81 per cent of the countries in the world allow competition in this segment of the market. In more than 73 per cent of the cases there were three or more Internet Service Providers (ISPs). However, not all regions exhibit the same level of competition.

The lowest level of competition at present is in the Arab States with 38 per cent of the countries keeping a monopoly in the provision of Internet services. The highest level was in Europe with some 93 per cent of the countries allowing competition, while the Americas, Africa, and the Asia-Pacific all stood at similar levels with approximately 80 per cent of the market open to competition (see Figure 2.4).

In the Internet service market, there are few monopolies left. In most cases, countries have gone straight into a market of multiple ISPs, rather than following the progressive approach that characterized wireline and mobile telephony. The monopoly arrangements were almost always followed by a duopoly scheme. It is also true that, in most countries, in particular developing ones, despite competition in the ISP market, prices remain fairly high. Penetration, hence, remains fairly low.

In Sub-Saharan Africa, for example, more than 65 per cent of the countries have competition in the Internet services market. A good number of the countries have three or more ISPs. But, the high costs associated with setting up and running ISPs and, in part due to the lack of economies of scale associated with large markets, most ISPs charge high prices for their services. On average, one hour of Internet connection costs around US$ 2.70. High prices and low purchasing power among the population means that in the region there is only one Internet user for every 1,800 people (see Table 2.2).

Competition in the Internet access market has gone beyond the boundaries that traditionally defined the telecommunications service market. Today a large number of companies whose major business is not in the provision of communication services are providing Internet access services to attract customers to their main retail business. In Europe, for example, there is an increasing number of retailers, such as Dixons Group plc (electronics retailer), Prudential Plc (insurance company), Barclays Plc (Bank), Tesco Plc (food retailer), Dell Computer Corp. (computer maker), and others, that provide free Internet access services. Dixons Freeserve, which was the first to launch a free service, quickly became the fastest online service provider, attracting more than 900,000 customers in its first three months of operations. By June 1999 the company had 1.4 million subscribers, twice the number of America Online (AOL) users in the UK. The free Internet service model is possible because network operators share part of the local telephone charges with the ISPs. It is this revenue that free ISPs are using to sustain the service.[10]

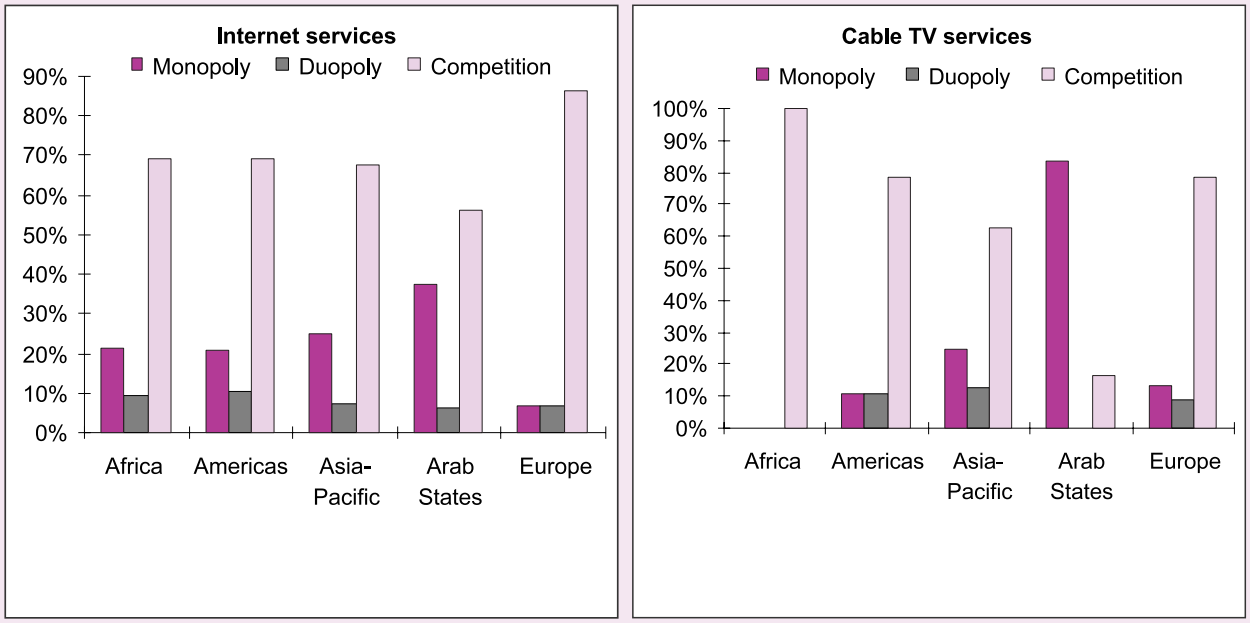
Conventional communications service providers (ranging from ISPs to PSTN operators) have reacted in different ways to this rising competitive challenge posed by "non-communications" firms. America Online UK, in an attempt to counter the erosion of its revenues due to the rapidly growing free Internet movement in the UK, was considering in mid-1999 the launch of a toll-free phone access for its users. Through the use of a 0800-service, AOL UK hopes to provide incentives to its users to stay with the company. In the UK, as in most other parts of the world, residential Internet users pay local telephone rates to be able to connect with their ISP. The company also cut subscription charges by 40 per cent to reinforce the attractiveness of the toll-free access.

British Telecommunications Plc, the former monopoly telecommunications service provider, has also launched a free Internet access service, similar to the one offered by Dixons and the other retail companies. Cable & Wireless Communications Plc, included in its Internet offer a national flat rate for local telephone calls triggered by an Internet connection. In France and Belgium, the incumbent carriers are planning to cut down the revenue shared to erode the ability of the new ISPs to provide free Internet services.

The rapid development of free Internet services and lower, or flat rate, local calls generated by competition in the Internet have been reinforced by pressure from both users and regulators. European users, organized through groups like France's Internet Moins Cher, are asking for flat-rate local calls and telecommunications tariffs that are closer to costs than the current ones. The move towards local flat rates is supported by some European government officials and even ISPs, such as 4thenet.co.uk, who are planning to pay back to users the money ISPs get from local telecommunications companies in their revenue sharing of local calls.[11]

Figure 2.4: The most open of all

Competition in Internet services, by region, 1999 (left hand chart). Competition in Cable Television services, by region, 1999 (right hand chart).



Source: ITU World Telecommunication Regulatory Database.

Although the Internet service market is considerably open and competitive worldwide, there are two aspects of it, transmission supply and service types, in which market dynamics and regulatory decisions have put restrictions on openness and competitiveness.

On the service side, for example, Internet telephony is banned in half of the surveyed countries. But, given that the by-pass function of Internet Protocol (IP) telephony is similar to that of call-back and other alternative calling services, one should expect that countries would react in a similar regulatory fashion to the way they have handled this kind of services. If that is the case, then it could be expected that close to 50 per cent of ITU member states would oppose, through formal legislation, the introduction of IP telephony in their markets.[12]

On the transmission supply side there are two types of restrictions. On a global scale the wholesale market for Internet transmission, the so-called IP backbone market, has been experiencing increasing concentration and remains much less competitive than the retail side of the market. While there are thousands of ISPs around the world providing services to end users, there are less than 50 major Internet backbone providers in the world, and most of them in the US. Furthermore, the top three backbone providers cover some 73 per cent of the market. Increasing consolidation of the Internet backbone market might lead to what some have called the "balkanisation" of the Internet.[13]

At the national level, the lack of competition in the leased line market poses a considerable bottleneck in the rapid development of Internet services by raising dramatically the prices that ISPs must charge to their customers (see Box 2.1).

2.1.5 Cable Television

In most markets around the world, cable television (CATV) services were, until recently, as regulated as telephony services. But in recent times, CATV has been moving towards a more open market arrangement in a parallel track with telecommunications services. In 1999, of the surveyed countries only 17 per cent of them retained a monopoly in CATV.

In this market segment, African and Arab markets are the ones that stand at opposite ends of the liberalization spectrum with the former allowing full competition in 100 per cent of the reporting countries and the latter allowing competition in only 17 per cent of the cases. With 89, 87, and 75 per cent of the countries allowing competition, the Americas, Europe, and the Asia-Pacific region are closer to the dominant trends in Africa than those in the Arab States (see Figure 2.4).

The rapid convergence of computing, telecommunications and broadcasting, however, is putting considerable pressure on CATV markets to open to competitive entry and allow other information and communication service providers to interconnect to CATV networks to transit services to customers.

Liberalization and interconnection demands on cable television networks are illustrative of a growing trend in the information and communication services industries. Technological convergence is not only blurring the traditional boundaries upon which telecommunications, computing, and broadcasting services are organized, but it is also creating considerable positive network externalities. These, and other related factors, means that users and new services providers are pressurizing for an integrated services marketplace.

Table 2.2: Competition in Africa

Degree of liberalization of the Sub-Saharan African ISP market, cost of Internet services, and Internet density

Country	*ISP Monopoly*	*Public Access ISPs*	*Call Cost ($/hr)*	*Internet Density (population/user)*
Angola	No	2	6.00	6,838
Benin	No	6	4.80	2,941
Botswana	No	3	0.60	1,551
Burkina Faso	No	3	1.10	4,561
Burundi	No	1	0.75	43,927
Cameroon	No	1	1.55	7,162
Cap Verde	Yes	1		8,340
Central African Rep.	Yes	1	6.90	17,445
Chad	Yes	1	10.50	22,973
Côte d'Ivoire	No	5	4.80	252
Dem. Rep. of Congo	No	1		98,416
Equatorial Guinea	Yes	1		2,150
Eritrea	N/A	0	0.60	11,827
Ethiopia	Yes	1	2.60	25,880
Gabon	No	2	13.90	1,171
Gambia	No	1	1.20	7,960
Ghana	No	3	1.34	1,451
Guinea	No	4	2.00	48,557
Guinea Bissau	Yes	1		51,153
Kenya	No	10	1.36	1,935
Lesotho	No	0	1.60	10,920
Liberia	No	0		36,640
Madagascar	No	3	0.43	23,354
Malawi	Yes	1	1.56	5,189
Mali	No	4	2.80	15,775
Mauritius	Yes	1	1.00	96
Mozambique	No	8	0.80	3,738
Namibia	No	5	1.00	827
Niger	Yes	1	1.31	33,730
Nigeria	No	12	0.40	40,591
Rwanda	Yes	1		65,270
Sao Tome & Principe	Yes	1		
Senegal	No	6	1.90	3,000
Seychelles	Yes	1		76
Sierra Leone	No	2	1.50	30,507
South Africa	No	70	1.60	177
Swaziland	No	2	0.95	1,036
Tanzania	No	10	1.94	10,730
Togo	No	7		2,608
Tunisia	No	2		1,357
Uganda	No	3	8.40	1,777
Zambia	No	2	1.60	2,483
Zimbabwe	No	13	4.00	1,192

Note: "Population/User" is the number of people in the country per Internet User. "Call Cost" is converted to US$/hour.

Source: Adapted from "African Internet populations, March 1999", African Internet Connectivity, M. Jensen.

Box 2.2: Facing the IP telephony challenge

Regulatory approaches to the rise of IP telephony

United States: Currently, the US regulatory framework considers ISPs as information services providers, as opposed to telecommunications carriers. Internet telephony is considered an information service, i.e. non-regulated, even when the Federal Communications Commission (FCC) has accepted that at least the phone-to-phone modality of providing Internet telephony is indistinguishable from conventional voice over PSTN.

European Union: In Europe, ISPs are also considered providers of information and telecommunications value added services, so they are exempt from the obligations that telecommunications carriers carry, such as universal service, interconnection charges, etc. The views of the EU on voice over IP is that it can not be considered a traditional voice telephony service since ISPs offer this service as one among many services. The European Commission recently issued a notice on the status of voice-over-IP, concluding that Internet telephony will not be subject to regulation until certain conditions have been met, so currently voice-over-IP is a non-regulated service.[14]

Latin America: Latin American countries are also facing similar problems to those in developed countries. Larger countries, such as Peru, Chile, Mexico, Venezuela, Bolivia, and Brazil, have not decided yet whether to impose any regulatory restrictions to services provided by ISPs, such as voice-over-IP. In Argentina, voice-over-IP services provided by value-added firms are prohibited. In Colombia, there is a legal dispute between a major cellular operator, which in December 1998 announced the provision of long distance services through voice-over-IP, and the two new long distance carriers, which recently paid high fees for their concessions (around US$ 150 million each) and who are committed to network expansion targets.

Other countries: In many countries, voice-over-IP services or voice-over-Internet have not been addressed in regulatory terms. Some have prohibited these services, as in the case of India and a number of Eastern European countries. Many other countries are still not sure how to address the problem or in some cases they do not face the problem yet. Some industry analysts have suggested that one of the indicators of how regulators and governments are likely to treat IP telephony services, lies in their regulatory approach to other alternative international services, such as call-back, refill, etc.[15]

2.1.6 Competition across market segments

Technological innovation also allows for a single, integrated IP-based network to provide voice, data and video services, creating significant comparative advantages in relation to other network types.[16] There are two main factors driving the rapid growth of IP networks. One is the integration features of IP networks that enable the realization of economies of scale in the production of combined voice, data and video services.[17] The second factor is opportunities for price arbitrage among traditional telecommunications services such as long distance voice, fax, and video conferencing services.[18]

These developments are changing the ways in which traditional telecommunications operators and value-added service providers compete with each other. Telecommunications carriers used to provide only basic voice telecommunications or bearer services upon which value-added applications were provided by value-added operators. For instance, ISPs, a class of value-added operators, provide computer processing and storage facilities, which retrieve, store, convert and forward electronic data over IP networks, which in turn, are, perhaps, using the public switched telecommunications network (PSTN) run by the telecommunications carriers. However, technology now allows downstream firms to provide substitute services, such as long distance telephony, thus competing directly. In this increasingly competitive arena, ISPs have received a mixed blessing from regulators. On the one hand, they generally do not bear the burdens and obligations that most incumbent carriers and other PSTN entrants do. While circuit-switched traditional telecommunications carriers are obliged to comply with strict sets of requirements and principles including concession fees, network build-outs, access charges, contribution to universal service, access deficits, international accounting rates, non-discrimination, equal access principles, etc., ISPs are exempt from most of these obligations.[19]

On the other hand, some of the services provided by ISPs have been considerably restricted by regulatory intervention. Internet telephony, for example, has been either restricted or fully banned in at least half of the countries in the world.

There are two predominant regulatory approaches underlying the prohibition of Internet Telephony. First, IP telephony could be defined and treated as any other public voice telephony services. In most countries basic long distance and international telephony services are either under a monopoly or a limited number of licensed operators are providing the service. Hence, ISPs, most of which do not have a license to provide these services, are not allowed to provide IP telephony services either. The second approach argues that IP telephony is a value added service. In most countries value added service providers are not allowed to provide voice telephony services. Hence, ISPs are not allowed either.[20] There is little consistency across regions or different development levels in the adoption of either approach, but in general in developing nations there is a stronger resistance to the development of IP telephony than in the advanced OECD economies (see Box 2.2).

Table 2.3: Estimating traffic volumes

Rough estimates of data and voice traffic requirements in the average daily use of various communication services

Service	*Average daily usage*	*Specifications*	*Average traffic in bits*
Telephone	20 calls	64 kbit/s; two way 5 mins/call	$8{,}000 \times 10^5$ bits
Email	20 emails	200 words/message; 7 chars/word; 8 bits/char	2×10^5 bits
Surfing	20 sites	50 Kbytes/site; 8 bits/byte	80×10^5 bits
Downloading	½ file	2 Mbytes/file 8 bits/byte	80×10^5 bits

Source: Noll Michael A. "Does Data Traffic Exceed Voice Traffic?", *Communications of the ACM*, Vol. 42, No. 6, June 1999.

In spite of these restrictions, a number of voice service providers are migrating to IP-based networks. Currently, several well known call-back operators are shifting their traffic from call re-origination technology to IP platforms. Even some traditional telecommunications carriers are gradually migrating some of their voice traffic onto IP platforms. Responding to this growing trend, Internet telephony carriers are even offering wholesale international IP minutes to traditional carriers rather than ISPs.[21]

Some analysts are arguing that voice over IP will increasingly substitute switched voice and that sometime in the near future IP and switched voice services will be indistinguishable from one another. According to this view, we are on the verge of witnessing a switch from networks that have been dominated by voice traffic to ones that are mainly in the domain of data traffic. The switch to data traffic will accelerate along with rising technological improvements in IP telephony. It is also expected that the greater the competition in some segments of the market, such as long distance and international services, the faster the migration to IP networks.

But, how well accepted is the notion that data traffic is the future of the telecommunications network? How serious is the competitive threat that data traffic is posing to voice services?

Countering the view that data traffic is in the process of surpassing voice traffic, if it has not already done so, is the position of those that consider that, due to the nature of what is being transmitted, voice traffic will remain the dominant and most important part of the communication business for the foreseeable future.

This assessment is based on the comparison of the transmission requirements of data and voice messages and estimates of the typical usage of some telephone and some data communication services, such as email, web surfing and downloading of files (see Table 2.3).

The large network capacity requirements needed for telephony are the main evidence for advocates of voice telephony predominance. A digitized, two way telephone call, for example, creates 128,000 bit/s if no compression is used. An email of 200 words requires about 9,600 bit/s. Following these figures, a one minute telephone call generates traffic equivalent (in bits) to 700 emails. A five minute telephone conversation is equivalent to 640 sheets of paper typed in single space. Similar figures are quoted for users browsing the web and page downloading.[22]

Video may mean that Internet traffic could yet exceed voice telephony traffic. Although, the economics of video transmission over the Internet, and the technical nature of the way the network operates, for the time being, mitigates against the possibility of turning the Internet into an attractive transmission option compared to more traditional video communication technologies. Given that the requirements of voice, data, and video are different, transmission modes for each of them would also remain different.

Finally, one should bear in mind that in this converged communications marketplace there is no safe haven. The clearest illustration of this is reflected in the recent strategic moves of the largest ISP in the world – America Online. The European branch of the company, was planning in mid-1999 to develop alliances with mobile and e-commerce companies to shift some of its businesses to other segments of the market and counter balance the competitive pressure posed by free Internet access service providers and incumbent operators.

2.2 Regulatory tools to promote competition in a converging marketplace

Experience around the world is showing that, due to the networked nature of telecommunications markets, the introduction of effective competition requires the active presence of regulators in the early stages of market reform. Digital convergence, however, is posing new challenges to the regulatory frameworks that had developed in recent years for the promotion of competition in the telecommunications market. This section looks at how convergence is affecting the competitiveness of telecommunication markets, and the ways in which regulatory intervention or regulatory abstention in a number of areas, such as interconnection, structural and accounting separations, mergers and acquisitions, price

controls, numbering, and universal services, are enhancing or hindering the likelihood of effective competition.

2.2.1 Interconnection

Interconnection terms and conditions remain in most countries a major, if not *the* major, key to creating a fully competitive marketplace. Regulators have in recent years, developed adequate legal frameworks to deal with most of the issues posed by interconnection. But, as convergence grows, and service providers move to provide an integrated range of services over various communications platforms, there will be many new challenges.

For example, should cable television companies, ISPs, and providers of proprietary value added services be required to interconnect with other communications companies operating in the marketplace?

In the United States, a recent judiciary ruling required AT&T to open its newly acquired cable television network, Excite@ Home, to ISPs interested in using the network to transmit Internet traffic.[23] Although regulatory agencies, like the United States Federal Communications Commission (FCC), do not favour this approach, there is a growing perception that in a converged marketplace the promotion of fair competition requires that interconnection should be mandated on all operators controlling bottleneck infrastructures.

Under this new paradigm, all communications networks are viewed as generic systems supporting all forms of digital transmission, and as such should be treated and regulated along the lines of public telecommunication networks. The integration of services into seemingly interoperable networks delivering services over various technological platforms could constitute a major step forward for consumers that today have to deal with a wide range of service providers to access the communications services they need.

2.2.2 Structural and accounting separations

Structural and accounting separations are viewed, in the early stages of market reform, as essential to avoid cross-subsidization between the various businesses of the incumbent. In the same light, the unbundling of facilities and service components has been perceived as a prerequisite for fair competition.

The rise of convergence, however, poses a challenge to this way of thinking. Many have started to question the virtue of these separations. Many would suggest that, in order to promote digital convergence, it makes economic and regulatory sense to permit the integration and bundling of multiple services into one multimedia package.

Depending on the degree of competition and the extent of convergence already experienced in the marketplace, regulators will have to face many challenges. In some markets where competition is at its early stages and converged services and technologies are not yet present to any significant degree, the requirement of structural and accounting separations seems to be the logical choice. The opposite would seem to be true for markets in which competition has spread throughout the various segments of the market and converged services are increasing.

2.2.3 Mergers and acquisitions

Mergers and acquisitions have been used by corporations to boost their competitiveness and presence in national and global markets. Vertical and horizontal integration across facilities, services, and content has become "business-as-usual" in the telecommunications industry. A large number of these companies enter partnership agreements to enhance competitiveness. However, how much more competition is there in the overall market due to the strategic moves of corporations?

From a regulatory point of view, mergers, acquisitions and alliances can affect competition in many ways. In some cases, ownership reforms can lead to a levelling of the playing field (i.e. making competitors more equal in size, market power, and other economic variables) and therefore to more competition in the marketplace. Yet, in a large number of other cases, these moves lead to market consolidation and the development of oligopolies.[24]

Furthermore, as service providers go global in their operations, ownership changes in one market can have profound effects on the competitiveness of markets abroad. The merger of WorldCom and MCI, for example, if it had gone ahead as originally planned, would have concentrated in one company more than half of all Internet backbone connections in the world. The merger presented one of the first challenges posed by new digital media to competition authorities, not only in the market of origin but also abroad. For that reason, it has been suggested that, given the global impact that some of these mergers and acquisitions have, competition authorities and regulatory agencies in all markets affected should be involved in the process.[25]

The pros and cons inherent with most mergers, acquisitions and alliances, mean that regulators will face complex challenges for which no single global recipe seems adequate. In the case of separations and bundling, local solutions based on the profile and stage of development of local markets appear to be the most appropriate approach.

2.2.4 Market dominance

Market dominance and the subsequent call for asymmetric regulation is not only the outcome of recent mega-mergers and acquisition but also the natural consequence of years of monopoly arrangements in most telecommunications markets of the world. To avoid market dominance in new market segments, such as cellular services and the Internet, some countries have blocked the entry of dominant operators, at least in the initial stages.[26]

Asymmetric regulation has a number of strengths aimed at promoting the growth of new entrants in the market. Yet, according to the view of some analysts, the approach can also undermine the rapid diffusion of digital convergence. Convergence is mainly about experimenting with various technologies and services. Banning players with deep pockets and cutting edge technologies from certain markets segments

can, in the long run, work against consumer welfare. Based on this concern, it has been proposed that specific regulatory decisions should be developed to avoid abuses by service providers with considerable market power, instead of adopting broad asymmetric regulation.[27]

It should be recognized, however, that for regulators with limited institutional resources and capabilities, particularly those in developing nations, the possibility of developing and implementing specific regulatory decisions to avoid market power abuses becomes almost an insurmountable challenge. Regulatory asymmetry and blocking entry of large carriers to certain segments, for some of these countries may be the only viable approach to providing a level playing field.

2.2.5 Price controls

Price evolution is one of the most tangible indicators of the competitiveness of markets. It is also one of the most valuable tools that regulators have to stimulate the growth of competition, while safeguarding at the same time essential social goals, such as universal access to telecommunications.

Today there is considerable accumulated evidence that points to competition bringing a reduction in the price of services. This is fairly straightforward in some services. For example, if international and national long distance services are liberalized, prices generally fall sharply from their pre-competition levels.

In the case of Internet services, the picture is not so clear. Although world markets for the provision of Internet services are open to competition, there are other components of the "Internet cost", such as the price of local calls and leased lines, that can lead to high prices for consumers. In most countries, calls for Internet services are not treated any differently from regular voice telephony calls. This means that when an Internet user dials up to reach an ISP, he or she is making a local call that is generally charged on the basis of time and distance.[28]

The scarcity of competition in local calling markets and the tradition of metered pricing have recently been identified key factors determining both the diffusion of Internet services and the extent of their use.

A typical United States user of America Online services, for example, spends an average of 27 hours online per month. His or her European counterpart, on the other hand, spends only 7 to 8 hours online per month. It is increasingly argued that the difference in the intensity of usage is due to the difference in pricing structure for local calls in each market (flat rate in the most of USA, metered calls in Europe).

In some regions of the world, consumers are protesting against metered local calls. In Europe, for example, there are a number of groups coordinating action and lobbying for regulatory reform in the pricing of local services.[29] In other areas, regulatory intervention has substituted for competition. In Argentina, for example, the regulatory agency has insisted on a special dialing arrangement to separate Internet calls from voice telephony. Through the establishment of a special "0610" number, Internet users can get significant discounts on local call charges.[30]

Increased competition in the local market, however, seems once more, to be the most adequate regulatory tool to correct the problem and increase consumer welfare. In the United Kingdom, for example, Localtel, a reseller of local services, began offering in April 1999 free local calls for Internet services at off-peak times. This strategy was designed to attract customers away from its competitor, the incumbent British Telecommunications Plc (BT). With 50,000 people registering in the first month of offering, Localtel has placed considerable competitive pressure on BT. The incumbent has responded to the move by offering a flat-fee service of US$ 18.91 for unlimited local calls during weekends.

Prices are certainly important in the evolution of any competitive market. However, recent developments in electronic commerce have shown that in a global electronic marketplace, price is not the only, and sometimes not even the determinant, factor in defining the most attractive businesses. Studies have shown that, for example, in the book retailing market, prices may be of little relevance to the success or failure of new entrants. Trust in the brand name appears, instead, as the major determinant of survival in this marketplace.[31]

2.2.6 Numbering and numbering portability

Numbering and number portability can be important drivers of competition, although many markets have yet to realize this. The control and administration of telephone numbers, and more recently of Internet addresses, are key elements in the management and control of demand and supply factors in the marketplace. Numbers and addresses may be managed in ways that are detrimental to competing companies, so serving the interests of those with dominant market power. Scarcity, for example, can be maintained so that allocation decisions can be exploited to enforce the objectives of whoever controls the supply.

This has to do with the customer "lock in" effect that is the result of the inability to port numbers across different communication service providers. Studies have shown that the majority of customers would be reluctant to switch service providers if they would lose their current number by doing so.[32]

If competition is to spread throughout the telecommunications market, number portability has to be implemented in all main market segments. Hongkong SAR's recent experience with the implementation of number portability in mobile services points to significant losses for consumers in markets where the mechanism is not implemented. The introduction of mobile number portability was met with a sharp decrease in the prices offered by different mobile companies. Some of them dropped their tariffs for a standard 100 minutes per month package, by as much as 50 per cent just before the launch of number portability. This came as a result of companies attempts to retain customers in a more volatile and competitive environment; evidenced in the fact that in the first three months of the introduction of number portability, more than 250,000 mobile numbers changed from one operator to another.[33]

2.2.7 *Universal service*

Universal service obligations have traditionally been a burden on the incumbent carrier for which it was sometimes unevenly compensated. In an open and competitive marketplace, universal service obligations have instead turned into tools that the carrier bearing the obligation can use to undermine the threat of competition. This strategy can be even more effective and valuable in markets where the multiplicity of converging services leads to the possibility of cross-subsidies and unreasonable charges and contributions imposed on competitors in the name of universal service goals.

The awareness that universal service obligations may be used as a barrier to competition led to the administrations participating in the World Trade Organization negotiations on Basic Telecommunication Services to include it in the "Reference Paper" on regulatory principles. Signatories recognized that member countries have the right to define the kind of universal service obligation they wish to maintain. But at the same time, they noted that such obligations would be regarded as anticompetitive if they were not administered in a transparent, non-discriminatory, and competitively neutral manner. They also noted that such obligations should not be more burdensome than necessary for the kind of universal service defined by the member. This concern is quite valid if one considers that, in the great majority of countries, universal service is still provided by the incumbent carriers.

2.3 Conclusion

There are many factors that affect competition. Some of them can be predicted, some of these cannot. Regulators need to be vigilant in order to combat the effects of the unexpected. It is easy to stifle competition unintentionally. It is worthwhile looking at the experiences of other countries to learn from their mistakes. Finally, there is no surrogate for competition. When it comes to regulating a telecommunications market, great emphasis should be placed on mechanisms which ensure the maximum possible level of competition. This has been proven to be good for consumers, suppliers and the market.

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[1] The committed liberalization dates are: Czech Republic [2000], Greece [2001], Hungary [2002], Poland [2003 – long distance and international], Portugal [2000] and Turkey [2006]. For more details see OECD "A review of market openness and trade in Telecommunications", Paris: OECD, April 1999.

[2] In terms of the numbers of countries that allow competition, but not necessarily in terms of the countries that had effective competition in that segment of the market.

[3] It is important to keep in mind that in most countries, in spite of the existence of legislation protecting the rights of the monopoly operator, there is always a considerable degree of *de facto* competition in a variety of service forms, call-back being services the most pervasive and well-known of them.

[4] "Brazil deregulates long-distance telecoms traffic", *Total Telecom*, 5 July 1999.

[5] In Europe, 71 per cent of the countries have more than three operators.

[6] It is worth noting that in the Asia-Pacific region some 67 per cent of the countries have more than three operators in their cellular markets.

[7] For more details see OECD. *Building Infrastructure Capacity for Electronic Commerce: Leased Line Developments and Pricing*. Paris: OECD, 1999.

[8] OECD, idem. The study reports that a 622 Mbit/s line between London and Paris owned by one of the incumbent carriers in this route, if fully marketed at the current discounted rate currently offered by the incumbents, would pay for itself in one year. This type of line can be purchased for US$ 5.4 million.

[9] A leased line tail is the local link from the lease line provider point of presence to the user's premises.

[10] The ISP main cost lies in billing, marketing, and services. Free ISPs do not have billing costs, marketing is done through the conventional marketing scheme of the companies, and services are often charged on a cost recovery basis.

[11] For further information on free Internet developments see various articles in Communications Week International at: http://www.totaltele.com.

[12] By October 1998 more than 86 countries have informed the ITU that call-back services were banned in their territories.

[13] From this perspective "ISPs and Internet Exchange Providers (IXPs) will increasingly cluster into self-selected groups which are either inaccessible from the networks of non-members, or accessible only if compensated in a one-way, non-reciprocal basis. Because ISPs do not have the 'common carrier' status of public telephone operators, they are free to discriminate among potential customers and other ISPs seeking interconnection. Thus, goes the argument, instead of arrangements based on sender-keeps all or bilateral peering, interconnection arrangements will become increasingly hierarchical with larger ISPs and IXPs imposing charges on others who are smaller, covering only regional or local areas, or which are foreign. This is a particularly alarming development for ISPs in developing countries who can not hope to match the traffic streams generated in the United States and Western Europe". See International Telecommunications Union. *Challenges to the Network: Internet for Development*. Geneva: ITU, 1999, page 131.

[14] For more details on national policies in this area by a selected group of OECD economies, see OECD. "A review of market openness and trade in Telecommunications", Paris: OECD, April 1999.

[15] See Intven, Hank. Regulatory issues on Internet Telephony, 1998.

[16] Arturo Briceño of OSIPTEL, Peru, contributed to the development of this section.

[17] It is important to note that integration of data, voice and video is also possible with other network platforms such as ATM, Frame Relay, ISDN, etc. For instance, several private commercial networks have been built using ATM or frame relay networks.

[18] The significant difference between the price of a service and the true production cost for some telecommunications services explains the existence of price arbitrage and why we are witnessing the entrance of new competitors to these markets, such as voice-over-IP providers. This happens in the case of long distance telecommunication markets, where huge differences between end-user prices and costs exists. IP-long distance telephony is undermining this traditional market pushing prices toward costs and forcing an accelerated decrease in accounting rates.

[19] Another important characteristic that may make a difference is that in several countries telecommunications operators are not allowed to get into value-added services, in particular, into the Internet service market.

[20] This legal distinction in categorizing IP telephony is important. The obligations that PSTN operators generally have, which are often not applicable to value-added service providers include: mandatory interconnection,

prohibition of discriminatory behaviour, disclosure of interconnection information, interconnection charges for transport and termination of calls as well as universal service.

[21] For more details on this development, see Scales, Ian. "International Carriers Lured by Wholesale IP", *Communications Week International*, 7 June 1999, page 8.

[22] Noll, Michael A. "Does Data Traffic Exceed Voice Traffic?" *Communications of the ACM*, Vol. 42, No. 6, June 1999.

[23] Excite@ Home is a cable TV franchise in the Portland area, previously owned by Tele-Communications Inc. The opening of the network to other ISPs was a requirement imposed by local officials to approve AT&T's acquisition of Excite@ Home. For more details, see Colleen McElroy, "Excite At Home falls after AT&T told to open Cable-TV network", *Total Telecom*, 7 June 1999, http://www.totaltele.com.

[24] Some have argued that the trend towards market concentration has been one of the most evident and undesirable consequences of the 1996 Telecommunications Act in the United States.

[25] For more details on this matter, see International Telecommunications Union. *Challenges to the Network: Internet for Development*. Geneva: ITU, 1999, Chapter 7.

[26] In Brazil, for example, the incumbent has been blocked from entering the Internet market. In India, a similar situation prevails at present in the cellular service market.

[27] See OECD. "Towards next generation regulation", Paris: OECD, March 1998.

[28] Although the notion of distance in a local call seems counterintuitive, in some developing countries large cities are divided into several area codes and calls within the same urban conglomerate is considered a long distance call.

[29] In response to rising consumer pressure France Telecom was (in June 1999) planning to offer a tariff of US$ 15.72 for 20 hours connected at off-peak hours.

[30] See Comisión Nacional de Comunicaciones de Argentina at: http://www.cnc.gov.ar/.

[31] See, for example, Shapiro, Carl and Hal R. Varian. *Information Rules: A Strategic Guide to the Network Economy.* Boston: Harvard Business School Press, 1998. http://www.inforules.com, Dillard, Martin. *The Economics of Electronic Commerce: A Study of Online and Physical Bookstores*. Thesis. Berkeley: University of California, Berkeley, 1999.

[32] See Ovum Ltd. *Number Portability: Numbering for Consumer Benefit in Hongkong*. Report to the Office of the Telecommunications Authority. Hongkong SAR: OFTA, 1994.

[33] Although a ported number does not exactly reflect the number of people that move from one company to a different one taking their original mobile number with them (some subscribers may have more than one number), it is still a close indicator of the number of people that move to a different company thanks to the implementation of numbering portability. The information on this experience was provided the Office of the Telecommunications Authority of Hongkong SAR. For more details, see http://www.ofta.gov.hk.

3 OWNERSHIP TRENDS

In most countries, telecommunications operators, up until recently, were state-owned and state-operated. From the beginning of the 1980s, however, countries began to sell at least part of their incumbent operators to private, and sometimes foreign, investors or corporations. These developments have had the result of increasing local and foreign private participation in the telecommunications sector in many countries.

On top of this, the growth of new technologies and services such as the Internet, cable television, new broadcasting services and new switching and transmission technologies, has enabled new participants to enter the telecommunications, broadcasting and information markets, also increasing private participation and foreign investments.

The rapid convergence between telecommunications, computing and broadcasting has also had an impact on the way each one of these individual markets operates. The overlap between these markets has been increasing, and the distinction between them has been decreasing. As a result, the ownership profiles of the participants in these markets has been changing towards more integrated companies.

This chapter addresses changing ownership trends and the impact of convergence. The first section of this chapter looks at privatizations in the telecommunications industry. The second section explores the injection of private sector participation in new entrants in the telecommunications, broadcasting and information markets. The third section discusses recent mergers and acquisitions in these markets due to the convergence of products and services.

3.1 The privatization of telecommunications services

Most countries have engaged in the privatization process in order to attract private and foreign investment into their telecommunications sector. In addition to raising funds, most countries have been involved in privatization efforts in order to improve their existing infrastructure, to satisfy unmet demand and to benefit from the rapid introduction of new products and services. Ownership profiles of incumbent operators have changed as a direct outcome of these privatization efforts.

Changes in the ownership of incumbent operators started in the early 1980s with the privatization of British Telecom in the United Kingdom. The momentum increased in the late 1980s and intensified throughout the 1990s. Despite the general increase in privatization initiatives, the privatization process is at different stages in different parts of the world.

In most countries, separation of the post from telecommunication services has been the first step towards privatization. This separation is almost complete in the Americas, the Asia-Pacific and Europe, while 20-30 per cent of the African and Arab countries have yet to carry it out. After this separation, many countries then go on to separate operational and regulatory functions. This often leads to the corporatization of the incumbent. Corporatization is a way of pursuing increased levels of efficiency and productivity in the telecommunications sector without giving up state ownership or control. Although many African and Arab countries have not privatized, they have incorporated their operators.

For a variety of reasons ranging from political to economic including national sovereignty issues, countries employ different methods to privatize their incumbents. Public offerings have been the most popular mode of privatization across all regions of the world. However, most regions have favored mixtures of privatization methods.

Despite the general reluctance to lose state-ownership in their incumbent operators, by 1997 roughly one-third of the countries in the Asia-Pacific region had some private participation in their operators. Since 1997, the percentage of Asian countries that have privatized their operators increased to almost 55 per cent. This figure will increase still further with Bhutan, Nauru, Cambodia and Thailand planning to corporatize and privatize their operators by the end of 2000.

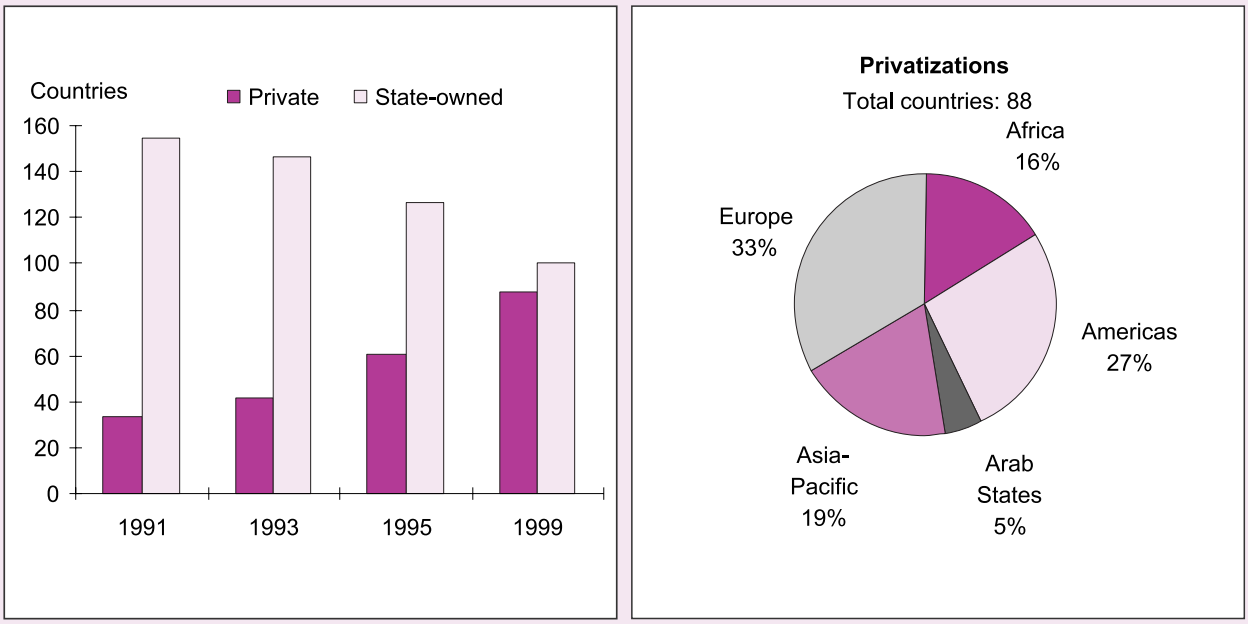
The **Asia-Pacific** region is well known for its use of build-transfer arrangements, management consultancy contracts and joint ventures. These encourage private and foreign private participation in the sector. As a result, large volumes of private capital have flowed into Asia's telecommunication markets and foreign investment in the sector has increased.[1]

In **Europe**, the privatization efforts of the 1990s started when several Central and Eastern European countries either privatized part of their national carriers or created new operators through joint ventures between government and foreign partners (e.g., Armenia and Georgia). These partnerships and privatization efforts increased foreign as well as local private capital involvement in the telecommunications sector. Taking Europe as a whole, of the 53 European ITU member states, 23 partially privatized their operators up to mid 1998. Finland and Poland privatized their incumbent during the second half of 1998. Moldova, Croatia, Albania and the Slovak Republic plan to complete at least partial privatization in 1999.[2] (See Table 3.1.)

Public offerings and sales to strategic partners have been two methods of privatizing in Europe. In most of these cases, only minority shares of the incumbent have been sold.[3] In the last two years, only Armenia took initiatives to privatize more than 80 per cent of its incumbent, while Ireland is the only

Figure 3.1: Privatization of the incumbent

Privatizations from 1991-1999, regional distribution of privatizations 1999



Source: ITU World Telecommunication Regulatory Database.

European country currently in the process of privatizing 100 per cent of its incumbent.[4]

With more than 20 countries that have privatized their incumbents, the **Americas** region has the largest number of fully privatized operators. This region has set the least limitations on private and foreign investment in the telecommunications sector. Brazil is the newest addition to the list, having sold part of its national carrier to foreign investors in 1999. The Bahamas, Honduras and Nicaragua are expected to follow suit in the near future.

African countries have moved quickly in reducing local and foreign private ownership limitations. In recent years, there have been intense efforts to restructure the telecommunications industry to allow local/foreign private investment and to facilitate the development of new services and technologies. As a result, of the 42 African ITU member states, 14 have privatized their operators and another eight have plans to privatize in the near future. Half of those that have privatized have sold majority shares of their operators.

Some of the most recent steps towards privatization in this region, have been taken by Kenya, Central African Republic, Zambia and Uganda (see Table 3.1). The Central African Republic, which has already privatized 40 per cent of its incumbent, is in the process of privatizing another 15 per cent. Uganda, one of the two African countries to license a private second national operator, is currently in the process of privatizing 51 per cent of the first national operator which was corporatized in 1998. Kenya is in the process of privatizing 46 per cent of its already corporatized incumbent. Zambia has just recently started the privatization process and Chad has announced its intention to privatize its national domestic operator.

In Africa, the most popular mode of privatization is the sale of shares to strategic partners. This approach usually entails performance requirements that obligate the private companies to make some investments in order to improve infrastructure and performance. As a result of this open attitude to private and foreign investment, the African telecommunication sector is developing relatively fast.

In contrast, in the **Arab States**, where the telecommunications sector is still dominated by state-owned monopolies, there are presently no fixed-link operators which are 100 per cent privately-owned. In these countries, foreign participation in the incumbent remains minimal. Yet, some of the Arab States are involved in privatization efforts – mainly because of the need for private capital for infrastructure development (see Table 3.1).

3.2 Private ownership of new operators

Many countries have increased private sector participation in their telecommunications sectors by allowing new market entrants which are privately-owned. In general, even countries that are reluctant to privatize their operators have been willing to allow and have even encouraged private sector participation in cellular and other value-added services. Some countries may even authorize new operators and service providers in basic telephony and Internet markets. For these countries, liberalizing these market segments and allowing private sector participation, is an alternative way of attracting foreign investment into the country.

Table 3.1: Anticipated privatizations in Africa, Arab States, and Europe

Plans of selected countries

AFRICA		*ARAB STATES*		*EUROPE*	
Country	***Privatization plans***	***Country***	***Privatization plans***	***Country***	***Privatization plans***
Burundi	Partial privatization by the end of 1999	**Egypt**	In the process of privatizing 20%	**Austria**	In the process of privatizing 25%
Central African Republic	Already privatized 40%, privatizing additional 15%	**Jordan**	In the process of privatizing 26%	**Azerbaijan**	Privatization by 2000
Eritrea	In the process of privatizing additional 45%	**Kuwait**	Preparing for privatization in 2001 through transfer of 25% of the shares to a strategic partner and sale of 51% through a public offering	**Bulgaria**	In the process of privatizing 51%
Kenya	In the process of privatizing 46%	**Mauritania**	Planning partial privatization	**Cyprus**	Privatization by 2000
Madagascar	At least partial privatization by the end of 1999	**Morocco**	Privatization delayed to end of 1999	**Republic of Macedonia**	In the process of privatizing
Niger	Privatization by 2000	**Oman**	Planning corporatization and subsequent privatization	**Kyrgyz Republic**	Privatization in the near future
Mali	Privatization in 2000-2001	**Saudi Arabia**	Corporatized	**Latvia**	Already privatized 49% – international public offerings delayed until 2000[5]
Uganda	In the process of privatizing 51%			**Norway**	In the process of privatizing 49%
Zambia	In the process of privatizing			**Sweden**	In the process of privatizing 49%
				Turkey	49% planned to be privatized by the end of 1999[6]

Source: ITU World Telecommunication Regulatory Database.

3.2.1 The cellular market

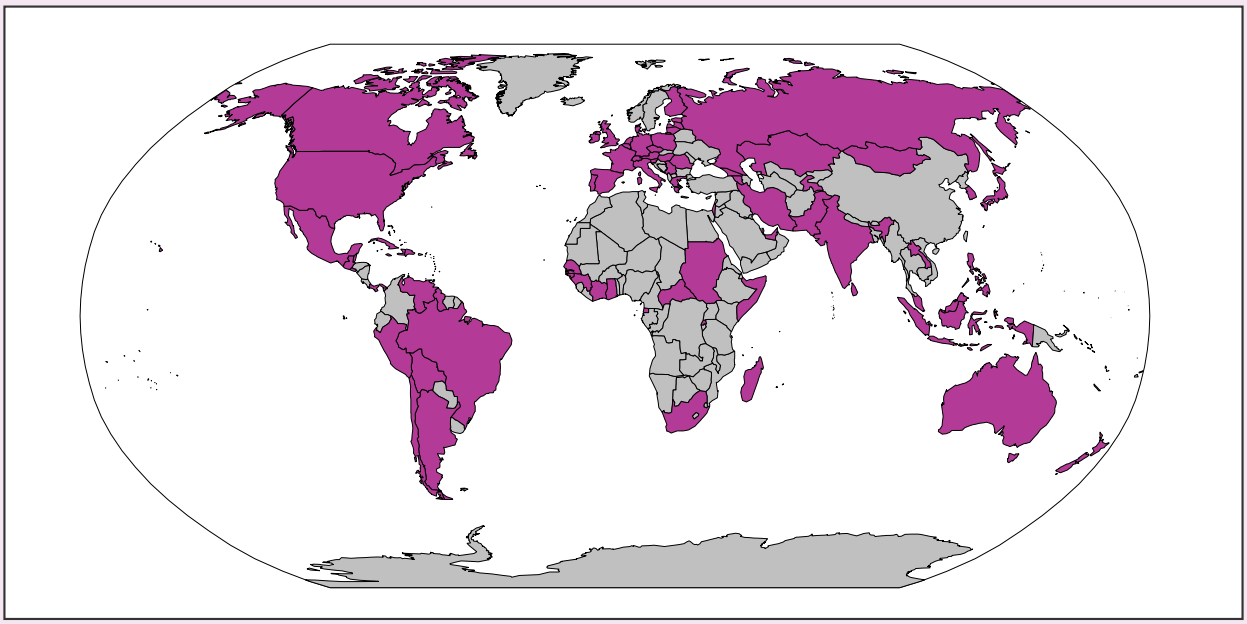
Even in countries that do not allow foreign investment in the fixed line network, there are generally fewer restrictions with respect to foreign ownership in mobile services. As a result, most of the cellular networks around the world are at least partially owned by foreign investors. Recent estimates consider that more than one hundred cellular networks around the world have investments from foreign sources.[7] Some of these foreign investors also provide fixed-line services in their home-country, while others like AirTouch of the United States, and Millicom of Luxembourg primarily focus on overseas wireless investments.

The effects of market liberalization, and the increase in local and foreign investments in certain parts of the telecommunication industry may be noticed in countries with state-owned operators. For example, Norway's incumbent competes with privately-owned Netcom in the GSM mobile market.[8] In Finland, there are approximately 60 local operators (including the incumbent) which are mainly privately-owned. Among these, Telia Finland provides national, international and digital mobile services. Kaukoverkko Ysi Ltd., a Finnet member, provides national long distance services while Finnet International offers international long distance and Radiolinja Oy (owned by Finnet) provides national digital mobile services.

In Germany (as of November 1997), 22 licenses were issued for the provision of PSTN services and 4 licenses for digital cellular mobile services. In Iceland, since May 1998, the incumbent competes with TAL Ltd. in the GSM mobile

Figure 3.2: A world look at privatization

Countries with private incumbent operators, 1999



Note: The dark shading indicates that this country has privatized.
Source: ITU World Telecommunication Regulatory Database.

market. In Israel, Partner Communications Co. was granted a third mobile cellular license. Furthermore, in Brazil, prior to privatization, 4 cellular licenses were granted and 8 more wireless companies have been licensed in 1998. In China, where there is no intention to privatize the incumbent operator, the third licensed private company in cellular services became operational in 1998.

3.2.2 ISPs and the Internet

Licensing of new entrants has been used as a way of increasing private investment in the ISP market in some countries. For example, in India, state-run ISP, VSNL, had a monopoly in Internet services for some years. The government opened up the market to competition and 72 ISP licenses have been issued since November 1998. Among these, 14 have been awarded to private public sector ISPs at the national level, 24 at the state level and an additional 34 on a regional level in small cities and towns. Similarly, in February 1999, Saudi Arabia licensed 37 companies to provide Internet access, although only seven of these companies are currently in operation.

Many other countries, like Malaysia and Singapore, have granted licenses to ISPs. Currently, Singapore has three ISPs. All of these ISPs were licensed in 1995, when Singapore decided to introduce competition into the ISP market. Despite the private status of these ISPs, their performance is monitored by the government, and the operators are fined if they fail to meet government standards.[9] Although, there are some countries with (partially) state-owned ISPs, in general, the ISP market is dominated by private companies.

The Americas, in particular North America, has the most developed ISP market in the world. In the United States and Canada, all ISPs are privately-owned and operated. Some countries, like Paraguay, have mostly local private ISPs while others, like Mexico have both locally-owned and foreign private participation in their ISPs.

After the Americas, Europe is the most developed region of the world with respect to the Internet market. The ownership of ISPs in this region is again dominated by private capital, coming from various segments of the communications industry. Some European countries like Italy have ISPs that are owned and operated by computing firms. In Latvia, state as well as local and foreign private satellite, computing and content companies own ISPs. However, most European ISPs are owned and operated by telecommunication companies.

In most African capitals, the Internet market is developing at a reasonable pace. Twelve African countries, including Benin, Côte d'Ivoire, Ghana, Kenya, Mozambique, Nigeria, Senegal, Tanzania, Togo, Uganda, Zimbabwe and South Africa have particularly active, competitive and mature ISP markets. Central African Republic, Ethiopia, Niger and Seychelles, however, have just one ISP each. Most ISPs in these countries are privately-owned.

In Asia, the ISP market is dominated by private capital. Australia, India, Indonesia, Nepal and New Zealand are among the Asian countries which have mostly privately-owned independent ISPs. The Philippines and Thailand, on the other hand, have partially state-owned and partially private service providers.

3.3 Mergers and acquisitions of service providers

The technological developments underlying digital convergence have enabled many services to be available over different platforms. This has allowed telecommunications companies, for example, to provide ISP services. Similarly, through their cable networks, some broadcasting companies can now provide Internet services. On the other hand, ISPs can provide both telephony and broadcasting services. As a direct result of the technological changes which are facilitating the convergence of services, the ownership of many market participants in telecommunication, broadcasting and information sectors are changing.[10]

To avoid losing market share or to increase their market share in new markets, companies have merged, acquired and formed alliances with other companies. By forming such partnerships, companies have benefited from the established brand name of their partners as well as achieving efficiencies like economies of scale and scope and the reduction of transaction costs.

In general, partnerships through mergers and acquisitions result in lower costs and an increasing traffic for both parties due to merged networks. They also allow companies to sell new services and cut costs by eliminating redundant operations and workers. Another plus is that consumers can have access to a variety of competitively priced services through the same supplier, perhaps more quickly than may have previously been possible.

Due to convergence, there is a "snowballing" effect in the consolidation of markets. In Europe, for example, competition between the telecommunications companies is mostly based on product differentiation. Therefore, while it makes sense for incumbent operators to have their own ISP services (so they do not have to share their revenues with other ISPs), the second-tier operators have to partner with other ISPs in order to challenge the services offered by the incumbent operators. In order to protect their competitive advantage, the incumbent operators with Internet services need to form further alliances, sometimes through mergers and acquisitions, to increase the bundling of services.

This "snowball effect" presented itself with the BT-AT&T joint venture and the entrance of new competitors like Qwest Communications Corp. which offer a new phone standard based on Internet technology. In reaction to these developments, many phone companies have had to re-evaluate their strategies. The link-up between Vodafone Group Plc. and AirTouch Communications Inc. has also led many other European mobile phone companies like Orange Plc. and Sweden's NetCom Systems AB to look for alliances in order to provide the same kind of coverage quickly and less expensively.

The convergence related activities of a few participants in each sector, telecommunications, broadcasting and the computing markets are considered below.

3.3.1 Telecommunications

The intense competition among telecommunications companies is the main driving force behind convergence related activities of these companies. An increase in competition has forced telecommunications companies to lower their prices. To make up for the loss in revenue, many operators have been exploring new and unsaturated markets looking for higher profits. The broadcasting and Internet telephony markets are two markets the traditional telecommunication companies have chosen to enter.

The effects of digital convergence on the telecommunications market can be best shown by looking at the profile of AT&T, the United States long distance phone company, which has been one of the most active telephone companies in the world in terms of expanding its services to new markets.

After the deregulation of the United States telecommunications market in 1996, AT&T formed many alliances and partnerships with companies from the Internet and broadcasting markets. In 1998, AT&T, for example, formed partnerships with Yahoo! Inc. and Lycos Inc., both Internet search companies, to sell phone services online. At the end of 1998, AT&T agreed to buy IBM's global network and completed the purchase of Teleport Communications Group. This allowed AT&T to expand its services further to the Internet market. Recently, AT&T acquired At Home Corp (a cable-TV and Internet access provider) and Tele-Communications Inc. (a United States cable-television company) and agreed to acquire MediaOne. With the approval of its acquisitions of TCI and MediaOne, AT&T will not only be able to provide high-speed Internet and data services, but it will also become the largest cable television operator in the United States.

AT&T's efforts to expand to the Internet market continued with its joint-venture with Unisource Communications Services (AUCS) which launched its Internet Protocol Virtual Private Network (IP VPN) services in June 1999. This joint venture was aimed at providing dedicated IP connections in 15 European countries and the United States. However, AT&T recently decided to drop its joint venture with Unisource in order to form a joint venture with British Telecom.

As a result of the alliances and acquisitions mentioned above, AT&T can now offer local phone services, long distance, Internet voice telephony, high-speed Internet connections, interactive video, high-speed data and cable services nationwide, and some Internet services in Europe. Many other telecommunications companies have expanded their operations into new domains through mergers and acquisitions (see Table 3.2).

Similar developments have also taken place in the telecommunications equipment market. Due to the convergence of services, especially between telecommunications and the Internet, many telecommunications equipment companies are shifting the emphasis onto producing equipment that can facilitate the convergence of services. Due to the increasing saturation of the mobile market, Ericsson has acquired Advanced Computer Communication which makes routers and remote access products. It is also looking into purchasing a number of United States' data networking companies.

3.3.2 Broadcasting

The effects of converging technologies on the broadcasting sector have been different in developed and developing countries. In developing countries, television and radio will still

Table 3.2: Impact of convergence on telecommunications companies

Selected examples

Country	*Company Name*	*Partnerships*
Australia	Optus Communications Pty.	Will acquire Microplex. Offers voice, data and IP products.
France	Cegetel	Owned by British Telecom, SBC Communications Inc of the US and Mannesmann AG. Offers long distance, mobile and business communications and data transmission services.
	France Telecom	Owns 80% of the existing Dutchtone and 100% of Casema. Intends to expand to the Netherlands, with a company called the Dutchtone Group, of which it will hold 86% of the shares. Dutchtone Group will offer mobile and fixed telephone services, Internet access and cable television services.
United States	Ameritech Corp.	Currently being acquired by SBC Communications Inc. Ameritech has stakes in former monopolies of Belgium, Denmark, and Hungary, and investments in wireless, fixed-line phone companies or ISPs elsewhere in Europe. SBC has business in France and Switzerland. Ameritech wants shares in Telenordia which covers Sweden.
United Kingdom	Cable & Wireless	Acquired Internet Network Services group. INS targets the United Kingdom business market. C&W offers Internet access to customers in markets including Hongkong SAR. Offers digital cable television services, which include high-speed Internet access and phone service.
United States & Canada	MCI WorldCom	Formed an alliance with Bell Canada, which allows Bell Canada to exclusively distribute voice and data services of MCI WorldCom in Canada. MCI also acquired OzMail, Australian ISP.
Sweden and Norway	Telia AB and Telenor AS	Will merge and compete in foreign markets. Telia provides services in Asia, Latin America and Africa, holds shares in some fixed line and mobile phone companies in Estonia, Latvia and Lithuania, wants to expand to the Baltic region. Telenor, has an alliance called Telenordia with BT and Tele Danmark A/S.
Italy	Telecom Italia	Owns 20% of Chilean phone company Entel, 50% of Entel Bolivia, 19% of Telecom Argentina, a mobile phone license in the Brazilian state of Bahia, and 29% of Etecsa, Cuba's national phone company. It is also trying to make a deal with AT&T.
Spain	Telefonica SA	Acquired European Telecom International GmbH, Austrian telephone company to provide services in the Czech Republic, Poland, Hungary and Switzerland.
Japan	NTT Communications Corp.	Will buy 33% of Japan Satellite systems to help expand its Internet business overseas.

Source: ITU adapted from Total Telecom.

be important mediums in the near future. In developed countries, Internet broadcasts are slowly replacing traditional broadcasting services.

In North America and in some countries in Europe, the effect of convergence on the broadcasting sector has affected the market shares and audience composition of broadcasting companies. Some studies report that over two-thirds of active Internet users in the United States seek out entertainment content, like sports, movies and TV, music, and games online.[11] In a complementary fashion, others have shown that newspapers, radio and TV broadcasters lose audience (and huge advertising revenues) as more homes turn to the Internet for news, information and other content.[12]

In order to secure market share, traditional broadcasting companies have tried to expand their services to the Internet. In addition, this strategy allows them to increase their revenues through Internet advertising. With this aim in mind, some media companies have formed partnerships with major portals like AOL, Yahoo!, Infoseek and Excite. For instance, Disney, which already owns one of the three major broadcast networks in the US, has purchased a 43 per cent stake in Infoseek and Bertelsmann has formed a US$ 10 million partnership with Lycos to create portals in the main European markets.[13]

Similarly, At Home Corp. (controlled by AT&T) has recently acquired Excite Inc. Although At Home and Excite offer different services, both companies are heavily dependent

Box 3.1: Another way

Not all market players are moving towards geographic and services expansion. The increase in competition due to the availability of services over many alternative platforms has led some companies to concentrate their services on a particular market in certain regions of the world. An example is France's Compagnie Générale de Vidéocommunications. It intends to sell its cable operations in order to concentrate on competing in the telephony market. Similarly, Comcast, a United States' Cable-TV company, is selling its cellular business to SBC in order to concentrate on the cable market. Swisscom, the former Swiss PTO has recently sold its shares in the Indian phone company Sterling Cellular Ltd. and the Malaysian cellular phone company DiGi, in an effort to concentrate its services in Europe. It also going to concentrate on neighbouring European countries, for example, by buying 58% of Debitel AG, the German wireless company.

on advertising revenues for profit.[14] Therefore the acquisition of Excite by At Home is an effort by At Home to increase its advertising revenues by serving both advertisers and the 17 million users of Excite. In addition, this acquisition allows At Home to add portal services (e.g., classified listings, free e-mail, chat and stock quotes) to its high-speed Internet access and cable-TV services. As its revenues and subscriber base keep growing, Excite At Home has been further expanding both into new services and geographic areas. Recently, Excite At Home agreed to buy iMail and has started negotiations with Deutsche Telekom of Germany. Through a possible alliance with Deutsche Telekom, Excite At Home hopes to provide cable and Internet services (over its ally's network) in Europe.[15] However, some other broadcasting companies have reacted very differently to the convergence of markets and services (see Box 3.1).

3.3.3 Computing

Computing companies are also a part of the general convergence trend, which has resulted in consolidation of markets. These companies (both infrastructure and service providers) are directly affected by digital convergence. On the services side, computing services are direct complements to Internet services and are therefore most easily converged with them. And as there is an important need for developed support systems which can facilitate provision of multiple services over the same infrastructure, computer infrastructure and support companies are very important for the convergence of services. Overall, these companies have been actively participating in the consolidation of markets.

In the computing services market, American Online (AOL) has been one of the most active players. AOL is an Internet access provider, which has recently expanded its services through partnerships with companies from complementary markets. In order to add portal services to its access provider, AOL purchased Netscape, which had a browser and NetCenter portal. This acquisition increased AOL's services online, allowing it to offer bundled services and to attract more traffic to its site. Further, AOL has announced plans to form an alliance with Hugh Electronics Corporation to provide digital entertainment and Internet services which will help develop AOL TV (the interactive TV) and AOL Plus (high speed Internet services).

AOL is also trying to increase its geographic presence by offering AOL-branded high-speed Internet access over the American Bell regional operating companies' lines. It has recently formed alliances with Bell Atlantic and SBC, which will enable it to provide high-speed access to the Internet in the US southern and western states. AOL has developed a considerable presence in Europe and is also entering the Latin American Internet market, via AOL Latino america, which is starting up in Brazil by the end of 1999 or early 2000.

Another one of the big computing companies, IBM, is responding to convergence differently. In contrast to those companies whose strategy has been to form partnerships through mergers and acquisitions, IBM has chosen alliances which allow it to collaborate with service and content providers by providing them with the hardware and support systems they need for their services. In 1998, for example, IBM and IDT made an agreement to jointly market Internet telephony services using IDT's Net2Phone software and IBM's Internet access products. IBM has struck a similar agreement with RealNetworks in which the two companies are producing secure standards for supplying music via the Internet.

IBM has formed a 10-year partnership with Telefonica SA, which allows IBM to take over and run Telefonica's computer systems in order to offer data transmission, voice and other enhanced services in Spain and Latin America.

IBM has also recently partnered with Cable & Wireless. This partnership is also based on bundling IBM's software and computer servers with Cable & Wireless's Internet network services. Other recent IBM partnerships include an agreement with Fraser Securities Pte., to develop a system to trade stocks over mobile phones in Singapore. This agreement follows IBM's recent collaboration with Nokia and Sabre Group Holdings Inc. to provide travel-reservation services through mobile phones.

As the markets continue to converge, not only is the distinction between markets and products disappearing, but so are international boundaries. For example, in Asia, an American ISP, PSINet, has become a major player in the ISP market. PSINet has so far acquired ISPs in Japan, Hongkong SAR and South Korea. Other big multinational Internet providers like AfricaOnline/Prodigy, CompuServe, EUnet, UUNet and Global One have entered the ISP market in Africa. AfricaOnline has been the most aggressive among these companies and currently has a presence in Côte d'Ivoire, Ghana, Kenya, Swaziland, Tanzania, Uganda, and Zimbabwe.

3.4 Regulatory reactions to changing ownership trends

Digital convergence continues to lead the consolidation of markets. Telecommunications, cable, satellite and content/ entertainment companies, as well as ISPs, benefit from

consolidation of markets. However, there is no evidence that the consumers will also benefit from this convergence.

Company partnerships do, however, provide customers with bundled services. And although the bundled offers are usually more convenient for customers – since they do not have to deal with multiple suppliers – it is not certain that this arrangement allows customers to benefit from the reduced costs (due to economies of scale and scope) enjoyed by the service providers. These partnerships reduce the number of market participants, and increase the market power of existing companies. This not only reduces competition amongst existing market participants (increasing the prices seen by consumers) but also makes the market entry by newcomers more difficult.

Due to the reduction in the number of market participants as well as the increased scope of their services, companies that form partnerships through mergers and acquisitions may have more market-power. For example, through its acquisition of MCI, WorldCom controls a large share of the United States' (and the world's) data traffic. If the proposed SBC-Ameritech merger goes through, the merged company will control 33 per cent of local telephone access lines in the United States. Governments are becoming increasingly concerned about ensuring fair competition due to the consolidating markets and the rules that govern them. However, the prevention of mergers could result in the loss of efficiencies, such as economies of scale, economies of scope and reductions in transaction costs. In addition, forcing a separation of merging markets and prohibiting services across platforms may inconvenience consumers by forcing them to deal with multiple suppliers. Hence, some countries are taking measures to only prohibit mergers which substantially lessen competition in the market.

For example, in the United Kingdom, the elimination of foreign ownership restrictions in 1990 and the full liberalization of telecommunications services in 1991 allowed cable television operators to provide voice telephony over their networks, and led to many North American telecommunications operators investing in United Kingdom cable networks.[16] In addition, the 1996 Broadcasting Act revoked the previous limitation of 20 per cent cross-ownership between cable television operators and broadcasters, and the 1998 Competition Act rolls back sector specific economic regulation in favour of a more horizontal approach. Instead of controlling the ownership configurations of corporations, the United Kingdom is now trying to control anti-competitive behavior in these markets by implementing a measure called "audience time-share".

In 1997, the EU proposed a directive restricting the incumbent's joint provision of both telecommunications and cable television. However, the directive did not restrict cross ownership of separate legal entities operating telecommunication and cable infrastructures.

In the United States, the Telecommunications Act of 1996 placed limits on local telephone companies and cable television operators serving the same market. Although the act allowed local telephone companies to provide cable television services in the same area, it did not allow telephone and cable companies to have joint ventures or to acquire ownership or to have more than 10 per cent of financial or management interests in each other. Similar acts have been prepared in many other countries such as Malaysia. In Austria, Belgium, France, Hungary, Japan, Korea, for example, cable television operators have limited ownership rights in the broadcasting industry.[17]

Many governments are concerned with the developments related to convergence. In these countries, there are still some ownership restrictions on cross-market participants. However, these restrictions have so far not stopped cross-market partnerships. And, with the continued rise of converging services and technologies, mergers and acquisitions among suppliers from different markets are expected to continue.

3.5 Conclusion

In general, in all regions of the world, the number of privatized incumbents and the amount of foreign investment in the telecommunications industry have been increasing and will continue to increase in the future. Privatization developments have allowed countries to increase private investment in their telecommunications sectors and to benefit more easily from the rapid introduction of new technologies and services into their markets.

With the technological developments that have brought about convergence of service providers of telecommunications, broadcasting and information services providers are now expanding into each other's markets. The service overlaps within these different markets are increasing and strategic partnerships among the participants of these markets have become more common. Despite the concerns of governments about ongoing partnerships, as the technological developments continue, the partnerships among market participants will continue as well.

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1 International Telecommunication Union (ITU). *General Trends in Telecommunications Reform. World. Volume I*. Geneva: ITU, 1998.

2 International Telecommunication Union (ITU). *General Trends in Telecommunications Reform. World. Volume I*. Geneva: ITU, 1998.

3 Some exceptions to this are Portugal (75% in 1995), Estonia (72%) and Hungary (97%).

4 The Irish government is selling its complete share of 50.9% to Irish retail investors and to international institutional investors through a public offering. Denmark, Spain and the United Kingdom are the only European countries that have privatized 100 per cent of their incumbents.

5 See http://www.regulate.com/references/latvia.asp.

6 Turkey plans to privatize its incumbent by selling 20% to a strategic partner, 14% through an international public offering, 5% to employees and granting 10% to the post. 51% will remain state-owned.

7 Organization for Economic Co-operation and Development (OECD). *Cross-Ownership and Convergence: Policy Issues* OECD, 1998.

8 Netcom is owned by Sweden's Kinnevik, United States' Ameritech, Singapore Telecom and local Orkla.

9 International Telecommunication Union (ITU). World Telecommunication Development Report: Trade in Telecommunications. 3rd Edition 1996/97. Geneva: ITU, 1997.

[10] Most of the information in this section is drawn from news provided in Total Telecom, http://www.totaltele.com.

[11] NUA Internet Surveys Analysis presents the results of a study conducted by Cyberdialogue at http://www.nua.ie/surveys/analysis/weekly_editorial/archives/issue1no13.html.

[12] The study conducted by the Yankee Group is presented by the NUA Internet Surveys Analysis at http://www.nua.ie/surveys.

[13] International Telecommunications Union (ITU). Challenges to the Network: Internet for Development. Geneva: ITU, 1999.

[14] @Home offers Internet access for cable-TV subscribers. Excite offers a network of free Web sites that provide news, classified listings, free e-mail, chat, stock quotes and other services.

[15] According to John O'Farrell, Excite At Home vice president, Excite@Home is looking more to Europe and is willing to enter any countries where it sees potential. Reynolds, Kevin et al. "At Home to Acquire Excite for $ 6.7 Billion in Stock". See http://www.totaltele.com/.

[16] Organization for Economic Co-operation and Development (OECD). *Cross-Ownership and Convergence: Policy Issues*. OECD, 1998.

[17] For example, in Belgium, the cable television operators are not allowed to own more than 24 per cent of a television broadcaster. They are also not allowed to take part in the management of the broadcaster. See Organization for Economic Co-operation and Development (OECD). *Cross-Ownership and Convergence: Policy Issues*. OECD, 1998.

4 LICENSING

4.1 Introduction

There are a wide variety of issues surrounding the licensing for telecommunications facilities and services. The identification of service and facility categories, the selection and application of various vehicles of authorization (e.g., individual licenses, class licenses, concession contracts, permits, registrations, etc.) and the determination of spectrum allocation and assignment mechanisms all require careful consideration. The coordination among various governmental authorities with shared or overlapping jurisdiction, the establishment of licensee qualification standards, the development of license application processing procedures, the setting of license fees and license terms and establishing mechanisms for monitoring and enforcing license conditions are not even all of the further issues that need to be addressed.

Licensing schemes vary, but it is true to say that the licensing scheme established in any particular country is integrally related to the nature and status of liberalization in that country. The inherited structure of the telecommunications industry, social and political priorities and, in some cases, the dictates of regional frameworks also affect the country's licensing scheme. Consequently, there are virtually as many different approaches to licensing as there are countries.

It is not possible in the space permitted here to provide a comprehensive summary of all of the facets of the licensing process as it is evolving around the world. Rather, this chapter identifies the broad contours of current trends and future issues in the licensing of telecommunications facilities and services while providing illustrative examples of actual practices in both developed and developing countries.

Firstly, the essential issues facing licensing authorities in liberalized markets are reviewed. Secondly, predominant models of licensing frameworks are identified. Thirdly, the sources and significance of the profound diversity in current licensing approaches are examined, with reference to case studies of the varying degrees of regional cohesiveness in Europe, Latin America and Africa. Finally, the emerging global challenges to licensing of convergence and cyberspace are explored.

4.2 Licensing in newly liberalized markets

The increasing liberalization of telecommunications markets has required regulatory authorities to devise new licensing and authorization regimes for the telecommunications sector. Previously, a PTT or national carrier may have been operating according to a specialized statute or concession agreement. Typically, such arrangements presumed that the national carrier was a natural monopoly fully occupying the market both vertically and horizontally. Moreover, virtually all of the national carrier's activities could be, and usually were, considered to be public services, or services affected with the public interest, requiring significant governmental participation or oversight. The opening of markets to private industry participation and the admission of multiple carriers pose several challenges to these traditional notions. Predominant concerns affecting licensing decisions in liberalized markets are summarized below.

4.2.1 Accepting the demise of the natural monopoly theory and managing competition

It is now widely agreed that, subject to various adjustments and safeguards, virtually every segment of the telecommunications industry can accept multiple players, including basic voice telephony. To the extent that governmental control and monitoring is considered desirable, licensing regimes must accommodate, if not facilitate, the participation of multiple facilities operators and service providers.

An immediate question that must be faced is how much competition should be allowed in each telecommunications market? A few countries, notably New Zealand, Taiwan and Chile, have thrown open their doors to unlimited competitive entry in basic as well as value added services. Some have viewed the tariff wars, profit losses, inter-carrier conflict and market consolidation experienced in those countries as evidence that consumers will benefit from more managed competition, particularly in basic voice telephony. Consequently, other countries, such as Argentina and Colombia, have deliberately limited the number of new entrants through the controlled licensing of certain basic services, in an effort to better manage the transition from state monopoly to competition. The European framework disfavors such limitations, although it recognizes that in some cases such limits may be justified on a temporary basis for transitional purposes.

In addition to, or even in place of, such overt controls, indirect control over entry in particular services may be exercised through such means as licensee qualifications (including foreign ownership limits), high license fees, burdensome infrastructure build-out requirements, extremely high interconnection charges, limited license terms and failure to license resale operations. In many cases, such approaches may be taken for deliberate reasons, such as to discourage entry by unqualified entities or to try to promote network development. Unfortunately, there is no set or best approach to this issue. In fact, the responses to the annual ITU regulatory survey demonstrate that practices on such issues as license fees and license terms vary so widely that generalizations are virtually impossible.[1] Each country confronts unique circumstances, and approaches these administrative issues in a singular way.

However, negative consequences may result from approaches which impose greater barriers to entry than intended or than are necessary to manage competition for consumer benefits. In particular, desired competitive entry may be stifled unintentionally. This has been the case in India, for example, largely as a result of high license fees. Every administration must attempt to find its own balance so that social and telecommunications policy objectives can be achieved.

An important consideration in many countries is the allocation of the responsibility for licensing among different government authorities. Often technical licensing decisions, particularly those concerning new services, involve the adaptation of, or establishment of, new market competition policies. They may also increasingly involve frequency allocations or assignments. In the United States, competition policies, licensing, enforcement and spectrum allocation decisions are handled by a single agency.

Brazil's new regulator, ANATEL, (excluding radio and television broadcast matters) enjoys a similar concentration of policy, licensing, enforcement and frequency assignment powers. This is fairly unique. In most other countries, different responsibilities are divided among two or more government authorities. Even in the United Kingdom, policies and licensing are handled by the Department of Trade and Industry, technical rules and enforcement are the province of OFTEL and frequency assignments are made by the Radiocommunications Agency. In the telecommunications sector, which is characterized by incessant change and technology convergence, effective implementation of social policy through a licensing regime will require close coordination among all decision makers.

4.2.2 Preventing abuses of market power

Because telecommunications monopolies are no longer considered natural, concentration, market dominance and abuse of market power are significant concerns. Licensing frameworks that differentiate operators with market power from those without such power may help to prevent and contain abuses of market power. Market power may be derived from market share or control of such essential assets as bottleneck or gateway facilities, proprietary standards or technology, or data such as customer information or control of number databases.

In most countries there is still one or more well-established incumbent operator, which may or may not yet be privatized. Even as competition is introduced, these operators are typically required to bear the special responsibility of the carrier of last resort. In light of this, as well as the incumbent's existing market advantages, authorities must anticipate that the incumbent carrier will have a natural incentive, and most likely the ability, to protect itself against loss of revenue and/or market share through such techniques as controlling the price and technical terms of interconnection, as well as by shifting costs between regulated and unregulated operations.

A special license category may be employed for operators of non competitive services, such as Panama. Special dominant carrier license conditions have been applied in the United States and Mexico and are required under the European framework for operators with "Significant Market Power". It is most likely that these conditions may be a requirement in many countries, at least for a transitional period, to ensure fair competition. If such protections are not in place, as has been the experience in New Zealand where licensing was eliminated, clear antitrust principles must be effectively enforced.

4.2.3 Addressing new technologies

Licensing categories, procedures and techniques must not only be flexible enough to accommodate new technologies, but also should be designed to avoid unnecessary impediments to their implementation. This is especially true with respect to new uses of radio frequency spectrum. Increasingly, countries are engaged in global contests for influence over spectrum allocations to ensure access to new services and to gain market advantages for domestic enterprises that are developing and deploying new technologies.

Some countries, such as the United States, prefer to let the market dictate customer preferences for superior technologies. Others, including European countries, have traditionally preferred the efficiencies of standards planning. Although both approaches have their advantages, it is true that delays caused by uncertain technical standards, competing industry interests, ponderous administrative procedures or inadequate regulatory resources can be very disadvantageous.

An example is the licensing of third-generation mobile communications (3G), also known in Europe as the Universal Mobile Telecommunications System (UMTS). This is a broadband wireless service that will provide high-speed Internet access and other multimedia services to mobile users. It is expected to be the next generation of wireless services around the globe.

Various countries have been racing to be the first to establish a significant 3G market presence. Finland is the first and only country to date to award national 3G licenses. The licenses have a duration of 20 years. Japan, which has been working with Europe towards a 3G standard, is expected to begin awarding licenses for the new service next year. The EU has set January 1, 2002 as the deadline for all member states to have UMTS services in operation.

In other cases, the licensing of a new service may involve more than frequency allocations and technical standards. It may involve a confusing array of issues concerning the rights and obligations of operators that many new regulatory authorities are ill-equipped to sort through. An example of this is Global Mobile Personal Communication by Satellite (GMPCS).

In recognition of the international complexities of the issues raised by this new service and the widespread concern among new regulators, particularly among developing countries, of the lack of resources to apply to the issue, the ITU undertook an effort to establish common principles that could guide local regulators in establishing domestic rules and provide a coordinated international approach to the regulation of GMPCS services. This initiative was important both to developing countries, especially in the Middle East and Africa,

that wanted to participate in the new markets without undue delay, as well as to members of the industry who must rely upon certain global commonalties in licensing for worldwide implementation of their systems.

4.2.4 Promoting network expansion

The promotion of efficient and effective infrastructure expansion is a primary objective of telecommunications liberalization in most countries. The licensing process provides an essential vehicle for implementing national policies and priorities with respect to network development.

Licenses for different types of operations and services may be categorized, targeted, limited, expanded, conditioned, burdened, taxed or withheld in a wide variety of ways to facilitate achievement of a desired result. Viewed from another perspective, any licensing regime will inevitably affect the way the telecommunications industry in any particular country evolves.

A licensing regime should be reviewed from time to time to ensure that it is not causing unintended or undesirable results, such as the exclusion of valued market participants, the discouragement of investment, the inefficient deployment of old technologies or the stifling of new technologies.

4.2.5 Ensuring access to scarce resources and/or public assets

Licensing serves as a means of allocating and ensuring access by qualified operators to such scarce resources as radio frequency spectrum, public rights of way, numbers and public network interconnection. Typically, licenses identify the particular rights and obligations of entities authorized to exploit public resources or assets, and facilitate the identification of users as well as the monitoring and enforcement of compliance by users with applicable rules.

Licenses also may provide for the return of public resources or assets to the public (via reversion to government ownership or control) at predetermined times, when a higher priority public interest such as national security is at stake, or when commercial exploitation ceases. A detailed discussion of the policy and licensing issues associated with such matters is beyond the scope of this chapter. However, it must be noted that the means employed for assigning or ensuring access to public resources and assets have significant implications for the efficiency of the use of the assets, as well as for the promotion of technology-neutral policies and the maintenance of a level playing field among competitors. Some comments on two of the more critical market entry issues, spectrum and rights of way, are presented below.

4.2.5.1 Frequency spectrum assignments

Some of the techniques that have been used for frequency assignments include direct assignment, comparative selection based upon applicant qualifications and/or technical proposals, lotteries, sealed bids, sequential auctions, and class licenses. The suitability of any particular technique is largely a function of the availability of the frequencies relative to the number of potential licensees. There are no perfect choices, however.

The United States experience, including the use of either comparative proceedings or lotteries for frequency assignments in commercial mobile services (e.g., cellular, PCS, paging, etc.), seems to encourage new entry and can help diversify an industry. But it can also involve significant delays and can create incentives for fraud.

Spectrum auctions help avoid fraud and recapture the value of licensed spectrum for the public through the payment of auction fees to the government. However, auctions also can involve delays, result in further concentration of ownership among those already wealthy enough to bid, lead to the failure of companies that bid too aggressively, impose higher cost burdens on the ultimate consumer and create insurmountable barriers to entry for global systems that face auctions in multiple jurisdictions.

Further, to the extent that national budgets come to be based upon anticipated levels of auction receipts, the development and implementation of telecommunications policies may be unduly influenced by prospects for revenue generation. Administrative licensing decisions based upon the desire to maximize treasury revenues will not always result in the same level of overall consumer welfare as those based solely upon public interest considerations. For example, certain frequencies reserved for auction may not be available for allocation for some applications, such as public safety services, which might be best able to use them (but cannot pay for them). Licensing authorities must attempt to balance these factors according to national priorities.

4.2.5.2 Access to rights of way

Particularly in countries whose licensing policies generally promote or demand infrastructure build out, ensuring access to public rights of way, including along roads, railways and even waterways, is critical. In Europe, the regional framework requires that each country's telecommunications license entitle their holders to access to rights of way.

Different countries have opted for different solutions. As a result, the EC has reported that operators in some countries, including Belgium, Spain, Germany, France and Italy have had problems obtaining approvals for access to public land from local authorities. Operators, dealing with private landowners, have had difficulties in Austria and the United Kingdom. Also, in Ireland, Spain and the Netherlands, it seems new entrants may not have been placed on the same footing as incumbent operators, utilities or other licensees.[2]

The South African Development Community (SADC), in its Model Telecommunications Bill,[3] also provides for a standard framework regarding licensee access to both public and private property. That framework outlines the factors that public authorities need to take into account in reviewing applications to use public property (e.g., economic use, security, public safety, aesthetics and compliance with laws). Approval may not be unreasonably denied. Further, where approval may not be obtained or conditions are onerous, appeal may be made to the telecommunications regulator for a final decision binding on the other public authority. The SADC Model Telecom-

munications Bill also allows telecommunications licensees to apply for access to private property (by way of the relevant authority), or if necessary to the telecommunications regulatory authority, for acquisition of rights under expropriation laws.

It may not always be possible under national laws to ensure recourse to the telecommunications regulatory authority as the ultimate decision maker on such matters. However, the establishment of clear standards and the identification of a specific path for appeal will be very important in protecting licensees against balkanized right of way access rules that could prevent a licensed facility or operation from actually being implemented.

4.2.6 Contents and enforcement

Licenses vary across a full spectrum of complexity. On one end of the scale, licenses may serve as a primary regulatory instrument, such as the original statute-like license granted to the privatized British Telecom in 1984 or the exhaustively detailed concession contracts typically entered into in Latin American countries, such as Argentina, Mexico and Venezuela, upon the privatization of their national telephone companies. On the other end of the scale, licenses may serve merely as administrative vehicles to compensate for the effects of regulations. There are also variations in between.

There are no standard guidelines on this issue. Generally, however, the trend seems to be moving away from using licenses as comprehensive and self-contained regulatory instruments and toward reliance on licenses that rely to the greatest extent possible on rules and regulations, even though they may be modified in the future, applicable to all similarly situated licensees. This approach facilitates efficient adaptation to new circumstances, incremental streamlining of regulatory requirements, non-discriminatory treatment of licensees, effective enforcement and transparent decision making. As needed, individually granted licenses still may contain unique provisions or conditions pertinent to a particular carrier.

4.3 Licensing models

The license models that are currently proliferating around the world, are generally built around central notions of the public interest. Different countries, each with their own industry structures, levels of service, costs of improvement and social objectives, use service categories and licensing requirements – along with other regulatory tools such as tariff and interconnection controls – to address their own particular public interest concerns.

There are three themes underlying individual country licensing regimes: (1) ensuring the availability of public services, (2) promoting the expansion of telecommunications infrastructure, and (3) controlling competitive entry and/or anti competitive conduct. These themes are not mutually exclusive. All three are usually addressed within a country's licensing scheme. Nonetheless, these themes provide a useful way of grouping the diverse approaches to licensing that have been evolving around the globe. This section describes each of these broad themes and summarizes examples of how they have actually been implemented in different countries.

4.3.1 Licensing public versus private services

Certain telecommunications services, particularly voice telephony, have been considered to be a public good. This notion is manifested in many common law jurisdictions in the concept that certain telecommunications services are affected with the public interest, and that private sector providers are obliged to make such services available on the basis of reasonable and non-discriminatory terms and conditions. In such systems, licenses impose constraints on the conduct of private sector enterprises to ensure that they act reasonably and fairly as common carriers to all customers in the provision of such services. Non-common carriers, may not require licenses because the interests they serve are private rather than public.

Civil law jurisdictions, particularly Latin American countries with administrative approaches firmly grounded in European legal principles, have the similar but slightly different notion that telecommunications services themselves may be public services which the public rightfully can expect the government to guarantee. In such countries, licenses generally have taken the form of detailed concession contracts under which the rights and obligations for the provision of such public services are allocated between the government and the chosen private enterprise. Telecommunications services which are not public services, and are not normally guaranteed by the government, may be subject to less formal and exacting administrative grants of authority, or may be exempt from licensing altogether. Countries that have taken this approach have tried to create a demarcation between public and non-public services, leaving little room for carrier self-selection or gradation.

This type of license framework requires that distinctions be maintained between licensing categories according to a general scheme that reflects apparent differences in how services are provided. However, concepts such as common carrier services and public services are difficult to maintain in a dynamic industry.

In the United States, the designation of a service as a common carrier service may have less to do with the intrinsic nature of the offering (e.g., voice versus data) and more to do with the way in which it is provided (i.e., on a non-discriminatory versus an individually negotiated basis). Common carrier services, which are subject to regulation, are supposed to be characterized by an indiscriminate holding out to the public.[4] However, this category also may include offerings carefully tailored to address new customer requirements, as long as the service provider theoretically makes the same options available to anyone.

Although, basic residential and most business voice telephony services may be uniformly as common carrier services, providers of other services, including private lines, network capacity and various satellite services, may essentially self-select non-common carrier status[5] unless there is some compelling public interest reason for common carrier regulation. The essential feature of a non-common carrier service, which is not regulated, is that the provider engages in individualized dealings with particular customers. Individualized dealings that reflect relatively minor distinctions, however, may look just like common carrier services.

Table 4.1: Examples of services or operator-based licensing frameworks

Country	*Service (or Operator) Category*	*Authorization (Federal Only)*
Brazil	1. Public services (applies only to privatized former Telebrás entities) 2. Private services (all other telecom a. Serving collective interests b. Serving private interests (1) Specialized limited services (e.g., CUGs) (i) Circuit services (ii) Network services (2) Specialized private services (i.e., intra-corporate) 3. Value added services	1. Concession (initial term of 20 years; awarded by public bid) 2. Authorization (awarded directly except for frequencies which are by public bid) (1) Specialized limited: (10 years) (2) Specialized private: (unspecified) 3. None
Korea	1. General service providers (basic telephony and voice) 2. Special service providers (e.g., cellular, paging) 3. Value added service providers	1. Approval from the Minister of Information and Communication 2. Registration with the Minister of Information and Communication 3. Report to the Minister of Information and Communication
Peru	1. Carrier services (provision of capacity for final services, broadcasting and value added services) 2. Final services (fixed and mobile service to users) 3. Private services of public interest (e.g., broadcasting) 4. Private services 5. Value added services 6. Spectrum (for any service)	1. Concession (20 years) 2. Concession (20 years) 3. Concession (20 years) 4. Authorization 5. Authorization 6. Separate licensing process
Philippines	1. Local exchange operator 2. Inter-exchange carrier 3. International carrier 4. Mobile radio services 5. Radio paging service 6. Value-added-Service provider	1. Congressional Franchise and Commission-issued Certificate of Public Convenience & Necessity (CPCN) 2. Franchise and CPCN 3. Franchise and CPCN, plus required installation of 300,000 local lines in 3 years 4. Franchise and CPCN, plus required installation of 400,000 local lines in 3 years. 5. Franchise and CPCN 6. a. Non facilities-based: None b. Facilities-based: Franchise and CPCN
USA	1. Basic (common carrier voice or data) services 2. Non common carrier services 3. Commercial mobile radio services 4. Enhanced services	1. Section 214 Authorization and radio license (if applicable) a. Domestic: no individual authorization required b. International: (global facilities based or resale) 2. None (except for radio license or submarine cable landing license) 3. License (by auction) 4. None

Source: A. Pisciotta and ITU.

Operating under an enabling statute, the Communications Act of 1934, as amended, which codified the common law concept of common carrier for the purposes of telecommunications regulation, the United States Federal Communications Commission (FCC) has had to exercise the limits of its creativity to maintain a rational demarcation point between services that fall under regulation and those that do not. The difficulty of making this distinction is aptly illustrated by the now commonplace phenomena of (1) facilities owned by common carriers but operated on a non-common carrier basis[6], and (2) facilities owned and operated by private or non-common carriers with the entire capacity sold on a non-common carrier basis to customers, who may include common carriers.[7]

Distinctions evolving in the civil law-based Latin American countries between public and private services are also facing challenges. For example, in Mexico a telecommunications service (voice or data) that is provided to even a single third party qualifies as a public service requiring a concession. Only truly intra-corporate networks may be deemed private. This approach imposes a constraint on service flexibility and innovation. For example, the provision of service to closed user groups requires a full concession. In contrast, under Brazil's more complex regulatory framework, only the operations of the privatized former state-owned companies are deemed public. All other services are more lightly regulated under a private regime. Some private services may serve collective interests, while others may serve restricted (e.g., closed user group or intra-corporate) interests.

Thus, the use of a licensing system to assure the public availability of certain telecommunications services inevitably requires one of two opposite approaches. On one extreme, the government may embrace market innovation and accept the significant administrative burden of continuously adapting and reinterpreting its regulatory framework to keep pace with it. At the other extreme, the government may forego the benefits of service and market innovation by maintaining an unyielding framework for the sake of clarity and simplicity.

4.3.2 Licensing facilities and promoting infrastructure investment

A separate theme in licensing regimes, sometimes used in combination with the public service theme, is that the individual authorization and regulation of facilities can be used to promote infrastructure investments. This is a critical issue in most developing countries, which on average have low teledensity and require substantial infrastructure investment and improvements just to support minimally acceptable levels of voice telephony penetration and quality.

The recognition that public resources may be inadequate to support the massive infrastructure investment required, has provided a critical incentive to some developing countries to open their telecommunications markets to private sector investment. This has led to innovative approaches aimed at attracting private investment while maintaining the existing industry structure, including state monopolies.[8] In these countries, contractual arrangements may be used as surrogates for licenses or as transitional measures in markets not yet officially open to competition. Examples of these arrangements and selected countries that have used them are summarized in Table 4.2.[9] Some countries, such as Lebanon, have discovered that these arrangements may outgrow their usefulness, particularly in the development of competitive services such as cellular telephony.

These arrangements can be used for a wide variety of facilities and services ranging from major terrestrial network facilities including terrestrial and undersea fiber cables, to specialized satellite services including VSAT networks. They have also been used for a variety of mobile services including cellular telephony and paging as well as value added and ancillary services, including data and security and alarm services. These schemes, such as Build-Operate-Transfer (BOT) and Build-Operate-Own (BOO) have been used widely in Asia. BOT and BOO have been used in Indonesia while the Build-Transfer-Operate (BTO) arrangement has been favoured in Thailand. Vietnam uses a form of joint venture arrangement. Ultimately, a more conventional licensing scheme may be eventually required to permit operators to avoid artificial limitations of government central planning and to expand, develop and modify their systems in response to market demands.[10]

The issue of infrastructure investment, however, is not restricted to developing countries. In the age of the Internet and spiralling digital capacity requirements, the adequacy of infrastructure is a serious concern in every administration. The use of licensing to ensure infrastructure investment is not without difficulty. It is becoming increasingly popular for regulators to make the installation and operation of telecommunications transmission facilities a condition of obtaining the license. In Europe, for example, several countries require an individual license for the installation and operation of infrastructure, variously identified as public networks (e.g., Belgium, France, Italy, Portugal and Spain), infrastructure or transmission lines (e.g., Germany, Greece and The Netherlands), fixed networks combined with voice services (e.g., Italy and Luxembourg), and mobile voice networks (e.g., Denmark and Finland). Such license conditions may be exclusive, particularly when a large initial infrastructure investment is required.

Facilities licensing regimes based upon the types of services provided over the facilities have the same problems as mentioned above. It may be difficult to distinguish between service categories in the face of market innovations. This problem is exacerbated in cases where the relationship between a facility and the service provided over it is attenuated, as it is when resale and/or value added services are involved.

For example, a single fiber and conduit facility may be utilized by different enterprises. Each enterprise may have an ownership interest in, or exercise some form of control over the facility utilized. For example: (1) the sale of dark fiber, (2) the sale of wholesale capacity (with the addition of electronics), (3) the lease or provisioning of retail services (including voice, video or data), (4) the provision of virtual private network (VPN), closed user group or managed bandwidth services (with

Table 4.2: Infrastructure investment incentive arrangements

Type of Arrangement	*Description*	*Illustrative Countries*
BOT: (Build-Operate-Transfer)	A private company finances the construction of a new facility and then continues to own and operate it for a period of time to recover its investment, sharing a portion of the revenues with the government. At the end of the term of the arrangement (e.g., 10 years), ownership of the facility is transferred to the national operator. Indonesia also has used a variation of the BOT called a Joint Operating Scheme (JOS) under which the private company operates the project on behalf of a state-owned operator, during the term of the arrangement (e.g., 15 years).	**Indonesia India Lebanon**
BTO: (Build-Transfer-Operate)	A private company finances and builds a project (typically a line expansion project in a particular geographic area) and transfers ownership to the state immediately after construction is completed. The private company is then authorized, generally pursuant to a concession agreement, to operate the facility for a period of years (e.g., 25 years) while sharing revenues with the government or state company. The state company technically retains control over the facility and remains ultimately responsible for the provision of the service.	**Thailand Philippines**
BOO: (Build-Operate-Own)	A private operator enters into a relatively permanent joint venture with a state-owned company to install and operate a new facility pursuant to a license or concession. There is no transfer of assets at the end of the term.	**Indonesia Malaysia Solomon Islands**
BCC: (Business Cooperation Contract)	A private company enters into a cooperative enterprise with a state company under which operational and/or product responsibilities are allocated and revenues are shared, but an actual joint venture is not established.	**Vietnam**
Revenue sharing	A private enterprise invests in national operator or in a project and receives a share of revenues in return.	**Indonesia**
Service Agreement	Private companies enter into exploratory arrangements that may involve financing of infrastructure or services but do not constitute foreign ownership or operation of infrastructure.	**People's Republic of China**

Source: ITU.

the addition of administrative services), (5) the provision of various types of digital transmission (with the addition of packet-switching, ATM and/or IP protocol conversion, compression and switching equipment), and (6) value added services (with the addition of software). With such layering it becomes extremely difficult to maintain a clear rule concerning the circumstances under which a facilities license should be required.

It is also difficult to maintain sustainable distinctions based solely upon the physical characteristics of certain facilities. Fixed and mobile networks are now largely substitutable. Any notion of infrastructure licensing which tends to create regulatory advantages or disadvantages for different technologies introduces market distortions. This will become more critical as digitalization becomes pervasive and networks become more substitutable as well as more distributed and stratified.

Under the traditional model, telecommunications infrastructure is a discrete, vertically integrated facility interconnected by two carriers end to end. In the future, it may be difficult to find physical boundaries between interconnected network facilities or to identify individual entities responsible for particular infrastructure segments. In the digital age, networks will be established over physical transmission systems operated and controlled by software and operating systems that may be located in different jurisdictions and owned by entirely separate enterprises. In that case, licensing a particular physical identifying segment of infrastructure may not be possible or meaningful.

Most fundamentally, to the extent that facilities-based licensing regimes are intended to promote infrastructure investment, it is not at all clear that they are most effective in doing so. In the Philippines, licenses for international gateways and domestic services including cellular telephony depend on the installation of exchange lines in unserved parts of the country.

Mexico has taken the approach that it will make competitive licenses available only for facilities based entrants. Although the Mexican 1995 Federal Telecommunications Law authorizes resale, the Mexican regulatory authority has declined

Table 4.3: Examples of facilities-based and hybrid licensing frameworks

Country	*Facility and/or service*	*Authorization*
Hongkong SAR	1. Fixed telecom network 2. Value added services 3. Mobile radio 4. VSAT (intracorporate)	1. Fixed Telecom Network License (FTNS) 2. Public non-exclusive telecom service license (PNETS) 3. Public Radiocommunication Service (PRS) License 4. Self-Provided External Telecom System (SPETS) License
Japan	1. Type I (installing and providing telecom. circuit facilities) 2. Type II (providing services using circuit facilities leased from a Type I carrier) a. Special Type II (large network capacity for many unspecified users or facilities for international communications) b. General Type II (all other Type II)	1. License 2. a. Registration b. Notification
Malaysia	1. Network Facilities Provider (any satellite earth station, broadband fiber optic cable, communications line and exchange, radiocommunications transmission equipment, mobile communications base station, broadcasting tower or equipment) 2. Network Service Provider (carrying communications by means of guided and/or unguided electromagnetic radiation) 3. Applications Service Provider (any voice service, data service, content-based service, or any service provided in connection with electronic commerce or any other transaction or transmission service) 4. Content Applications Service Provider (any traditional broadcasting service, or any on-line publishing or information service)	1. Individual or class license 2. Individual or class license 3. Individual or class license 4. Individual or class license
Mexico	1. Public networks (service to any 3rd party) 2. Resale 3. Mobile radio 4. Private network (intracorporate) 5. Value added	1. Concession (49 per cent foreign maximum; up to 50 years) 2. Permit (no foreign limit) 3. Concession (49 per cent foreign maximum) 4. Permit (no foreign limit) 5. Registration

Source: A. Pisciotta and ITU.

to adopt regulations governing the issuance of resale licenses. In fact, no resale permits have yet been granted. Therefore, companies wishing to enter the Mexican market for the competitive provision of public telecommunications services must obtain a concession, which carries the obligation to make a certain level of investment in infrastructure. This approach reflects the view that the imposition of infrastructure investment obligations will best ensure the extension of the public network to underserved areas.

In fact, however, initial infrastructure investment by competitive long distance carriers tends to be in high capacity fiber links between urban areas. If given a choice, remote rural and high cost areas typically are the last areas served by such carriers. Mandatory infrastructure investment policies also may fail to attract alternative technologies and niche service providers, both of which provide critical linkages in a nationwide network. Moreover, the demand for infrastructure first does not acknowledge the significant advantages of authorizing resale. Resale opportunities permit more carriers to enter the market on a cost-efficient basis. Once resale carriers have established a loyal customer base, they have the incentive to invest in their own facilities to gain higher margins. Over time, this approach may produce a more diversified market and more efficient deployment of appropriate technologies.

Table 4.4: Examples of market structure-based licensing frameworks

Country	*Service*	*Authorization*
Hungary	1. Non-competitive public services, e.g.: Basic voice telephony, mobile telephony, nationwide paging, and Radio & TV broadcast 2. Competitive public services 3. Non-public services	1. Concession (MATÁV has exclusivity in long distance and international services and in several local markets until 2002) 2. License 3. Registration
Panama	1. Services not subject to competition, e.g., basic telecommunications, public and semi public payphone, leased dedicated voice circuits, PCS, and mobile cellular (bands A&B) 2. Services subject to competition, e.g.: Digital data transmission, digital switched data, resale, VSAT, Internet access, fixed and mobile radio, trunking, paging, satellite transmission, and store and forward fax	1. Type A concession (20 years with exclusivity granted to C&W for voice and fax until 2003) 2. Type B concession (frequencies subject to competitive bid)

Source: A. Pisciotta and ITU.

4.3.3 Licensing to control competition and/or prevent anti competitive conduct

Licensing used to control competitive market entry may have the effect of either facilitating market growth or creating barriers to entry.

Limitation on the number of entrants directly constrains the development of competition. This may be necessary, at least initially, to protect an incumbent carrier from adverse impacts during the transition to competitive conditions. This may be a concern particularly in the case of a large number of developing countries where the domestic and international tariffs of incumbent carriers have not yet been rebalanced, and carriers remain vulnerable to bypass on overpriced international routes.

Another reason for controlling entry is to protect the new entrants from failure. In Chile, privatization accompanied by unfettered competitive entry led to vigorous price wars during which competitors had great difficulty making profits. The European framework, in contrast, recognizes that it may be necessary to limit the number of entrants, but only when truly necessary for a transitional period and only to the extent that the overall impact on competition is positive.

Other aspects of licensing that tend to limit market entry may have less lofty purposes. For example, the imposition of license conditions that require inordinate levels of infrastructure investment, impose burdensome service undertakings, require compliance with unnecessary technical standards, and/or demand compliance with stringent licensee qualification requirements (such as foreign ownership limitations) may simply be exclusionary. Similarly, the application process itself can be made extremely burdensome and time consuming and the application review process may not be sufficiently transparent. These factors can discourage potential entrants from even trying to obtain a license.

Fees may serve many purposes. They may be gauged to recover actual costs of administering license applications. However, annual or other fees also may be used as a mechanism for revenue generation. Sometimes this can be more harmful than helpful. In India, a system of annual fees established in the 1994 National Telecom Policy became so burdensome in practice that it essentially paralyzed emerging competition in the country.[11]

A licensing regime may aim to prevent anti-competitive conduct if it imposes special obligations on carriers with market power. Market power may be derived from market share, control of essential or bottleneck facilities or the ability to shift costs between regulated and unregulated activities and price below cost to exclude competitors from the market.

License conditions addressed to the special issues raised by dominant carriers may include such protective measures as accounting and cost separation, the requirement for separate subsidiaries for competitive enterprises and the close scrutiny of prices. Control over affiliate transactions, requirements to provide access to essential facilities and to share important assets such as databases, may also need to be specified within the license as well as the requirement to submit periodic reports on traffic, facilities and revenues.

In many countries, especially where monopoly national carriers have only recently been privatized, prevention of anti-competitive conduct by incumbent dominant carriers is a real concern. In fact, the initial stages of liberalization in any market require substantial vigilance against abuses of market power by dominant carriers. This was certainly true in the United States in the late 1970s and early 1980s when long distance competition was first introduced.[12] Since that time, however, competitive markets have evolved so that no intra-state or international carriers subject to FCC jurisdiction are now considered dominant.[13]

This sort of evolution is beginning to be played out in other countries, such as Mexico, in which privatized and competitive markets have begun to mature.[14] License conditions imposed to control market power are important transitional mechanisms, but may not be permanently required. As competitive markets evolve, licenses should become more symmetrical, with anti-competitive conduct addressed

increasingly through the enforcement of anti-trust and fair trading laws.

It is also true, however, that reliance on anti-trust enforcement as well as fair trade and consumer protection laws is not necessarily effective in markets still dominated by an incumbent with significant market power or control over bottleneck facilities. Difficulties have been experienced in New Zealand, where the government opted to completely eliminate regulation and licensing at the same time that the national carrier, Telecom New Zealand, was privatized and all telecommunications markets were liberalized. While the impediments of regulatory licensing and policy-making have been avoided, the delays and costs of court proceedings on such issues as interconnection and pricing, which are typical issues in asymmetrical markets, have been a problem.

Delays and uncertainties also have been experienced in Chile, which has placed high, though not exclusive, reliance on *ex post facto* court challenges rather than *ex ante* administrative policy proceedings and license conditions to address predictable areas of dispute between dominant and non-dominant carriers.

4.4 Diversity in licensing approaches

Perhaps the single most important characteristic of emerging licensing frameworks is the degree of diversity among them. The differences reflect a wide variety of views from one country to the next on the functions and objectives of licensing. The significance is many-fold.

It is clear that there is no perfect approach. Partly this is due to the fact that each country must build its liberalization programme on the foundation of the particular governmental and industry structure that already exists. Other factors then come into play, including the overall objectives of the licensing process: to control the rate of competitive entry, to minimize or maximize foreign investment, to promote infrastructure investment, to maximize revenue production, to attract advanced services for multinational business, or to minimize adverse economic impact on a national carrier, etc. Cultural predilections for complexity or simplicity and the existence or non-existence of effective anti-trust laws also means that each country will come to its own solution.

The diversity of licensing regimes is significant not so much for the reasons underlying it, but for the impact that it will have on the global telecommunications market. Asymmetrical licensing regimes may impede the growth and implementation of global services, and make more complex the transition to new generation regulatory frameworks that will be required for the age of cybernetworks. Pressure will increase for greater simplicity and harmonization.

4.4.1 The impact of the WTO basic telecommunications agreement

One of the most internationally pervasive factors influencing the development of new licensing frameworks worldwide is the World Trade Organization Basic Telecommunications Agreement (WTO Agreement)[15], which became effective at the beginning of 1998. This new multilateral framework substantially accelerated the worldwide acceptance and implementation of liberalized telecommunications markets. The agreement by a substantial portion of the signatories to the WTO Basic Telecommunications Agreement to abide by the Regulatory Reference Paper attached to the WTO Agreement also has helped significantly to foster and shape new regulatory regimes.

The Reference Paper, however, establishes only very general principles. With respect to licensing issues, it is addressed primarily to ensuring fairness in the licensing process. The Reference Paper commits signatories to establish a regulatory body separate from any supplier of basic telecommunications services so as to ensure impartiality in the licensing process. The Reference Paper also requires that, to the extent licenses are required, the criteria upon which a license may be granted should be made publicly available, including the period of time normally required to reach a decision on a license application as well as the terms and conditions of individual licenses. The reasons for denial of a license also should be made known to the applicant upon request.

Particularly in countries still accustomed to viewing telecommunications as a public service for which the government is primarily responsible, the standard set in the Reference Paper for the objective and transparent granting of licenses represents a milestone. It is fundamental to the creation of confidence in the trustworthiness of public decision-making that is essential for new private sector entrants and investors. Even in countries that have developed sophisticated competition and licensing policies, the failure to meet this essential initial threshold may significantly undermine efforts at sector reform.

For example, the government of India has so far failed to wrest licensing responsibility from the Department of Telecommunications (DoT), which is still the dominant national operator.[16] Even the National Telecom Policy of 1999 (NTP'99), which includes several important liberalization measures, has not been able to resolve this issue. The problem has been highlighted by court battles that have been joined in India over recent actions by DoT to terminate interconnection arrangements to cellular operators that have failed to pay license fees. Observers have noted that the strengthening of the role of the Telecom Regulatory Authority of India (TRAI) is necessary to alleviate the situation.[17]

4.4.2 Regional case study # 1 – Europe

Even though the WTO Reference Paper establishes a critical baseline for an effective licensing regime, it does not provide any substantive guidelines for the design of a licensing regime. In fact, beyond the models being created by individual countries, there are virtually no real international or regional substantive models for licensing frameworks. The closest in existence are the principles and standards established in the European Union (EU).

Two essential observations may be made with respect to the EU licensing framework. First, the framework is broadly stated and affords individual member states significant flexi-

Box 4.1: The regional framework for licensing in Europe

A common framework for licensing is established for all EU member countries in the EC Services and Licensing Directives. The objectives of these directives are to facilitate liberalization and harmonize national approaches throughout Europe, promote the free provision of telecommunications throughout Europe, and preserve the discretion of national governments to implement licensing regimes that address their own individual circumstances and concerns.

Authorizations: Article 3 of the Licensing Directive establishes:

- Telecommunications services must be permitted to be provided in most cases without an authorization or pursuant to a general authorization. Member states can require notification under a general authorization.
- Individual licenses may be required only for the provision of public voice telephony, the establishment of public telecommunications networks or the establishment of other networks utilizing the radio frequency spectrum, or otherwise only for the following purposes:
  1. To permit access to radio frequencies or numbers;
  2. To provide rights with regard to access to public or private land;
  3. To impose universal service, open network provision or other obligations associated with the mandatory provision of publicly available telecommunications services; or
  4. To control significant market power.
- Member states must formulate and apply authorization systems to facilitate the provision of telecommunications services between Member states.

Permissible Conditions: The Annex to the Licensing Directive specifies:

- Conditions must comply with the competition rules of the Treaty establishing the European Community; Conditions may be attached to all authorizations,
- Conditions may be attached to individual licenses, where justified and subject to the principle of proportionality, relating only to: allocation of numbering rights, effective use and efficient management of radio frequencies, specific environmental and town and country planning requirements, maximum duration to ensure efficient use of frequencies, provision of universal service obligations, control of significant market power, ownership restrictions, licensee qualifications and the assurance of continued provision of public services, and provision of leased lines.

Procedures and Fees:

- Article 5 of the Licensing Directive, pertaining to general authorizations, provides that information about the granting of general authorizations is publicly available. The national regulatory authority may enforce compliance with applicable conditions of a general authorization, but must follow prescribed procedures.
- Article 9 establishes similar due process procedures for the grant of individual licenses, and further provides that the award of licenses must be through open, non-discriminatory and transparent procedures.
- Article 10 of the Licensing Directive permits member states to limit the number of individual licenses that may be granted in any particular category of service and for the establishment and/or operation of telecommunications infrastructure, but only to the extent required to ensure the efficient use of radio frequencies or for the time necessary to make available sufficient numbers in accordance with "Community law".
- Article 6, applicable to general authorizations, and Article 11, applicable to individual licenses, both provide that license fees may cover only relevant and proportionate administrative costs. However, Article 11 also provides that additional non-discriminatory charges may be imposed to ensure the optimal use of scarce resources, such as radio frequencies.

One Stop Shopping:

A unique regional One-Stop Shopping ("OSS") procedure allows telecommunications service providers operating in multiple EU member states, to apply to a single office, the European Telecommunications Office (ETO), for authorization to provide certain services in any or all member states – except Austria which does not currently participate in OSS. The ETO maintains its own categories of services. If an application proposes services which fall within those categories the ETO acts as the central processing point for submitting the necessary forms to each pertinent regulator and collecting and compiling the various responses. Services *not* covered under the OSS process include voice telephony, telex, mobile radio services, satellite services and broadcast services.

bility within which they may design their own regimes while remaining in compliance with EC directive requirements. This is the essential reason for the diversity in approaches now apparent throughout Europe, notwithstanding the unifying influence of the EC directives.

Second, however, the European licensing framework, which is established within the context not only of the EC Services and Licensing Directives, but also the Voice Telephony, Leased Lines and Interconnection Directives[18], reflects a particular view of the telecommunications market that is essentially grounded in the voice telephony paradigm. This paradigm may be described simply as the view that basic live-voice telephony can and should be identified and authorized as a discrete service offering. Authorizations for the provision of other services and the establishment and operation of particular facilities are made specifically with reference to the impact on the public availability of voice telephony. As this paradigm comes increasingly under attack, even the flexible European framework will be increasingly strained.

Most countries have transposed into their national regimes the specific licensing categories recognized by the EC Licensing Directive (i.e., public voice telephony services, public telecommunications networks, operators with significant market power, and operations involving access to such limited resources as radio frequencies, numbers or public or private land).[19] In doing so, European countries have broadly institutionalized a regional licensing framework that combines service-based and facilities-based authorization categories. In many countries, this requires that combinations of authorizations be obtained so that, for example, the provision of basic voice telephony service over the operator's own facilities would require both a voice telephony service and public network facilities license.

Within this generally common framework, a number of countries have created individual variations. Germany has three different classes of licenses for facilities used in the transmission of public services (mobile, satellite and fixed). The provision of facilities-based public voice telephony requires the combination of one of these transmission licenses with a separate voice telephony license. In contrast, Italy and Luxembourg offer a single license for public voice and network operations. Other countries such as the Netherlands and Germany also offer infrastructure licenses on either a national or geographically specific basis. In yet another variation, the Public Telecommunications Operator or PTO license offered in the United Kingdom covers both facilities provisioning and voice telephony for domestic services, but a separate International Facilities License (IFL) is required for international operations.

Some countries, including Belgium, France, Portugal and Spain, have developed regimes that are based almost exclusively on individual licenses, granted in categories that closely follow the EC permitted categories of public networks, voice telephony and access to frequencies. Other countries, including Austria, Germany, Greece, Luxembourg and the United Kingdom, require individual licenses for public networks and/or voice telephony, but also rely upon registrations, notifications and/or class licenses for other services, such as certain satellite or mobile radio services and non-voice networks or closed user groups. Still others, including Denmark, Finland, the Netherlands and Sweden have opted for a very light licensing regime, relying upon class licenses and/or registrations even for many types of public networks.

Adding to the distinctions between regimes are a wide variety of approaches with respect to license application requirements, conditions and processing procedures. By way of illustration, in its Fourth Implementation Report, the EC itself noted varying concerns with respect to license conditions (Belgium, Spain, France and Italy), lack of transparency (Ireland), the level of license fees for various services (Germany, France, Luxembourg and Italy), time limits for the issuance of licenses (Belgium, Greece, France, Italy and Luxembourg), lengthy or cumbersome license procedures (Belgium, Spain, Italy and Austria) and the failure to grant competitive licenses with full rights (Greece and Belgium).[20]

Thus, as illustrated in Table 4.5, despite the harmonizing influence of the EC's directives, even the member states of the European Union have developed significantly divergent licensing regimes.

4.4.3 Regional case study # 2: Latin America

In implementing liberalization programmes, Latin American countries have generally followed a pattern of granting concessions to the purchasers of their national telephone companies which contain exclusive rights for a limited term of years for the provision of public services, normally defined as basic voice telephony. For example, Téléfonos de México (Telmex) was granted a 50-year concession in 1976. That concession was modified at the time of privatization in 1990 to become the primary regulatory instrument governing Telmex and to specify that competition would be introduced in basic long distance service within six years.

In 1976, in Venezuela, the Compañia Anónima Nacional de Teléfonos de Venezuela (CANTV) was granted an exclusive concession to operate telecommunications systems in Venezuela for 25 years, or until 1990. When it was privatized in 1991, CANTV was granted an entirely new concession for an initial duration of 30 years, with a period of exclusivity for the provision of basic services for the first nine years.

As competition has been introduced, concessions have begun to evolve away from a form of singular and self-contained grant of monopoly toward a more standard form of a grant of rights, albeit by contract, subject to an exogenous and generally applicable body of regulations. As yet there is no particular consensus in the region as to how public services should be defined or treated, and which form of regulatory authorization should be utilized for which services. As demonstrated in Table 4.6, below, a significant diversity of approaches has developed.

4.4.4 Regional case study #3: Southern African Development Community

Regional coordination among southern African countries across the full spectrum of telecommunications regulatory issues is being pursued directly and methodically under the

Table 4.5: Current licensing requirements for EU countries

	Fixed wireline – Public	*Fixed wireline – Closed User Group ("CUG")*	*Fixed wireline – Self-provided*	*Voice Telephony – Public*	*Voice Telephony – CUG*	*Voice Services – Self-Provided*	*Data Services – Public*	*Data Services – CUG*	*Data Services – Self-provided*	*Mobile Communi-cations*	*Mobile Communi-cations – Data*	*VSAT*	*VAS*
Austria	I	R	F	I	R	F	R	R	F	I	I	V	R
Belgium	I	R	R	I	R	F	R	R	F	I	I	V	R
Denmark	C	C	C	C	C	C	C	C	C	I	I	C	C
Finland	R	R	F	R	R	F	O	F	F	I	I	V	F
France	I	I	I	I	F	F	C	F	F	I	I	I	C
Germany	I	I	F	I	R	F	R	R	F	I	I	I	R
Greece	M	I	R	M	R	R	R	R	R	I	NR	I	R
Ireland	I	F	F	I	F	F	I	F	F	I	I	I	F
Italy	I	I	I	I	R	F	R	R	F	I	I	V	R
Luxembourg	I	I	R	I	R	R	R	R	R	I	I	I	R
The Netherlands	R	F	F	R	F	F	F	F	F	I	I	I	F
Portugal	M	M	NR	M	I	F	R	NR	F	I	I	V	R
Spain	I	I	R	I	R	R	R	R	R	I	I	I	R
Sweden	R	C	C	R	C	C	C	C	C	I	R	V	C
United Kingdom	V	V	C	V	V	C	V	V	C	I	I	C	V

Key: I = Individual license; C = Class license, no notification required; F = Free regime (unregulated); R = Registration; O = Notification optional; M = Monopoly; V = Varies with services provided; NR = No regulation in place.

Source: Derived from European Telecommunications Office and EC Information Society Promotion Office Reports, 1999.

Table 4.6: Comparison of selected licensing regimes in Latin America

Operation	*Argentina*	*Brazil*	*Chile*	*Colombia*	*Ecuador*	*Mexico*	*Panama*	*Peru*	*Venezuela*
Data processing	VAS license	Unregulated	Unregulated	VAS license (can include VSAT)	VAS license	VAS registration	Type B concession	VAS registration Authorization required for own Facilities	VAS concession
Value added services (VAS)									
Data transmission	Data trans. license	Specialized limited services authorization	Limited services license	N/A		Public service concession		Carrier services concession	Switched data concession
Private network	License	Private limited service authorization		Unregulated	License	Unregulated			Private network permit
Limited network or closed user group	N/A	Private limited service authorization		N/A	N/A	N/A			
Satellite (VSAT)	License	Specialized or private services license	License	Carrier service license	Authorization	Concession			VSAT concession
Private wireless	License		License		Authorization				Included in private network permit
Carrier services	N/A	N/A	N/A		N/A	N/A	Type A concessions (limited)		Exclusive
Public mobile voice telephony	Limited concessions	Limited concessions	Limited concessions	Limited concessions	Limited concessions	Limited concessions		Limited concessions	Limited concessions
Public network resale	N/A	N/A	Concession	Tele-Services Local service unregulated	N/A		Type B service concession	Final services concession (can include fixed and mobile)	N/A
Public fixed voice telephony	Exclusivity reserved	Duopoly		LD & Int'l License	Gov't monopoly	Concession	Type A concessions (limited)		Exclusivity reserved

Source: A. Pisciotta and ITU.

aegis of the South African Development Community (SADC). SADC was formed as a result of a series of conferences, beginning in 1979, among Southern African ministers on regional economic cooperation. Initially formed among the nine countries of Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe, SADC has grown to include the Democratic Republic of the Congo, Mauritius, Namibia, Seychelles and South Africa.

Pursuant to the Protocol on Transport, Communications and Meteorology, SADC members have agreed to develop a common telecommunications policy that will facilitate the development of national networks and availability of affordable telecommunications services throughout the region. SADC has already prepared both Telecommunications Policies and a Model Telecommunications Bill.[21] In June 1998, these documents were adopted as common policy and legislative guidelines for implementation at the national level. Member states have been urged to adopt them. As mentioned in Chapter 1, the Telecommunications Regulator's Association of Southern Africa (TRASA), formed in 1998 as an organization within SADC representing independent telecommunications regulators, is pursuing several initiatives to facilitate the

Box 4.2: The impact of shared structures and traditions on licensing in Latin America

Common Legal and Political Systems – Latin American countries do not share a regional regulatory framework, but they do share significant commonalties in legal and political systems and administrative traditions. Typically, Latin American constitutions provide for strong executive powers, which either directly under the constitution, or indirectly as implemented through "organic" laws, have vested in them, among other things, the power to administer "public services" such as telecommunications. This has important consequences. One such consequence is that the structural options for the creation of an independent regulatory authority are limited. The agency must be established within the executive branch. Frequently, the regulatory authority remains subject to the direct oversight of a Minister who is accountable to the president. Particularly in cases where efforts to pass new telecommunications legislation have failed, regulatory authorities have been established by executive decree, which can leave them vulnerable to dissolution or modification by decree, and thus very sensitive to political shifts.

The Concept of "Public Services" – Additionally, under typical Latin American legal frameworks and prevailing administrative principles, the executive is viewed as the sole provider of "public services." The rights and responsibilities for providing a public service may be delegated to a special governmental organization or to a private party. However, such delegations traditionally have been discretionary to the government and virtually unilateral.

Traditional Forms of Authorization

- **Concession** – Effected through a contract, a "concession" is a delegation of power to stand in the shoes of the government as provider of a public service. The concession contract includes the specification of numerous rights, as well as obligations, of the concession holder. In its traditional form, a concession typically confers exclusive rights. Generally, concessions may be privately negotiated on a confidential basis, and are frequently granted for a lengthy term, such as 25 to 50 years. Concessions frequently contain substantive regulatory provisions, including prohibitions against competition (at least for a term of years), rate rebalancing requirements and infrastructure investment and/or development obligations. In the traditional form, they may be modified or terminated by a completely discretionary act of administrative rescission, although fair compensation must be paid to the concessionaire. Upon cancellation or termination of a concession, any facilities installed by the concessionaire for operation in connection with the provision of the public service are revert to the government.
- **License** – In the course of telephone privatizations and regulatory liberalization in the region, the term "license" has been adapted by Latin American administrative systems from such common law countries as the United States, United Kingdom and Canada. In some countries it is interpreted as an intermediate form of authorization. It does not carry the connotation that the holder is being granted rights otherwise exclusively held by the government, but rather that the holder enjoys a discretionary grant by the government of the right to undertake an activity or provide a service already permitted by law to be provided by a private company. Argentina, the first country in the region to utilize the term "license" in connection with the authorization of private telecom operators, intended thereby to inhibit the ability of the government to arbitrarily or unilaterally modify or rescind the grant of operating rights. A license is not ordinarily subject to modification or revocation by the government absent a finding of a violation of law in an adjudicative proceeding. However, the Argentinian "licenses" are also contracts. In the absence of clarifying legislation, Argentinian courts are left to resolve disputes arising under these contracts according to existing legal principles, which are essentially the same as those applicable to traditional concession agreements. In contrast, some other countries, such as Colombia, have passed new laws clarifying the legal significance of using different forms of authorization. Depending upon the country, a license may authorize public and/or private services.
- **Permit** – Like a concession a "permit" is a traditionally recognized form of authorization in Latin America. Unlike a concession or license, however, which confers limited but protected rights that may be enforced in court, a permit does not necessarily confer enforceable rights. As a purely discretionary administrative grant, often of relatively short duration, a permit usually authorizes the offering by a particular entity of services that are not public services.
- **Registration, Notification, Authorization** – A few countries also utilize "registrations", "notifications" or "authorizations" in connection with fully competitive, value added or private services. Such measures do not actually affirmatively confer a grant of rights but merely provide a formal acknowledgment that the holder may operate as permitted by law.

Box 4.3: Shared licensing policies in Southern Africa

Telecommunications Policies for SADC: The Policies established the following policy objectives for telecommunications regulation in member states:

- Assurance of affordable, efficient and high quality services
- Influencing global trends and participation in the Global Information Society
- Building a competitive regional telecommunications sector
- Creating an environment for sustainable "info-communications" development
- Creating partnerships between public and private sectors
- Strengthening business practices and a code of conduct for the sector
- Promoting gender equity in the telecommunications field

The Policies further promote the establishment of a Regulatory Authority separate from any service provider, that will work with the Ministry and assume the primary role of enforcing rules and regulations. The specific licensing functions proposed for the Regulatory Authority include:

- License all telecom service providers, according to such guidelines set by the Minister.
- License radio spectrum users, except those operating under licenses issued by the broadcasting regulatory agency, where such an agency exists.
- Review existing licenses, where applicable.
- Monitor and enforce compliance with relevant legislation and regulations.
- Determine appropriate classes of licenses.
- Hear complaints from users and service providers.

Model Telecommunications Bill: Part V of the model law sets out the guidelines for licensing telecommunications services providers. The guidelines describe a very broad framework that gives confers substantial discretion and flexibility on the Regulatory Authority. The principal licensing features are:

1. *Classes of providers of services* – Classes are to be prescribed from time to time by the Regulatory Authority, and shall include:

- Public telecommunications services – defined as those "provided to the general public or to a class of persons so as to be generally available."
- Private telecommunications services – defined as those "provided exclusively for transmission and reception by one person or its employees or among persons under common ownership or control or their employees."

2. *Services Authorized* – Licenses must describe the services authorized and may include:

- Exchange services
- Domestic long distance services
- International public switched voice services
- Domestic and international telex and telegraph services

3. *Number of licensees* – The Regulatory Authority may license public and private telecommunications service providers "as market conditions warrant."

4. *Regulations governing licensing* – The Regulatory Authority shall establish licensing regulations and procedures, and may impose conditions on licenses. The Authority also may decide that certain services may be provided on an unlicensed basis.

5. *Transfers and assignments* – Prior approval of the Regulatory Authority is required.

6. *Review of agreements* – Agreements between license holders (e.g., for interconnection) must be submitted to the Regulatory Authority for approval. The Authority has broad power to review any agreements entered into by licensees to ensure compliance with the telecom law.

7. *Interconnection* – The interconnection obligations of public telecommunications service providers are specified to in the law and the Regulatory Authority may issue binding decisions resolving disputes.

8. *Spectrum management* – The Regulatory Authority has broad authority to make spectrum allocations and assignments and to manage the spectrum according to policies prescribed by the Minister. Auctions may be used in certain cases, including mutual exclusivity, if the public interest would be served.

9. *Access to Rights of Way* – Public telecommunications service providers are entitled to enter on public property and may request expropriation of private property. The Regulatory Authority has broad powers to approve such uses.

Source: See http://www.satcc.org/Telecomm/Telecoms.htm.

effective implementation of these regional policies at the national level.[22]

It is too early to fairly describe the licensing schemes that will emerge in SADC member countries as a result of these developments. However, the creation of TRASA, a regional group of national regulators separated from operators, promises to help each country more effectively leverage its limited administrative resources and may promote a harmonized regional approach to licensing issues.

4.5 Challenges of convergence and cyberspace

Just as many countries are finally establishing new laws and regulatory regimes that permit the licensing of competitive service providers, the familiar contours of the telecommunications industry upon which they are based are quickly fading from view. Licensing regimes around the world reflect the common policy objective of ensuring the universal availability of traditional public voice telephony services. However, the digital-revolution is on the doorstep, changing both the nature of telecommunications services and the way they are provided. In order to be effective, licensing regimes will have to adapt. Notably, both developed and developing countries are entering these uncharted waters at the same time. In many respects, developing countries may be able to leapfrog into the future and end up having an advantage in the global marketplace.

This section examines some of the current and future developments that will forever change the paradigms that govern the licensing and regulation of the telecommunications industry. It also outlines the new licensing principles that are most likely to emerge.

4.5.1 Developments that are redefining licensing issues

The persuasiveness of digitization is having two predominant effects upon telecommunications. The first is the general effect commonly referred to as convergence. This means that different types of services, historically provided over different technologies with distinct characteristics, are now being provided over single undifferentiated bit streams. The second general effect may be referred to as cyberspace or virtuality. Digitization, in combination with the rise of the Internet, is literally eliminating geographic location as a factor in both the provision and the use of many telecommunications and information services. Some of the ways in which these effects are manifested in telecommunications services, and the licensing challenges they present, are summarized below.

4.5.1.1 Stratified network structures

Technological dynamism has opened up opportunities for niche players in increasingly stratified, as well as distributed, networks. Customer service offerings are frequently provided over configurations that involve several layers of activities by different enterprises. These layers, usually invisible to the user, may include various entities engaged in high capacity facilities provisioning, large scale traffic aggregation, wholesale and retail marketing, bandwidth management, value added services such as protocol conversion, database access and encryption, and administrative services such as billing and collection. Not all entities or activities need to be licensed or regulated.

4.5.1.2 Splintered service markets

Service innovations continue to challenge the rationales upon which licensing regimes are based. The proliferation of services with various degrees of quasi-public and quasi-private characteristics, as well as combinations of basic and value added features, make clear distinctions very difficult. This confounds efforts to identify sustainable service and licensing categories. Moreover, services are becoming less technology specific. Not only can a single technology now provide multiple services (e.g., voice, video and data), but several different technologies also can provide the same or closely substitutable services (e.g., wireless and wireline voice). The lack of clear and logical demarcations has contributed to substantial creativity and diversity in licensing regimes around the world.

4.5.1.3 Technology and service convergence

Because voice, video and data services are converging over single delivery systems, it is more difficult to distinguish one application from the other for regulatory purposes. In addition, true multimedia applications are becoming increasingly commonplace. Simultaneously, technology choices for broadband delivery of converged services are expanding. The telephone company's local loop, competitive local exchange fiber facilities, cable television systems and set top boxes, terrestrial wireless networks and global satellite constellations are all vying to extend essentially substitutable broadband multimedia services directly to the consumer.

Additionally, multimedia information technologies are increasingly relied upon for more than the familiar telephone, television and PC-based applications. Information technology is becoming a fundamental and pervasive aspect of nearly every service industry. As multiple multimedia delivery systems become more common in the office and home, traditional telecommunications licensing may become both over-inclusive and less relevant. For example, switched two-way live voice transmissions will become increasingly feasible and available over facilities maintained by service providers in non-telecommunications industry sectors (e.g., transportation, electric and other utilities). It may be tempting, but ultimately unnecessary, to subject operators in these other industry sectors to traditional telecommunications licensing and/or regulation.

4.5.1.4 Globalization

Globalization of information technology, services and businesses is creating the ultimate challenge for licensing authorities. The initial stages of worldwide liberalization has been marked by significant experimentation and diversity among different countries' licensing approaches. In the near term, such diversity may be good. It facilitates the identification of alternative and improved approaches to common regulatory issues. Over the long run, however, significant diversity can create significant impediments to the implementation of desirable multinational and global services. Truly global services

may soon demand more harmonization of licensing approaches.

Additionally, in the new age of virtuality, in which communications occur and transactions take place in cyberspace which is both anywhere and nowhere, the traditional location-based notions underlying telecommunications policies and regulatory jurisdiction break down. Services may be accessible by anyone from anywhere, and provided over globally integrated networks designed for efficiency and convenience. Administrations that are less hospitable than others may find it difficult to attract investment, retain control over their own national markets and maintain autonomy over their own national telecommunications and information policies.

4.5.2 Future licensing principles

In an industry that has entirely different technical, operational and jurisdictional characteristics than any that have so far been known, new approaches will have to be found to achieve public interest objectives. In the new world of convergence and cyberspace and pervasive information-based economies, voice communications will be only one facet of the fully integrated multimedia offerings provided over highly integrated real and virtual networks. In such an environment, it will be extremely difficult to clearly identify individual services, facilities or operators to license. Operations also will involve activities that include various combinations of telecommunications, information, entertainment, utility and commercial applications. All of these factors will make it increasingly difficult for regulators to determine who and what should be regulated, as well as by whom. Some of the different regulatory and licensing principles that may evolve within the new IT paradigm are explored below.

4.5.2.1 Promoting availability of voice services through multimedia delivery

Licensing frameworks that continue to seek to safeguard a discrete voice telephony market segment will most likely miss the mark. Not only will separate treatment of voice telephony services over separately identifiable facilities be increasingly difficult to achieve, but continued efforts to ensure such separate treatment will inhibit the realization of the full benefits of information technology convergence. In the new e-commerce marketplace, countries will have to compete more aggressively to attract global businesses with a sophisticated information infrastructure. Those that embrace the IT paradigm most quickly and effectively will win. Thus, the first goal for any administration in the information age should be to foster the development of information services to the greatest extent possible.

This may be accomplished without sacrificing the goal of extending basic service to residential consumers. Many voice applications will emerge as adjuncts to multimedia and information services. At some point regulators may find that voice telephony is more economically and beneficially provided as an adjunct service to the widest possible array of multimedia applications than solely as a discretely maintained public offering. Expanding the approved means by which citizens may be reached by voice applications may actually accelerate the expansion of affordable public voice telephony services.

Getting from here to there will not be easy. Tricky issues, such as the regulatory status of voice telephony over the Internet or Internet Protocols (IP Telephony) are just now beginning to be addressed. So far, developed countries, including the United States and the EU countries have declined to subject IP Telephony to basic services regulation, even though some configurations appear to be closely substitutable with basic voice transmission.[23]

Japan is one country that has affirmatively authorized IP telephony. Few countries have banned it, but some countries such as Argentina and Hungary maintain that IP Telephony may not be competitively provided until the end of the state-approved voice telephony exclusivity. Many countries are concerned that unrestrained IP Telephony services will bypass public networks or divert traffic that is relied upon to provide subsidies for universal service funds.

Rather than outlawing IT paradigm services such as IP Telephony, it may prove to be more effective to find other solutions to the problems they are perceived as causing (i.e., diverting universal service funds). Universal service inevitably will have to be redefined to recognize the persuasiveness of IT-based services. This does not mean that every citizen should be entitled to affordable access to the full panoply of the most advanced services. Rather, it may mean that whatever services public policy dictates must be made universally available at a reasonable price (i.e. two-way live voice), should be required to be incorporated within, or provided as adjuncts to, advanced services offerings.

New universal service funding mechanisms will need to be designed so that IT paradigm services can be facilitated and promoted, rather than stifled or prohibited. In a pervasively IT-based economy, however, it may be that requirements to provide universal service become so widely spread across industry sectors that the only truly rational and technology-neutral sources of support are general tax revenues.

4.5.2.2 Ensuring reliability and interoperability

The public switched network is likely to become a virtual network, comprised of an amalgamation of separately owned facilities and software features. It may combine various terrestrial wireline, wireless and satellite technologies, perhaps even be located in several jurisdictions and used for both public and private communications.

As it becomes harder to identify individual public network operators who control discrete physical portions of such a public switched network, regulators may have to turn their attention away from facilities licensing toward standards of reliability and interoperability. Such standards, applied in a class license framework, would address the technical and operational issues required to ensure that the network of networks continues to function according to public service standards. They would also address critical issues of interconnection and

access to essential facilities and assets, including numbering, as well as rights of way.

4.5.2.3 Promoting efficient infrastructure development through appropriate technologies

It is now nearly axiomatic that the extension of exchange lines for basic services in many countries is more efficiently achieved through wireless technologies than the twisted copper wire local loop. It has also been observed that competition among a number of enterprises utilizing a variety of technologies can lead to faster public network growth than can the imposition of infrastructure build-out requirements on geographically exclusive traditional wireline telephony franchises.

Many countries may discover that infrastructure development is best fostered by public policies that facilitate private investment – including the lowering of entry barriers for new entrepreneurs. Those policies may need to promote and support the appropriate application of a variety of technologies to different circumstances and even allow small niche enterprises to become profitable. Under such an approach, issues of fair interconnection and maintenance of overall technical standards supporting advanced services will be more critical than maintaining exclusivities.

4.5.2.4 Promoting the open and efficient use of spectrum

Digitization and compression are reducing concerns over spectrum scarcity. Convergence, by itself however, will not obviate the need for government participation in the allocation of spectrum to particular applications. Thus, regulatory authorities must still expend significant resources in frequency allocation and planning.

Many uses of radio frequencies also will still require approvals and assignments. However, efficient spectrum use may not always require individual licensing. Regulatory authorities may continue to resort to licensing in cases where there is true spectrum scarcity or mutual exclusivity.

Spectrum auctions may continue to be appropriate in particular circumstances. However, assignment and licensing approaches should promote new entry and reduce regulatory barriers. In some cases, however, especially for low power applications, spectrum use may be subject only to class licenses or notification procedures and equipment certification requirements.

Some operations, such as receive-only satellite earth stations, may be completely deregulated. Also, non-governmental frequency managers can be used to maintain registrations of users of deregulated frequencies and to monitor and resolve interference issues.

4.5.2.5 Preventing abuses of market power

Authorities will certainly continue to have to protect against the abuses of market power. As technologies change, new types of facilities and services will be identified as essential for effective interconnection. Also, companies will continue to combine, authorities will have to be forever vigilant against harmful concentration and/or exclusionary conduct by the more powerful players. However, as long as public policies require the establishment and maintenance of a competitive marketplace, reliance on license conditions and regulatory oversight to protect against anti competitive conduct may be reduced to the extent that antitrust and fair trading principles are clearly established and effectively enforced.

4.5.2.6 Clarifying and allocating content liability

Within the IT paradigm, content-related issues are of central concern. These issues will range intellectual property issues, privacy and compliance with cultural restrictions such as advertising limits, to economic liability for lost or damaged information, fraud and even national security issues. Sorting out the allocation of liability among different participants in the provision of a multimedia service will be a consuming challenge.

Traditionally in the United States, licensed telecommunications common carriers have enjoyed insulation from liability for content. As the lines between public and private services, as well as between telecommunications and information services, continue to blur it will be more difficult to provide such categorical exclusions by regulation or legislation.

Undoubtedly, the industry will have to assume a greater burden for protecting itself from liability by specifying relevant terms in contracts with users and interconnecting carriers. Industry standards for the self-regulation of the protection of proprietary information and privacy will also be increasingly relied upon. However, some types of individual or class licenses may still serve to clarify relative rights and obligations with respect to transmitted information by establishing the parameters of types of telecommunications operations unrelated to content.

4.5.2.7 Protecting consumer interests

With increased competition among multimedia services, the IT paradigm will place a high value on a wide range of consumer protection issues including prevention of fraud in advertising and e-commerce, privacy and data protection, fairness in pricing and accuracy in billing, and responsiveness to consumer complaints. Licenses, whether issued individually or on a class basis, will increasingly include conditions aimed at addressing these issues.

4.6 Conclusion

Licensing telecommunications operations in a liberalized market is a complex undertaking which both reflects and serves a multitude of social policies. Although licensing regimes around the world are enormously varied, they are generally structured around a central concern for assuring access to public voice telephony, promoting the expansion of infrastructure used to provide public voice telephony and/or controlling competitive conditions in voice telephony markets. Each of these concerns represents a different facet of what is referred to in this chapter as the voice telephony paradigm. Examples of each of them are found in both developed and developing countries.

Licensing frameworks around the world, many of which are already mature and some which are just emerging, will all soon face pressures for dramatic change. The contours of the future are very uncertain. Nonetheless, even from this distance, it seems clear that the voice telephony paradigm that defines the telecommunications industry as we know it is quickly being overtaken and inevitably will disappear. It will have to be replaced with an IT paradigm that accommodates the multimedia characteristics, global seamlessness, and virtuality that will characterize a pervasively IT-based global economy operating over converged technologies and services in cyberspace.

Regulatory regimes of the future will have to reflect different public interest concerns. Countries that embrace rather than resist the IT paradigm will shift their focus away from a concern for the assured availability of reasonably priced basic voice services provided over traditional public networks. Instead, they will focus more on promoting multiple outlets for voice telephony and ensuring that a reliable and universal virtual public network is maintained across a crazy quilt of interconnected technologies and applications. Overall this will likely mean decreased reliance on individual licensing of particular services and facilities and increased reliance on general rules. It will also involve greater coordination among authorities in different industry sectors.

Telecommunications regulation will be concerned less with licensing and pricing and more with continuous efforts to adapt standards of reliability and interoperability to unrelenting technology changes, as well as with frequency allocation and assignment, dispute resolution, and consumer protection.

Developing countries may have to continue to contend with low teledensities for years to come. For such countries, licensing regimes grounded in the traditional voice paradigm may actually constrain rather than foster growth. In contrast, licensing regimes flexible enough to permit regulators to embrace the IT paradigm will be more likely to promote both competitive entry and technology diversity, the twin engines of market development.

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[1] Responses to the ITU's 1999 Telecommunications Sector Structure Survey indicate that most countries impose a definite time limit, ranging from 1 year (e.g., Guinea, Yugoslavia) to 30 years (e.g., Chile), on licenses for both non-competitive basic and competitive value added or specialized wireless services. Only a few countries, including the United States, Argentina, Guatemala, Germany, Switzerland and Slovenia, have unlimited or unspecified terms for basic wireline services. Limited terms may be necessary for licenses that include special conditions, such as monopoly rights or infrastructure build-out requirements. They also are reasonable for services utilizing limited radio frequency spectrum. However, for services that accommodate open entry, defined license terms probably serve little purpose, especially where authorities have the power to rescind licenses for failure to comply with regulations.

[2] European Commission, Directorate General IV, Fourth Report on the Implementation of the Telecommunications Regulatory Package (25.11.1998 COM (1998) 594) (EC Fourth Implementation Report), pages 27-28.

[3] Official reports of SADC activities are located on the website of the USAID Regional Telecommunications Restructuring (RTR) Program, http://rtr.worldweb.net/home.

[4] *National Association of Regulatory Utility Commissioners v. FCC*, 533 F.2d 601, 608-609 (D.C. Cir. 1976).

[5] The FCC retains the authority, however, to impose common carrier regulation where there is a compelling public interest in such regulation.

[6] It is increasingly common that excess capacity on undersea cables owned by common carrier telephone companies is sold on a non-common carrier basis, often to other common carriers.

[7] In undersea cable markets, several non-common carrier developers have been authorized to sell capacity to common carrier customers. Also, in the satellite arena, individual transponders may be sold on a non-common carrier basis to common carrier service providers.

[8] Hudson, Heather E., *Global Connections: International Telecommunications Infrastructure and Policy*, (Van Nostrand Reinhold 1997), pages 301-324.

[9] *Trends in Telecommunications Reform 1998*, World Volume I, Table 5.5: Asia-Pacific: involving the private sector, (ITU 1998).

[10] "Lebanon: Dispute over BOT contracts and their transfer to regular licenses", Intelecon Research & Consultancy Ltd., June 17, 1999 (available at http://www.regulate.org./references/lebanon.asp).

[11] Pisciotta, Aileen A. and Wakhariya, Shabbir S., "New Developments in Telecommunications Reform in India", *ConnectWorld Asia*, Spring, 1999.

[12] *Policy and Rule Concerning Rates for Competitive Common Carrier Services, First Report and Order*, 85 F.C.C.2d, 1 (1980).

[13] *Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier* FCC 95-427 (rel. Oct. 23 1995) and *In the Matter of AT&T Corp. to be Declared Non-Dominant for International Service*, 3 Comm. Reg. (P&F) 111 (rel. May 14, 1996).

[14] "Mexican Court Frees Telmex From Dominant Carrier Rules", *Telecommunications Reports Daily*, June 17, 1999.

[15] Fourth Protocol to the General Agreement on Trade in Services (WTO 1997), 36 I.L.M. 354 (1997).

[16] In 1997, the Indian government enacted the Telecom Regulatory Authority of India Act establishing the Telecommunications Regulatory Authority of India (TRAI). TRAI is responsible for setting standards, determining tariffs, settling interconnection disputes and protecting consumer interests. Notably, it is not responsible for licensing or spectrum assignments which remain the responsibilities, respectively, of DoT and the Wireless Planning and Coordination Wing (WPM) of the Ministry of Communications.

[17] "Indian Operators Take Action As DoT Cuts Licenses", *Communications Week International*, June 21, 1999, page 25.

[18] Commission Directive 90/388/ECC of 28 June 1990 (Services Directive), European Parliament and Council Directive 97/13/EC of 10 April 1997 (Licensing Directive), Commission Directive 95/62/EEC of 13 December 1995 (ONP Voice Telephony Directive), European Parliament and Council Directive 98/10/EC of 26 February 1998 (Revised Voice Telephony Directive), Council Directive 92/33/EEC of 5 June 1992, as amended by Directive 97/51/EC of 6 October 1997 (Leased Lines Directive) and European Parliament and Council Directive 97/33/EC of 30 June 1997, as amended by Directive 98/61/EC of 24 September 1998 (Interconnection Directive).

[19] EC Fourth Implementation Report.

[20] Id. at page 17.

[21] The RTR Program funded by USAID assisted in the preparation of the model legislation and bill. SADC, through its Southern Africa Transport and Communications Commission (SATCC) also has issued White Paper: Universal Service Review (Dec. 1998) and White Paper: Internet Review (Dec. 1998). Copies of all of these documents are also available at the RTR website.

[22] *See,* Gullish, Jay, "The Origins and Objectives of the Telecommunications Regulator's Association of Southern Africa (TRASA)", Price Waterhouse Coopers LLP, 1999. Several Southern African countries have adopted new basic telecommunications legislation over the past few years, including Mozambique (1992), Zambia (1994), the Democratic Republic of Congo (1996), Botswana (1996) and Mauritius (1998). It should be noted that other African countries are similarly revising their telecommunications laws. For example, new telecommunications legislation has recently been enacted in Ghana (1996), Uganda (1997) and Kenya (1998).

[23] On January 10, 1998, the European Commission published a Status Notice on its review of the regulatory treatment of IP telephony under the Services Directive (Directive 90/388/EEC), concluding that Internet telephony does not currently meet all of the criteria for voice services. Thus, at the present time IP Telephony may be provided in the EU without the requirement of an individual license. The EC has indicated, however, that it will further review the issue before January 1, 2000. Individual European countries are also examining the issue. The French regulatory authority, ART, initiated a consultation on IP Telephony regulation through a public call for papers in April 1999. In the U.S., the FCC has observed that the provision of phone-to-phone voice telephony over Internet Protocols is similar to a regulated telecommunications service, it has so far preserved the unregulated status of Internet service providers and IP Telephony. *See generally,* Oxman, Jason, "The FCC and the Regulation of the Internet", FCC Office of Plans and Policy, OPP Working Paper No. 31, July 1999.

5 UNIVERSAL ACCESS

Universal access policy has become an important aspect of communications regulation. It is, perhaps, one of the few areas where sector-specific regulation may be required indefinitely, even when competition has spread across market boundaries.[1] This is because it aims to meet needs for basic telecommunications which are thought impossible to be met by purely commercial means.[2]

5.1 Universal access in the age of digital convergence

Modern communications are widely perceived as vital to international competitiveness in the information era. For this reason, it is a prime concern of many developed nations to spread broadband access as quickly as possible. This is also the underlying force in the effort of many developing countries to make basic Internet services accessible to an increased number of communities across the nation.

Universal access is certainly a concern to most countries around the world. A number of them are developing new policies and regulation that attempt to bring together the benefits of advanced digital services and the needs of universal access to communications (see Table 5.1). The awareness of the importance of communications technologies for economic development is something that today is recognized in all countries of the world no matter the level of economic and social development.[3]

5.2 Redefining universal service/access

The term universal access, together with the variant universal service, has been defined and used in many different ways.[4] Variations depend on legal, cultural and philosophical traditions, and perhaps even more, on a country's stage of network development.[5]

But there is a common core of meaning to most if not all of these approaches. The access referred to is seen as essential (or highly desirable) for everyone, along with clean water, food, fuel and shelter. What is seen as essential obviously changes as society develops – it may move from a payphone within 50 km to an Internet connection in every home. Providing this degree of access to everyone is not expected to be possible using normal market mechanisms. Thus, the approach is one of meeting needs rather than of fulfilling demands.

There is a widespread debate at present over how, if at all, digital convergence should affect the definition of universal access. Different trends may be observed in countries at different levels of development.

Several countries with advanced networks, for example the United States, Australia and the United Kingdom, are considering whether Internet access has become so widespread or even essential that it should be part of the definition of universal service. Broadly, the conclusions seem to be: a) home Internet access has not yet reached this status – its development should be left to market forces; b) public Internet access, especially in schools, is an important public good deserving policy and financial support, if not USO status.

Several countries with less-developed networks are incorporating new and innovative services in their national telecommunications and universal service plans. In India, for example, the 1999 Telecommunications Policy aims at providing Internet access to all district headquarters by the year 2000, and high speed data and multimedia capability, including ISDN, to all towns with a population greater than 200,000 by the year 2002 (see Box 5.1).

Some countries have made the definition of basic service more precise by listing those features which should be included. A good example comes from Australia (see Box 5.2). A similar list appears in a consultation paper on universal service produced by the Pakistan Telecommunications Authority.[6]

Specifying or regulating the quality of basic service is another sizeable topic.[7] It is important that service standards are not allowed to fall below a certain minimum. However, where differentiated service levels are feasible, some customers happily choose a lower quality service that allows worthwhile savings.

Some aspects of service quality which have come to the forefront in recent years may reasonably be considered privacy rights. These include, for example, the right to withhold sending one's calling line identity, the right to choose the form of one's directory listing (including a refusal to receive telemarketing calls), and the right to have itemized bills which do not list the full numbers called.[8]

As basic rights, arguably, all these services should be reflected in the definition of basic service and are equally relevant to customers with their own lines in all income groups and in any society. In developing countries, however, practical and pragmatic considerations are leaving these matters for a future time.

Itemized billing also plays an important role in user rights under competition, as it is often the best way for the caller to know the costs of calls, a necessary aspect of informed choice. Other relevant aspects include number portability (the right to change service provider without changing number) and dialing parity (the right to choose long-distance operator without dialing more digits). As discussed above, these are increasingly strong candidates for inclusion in the definition of basic service in a competitive environment.

Table 5.1: Accessing new digital services

Selected national initiatives aimed at increasing access to advanced services

Country	*Position*
Argentina	The government believes that universal access to advanced services is critical to economic growth. It sees its role as providing incentives to the private sector to supply advanced services to all. An initial project will finance 500 community access centres.
Australia	After a thorough review of whether digital data should be incorporated in the USO, legislation has been introduced to this effect. Telstra must make basic rate ISDN available to 96 per cent of the population, with the remaining 4 per cent to be served by satellite at subsidized prices.
Canada	Canada is considering including Internet access in the universal service package for high-cost areas, if there is evidence that the market will not provide these services on its own.
Chile	When all locations have a payphone (2000), universal access programme will focus on telecentres (including on-line access to government services) – 5 planned in 1999. A joint programme with Ministry of Education for Internet access for rural schools is planned.
Colombia	The Government is providing public Internet access where there is a business case, to promote commercial activity in rural areas.
France	The Ministry of Communications is providing discounted Internet access for schools to enable all children to have access to this communications medium.
Gambia	There is official encouragement for the proliferation of telecentres as a resale service, to be provided by the private sector (while the PSTN remains a public monopoly).
India	India's goal is for all villages to have a public telephone in 2 years. All suitable public telephones to be transformed into Public TeleInformation Centres, including Internet access.
Japan	The MPT Minister in October 1998 asked the industry to provide low-cost Internet access to schools, and to consider ways of bringing IT to local communities.
Peru	The Next 3 projects will bring Internet access to District Capitals (200 villages) in 1999/2000. It is publicly funded, despite the general belief that such centres should be self-financing through commercial activities.
Portugal	The government funds Internet access for schools to ensure that the country and its citizens become part of the Information Revolution.
South Africa	Information literacy for all is seen as a basic right. Universal Service Agency is therefore promoting telecentres, including training in using the facilities.
Sri Lanka	The government is setting up 150 computer centres by end 2000, to enable 150,000 young people to become computer-literate.
United Kingdom	The current USO definition covers basic telephony only; due for review in 1999. Meanwhile Oftel is facilitating Internet service to schools by permitting BT to offer it at cost-based prices.
USA	Internet access for all is necessary for meaningful participation in the Information Society. Subsidized access therefore is available for schools, libraries and hospitals. Meant to act as "market makers" – generating demand for new services.

Source: ITU adapted from Ovum 1999.

5.3 Regulatory strategies to promote access

The diffusion of communications infrastructure and services depends on a number of factors. Technological innovation and the reduction of costs generally associated with it is, no doubt, a major force in the increase in networks and services. Particular market configurations and certain conditions in the offering of services have also proven to be major drivers in the expansion of services across nations. Adequate regulatory incentives seem to be, for the time being, the most adequate approach to the promotion of communication services.

The following section take a look at the role of competition and price controls in the age of digital convergence and their impact on the strengthening of universal service. It also explores the role of licensing in this regard.

5.3.1 Competition and price control

The introduction of network competition is itself perceived in most countries to be the single most powerful tool for spreading access, by bringing down prices and injecting new energy into the sector. More generally, the new competitive environment offers regulators considerable opportunities for

Box 5.1: Forward-looking solutions

India's 1999 Telecommunications Policy – objectives and targets

The objectives of the New Telecommunications Policy 1999 are to:

- strive to provide a balance between the provision of universal service to all uncovered areas, including the rural areas, and the provision of high-level services capable of meeting the needs of the country's economy;
- encourage the development of telecommunication facilities in remote, hilly and tribal areas of the country;
- create a modern and efficient telecommunications infrastructure taking into account the convergence of IT, media, telecom and consumer electronics and thereby propel India into becoming an IT superpower;
- convert PCO's, wherever justified, into Public Teleinfo centres having multimedia capability like ISDN services, remote database access, government and community information systems etc.

Specific targets include:

- making available telephone on demand by the year 2002 and sustain it thereafter so as to achieve a teledensity of 7 by the year 2005 and 15 by the year 2010;
- encouraging the development of telecommunications in rural areas making it more affordable by a suitable tariff structure and making rural communications mandatory for all fixed service providers;
- increasing rural teledensity from the current level of 0.4 to 4 by the year 2010 and provide reliable transmission media in all rural areas;
- to achieve telecommunications coverage of all villages in the country and provide reliable media to all exchanges by the year 2002;
- to provide Internet access to all district head quarters by the year 2000;

to provide high speed data and multimedia capabilities, using technologies such as ISDN, to all towns with a population greater than 200,000 by the year 2002.

Box 5.2: Getting sophisticated

Australia's Universal Telephone Service

Under normal operating conditions a standard telephone service provided by Telstra includes the following features:

- connection from the network boundary at the customer premises to the carrier local exchange;
- access to the public switched telephone network being part of the multi-vendor national integrated telephone network;
- the ability to make and receive automated national and international voice grade telephone calls 24 hours-per-day;
- access 24 hours-per-day to an emergency number, which when called by the customer, gives the customer access to emergency services, free of charge;
- access 24 hours-per-day to operator assistance for directory assistance, national and international call connection and reporting of service difficulties;
- a unique telephone number, allocated in accordance with the National Numbering Plan, and an appropriate directory listing, except where the customer requests otherwise, for that number;
- a level of privacy and security to enable users to conduct business and personal communications with confidence;
- monthly billing where requested by the customer;
- itemized billing for all calls, other than local calls;
- where technically feasible, calling number display, for use by the called party, transmitted at the discretion of the calling party;
- a voice grade service which enables the user to establish a telephony connection to another party anywhere on the multicarrier national integrated telephone network and conduct intelligible communication consistent with the national "any to any" connectivity criteria.[7]

Source: Telstra's Universal Service Plan 1998.

Box 5.3: Transparent, non-discriminatory, and competitively-neutral subsidies

Features of "ideal" universal service subsidies in a competitive marketplace

Transparent means that the rules and regulations that apply to a particular measure should be published and made available to all interested parties. Thus, an incumbent operator might be obliged to publish separate accounts for different parts of its operations, and to show the actual level of cross-subsidy which occurs between a loss-making part and a profitable part.

Application of USOs in a **non-discriminatory** manner implies that the same rules should be applied to all operators, domestic or foreign. It could imply, for instance, that the costs of meeting USOs should be shared in an equitable manner by all operators with a national presence, or a significant share of the national market.

Competitively-neutral implies that no potential service provider should be unfairly prevented from entering the market, and that no existing service providers should be unduly advantaged or disadvantaged as a result of the application of USOs.

Virtually all examples of transparent Universal Service funding mechanisms involve some form of obligation placed on service providers which are present in the domestic market. These may take the form of a tax on revenues, a sales tax, a license fee, an access deficit charge (ADC), an interconnect payment or whatever. The general trend is away from subsidies which are applied through higher prices (for instance, higher interconnect, access charges or local call charges) towards other forms of targeted subsidy, directed towards, say, low-income users.

Source: ITU Secretariat 1998.

striking bargains with regulated companies. Regulatory gains may well be of a social nature.

A good example is acquisitions and mergers, which may be approved only subject to certain conditions. The United States Federal Communications Commission recently put forward 28 conditions for approval of the proposed SBC – Ameritech merger, insisting on promises to offer high-speed data service to low-income areas. Heavy fines would be built in for failure to comply with the conditions.

Furthermore, as the recent ITU Regulatory Survey shows, the majority of reporting countries which impose universal service obligations on incumbents, also impose them on the new operators that have been allowed into the market due to liberalization. Malaysia's recent Communications and Multimedia Act, for example, requires all fixed-line operators to contribute to the provision of payphones in rural areas, while this had previously been required only of the incumbent, Telekom Malaysia.

The aim of most universal access regulation is to allow effective competition without detriment to universal access. This usually means promoting price rebalancing, in order to reflect costs and thereby facilitate competitive entry. At the same time there is a desire to protect vulnerable groups from excessive price increases. In developed countries, this is relatively easy to achieve – a huge blanket cross-subsidy to all telephone line rentals may be gradually replaced by a targeted cross-subsidy to some users only.

But in developing countries there may be no easy solution. Rapid falls in international accounting rates cause special problems in many countries, which are losing income formerly derived from a large surplus of inpayments over outpayments. Either competition must wait, or domestic prices must rise to such an extent that they put service out of the reach of many current and potential subscribers, or both. A similar problem is faced in several of the transition economies of central and eastern Europe, and the former Soviet Union, whose prices were kept artificially low. They have built up subscriber bases well in excess of what would have been expected at economic prices.

One possible approach to the problem of tariff rebalancing is to make the subsidy transparent, non-discriminatory and competitively-neutral. A transparent subsidy can also be more directly targeted to those it is intended to help. But what do the words "transparent, non-discriminatory and competitively-neutral" actually mean? (see Box 5.3).

The expectation is that competition will eventually benefit all consumers by bringing prices back down again. Because line rentals often have to rise considerably to cover costs, however, it can take a considerable period before those users, who make few calls, begin to experience lower prices in real terms.[10] Inevitably, a compromise must be struck. A good example of this is the recent decision by the Indian regulator, TRAI, to limit the DoT's increase in rentals for rural subscribers who make few calls, while other rentals were allowed to rise much more steeply in a move towards cost recovery.[11] Similarly, Sri Lanka's Telecommunication Regulatory Commission has recently allowed Sri Lanka Telecom's business rentals to rise by 67 per cent while leaving residential rentals unchanged.

In most markets, the pairing of competition with selected price controls is becoming an attractive mix to achieve the diffusion of selected new services to the population at large or basic services to selected groups in society. Monitoring the various prices charged for Internet services and developing adequate regulation to promote the service when needed is, for example, an increasingly popular approach among regulators worldwide. Some of them are:

- Monitoring end-user prices charged for Internet access. Often practiced and appropriate where there is little or no competition in Internet service provision to ensure affordability – as it is done in the Gambia.

Box 5.4: Licensing with social obligations

Building universal service obligations in the new licensing regime of Sri Lanka[13]

Sri Lanka Telecom's license includes a condition entitled Special Provisions for the Disadvantaged. This requires the operator to consult the regulator about making available "services capable of satisfying the reasonable demands of the disabled (especially persons with a hearing impairment) and persons of pensionable age." In 1997, Nippon Telephone and Telegraph (NTT) bought a 35 per cent share of SLT, with management control. The agreement between NTT and the Government of Sri Lanka specifies demanding network expansion and quality targets in return for 5 years' continued exclusivity in international telecommunications.

In 1996 two new wireless local loop (WLL) operators were licensed. Their licenses contain two incentives to achieve specified rollout targets: (1) *carrot:* achievement of aggregate line targets, together with an acceptable call completion rate, guarantees them an additional two years during which no further WLL licenses will be granted; (2) *stick:* punitive additional license fees become payable (US$ 100,000 per unserved secondary area per year) if at least 10 working lines have not been installed in each of Sri Lanka's 28 "secondary areas" three years from launch. A "fine" of US$ 2 million is also payable if the aggregate line target has not been met at this time.

Sri Lanka's National Telecommunications Policy includes among its objectives: (a) to provide telecommunications facilities to all, at cost-based tariffs; (b) to achieve universal service covering the whole country including all villages. This implies easy access to basic telecommunications facilities such as telephone, telegraph and facsimile to all at affordable and reasonable prices. The specific targets stated in the policy document include: (a) telephones to be available on demand by 1998. All waiting lists to be cleared by this time. Those who are far away from cable networks to be serviced by wireless means; (b) to provide telephones, telegraph and fax access to all villages and villagers by 1998.

One of the regulator's primary objectives was to ensure the provision of a reliable and efficient national and international telecommunications service in Sri Lanka (in so far as the provision thereof is impracticable) such as will satisfy all reasonable demands for such service including emergency services, public call box services, directory information services, maritime services and rural services as may be considered essential for the national well being.

Source: http://www.trcsl.gov.sl.

- Developing new charging schemes for local calls used to access Internet services. Special dialing numbers and reduced prices are being implemented in some countries to promote Internet access and usage.
- Monitoring the interconnection prices charged by telecom network operators to Internet service providers. In particular, to ensure they are no higher than those charged to the network operator's own Internet service provision branch.
- Exploring ways to bring down the price of leased lines (which are main network resource used by ISPs to provide Internet services). High leased line prices lead to high consumer prices, and, subsequently to a limited diffusion of Internet services.
- Requiring value-added operators, including Internet service providers, to contribute, either in cash or in kind, to the achievement of universal service goals.

5.3.2 Licensing

Licensing has always been one of the preferred mechanisms of policy makers and regulators to achieve universal access goals. In the days of PTTs, performance agreements between the company and the relevant Ministry would set network expansion targets, and, in some case, special service arrangements – such as subsidized prices – aimed at improving access to communications services for disadvantaged groups in society.

The move towards the privatization of state-owned companies also saw the granting of licenses to the new owners as a mechanism to set universal service targets to be achieved – mainly during the period of exclusivity often granted after the privatization. Mexico, Argentina, Peru, Venezuela, and others are examples in this regard.

With the opening of markets and the entry of new operators, licenses are being used once more to achieve certain universal service/access goals. Licenses now usually contain incentives and/or obligations relating to network expansion. That is the case in a number of Asia-Pacific countries, such as Indonesia and the Philippines where both new wireline and wireless operators have been required to comply with certain network expansion targets.[12] That has also been the case in Sri Lanka (see Box 5.4).

Different types of licensed entities may be subject to different types of conditions. For example, co-operative or self-help ventures to bring service to disadvantaged communities may receive outside support. This holds particularly true for remote or ethnic communities in developed societies, such as the Aboriginal Tsunami network in Australia or the networks of Native Americans in North America.[14] In Bolivia, however, it seems the scales are tipped the other way. Co-operatives have six years of exclusivity, from 1995 to 2001, subject to ensuring that every town with a population of 350 people or more has one public phone. If a co-operative fails to meet this target then it will automatically lose 20 per cent of its relevant market to ENTEL, the former monopoly operator.

Table 5.2: Bidding for the unphoned

Results of Telecommunications Development Funds

	Chile (first 3 years)	*Peru (first bid, 1998)*
Localities served	4,500	193
Total inhabitants (millions)	1.8	0.145
Mean subsidy per locality:	US$ 2,400	US$ 8,609
Mean subsidy per inhabitant:	US$ 6	US$ 11
Companies receiving funds	5	1

Source: Subtel, Chile and OSIPTEL, Peru.

Some regulators are going further and introducing an element of competition in the fulfillment of universal access goals. Competitive tendering for payphone provision to unserved villages has been in place for some years now in Chile and in Peru last year (see Table 5.2). In Chile, a specially constituted council examines the applications and awards each tender to the best bid. At first, this meant the bid requiring the lowest subsidy, but now other factors such as speed of provision are also being considered. Australia's Ministry for Communications has recently announced its intention of developing a process for putting also the USO out to competitive tender.[15]

5.4 Redefining access points

Many approaches share a new emphasis on the importance of public access points for broadening access to whatever communications technology has been installed. The hope is that public access will diminish the worst inequities between the richer and poorer parts of a society and at the same time, feed demand for private (commercial) access to these technologies.[16]

Regulators may require licensees to provide a certain number or percentage of public access points as a condition of their license. But they may also encourage the provision of public access by non-licensees by permitting or requiring service that will be resold at a low price, to permit a margin for the reseller and/or limiting the permitted mark-up. In Senegal, for example, the incumbent network operator, Sonatel, provides service for private resale at a 40 per cent discount to normal retail prices, and the permitted mark-up is limited to 75 per cent.[17] This has been an important factor in achieving the 7 000 plus privately run public telephone access points in that country.

A number of countries in the developing world are putting a special emphasis in multiplying the points at which the public can have an easy and reliable access to communications services. Some have decided to supply, for the time being, traditional basic services. Others are aiming instead at more complex schemes, which might include some or all of the features of a multimedia telecentre (see Box 5.5).

The growing movement towards providing community telecentres is built in part on the desire to make the Internet more widely accessible. They have become a central plank of some universal access strategies, most notably in South Africa.[18] The community telecentre is a result of a marriage between the public telephone and the commercial cybercafes. It may range from a single phone in a hut (possibly with an enhanced data or fax capability) to a purpose-built, air-conditioned centre equipped with a dozen phone lines, computers, photocopiers, and a team of trainers and modern "scribes" (who help the uninitiated to find their way around the Internet).

Telecentres are being tested in a range of developing countries across Africa, Asia and Latin America. Most of them are very new and the conditions for their success are not clear, but it seems that they will require:

- Support by the regulator for the low-cost resale of telecommunications.
- Careful planning towards self-sufficiency as an integral part of the local economy, including the phased filling of relevant jobs by local people.
- Involvement of the local community in the planning and management of the centre, as well as in its running.

5.4.1 Customizing access facilities

In redefining modes of access to communications services policy makers and regulatory agencies are increasingly taking into account the fact that not all citizens have the same physical and mental capabilities available to them. This fact is leading to an increasing public recognition of the need for positive action to secure equitable treatment of citizens with disabilities.[19]

The nature of a disability may call for physical adaptation of the network, or more usually of terminal equipment, to achieve functional equivalence for people with that disability. For example, profoundly deaf people have no use for voice services. To communicate amongst themselves, they may use text or other visual services (for example, videophones which transmit sign language). To communicate with the hearing world, they must have a telecommunications relay service which translates between voice and these other services. Wheelchair users may be unable to reach public phones because of the height at which they are placed or the size of an enclosing kiosk. People with reduced vision or dexterity may find phones with big buttons a great help.

Concerns about the cost associated with supplying special access conditions to the disabled community has lead to a reluctance to address the problem. This concern however has,

Box 5.5: Boosting public access

How Sri Lanka used payphone subsidies to expand public access to telecommunications networks

In May 1999, Sri Lanka's government announced a subsidy scheme to encourage the installation of payphones in rural areas. Up to 2,500 payphones installed with prior approval in rural areas will be eligible for the subsidy of US$ 1,000 per payphone. An individual operator will be entitled to the subsidy for up to 25 payphones, subject to a limit of 100 units in each of the 25 districts. The subsidy is available to all payphone operators, and is funded from license fees. The aim is to bring Sri Lanka's payphone penetration up to the levels of those in other countries of "similar economic standing".

in most cases, been exaggerated. Common disabilities (e.g., moderate hearing loss) can usually be helped by minor equipment modifications, whose cost is further reduced by volume production.

It is increasingly common and relatively non-controversial for relevant obligations to be placed on incumbent telecommunications operators, or other universal service/access providers. In liberalized environments, however, there may be a difficulty relating to terminal equipment. It is not obvious how a diffused market of many unlicensed suppliers can be required to make available the required specialized equipment. This problem is being addressed in the European Union, where disability groups propose progressing along the following lines:

- Promote the inclusive principle of "design for all" wherever applicable. This means that designers of any new service or equipment should consider all types of special needs, and build solutions into their designs from the outset. This often results in improved design for the majority (for example, simple, easy-to-read displays) as well as avoiding costly retrospective changes to achieve access for a minority.
- Promote the minimum number of global standards (e.g., the V.18 standard for textphones) in order to maximize the potential market for each type of specialized equipment, and thereby lower production costs as well as making products work together.
- Build minimum levels of social requirements (e.g., ability to make emergency calls) into equipment approval procedures, and permit countries to add other features (e.g., hearing-aid compatibility) without risking accusations of anti-competitiveness.
- Oblige universal service providers to underwrite the provision of suitable terminal equipment for disabled users.

5.5 Enhancing the diffusion of and access to new technologies

Technological innovations and new services are widening the range of ways in which universal service aims can be tackled. In most countries, however, the chosen route is simply to open the market, without any special regulations to promote universal access. Yet, a number of regulatory decisions related to the type of technologies that can be used under a particular license has the ability to either promote or undermine the rapid diffusion of new information and communications technologies in a society.

If a particular technological configuration or standard is linked to a license to provide a certain type of service, those holding the license would find little incentive and lots of barriers to move up in the technological ladder. In other words, licenses that are not technology neutral often work against technological innovation affecting in this way the possibility of lower prices of hardware and services.

The following section takes a brief look at some current technology trends which have important implications for universal access.

5.5.1 Internet service provision

A major phenomenon of the last year has been an enormous growth in use of the Internet, fuelled in developed countries by increasingly attractive tariff packages. These are often advertised as free, although users do normally pay something, either through a flat-rate subscription or through call charges.

Service providers supplement their revenues from other sources, including advertising and commission on on-line sales. To date, this growth has mainly been among a privileged market segment of early adopters who are already well connected to all forms of communications that they desire. Its significance for universal access is that it has highlighted the big advantages that people who are connected to this new medium can enjoy, and the spectre of a new division in society.

In some European countries, user movements are pressing for "free" (in practice, flat-rate unlimited) Internet access in a tone suggestive of the fulfillment of a basic right. Given that Internet access of any kind is still confined to minorities in these countries, this campaign is perhaps better viewed as an expression of demand rather than of need. A similar remark applies to the universal supply of free e-mail addresses, which is springing up in various countries. Since an e-mail address is useless without a way of accessing e-mail service, this appears to be more of a demand stimulant than the response to a need.[20]

5.5.2 Mobile

The last few years have seen a huge growth in the accessibility of cellular mobile phones worldwide. In a few developed countries like Sweden, Finland and Japan there are, or soon will be, more mobile phones than fixed lines. In many developing countries too, mobile phones are making a major contribution to the total number of lines – often substituting for fixed lines. Where fixed lines are especially scarce, as in

Table 5.3: Sharing the market

Evolution of fixed and mobile services in China, 1996-2010 and mobile services as percentage of total

Year	*Fixed lines (m)*	*Mobile lines (m)*	*Mobile as % of total*
1996	55	7	11
1997	70	13	16
1998	87	25	22
2010 (projection)	290	200	41

Source: Ministry of Information Industries, China.

Cambodia, again mobile lines may actually exceed fixed lines. Similar trends can be seen in countries like China, where it is expected that by 2010 mobile services will constitute as much as 40 per cent of all telecommunications services (see Table 5.3). Traditional teledensity measurements (of fixed lines per 100 population) are now of very limited value in assessing actual telecommunications access, without an indication of cellular density as well.[21]

5.5.3 Satellite

Satellite systems, in principle, hold great promise for extending communications access to large thinly populated areas which are hard to serve by terrestrial means. VSAT technology is already well-established, primarily for serving isolated but profitable business installations such as mines or oil-wells. The emerging next generation is GMPCS (global mobile personal communications by satellite). To date, only a few of these systems have been launched. Their prices remain out of reach for the vast majority, and not surprisingly business is slow. In response to the desires of some developing countries, some of these companies have announced their intention of serving the needs of the rural areas.

5.5.4 Smart software and virtual telephony

Today's intelligent networks and peripherals, especially when coupled with sophisticated voice technology, offer several new opportunities for extending communications access and use.

Best known is perhaps the notion of *virtual telephony*, which has become quite widespread among homeless people in the United States and is also being sold successfully in other countries like Botswana and Chile.[22] Virtual telephony gives a subscriber a telephone number and a voice mailbox, enabling him or her to receive messages and access them from any phone. An upgraded but still economical service radiopages the subscriber when new messages arrive.

The flexibility now exists to offer customers who have a phone line differing levels of access and service – including chosen levels of call barring, or conversely, permitting calls only to identified numbers. Different customers sharing a line can be separately identified and separately billed, and can each have a distinctive ringing tone. Credit limits could be set, if desired for different categories of service. Such facilities are not yet, however, generally on offer, at any rate at prices that would appeal to low-income customers.

5.5.5 Digital broadcasting

Digital broadcasting greatly multiplies the number of channels available. To access this wealth of material, an individual must not only live within coverage of the new services, but also invest in terminal equipment: a new television, possibly a satellite dish, and a "set-top box" which makes possible access to just those facilities that have been paid for. Inspite of the costs of all this equipment, the technology offers tremendous opportunities. Digital television could rapidly find its way into more homes than have personal computers, and provide a measure of data and Internet access which would satisfy a high proportion of demand. This could be the route towards true democratization of the Internet in developed countries, and an economical way to provide both broadcast and two-way communications to isolated communities anywhere in the world. Again, this is an emerging market whose future can only be guessed.

Assuming that the most appropriate policies and regulations have been devised and the most adequate technology is available on the market, we still have a major problem to face: how do we pay for the provision of universal access. Here, as in the previous areas, regulators and policy makers have a crucial role to play.

5.6 Paying for universal access

Part of the idea of universal access, as explained above, is that it goes beyond what can be achieved on a purely commercial basis. This means that it must attract additional funding from some source. Not surprisingly, funding and the costing of universal service have caused considerable debate and controversy in industry circles – the relevant literature greatly outweighs that on basic needs.[23] In recent years, some dominant funding mechanisms have arisen among countries pursuing universal service goals (see Table 5.4).

Of course, the key to any shared funding mechanism is the determination of the net cost that is to be shared. In the past, most countries have used historic cost accounting and fully allocated costs to assess the costs of universal service. However, more and more regulators are requiring a transition to long run incremental costing (LRIC) methodologies. Three transition paths are appropriate to different circumstances:

- Implement LRIC direct from the traditional approach. This path will suit areas where new infrastructure is being

Table 5.4: USO funding mechanisms

Universal service funding strategies

Mechanism	*Environment*	*Example countries*	*Explanation*	*Key advantage(s)*	*Key disadvantage(s)*
Cross-subsidisation	Traditional monopoly	Pakistan, Czech Republic	Profitable services (e.g., international) subsidize universal access	Well-established, easy for incumbent	Long-term, incompatible with competition
Co-operatives	Independent local telecoms operators	Argentina, Finland	Residents invest and own local telecoms operators	Local control	No help to high-cost areas or low-income communities
License obligations, absorbed cost	Transition from monopoly to competition	UK	Net cost of universal access presumed negligible, outside funding unnecessary	Low administration cost	Little incentive for new entrants to take on USOs
Access charges	Liberalizing	Canada	Interconnecting operators contribute to access deficit	Compatible with early stages of competition	Hard to get charge levels (and incentives) right
Central fund (real or virtual)	Competitive	France, USA, Chile, Australia	All competitors share in net cost (in cash or kind)	Potentially fair	High admin. cost, especially when agreeing costing approach
Direct assistance	Competitive	Finland	Government support for needy areas or households	Should minimize market distortion	Have to secure outside funding, identify eligible recipients

Source: ITU adapted from Ovum 1999.

installed (e.g., developing countries and rural areas) and the USO aim is to ensure efficient investment.

- Introduce an interim stage of current cost accounting while still using fully allocated costs. This path is appropriate where the universal service provider has a substantially digital network. In this case the move to current cost accounting will be an evolution from the traditional costing methodology.
- Introduce an interim stage of incremental costing while still using historic cost accounting. This approach should be used where the incumbent's network is still largely analogue, and a move to current cost accounting would undermine the incumbent's ability to invest in digital technology.

To calculate the net costs of USOs to a provider, not only costs but also the associated benefits must be estimated. An important benefit that unfortunately is hard to measure is the value of inbound calls from the existing network to newly connected lines, together with the longer-term call stimulation effects of having a larger network. A range of less tangible benefits has been cited, including brand enhancement, corporate reputation, life-cycle effects, ubiquity, and the avoidance of the costs of discrimination. These are all difficult to estimate, and some of them are specific to an incumbent and not transferable to an alternative operator.

In looking at providers' claims for USO cost recovery, it is important to remember that all industries have a mix of product and service lines with different levels of profitability. It is normal commercial behavior to offer some services at or even below marginal cost, as "loss leaders" (e.g., student bank accounts) or in order to derive some revenue from otherwise unproductive spare capacity (e.g., hotel and airline cut-price off-peak offers). There is every reason to expect such pricing to emerge in a competitive telecommunications industry, and no reason why telecommunications companies should have unique protection against incurring losses in some areas of business. Even if they were free to withdraw from unprofitable areas or from serving unprofitable customers, the costs of identifying these areas or customers and substantiating that they are unprofitable are likely to be a strong deterrent from withdrawal.

Another issue to be sorted out in the USO funding debate is, assuming shared funding, which companies are caught in the funding net and which of their revenues are regarded as relevant for this purpose. To date, there seems to be a consensus that infrastructure-based fixed network competitors should pay and that non-infrastructure service providers, in particular Internet service providers, for the time being at least, should not.

The regulatory attitude towards ISPs is essentially to provide the best conditions in which they may flourish. The position of mobile network operators is less clear.

In many countries, the huge success of mobile services, together with fixed/mobile service convergence, suggests that mobile operators are now sufficiently mature to be asked to contribute to social goals. Contributions may be in cash or in kind: in South Africa, cellular operators have to provide cellular payphones within their coverage areas, and Grameen Phone in Bangladesh are providing village cellular payphones.

Aside from government funds and company contributions, regulators are looking at various incentive mechanisms and strategies that might induce consumers to cover the cost of expanding infrastructure and services across the country.

Research among people without phones in a number of affluent societies reveals a common set of needs for telephony and barriers to connection.[24] The most important barriers are: (a) large lump sum payments, such as may be required for initial connection, or to cancel a previous debt; (b) the variable and unpredictable size of phone bills, typically received at long intervals (of two or three months). These, of course, are problems affecting not only the unphoned in high income societies, but also most middle and low income population in developing nations.

In response to these concerns, special packages are becoming available (usually with the regulator's encouragement, if not as a specific requirement) with the following features:

- Initial connection charge not levied, or spread over the first year or more of service.
- A flexible range of billing and payment options, including more frequent billing, budget accounts (say, with payments averaged over a year), and prepayment – whereby calling is only allowed up to the amount prepaid, and therefore no debt is possible.
- The ability to selectively bar certain categories of call, typically international and/or premium rate services, but possibly also long-distance calls or even all but emergency calls.[25]
- An alert if the cumulative call bill to date exceeds a specified amount.
- Provision of alternative payment methods when the customer has a problem with paying a bill, which can help avoid disconnection of service.

The explosive growth in prepaid mobile services and the rapid diffusion of mobile services among middle- and low-income groups of some developing countries – like Mexico – points to the fact that adequate, customized pricing strategies can go a long way in opening access to people that were before excluded from the market due to unfriendly charging schemes.

What is interesting in the case of prepaid mobile cards is that the service itself is more expensive than fixed wireline services and even conventional cellular services, but the ease and informality of purchase has lead to a boom in customer growth. The experience also indicates that there is still considerable margin for the cost of prepaid cellular services to come down. Regulatory intervention in this direction might help increase access for a large number of citizens without having to go into any subsidies scheme.

Finally, there is an increasing awareness that people with disabilities should receive a preferential treatment in regard to service charges. Disability often implies a reduced earning capacity. Equity demands that disabled people should not be further disadvantaged by having to pay more than others to achieve functional equivalence. This means, for example, that:

- People with impaired vision such that they cannot use a printed directory should be entitled to free use of directory enquiry services.
- Where a disability means that it takes longer than usual to complete a telephone call, for example because of the translation process in a relay service or where a vision-impaired user needs assistive technology to access the Internet, the caller should not have to pay extra charges.
- Expensive specialized terminal equipment, as required for example by deaf-blind people, should be provided at no more than a token charge to the user.

5.7 Conclusion

The provision of universal access is one thing that will probably not be able to be guaranteed if left to market forces alone. The provision of universal access to some communities or regions in a country entails at least some investments on the part of a network operator which it has little or no chance of ever recouping. If universal access is to be promised, it will require its imposition by a regulatory mechanism or body of some sort or other.

It will also not be such an easy affair as to simply require universal access provision as a quid pro quo for obtaining a telecommunications license. If the requirement should be for the universal access to basic services, definitions are required of what constitutes a basic service. In the Information Age, should this not also include Internet access, for example?

A decision has also to be made about what constitutes an acceptable quality of basic service. Low quality can render a service unusable. At the same time, should subscribers not be allowed to elect to have a lower quality service in exchange for economic savings? Also, what kind of ancillary services, if any, should be bundled with a basic service – a directory entry, call waiting, or the option to elect not to have a directory entry, for example? And what special provisions should be made for special groups such as language minorities or those with disabilities?

The same progress in technology, however, which may complicate the definition of a basic service, could serve to make its provision simpler and may be even cheaper, and therefore the imposition of a universal access requirement less onerous. Satellite, wireless local loop, mobile telephony and virtual telephony all have the potential to reduce the cost of providing universal access compared to conventional fixed technologies, as may the Internet in the not too distant future. And the Internet could also help implement new types of services for special groups – e.g. speech to text conversion for the deaf.

Payment for the provision of universal access is – perhaps predictably – a controversial issue. Approaches in different countries vary from profitable customers subsidizing an

operator's unprofitable customers to a universal access levy shared between all of a country's operators.

Ironically while most agree the market will not address the issue of universal access if left to itself, it has come up with a solution for some of those denied access to telecommunications because of their lack of credit worthiness. Prepaid cards which can be bought by anyone regardless of their credit status, are in fact the fastest growing part of the mobile phone market in many countries. They are also becoming increasingly prevalent in many countries' long distance market. And they are already well-established in the payphone market. Other applications could include Internet access, remote payment, pay-per-view television – in fact, virtually any telecommunications service.

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[1] Other areas include the central management of limited resources such as spectrum and numbering.

[2] This chapter is a brief overview of a huge field, which has generated much literature, both academic and more practical. An excellent first reference for the reader wishing to explore further is: International Telecommunications Union. *World Telecommunication Development Report: Universal Access*, Geneva: ITU 1998.

[3] It is interesting to note that people in developing countries now accord a high importance to telecommunication services. A recent Chinese survey, for example, showed 78 per cent of respondents regarding the phone as a necessity (with 88 per cent saying it is a convenience, and only 4 per cent a luxury). A recent Sri Lankan survey revealed rural residents assigning a higher priority to telecoms than to transport or electricity. Rural Peruvians are reported to be prepared to spend US$ 3 a month on telephone service out of a monthly income of US$ 18. China survey: Beijing University of Post and Telecommunications' Zhongze Research Institute of Communications. Reported in *The yearning a phone call away* in CTC News, Vol. 5 No. 5, 20 March 1999. Sri Lanka survey: Org- Marge- Smart for the regulator, Telecoms Regulatory Commission of Sri Lanka. Peru data: Fabrice Langreney of Intelsat, at the First NTCA-World Bank international conference on rural telecommunications, Washington DC, 30 November – 2 December 1998.

[4] Some authors use these two terms almost interchangeably. Often, however, "universal service" means "a phone in every home" while "universal access" means some lower level of telecoms availability, such as payphones in all population centres.

[5] See for example: Garnham, Nicholas. *Universal service in European telecommunications*, in "Universal service and rate restructuring in telecommunications", OECD, ICCP Series No. 23, Paris 1991; Rapp. Lucien. *Public service or universal service?* Telecommunications Policy 20 No. 6 (1996): 391-397. Milne, Claire: *Stages of universal service policy*. Telecommunications Policy 22 No. 9 (1998): 775-780.

[6] Muhammad Talib Dogar. *Universal service obligations: a policy review. Public opinion solicitation.* Pakistan Telecommunication Authority 1998.

[7] See for example Oodan, A. P., Ward, K. E., and Mullee, A. W. *Quality of service in telecommunications*. IEE Telecoms Series No. 39. London, 1997. Chapters 14, 15 and 16 are especially relevant.

[8] A recent development in the United Kingdom is worth noting here. The last decade has seen a big growth in the provision of telephone helplines, which offer callers advice and support over a multitude of problems of social welfare – including rare medical conditions, drug abuse, homelessness and children at risk. A cornerstone of these helplines is their confidentiality, which has been threatened by the spread of itemised billing. After a protracted search, the solution chosen to this dilemma is that bona fide helplines are entitled to a special no-frills freephone service at a low cost-reflective tariff. A remaining problem however is that calls to freephone numbers are often not free from mobiles.

[9] To be offered within the following performance objectives: (1) an ability to originate or terminate calls, as indicated by the presence of dial tone, 99 per cent of the time over a continuous 12 calendar month period; (2) over any three calendar months more than 95 per cent of non international calls through each local exchange during the Day period will be successfully switched at the first call attempt to the required number; (3) an insertion loss of not greater than 7 dB measured between 600 ohms at a frequency of 820 Hz between the customer side of the network boundary and the customer's local telephone exchange equipment; (4) a continuous random noise power of not greater than 55 dBmP measured at the customer side of the network boundary.

[10] See for example: *For whom the phone rings: residential consumers and telecommunications competition,* Consumers' Telecoms Network, Sydney, 1995; Barrados, Angie, *Still a long distance to go: residential consumers and the transition to competition in the long distance market*, Public Interest Advocacy Centre, Ottawa, February 1999; Annex II to *First Monitoring Report on Universal Service in Telecommunications in the European Union*, European Commission, 1998.

[11] To inflation since the last increase.

[12] For more details see International Telecommunications Union. *Asia Pacific Telecommunications Indicators: New Telecommunications Operators*, Geneva: ITU 1997 and International Telecommunications Union. *World Telecommunication Development Report: Universal Access*, Geneva: ITU 1998.

[13] Sri Lanka's population of some 18.6 m occupies a fairly densely populated territory of 65,000 km^2. Despite the strains of civil war, its economy is expanding. The telecommunications network too is growing fast, partly because of recent liberalization. By the end of 1998 fixed line teledensity had reached 2.6 per cent, supplemented by a mobile teledensity of 0.9 per cent. In the three years to 1998, the incumbent, Sri Lanka Telecom (SLT), more than doubled its number of lines.

[14] See Casey, James, Randy Ross and Marcia Warren. *Native Networking: Telecommunications and Information Technology in Indian Country*, Benton Foundation 1999. (available at http://www.benton.org).

[15] *Request for Comment and Expression of Interest for Provision of the Universal Service Obligation,* Department of Communications, Information Technology and the Arts, March 1999. (http://www.dcita.gov.au).

[16] The phrases "information-rich and information-poor" and "digital divide" are often used in this context.

[17] Garthwaite, Nicholas. *The expansion of community telephony in Senegal.* Translation and summary of a paper by the Direction Générale of Sonatel, April 1996.

[18] Jensen, Mike. *Telecentres for rural access to information and communication technologies*. ITU workshop on telecommunication reform, Gaborone, Botswana, May 1999 (available at http://www.itu.int/treg).

[19] Modern communication technologies may be of special value in helping disabled people to overcome their disabilities. For example, the ability to work from home opens up new opportunities to many with restricted mobility, while mobile phones provide new levels of reassurance to disabled drivers. Much relevant work has been carried out under the auspices of the European Union, building on best practices in North America and elsewhere. A good first reference is: Roe, Patrick R. W. *Telecommunications for all.* COST 219 project. CEU, Luxembourg, 1995. Provisions like those mentioned here are being implemented throughout Europe.

[20] Provision of genuinely universal e-mail access in the USA is discussed in: Anderson, Robert H., Bikson, Tora K., Law, Sally Ann, and Mitchell, Bridger M., *Universal access to e-mail: feasibility and societal implications*, RAND, 1995.

[21] Minges, Michael. *Measuring access to telecommunications.* ITU workshop on telecommunication reform, Gaborone, Botswana, May 1999 (available at http://www.itu.int/treg). A further important point here is the need for disaggregated measurements so that regional differences in access can be understood.

[22] Benton Foundation. *What's working?: community voice mail* at http://www.benton.org (another source of much relevant information, including the Universal Service Virtual Library).

[23] For example: ACA consultants' reports *Weighted average cost of capital for 1997/8 net universal service cost, Year 1 problem for 1997/8 net universal service cost, Forward looking technology for 1997/8 net universal service cost* (all available at http://www.aca.gov.au); *Assessment criteria for national schemes for the costing and financing of universal service in telecommunications and guidelines for the member states on the operation of such schemes*, European Commission Communication, Brussels, 1996.

[24] Public Interest Advocacy Centre. *Survey of consumer perceptions surrounding telephone service* and *Perceptions of telephone service by low income consumers*. Ottawa, February 1996.

– Horrigan, J., et al. *The evolution of universal service in Texas.* Lyndon B. Johnson School of Public Affairs, Policy Research Project Report No. 116, 1995.

– Haddon, Leslie and Silverstone, Roger. *Lone parents and their information and communication technologies* and *Information and communication technologies and the young elderly.* Reports 12 and 13, SPRU CICT Series. University of Sussex, 1995/6.

– Elix, Jane and Lambert, Judy. *Have your say.* Final report of national seminar series on future communications technologies: issues and opportunities. Sponsored by Telecom Australia and Broadband Services Expert Group. Sydney, 1994.

[25] One would expect access to freephone numbers to be encouraged from all lines, as these calls generate revenue at no cost to the caller. However, alternative access providers often offer freephone access. In the UK, to avoid subscribers to subsidized basic service taking advantage of competitive bypass, all freephone access is barred. This could have been avoided by restricting bypass access numbers to a specific barrable freephone range.

6 INTERCONNECTION

Interconnection is accepted to be a key factor in the development of competition in the telecommunications industry. In simple terms, interconnection is the set of legal, technical and economic arrangements between network operators that enable customers connected to one network to communicate with customers of other networks.

Due to the importance of the latest developments in interconnection between public telecommunications carriers and the role of national regulatory authorities in this development, the first section of this chapter focuses on key features of the interconnection regulatory framework across countries with respect to interconnection of fixed local networks.

The convergence of different technologies and networks, along with the development of new applications and services, is forcing regulators to look at how to deal with the interconnection issues arising from developments such as voice over Internet Protocol (IP) or frame relay, fax over IP, video conferencing, electronic commerce, etc. The second section of the chapter will look at the interconnection of value-added networks, with a special emphasis on Internet Service Providers (ISPs).

6.1 Regulation of interconnection between telecommunications carriers

Why is interconnection mandatory for telecommunications carriers? If interconnection is a contract negotiation between private parties, why does the public authority (i.e. regulator) have to intervene in part or all of the process? Does private bargaining not lead to an efficient outcome? Is there a possibility that public intervention may help to obtain a better private outcome?

These are some basic questions raised by regulators when approaching interconnection issues. A satisfactory answer to all these questions is beyond the scope of this chapter, however some of the basic ideas behind why some interconnection issues deserve to be regulated will be explored.

From an economic point of view there may be two reasons to regulate interconnection:

1) the presence of economies of scale and scope; and

2) the presence of network externalities.[1]

In the first case, the nature of network economics in the production of basic telecommunications services generates market power for the incumbent telecommunications service provider.

The incumbent operator may have incentives to exercise its market power against an entrant to raise the rival's costs through interconnection or simply to deter entry into the market. Private bargaining among parties with equal bargaining power might lead to efficient outcomes. However, the significant bargaining power of the incumbent may allow it to provide inefficient interconnection terms to its rivals in order to delay or weaken competition, or to increase the rival's costs through the imposition of high interconnection charges.[2]

From a social perspective, positive network externalities mean that the subscribers of the first interconnecting network derive additional benefits, without paying an additional charge, from exchanging calls with the subscribers of the second network and vice versa. Therefore, a fully interconnected network maximizes network externalities and thus it is the most efficient supply structure.

In this context, for instance, an incumbent operator that deters entry to a new operator by refusing to interconnect would keep that social efficiency from being maximized. To achieve the possible economies of scale and scope and network externalities, the role of the regulation should be to reduce or eliminate market power (level the playing field) and mimic the outcome of competitive markets.

The most important interconnection issues emerge from the local network because of its characteristics of quasi-natural monopoly. With interconnection, local telecommunications networks do not constitute a natural monopoly as classically defined, since the average costs of serving a local exchange area do not increase appreciably once a quite small minimum size is reached. Without interconnection, the incumbent can combine its network externalities and installed base to foreclosed or handicap competitors.[3]

Countries that are implementing liberalization of potentially competitive segments of telecommunications must be aware that one of the competitors may have control over essential facilities (becoming a bottleneck in the local network) which are used as inputs in the production of the competitive services by other competitors.

Under these circumstances, regulatory authorities must ensure efficient allocation of resources. This explains why the first part of the chapter concentrates on interconnection with the local network.

6.1.1 Types of regulatory intervention

In general, the national regulatory authority of a given country may adopt one or a mixture of the following approaches to different interconnection issues:[4]

1) Leave the issue entirely to commercial negotiation between parties. If parties fail to agree, they may appeal to general competition and anti-trust law.

2) Leave the issue entirely to commercial negotiation between parties, but subject to regulatory intervention if the parties fail to agree.
3) Leave the issue entirely to commercial negotiation between parties, but the regulatory authority sets the framework for negotiations and it has to approve the agreement or intervene if the parties fail to agree.
4) Specific issues are prescribed from the outset by the regulatory authority, and parties negotiate over the remaining issues.

Approach (1) and (2) rely on market forces rather than regulation. New Zealand has taken this approach, letting market forces to be the drivers for interconnection agreements. The general competition rules in New Zealand are also applied for telecommunications issues. It took almost two full years until the first interconnection contract was signed between the incumbent and the first long distance carrier in New Zealand.

Chile also adopted a similar light-handed approach to regulate interconnection at the first part of its deregulation process in the early 80's. However, due to the long delay in interconnection Chile had to implement new rules for interconnection such as the imposition of interconnection charges.

The majority of African countries also let the parties negotiate most of the fundamental issues of interconnection, but for different reasons. In many cases, the regulatory authority is unable to develop an interconnection policy simply due to the lack of expertise, staffing or funding problems, as well as jurisdictional issues.

One of the potential drawbacks of this approach is that entrants often find that the regulatory framework does not specify interconnection policy or guidelines, making it difficult for new operators to obtain interconnection from the incumbent.

In the Americas the regulatory frameworks rely more on approaches (3) and (4). With the rise of competition, interconnection has long been a disputed issue and is likely to become more contentious. It has reinforced the need to have a referee to mediate disputes between the incumbent and new operators. The referee is usually the regulator or the sector ministry. Most countries have left interconnection arrangements up to the operators. In the event that operators cannot reach an agreement, the regulator or some other government body steps in. With the emergence of new operators and the ending of exclusivity periods for certain monopoly operators, interconnection disputes are likely to continue.

Europe is also adopting approaches closer to (3) and (4). Thus the European regulatory approach is to allow the national authorities to set up the framework for negotiations, while the regulatory authority supervises the process of negotiation. The framework for negotiations are set up in advance, including the dispute resolution procedures, the conditions under which the regulator has the right to step in any stage of the process, the content of the interconnection agreements and the specific rules for interconnection. While regulation of interconnection is mainly a national responsibility, the European Commission is also playing a role in its evolution by means of Directives that are then adapted by each of the country members.

Some of the Eastern European countries, which are gradually opening up their telecommunications services, such as data, mobile and paging services to some kind of competition, are already focusing on interconnection policies and watching closely their Western counterparts' interconnection policies.

Whatever negotiation scheme is adopted, it is important to curb the incumbent incentives to delay or block negotiations unnecessarily in order to keep its dominance in the market. Not all countries have had success in this endeavour due to different reasons: the timeframe for completion of negotiations was not set in advance, incumbent preference for litigation on the judiciary system, lengthy and cumbersome dispute resolution mechanisms, the possibility of by-passing regulator authority, etc.

In New Zealand the negotiation period of the interconnection agreement between the incumbent and the first long-distance operator took over two years. As was mentioned before, New Zealand's regulation of the telecommunications sector is based on general anti-trust law, so the parties involved in the interconnection negotiations had to use the judicial system in order to solve their disputes. In acute contrast, the model used in Singapore relies on very detailed provisions for the conduct of negotiations, with regulatory oversight and involvement.[5]

Guatemala is an interesting case in terms of using dispute resolution mechanisms to enforce interconnection within a specific time period (set in advance). Guatemala is successfully using a "final offer" arbitration procedure, also known as pendulum arbitration or binding arbitration, by which two parties can negotiate interconnection under a specific timetable (four months at the most), requiring any disputes to be resolved through "final offer" arbitration administered by the designated arbitrator authority.

At the final offer arbitration, the arbitrator chooses only one of the two final offers presented by the disputing parties, and the chosen offer becomes binding on both parties.[6] Other Central American countries, such as El Salvador, Honduras and Panama, have also adopted dispute resolution mechanisms similar to Guatemala.

6.1.2 Interconnection charge agreements

The role of the regulator. In practice, the regulatory intervention for setting interconnection charges may vary from virtually none to full intervention. In one extreme, charges may be set freely by the parties without any regulatory intervention, while the negotiation process is done entirely by the parties. At the other extreme, charges are prescribed in the regulatory framework set by the regulator. The degree of intervention depends on: the power and authority given to the regulator by the legal framework to intervene (before, during, and after interconnection negotiations), the circumstances under which regulators may intervene and the level of discretion afforded by legislation. The specific roles of the regulators may be, among others to:

- set principles and rules for interconnection charges;
- oversee private negotiation agreements;
- approve negotiation agreements on charges;
- supervise the agreements.

Box 6.1: European interconnection regulation

Many of the key elements of interconnection regulation are contained in the wide-ranging Interconnection Directive (Directive 97/33/EC of the European Parliament and Council) adopted in June 1997. The Directive is consistent with the European Union's (EU) principles on interconnection, has included additional commitments by European countries participating in the World Trade Organization (WTO) Agreement, and requires EU member states to guarantee the rights of new telecommunications operators to obtain equitable terms of interconnection.

The Interconnection Directive focuses on the special obligations of operators with significant market power (around 25 per cent market share). These obligations are: to grant special network access to other operators on a non-discriminatory basis; to publish interconnection price lists; and to set cost-oriented interconnection prices, which will be validated by transparent cost-accounting systems; to announce a referential interconnection offer, which clearly states information regarding tariffs, conditions, and components subject to the approval by the regulatory authority.

The Directive also requires the regulatory agency to prevent discrimination, to inspect all interconnection agreements and to put dispute resolution mechanisms in place for the cases where the commercial negotiation of interconnection agreement fails. In addition, it requires the regulatory agency to take responsibility for aspects of numbering and portability policies, which affect competitive advantage as well as setting the rules for the costing and financing of universal service in a competitive environment.

The Directive was amended on 24 September 1998 (Directive 98/61/EC of the European Parliament and of the Council), in order to bring forward the date for introduction of number portability to 1 January 2000 (with the exemption of those member states that had requested to postpone full competition, in which case two additional years for the dateline are granted) and to extend its coverage to all of fixed networks. On the other hand, the amending Directive requires the introduction of carrier pre-selection by at least all fixed network operators with significant market power also by 1 January 2000.

Even when the regulatory framework does not prescribe actual charges, it may set pricing principles to be applied in interconnection negotiations. There are a considerable number of countries that have laws for determining interconnection charges from costs. Another role of the regulator is to approve the interconnection charges agreed by the parties. For instance, the enforcement of neutrality, non-discrimination, and equal access principles in interconnection charges between operators may fall to the regulator.

Table 6.1 summarizes how different countries around the world deal with some basic features related to interconnection charges.[7] The first column shows whether the negotiations of the interconnection charges are left to private negotiation or are prescribed by the national regulator. Column two shows whether countries have some basic principles for the determination of charges, such as non-discrimination, neutrality or other principles.

The first column of Table 6.1 indicates that most countries prefer commercial negotiation between private parties. However, in practice, in most of these countries a certain degree of public intervention exists in the process of setting charges. This is done either establishing the principles (i.e. cost-based, revenue sharing, etc.) over which charges must be negotiated, framing the negotiations according to pre-established methodologies or setting timetables for the completion of negotiations. Therefore, in most cases, the regulator always reserves the right to exercise its regulatory authority over charges.

In those cases in which charges are set in advance by the regulator, there is also the possibility that pre-established interconnection charges may be used as a basis for negotiation between parties, using the pre-established charges as ceilings of ongoing negotiations. This has recently been the case in Peru, where the regulator set a cap on interconnection charges based on an interconnection charge benchmark, and let parties negotiate a final charge below that level. Regulators in Argentina and Mexico have also recently relied on benchmarks of interconnection charges in order to set their own charges.

Venezuela and Paraguay are currently comparing international interconnection charges (international comparison of charges) in order to set their charges. Chile has a tariff revision each four years. The methodology for setting interconnection charges, and in general any tariff, is specified in detail in the Chilean legislation and it is based on long-run average incremental costs. The latest tariff revision plans to reduce the interconnection charge to less than US$ 0.01 a minute.

One reason for the growing use of international comparison of charges as a means to set charges, may be that it is less time-consuming than cost studies. It is also a way to learn about best international practice in other countries.

Information asymmetries. Most countries do not have a developed market for interconnection where sellers and buyers of interconnection services interact and prices are reached as a result of market forces. On the supply side, usually there is just one dominant supplier of services and on the demand side there are few demanders who may negotiate their contracts in an unsynchronized way, not always at the same time. In this context, there is a need to reduce information asymmetries in the market, by making interconnection charges and other key interconnection conditions public in order to avoid discriminatory behaviour of the supplier to the demanders of interconnection.

Table 6.1: Interconnection charges

Selected countries by region, as of 1 January 1999

REGION Country	*Interconnection charges*	*Pricing principles*	*Regulatory approval of charges*	*Public charges*	*Historic or forward looking cost model*	*Unbundling local loop (1); local and tandem switching (2); operator services (3); trunk lines/transmission (4)*
AFRICA						
Eritrea	Commercial agreements	Reasonable and non discriminatory	Yes	Yes	No (Under preparation)	No
Ghana	Commercial agreements	Reasonable, non discriminatory, cost-oriented	No	No	FDC	(1)
Kenya	Prescribed by regulator, Commercial agreements	Reasonable and non discriminatory	N/A	Yes	Yes, but still under preparation	(1), (2, (3), (4)
Morocco	Commercial agreements	Non discriminatory, transparent, cost-oriented	Yes	Yes	FDC (LRAIC planned)	No
Namibia	Commercial agreements	No	No	No	No	N/A
Republic of Yemen	Commercial agreements	Reasonable and non discriminatory	Yes	Yes	N/A	N/A
Central African Republic	Commercial agreements	No	N/A	N/A	N/A	N/A
Chad Republic	Commercial agreements	No	No	N/A	N/A	N/A
South Africa	Commercial agreements	Reasonable, non discriminatory, cost-oriented	Yes	Yes	LRAIC (adopted due to WTO agreement)	No
Togo	Commercial agreements	Reasonable and non discriminatory	N/A	No	N/A	N/A
Uganda	Commercial agreements	Reasonable and non discriminatory	Yes	No	No	(1), (4)
Zambia	Prescribed by regulator	Reasonable and non discriminatory	No	No	No	N/A
Zimbabwe	Commercial agreements	Reasonable and non discriminatory	No	No	No	(1)
AMERICAS						
Argentina	Commercial agreements. If regulator intervenes, it sets up charges based on: reference charges, incremental costs or benchmark	Non discriminatory, cost-oriented	N/A	Yes	Benchmark (LRAIC planned)	Essential facilities • Call termination or origination • Co-location • 2 MB Interconnection link

Table 6.1: Interconnection charges *(cont.)*

Selected countries by region, as of 1 January 1999

REGION Country	*Interconnection charges*	*Pricing principles*	*Regulatory approval of charges*	*Public charges*	*Historic or forward looking cost model*	*Unbundling local loop (1); local and tandem switching (2); operator services (3); trunk lines/transmission (4)*
AMERICAS *(cont.)*						
Bolivia	Prescribed by regulator, Commercial agreements	Non discrimination, competitive safeguards	Yes	No	LRAIC	No
Canada	Prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	Phase II cost (LRAIC) plus 25% mark-up	Mandatory Unbundling (essential facilities) • Central service codes • Subscriber listings • Local loops in certain bands (i.e. small urban or rural areas) • Local transiting of traffic • CCS7 signalling for transiting (transitorily)
Chile	Prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	LRAIC	No
Colombia	Prescribed by regulator	Reasonable, non discriminatory, neutrality	No	Yes	FDC, LRAIC (before revenue sharing)	Essential facilities: • Local and tandem switching • Signalling • Directory assistance • Information for billing • Civil construction, towers, energy power
Costa Rica	Prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	Opportunity costs	No
El Salvador	Commercial agreements	Reasonable, non discriminatory	No	Yes	LRAIC	Unbundled elements • Local loop • Ports at all levels • Switching at all levels • Billing services • Access to user databases
Jamaica	Commercial agreements	No	No	No	No	No
Mexico	Commercial agreements	Reasonable, non discriminatory	No	Yes	LRAIC	• Co-location • Signalling • Local and tandem switching • Local transit
Panama	Commercial agreements	Reasonable, non discriminatory	No	No	LRAIC	• Unbundled local loops • Unbundled signalling systems
Peru	Regulator has set a cap for interconnection charges, but operators may negotiate a lower charge	Reasonable, non discriminatory	Yes	Yes	Benchmark (LRAIC planned)	• Origination and termination of calls, • Transport; • Ancillary services

Table 6.1: Interconnection charges *(cont.)*

Selected countries by region, as of 1 January 1999

REGION Country	*Interconnection charges*	*Pricing principles*	*Regulatory approval of charges*	*Public charges*	*Historic or forward looking cost model*	*Unbundling local loop (1); local and tandem switching (2); operator services (3); trunk lines/transmission (4)*
AMERICAS *(cont.)*						
St. Vincent and the Grenadines	Commercial agreements	No	No	No	No	N/A
United States	Commercial agreements, prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	LRAIC, TELRIC	• Local links • Local and tandem switching (including software) • Trunk facilities • Signalling and database facilities related to calls (including "Advanced Intelligent Network") • Support systems information • Operator assistance and directory • Interface network designs
ASIA-PACIFIC						
Australia	Commercial agreements	Reasonable, non discriminatory	N/A	No	Yes, directly attributable incremental cost	Origination and termination of calls for PSTN, GSM, AMPS; interconnection link; conditioned local loop service; broadcasting access service over cable networks
China	Prescribed by regulator	No	No	Yes	N/A	N/A
Hongkong SAR	Commercial agreements	Reasonable, non discriminatory	N/A	N/A	LRAIC	(1)
Israel	Prescribed by regulator	Reasonable, non discriminatory	N/A	No	LRAIC	No
Malaysia	Commercial agreements	Reasonable, non discriminatory	N/A	N/A	FDC, but revenue sharing until January this year	N/A
New Zealand	Commercial agreements	Fair and reasonable	No	Yes (Incumbent has to publish prices and other supply conditions, to disclose its financial statements)	No, tariff based	N/A
Pakistan	Commercial agreements	Reasonable, non discriminatory, cost-oriented	Yes	No	Yes	(1), (2), (3), (4)

Table 6.1: Interconnection charges *(cont.)*

Selected countries by region, as of 1 January 1999

REGION Country	*Interconnection charges*	*Pricing principles*	*Regulatory approval of charges*	*Public charges*	*Historic or forward looking cost model*	*Unbundling local loop (1); local and tandem switching (2); operator services (3); trunk lines/transmission (4)*
ASIA-PACIFIC *(cont.)*						
Philippines	Commercial agreements	Reasonable, non discriminatory	Yes	No	Revenue sharing	N/A
Republic of Korea	Prescribed by regulator	Reasonable, non discriminatory, cost-oriented	Yes (adequacy of cost calculation)	No	FDC	(2)
Singapore	Commercial agreements	Reasonable, non discriminatory	N/A	N/A	FDC	No
Thailand	Commercial agreements	No	No	No	As negotiated, revenue sharing	No
EUROPE						
Albania	Commercial agreements	Reasonable, non discriminatory	No	No	N/A	No
Republic of Armenia	Prescribed by regulator, commercial agreements	Reasonable, non discriminatory	Yes	Yes	No	(1), (2), (3), (4)
Austria	Prescribed by regulator, commercial agreements	Reasonable, non discriminatory	No	Yes	LRAIC	(1), (2)
Azerbaijan	Commercial agreements	Reasonable, non discriminatory	Yes	Yes	Yes	No
Belgium	Prescribed by regulator	Reasonable, non discriminatory, cost-oriented	Yes	Yes	Current costs (before it historic FDC)	No
Czech Republic	Commercial agreements	Reasonable, non discriminatory, cost-oriented	No	No	Historic FDC	No
Denmark	Commercial agreements	Reasonable, non discriminatory	No	Yes	Historic FDC (LRAIC planned)	(1), (4)
Estonia	Commercial agreements	Reasonable, non discriminatory	No	No	No	No
Finland	N/A	Reasonable, non discriminatory, cost-oriented	No	Yes	Historic FDC (LRAIC planned)	(1), (2), (3), (4)
France	Prescribed by regulator, commercial agreements	Reasonable, non discriminatory, cost-oriented	Yes	Yes	Historic FDC (LRAIC planned)	(2), (3), (4)
Germany	Prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	Benchmark (LRAIC planned)	Yes but is to be defined
Greece	Set up by incumbent	Reasonable, non discriminatory	Yes	Yes	N/A	N/A

Table 6.1: Interconnection charges *(end)*

Selected countries by region, as of 1 January 1999

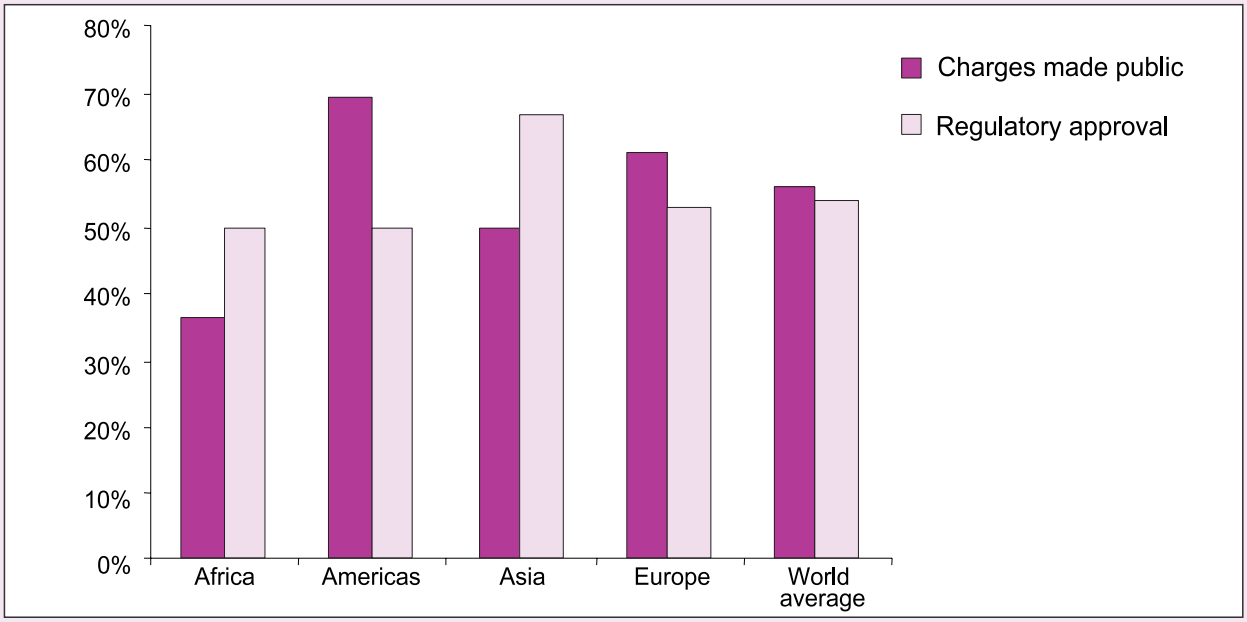
REGION Country	*Interconnection charges*	*Pricing principles*	*Regulatory approval of charges*	*Public charges*	*Historic or forward looking cost model*	*Unbundling local loop (1); local and tandem switching (2); operator services (3); trunk lines/transmission (4)*
EUROPE *(cont.)*						
Hungary	Prescribed by regulator	Reasonable, non discriminatory	Yes	No	No	No
Ireland	N/A	Reasonable, non discriminatory, transparency, cost orientation	N/A	Yes	Historic FDC (LRAIC planned 2000)	N/A
Republic of Kazakhstan	Commercial agreements	Reasonable, non discriminatory	Yes	Yes	Yes	N/A
Latvia	Commercial agreements	No	No	No	No	No
Macedonia	Commercial agreements	Reasonable, non discriminatory	Yes	Yes	No	Yes
Netherlands	Commercial agreements	Reasonable, non discriminatory	Yes	Yes	FDC (includes a 12%-17% capital rate of return)	Yes
Norway	Commercial agreements	Reasonable, non discriminatory, cost orientation	Yes	Yes	FDC (planning to use LRAIC)	(2), (3), (4)
Portugal	Set up by incumbent	Reasonable, non discriminatory	Yes	N/A	N/A	N/A
Slovak Republic	Commercial agreements	Non discriminatory	Yes	No	LRAIC	No
Spain	Prescribed by regulator	Reasonable, non discriminatory	Yes	Yes	Historic FDC	No
Switzerland	Commercial agreements	Reasonable, non discriminatory, cost-oriented	No	Yes	FDC (LRAIC planned in 2000)	No
Sweden	Commercial agreements	Reasonable, non discriminatory, cost-oriented	No	No	FDC (current cost LRAIC planned)	(2), (4)
United Kingdom	Prescribed by regulator, commercial agreements	Reasonable, non discriminatory, cost-oriented, price cap regulation	Yes	Yes	Current and Historical FDC, LRAIC	No

Key: FDC = Fully Distributed Costs; LRAIC = Long Run Average Incremental Costs; N/A = not available

Note: This table is intended to be indicative rather than exhaustive.

Source: ITU World Telecommunication Regulatory Database, OVUM (1998), OECD (1997).

Figure 6.1: Transparency of interconnection charges, by region



Source: ITU World Telecommunication Regulatory Database.

According to the ITU 1999 Annual Regulatory Survey results, almost 60 per cent of countries mandated that interconnection charges be public. However, there are significant regional differences especially in Africa, who has the lowest proportion of countries in which there is an obligation to make charges public (almost 40 per cent). More transparent systems are observed in the Americas, where almost 70 per cent of the administrations indicated they have to make charges available to the public. This was followed by Europe (over 60 per cent) and to a lesser degree by Asia-Pacific.

Regulatory approval of charges. More than 50 per cent of the countries surveyed require interconnection charges to be approved by the regulatory authority, even when the vast majority of these countries prefer charges to be negotiated by the parties involved. This may indicate that, in those countries, there are some rules or principles that negotiating parties must follow in order to get a final agreement on charges.

The methodology for determining interconnection charges. There is an abundance of literature suggesting the convenience of adopting socially optimum prices for interconnection services.[8] The convenience for establishing efficient prices derives from the fact that these prices assure the realization of network externalities, allow the incumbent operator to break even, and adjust prices to costs.

However, in practice it seems very difficult, at least from the very outset, for countries to mandate the adoption of socially optimum prices, or even enforce the adoption of those in cases in which the principles for their estimation were prescribed in law. For instance, a recent study covering 16 developed countries concluded that the attempt to implement optimum prices from the outright would in all likelihood be unfeasible.[9]

The study suggested that the regulator should establish upper and lower limits for interconnection charges. The lower limit would be the long run average incremental cost (LRAIC). The upper limit would be established by adding a mark-up for recovering common cost and other revenue requirements, which they call "minimum uniform mark-up". If operators enter private negotiations, they should arrive at charges within those two boundaries.

There are other approaches for establishing the upper limit for the interconnection charges, such as the Efficient Component Pricing Rule (ECPR), by which the mark-up is equal to the opportunity costs of the operator who is providing interconnection.[10] The key advantage of having principles of cost-based charges incorporated in the regulatory framework is that it constitutes a step towards the establishment of socially optimum prices over the long run.

One important outcomes of the 1999 ITU survey is that a significant number of countries have some cost-based methodology prescribed in their regulatory frameworks for setting interconnection charges (see Table 6.1).[11] In fact, almost two-thirds of the surveyed countries have some cost-based estimation of charges. The cost standards chosen by many countries are mainly LRAIC and Fully Distributed Costs (FDC).

In the Americas, United States, Chile and Canada have adopted LRAIC standards. Other countries like Peru, Mexico, Argentina and some of the Central American countries (i.e. Panama, El Salvador) have included in their regulation the plan to implement LRAIC, however in the short-run they have adopted other cost standards or have estimated charges based on international comparison or benchmarks. Thirty-three per cent of the countries in the Americas region do not have cost-based charges.

In some Asian countries, such as Malaysia, the Philippines and Thailand, the preferred methodologies for setting charges are revenue sharing agreements. This is changing in recent years to cost-based standards. For instance, in January 1999, the then Malaysian regulator, Jabatan Telekom Malaysia opted for estimating charges using FDC methodology, replacing the long-time preferred method of revenue-sharing. This decision also affected the equal access system for selection of long distance carriers. Since there is a cross-subsidy going from long distance tariffs to local tariffs, the incumbent was not going to be able to compete efficiently with the liberalization of the long distance market. In order to avoid substantial financial losses for the incumbent, the regulator ruled that none of the long distance operators were allowed to undercut current long distance tariffs by more than 20 per cent.

In Africa and the Arab States, 56 per cent of countries reported that they had not implemented a cost-based methodology. Notable exceptions are South Africa and Morocco, which have cost methodologies based on LRAIC principles.

In South Africa, the regulatory authority has established that interconnection charges should be based on the long run incremental cost principle. Charges estimated in this way should provide incentives for investment and efficiency on the use of resources. Where parties fail to agree on terms and conditions within a reasonable time/period (which may be prescribed), one or both of them may request that the regulator establishes binding charges and the terms and conditions of interconnection. In resolving such disputes, the regulator should be guided by the principles of non-discrimination and incremental cost.

In Europe there is a sharp difference between Western and Eastern countries, since the former have their charges based on cost standards, while the latter have yet to establish cost standards, with the exception of the Czech Republic and the Slovak Republic. The European trend on interconnection charges is that they should be economic cost-based charges.

Thus, the Commission Recommendation on Interconnection of 8 January 1998, provides greater detail on the specific interconnection issues regarding pricing. It outlines the foundations on which interconnection charges should be laid for the pricing of call termination services in the case of operators that have significant market power. Amongst the recommendations are that:

- Interconnection costs should be calculated on the basis of forward-looking long-run average incremental costs, since these costs closely approximate those of an efficient operator employing modern technologies. The use of forward-looking long-run incremental costs may include justified mark-ups to cover common costs, as they would arise under competitive conditions.
- Where charges lie outside the range of a set of "best current practice charges", established regularly by the Commission, a National Regulatory Authority may use its rights under Article 7(2) of the Directive 97/33/EC to request full justification of the proposed charges and, if appropriate, to require retrospective changes to interconnection charges.
- The use of forward-looking, long-run incremental costs implies a cost accounting system using activity-based allocation of current costs, rather than historic costs. National regulators should set deadlines for the operators with significant market power to implement new cost accounting systems based on current costs, where such systems are not already in place.[12]
- The costs of the local loop should not be included in the estimation of interconnection costs since the provision of interconnection does not lead to any increase of costs in the dedicated components of the local loop of the terminating network.

Unbundling elements of interconnection. Unbundling is a feature related to the specification of interconnection services. Specifically it refers to whether the entrant is entitled to buy particular interconnection functions and pay for each of them – or a single bundle of interconnection functions and pay for them whether it uses all of them or not.

Table 6.1 presents a summary of the unbundling policies across a sample of countries in different regions of the world. The United States is the leading country in promoting the unbundling of elements of interconnection. The 1996 Telecommunication Act established very strict unbundling policies, by which local exchange carriers have to open up their local networks to their competitors, especially to long distance carriers and competitive local exchange carriers.

This mandated unbundling in the United States goes beyond what is required by the essential facilities doctrine in the sense that not all the unbundled elements that a local network operator has to make available to competitors represent bottlenecks. According to the essential facilities doctrine, a bottleneck facility is essential when the following conditions are met:

- the facility is controlled by a monopolist;
- the refusal of access to the facility by other competitors harms competition;
- the facility is economic and technically unfeasible to duplicate in the short-run; and
- the absence of a valid business reason for not providing access.[13]

There is an argument that points to the inconvenience of the United States' approach to unbundling and instead suggests a more conservative approach, such as the essential facility doctrine that Canada and Australia have adopted. Thus some critics of the United States argue that there can be too much mandatory unbundling, especially as against facilities-based competition, since it does not provide incentives for investing in telecommunications infrastructure.[14] They argue that if unbundling policy is not based strictly on the essential facilities doctrine, entrants will not have the incentives to deploy their own infrastructure. Similarly, excessive mandatory resale of services or infrastructure also may discourage additional investments in telecommunications infrastructure.

Europe has been reluctant to embrace, at least until very recently, unbundling policies in their telecommunications markets. However, nearly 50 per cent of European countries exhibit some unbundling regulation in their regulatory

frameworks. The key difference between the European model and the United States model is that while the former prizes facilities-based competition, by which new operators have incentives for efficient investments, the latter maximizes service competition. This also explains why the United States employs the forward-looking long-run incremental costs for calculating costs for specific unbundled elements (called Total Element Long Run Incremental Costs, TELRIC). The European countries employ as an increment the total service of interconnection (called Total Service Long Run Incremental Cost, TSLRIC). Africa has the lowest proportion of countries adopting unbundling policies (nearly 40 per cent).

Retail tariffs. An important way to promote local competition is to allow balanced end-user tariffs, i.e. tariffs above or at cost. Local tariffs below costs inhibit efficient entry. In economic terms, efficient entry occurs when industry costs decrease as a new entrant comes on to the market. In other words when the consolidated sum of incumbent and the entrant costs are lower than the existing costs before entry.

It is very common to observe that countries in different stages of telecommunications development have highly unbalanced final user tariffs, even when the same countries tend to have price-cap regulation as the preferred method of controlling tariffs (see columns 1 and 2 of Table 6.2). The situation is more complex when countries also have other hidden subsidies, such as: (a) "access deficits" (when local tariffs do not cover access costs); (b) universal service schemes (see columns 3 and 4 of Table 6.2); (c) financed from different sources: special fees, cross subsidies from urban to rural consumers, etc. Very often, unbalanced tariff structures consist of local rates set well below their long run incremental costs and long distance rates set well above their long run incremental costs (see column 5 of Table 6.2).

Just as local tariffs set below cost may block efficient entry, long distance tariffs set above cost may encourage inefficient entry. Usually, such an unbalanced retail price structure has been promoted or created by regulatory authorities for different reasons: political interests that preclude the increase of local tariffs, the gradual phasing-out of cross-subsidization between services, etc. When unbalanced end-user tariffs exist, the liberalization of competitive telecommunications segments may encourage a misallocation of resources as there may be efficient, as well as, inefficient entry, and the new competitors will simply arbitrage the opportunities that the distorted price system gives them.

According to Table 6.2, the rebalancing of end-user tariffs are at very different stages of implementation between regions and countries within regions. In Africa, with the exception of Kenya and South Africa, most countries have just started the process (or not even started, as in the cases of Eritrea, Ghana or Yemen).

In the Americas, some countries like Peru, Argentina and Chile have already completed their rebalancing. Others are well advanced, as in the cases of Mexico, Canada and United States, but there are still access deficits.

Several Asian countries, such as Pakistan, the Philippines, Armenia, Korea and Syria have just started the tariff rebalancing process, while others have not yet started, as in the cases of Kazakstan and Thailand. In acute contrast, the majority of Western European countries have completed or almost completed the process (Austria, Denmark, Finland, France, Germany, Netherlands, Sweden, and United Kingdom), while just a few are still some distance from achieving tariff rebalancing (i.e. Belgium, Norway, Spain, and Switzerland).

6.1.3 Determinants of interconnection charges

What variables lead to differences between interconnection charges across countries? Table 6.1 contains some of these variables in terms of government intervention, pricing principles, etc., which may be labelled as micro-level variables. But there are also macro-level variables that may be as important as the micro-level variables in the explanation of interconnection charges, such as the level of economic development, the degree of urbanization, the fixed-phone penetration, the network digitalization, the population density, the geographic location or the end-user tariffs.

That a country's level of development affects telecommunication prices in general and interconnection charges in particular is a very common hypothesis put forward as an explanation for the differences between countries. In general it is expected that a developed country will exhibit lower interconnection charges than a developing country.

Sometimes it is argued that there should be an inverse relation between interconnection charges and the telephone penetration level, measured as telephone lines per 100 inhabitants. It is argued that a developing country usually has a low penetration level in comparison to developed countries, which precludes it of the benefits coming from economies of scale in the provision of telecommunications services. Theoretically, economies of scale mean that the average unit cost of a service declines as production increases. Similar arguments have been advanced for the degree of influence of population density or degree or urbanization on interconnection charges. For instance, it can be argued that costs in the provision of services are lower in areas where there is more concentration of people per square kilometre.

Recent literature has highlighted the importance of institutional factors for the development of the telecommunications market. Perhaps greater institutional development may positively affect the development of the telecommunications sector in a country.[15]

For instance the development of the institutional framework of a country expressed in years of telecommunications legislation may affect the level of interconnection charges. It may be expected that institutional development may be inversely related to the interconnection charge levels: the longer the period of time the laws are effective, the greater the maturity of the system, and therefore, the lower the interconnection charges.

Table 6.2: End-user tariff regulation

Selected countries by region, as of 1 January 1999

REGION Country	*Type of regulation of end-user tariffs*	*Rebalancing of end-user tariffs*	*Access deficit charges*	*Access deficit in interconnection charges*	*Cross subsidy from long distance*
AFRICA					
Eritrea	Under preparation	Not started yet	No	No	No
Ghana	Price cap	Not started yet	No	No	No
Kenya	Price cap	Almost completed	Yes	N/A	N/A
Morocco	N/A	Just started	Yes	Yes	No
Niger	N/A	N/A	N/A	N/A	N/A
Republic of Yemen	No	Not started yet	N/A	N/A	N/A
South Africa	Price cap	Almost completed	Yes	No	No
Uganda	Price cap	Just started	Yes	No	N/A
Zambia	No	N/A	N/A	N/A	N/A
Zimbabwe	PTO set tariff with approval by Ministry	Just started	No	No	No
AMERICAS					
Argentina	Price cap	Completed	Yes	No	Yes
Bolivia	Price cap	Just started	Yes	No	N/A
Canada	Price cap for incumbent's non competitive services	Almost completed	Yes	No	Yes
Chile	Price caps	Completed	Yes	No	No
Colombia	Cap prices only to those operators who have a dominant position or are a monopoly	No	Yes	No	No
Costa Rica	No	No	Yes	N/A	No
El Salvador	Price cap	Just started	Yes	No	No
Mexico	Price cap for services with monopoly or dominant provision	Almost completed	Yes	Yes	Yes (planning the creation of a universal service fund through a tax on operators revenues, similar to Peru and Chile)
Panama	Price cap	Just started	No	N/A	N/A
Peru	Price cap	Completed	No	No	No
St. Vincent and the Grenadines	Price cap	No	No	N/A	N/A
United States	Price caps	Almost completed	Yes	No	No
ASIA-PACIFIC					
Australia	Price cap for sub-set of baskets	N/A	Yes	No	
Hongkong SAR	N/A	N/A	No (access deficit charges were abolished in 1996 and have been replaced with a USO fund)	No	No

Table 6.2: End-user tariff regulation *(cont.)*

Selected countries by region, as of 1 January 1999

REGION *Country*	*Type of regulation of end-user tariffs*	*Rebalancing of end-user tariffs*	*Access deficit charges*	*Access deficit in interconnection charges*	*Cross subsidy from long distance*
ASIA-PACIFIC *(cont.)*					
Israel	Price caps only to some services of BEZEQ and cable monopolies	Almost completed	Yes	No	No
New Zealand	Under the Kiwi Share Obligation, the incumbent is required to: • maintain in real term tariffs for residential services • maintain free calls for residential users • maintain averaged line rentals for residential users in rural and urban areas	N/A	N/A	N/A	N/A
Pakistan	Price caps for de-regulated services there is open competition	Just started	Yes	No	No (gradual rebalancing)
Philippines	Republic Act 7925	Just started	Yes	N/A	N/A
Republic of Korea	Rate of return	Just started	Yes	Yes	No
Syria	Price cap, rate of return	Just started	No	No	No
Thailand	No, government approval	No	Yes	No	N/A
EUROPE					
Albania	Price cap	No	Yes	N/A	Yes (rebalancing is planned shortly after privatization)
Republic of Armenia	Price cap	Just started	Yes	No	No
Austria	Price cap, cost orientation of tariffs	Almost completed	Yes	No	No (a tariff rebalancing is expected soon)
Azerbaijan	Price cap	Completed	No	No	Yes
Belgium	Price cap for incumbent	No	No	No	No
Cyprus	Price cap	Just started	No	N/A	N/A
Czech Republic	Price cap for basic telephony services	Almost completed	Yes	Yes	No
Denmark	Price cap for basic telephony and leased lines	Completed	No	No	N/A
Estonia	No	Just started	No	No	N/A
Finland	No (operators can freely set tariffs without approval)	Completed	No	No	No

Table 6.2: End-user tariff regulation *(end)*

Selected countries by region, as of 1 January 1999

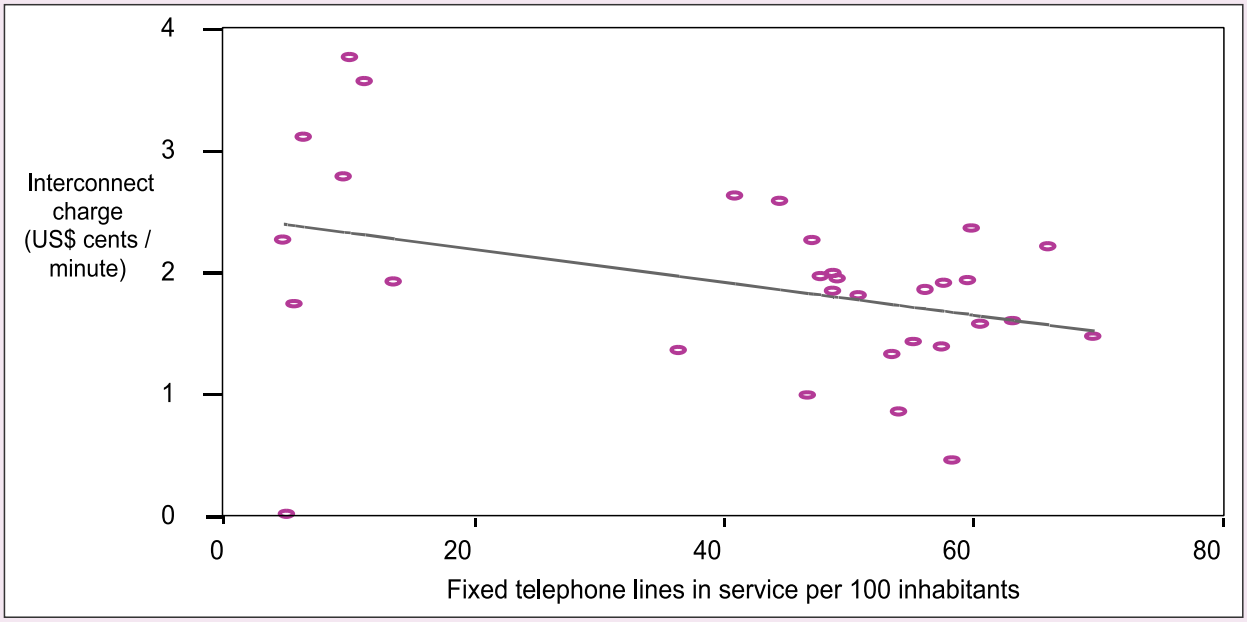
REGION *Country*	*Type of regulation of end-user tariffs*	*Rebalancing of end-user tariffs*	*Access deficit charges*	*Access deficit in interconnection charges*	*Cross subsidy from long distance*
EUROPE *(cont.)*					
France	Price cap for monopoly and other services	Almost completed	No	No	N/A
Germany	Price cap for telecommunications and mobile services	Almost completed	Yes	No	N/A
Greece	Price cap	Just started	N/A	N/A	N/A
Hungary	Price cap for telecommunications services with three sub-tariff classes	Just started	Yes	No	Yes
Ireland	Price cap for telecommunications services	Almost completed	Yes	No	N/A
Republic of Kazakhstan	Price cap only for monopoly	No	Yes	Yes	No
Latvia	Price cap	Just started	Yes	No	N/A
Macedonia	Price cap	No	No	No	No
Netherlands	Price caps for the overall and small packages	Almost completed	Yes	N/A	N/A
Norway	Price caps. For operators with market power, cost-based tariff regulation	Completed	No	No	No
Portugal	Price cap in basic telecommunications services (i.e. telephony), leased lines, ISDN, mobile services	Just started	N/A	N/A	N/A
Republic of Moldova	N/A	N/A	N/A	N/A	Yes
Slovak Republic	Price cap	Just started	Yes	No	No
Spain	No (incumbent sets up tariffs with government approval)	No	Yes	No	N/A
Switzerland	No	No	N/A	No	No
Sweden	Price cap for incumbent basic services	Almost completed	N/A	No	N/A
United Kingdom	Price cap for final user tariffs and interconnection services	Almost completed	Yes	No	No

Key: N/A = not available

Note: This table is intended to be indicative rather than exhaustive.

Source: ITU World Telecommunication Regulatory Database, OECD (1997).

Figure 6.2: Interconnection charges and fixed telephone lines per 100 inhabitants in 31 countries, end 1998



Source: Briceño *et al* (1999).

It might be difficult to create satisfactory research that could explain the observed disparities in interconnection charges between countries. Despite this difficulty, this part of the chapter presents some preliminary results of ongoing research into the empirical determinants of interconnection charges. The objective of the exercise is to estimate the degree of correlation between interconnection charges in a set of countries against a set of macro-level variables such as those mentioned earlier.[16]

Figures 6.2 to 6.6 compares interconnection charges with their levels of fixed-line penetration, population density, per capita income, years of legislation and years of competition in fixed telephony, respectively. One important feature of this sample of countries is that it includes countries with strong competition in the telecommunications infrastructure (e.g. United Kingdom, United States) with others where competition is very limited (e.g. Brazil, Spain, Italy). Likewise, the sample has included both developed as well as developing countries.

Key empirical results show that:

- some variables were statistically significant in the explanation of the interconnection charge level: population density, years of legislation and whether a country is located in Latin America;
- the interconnection charge may be related to the density of population. The estimated measure that summarizes this reaction ("elasticity") shows that a 10 per cent increase in the population density would mean a 1.5 per cent decrease in the interconnection charge. Thus, the higher the population density, the lower the interconnection charges, due to the likely presence of economies of scale;
- a country with 10 years of telecommunications legislative effectiveness exhibits lower interconnection charges than countries without this legislation. The difference in charge levels is around 55 per cent. Another interpretation of this result may be that once deregulation begins there is an imminent decline over time of interconnection charges;[17]
- the interconnection charge in a Latin American country would range from 50 per cent to 120 per cent above non-Latin American countries.

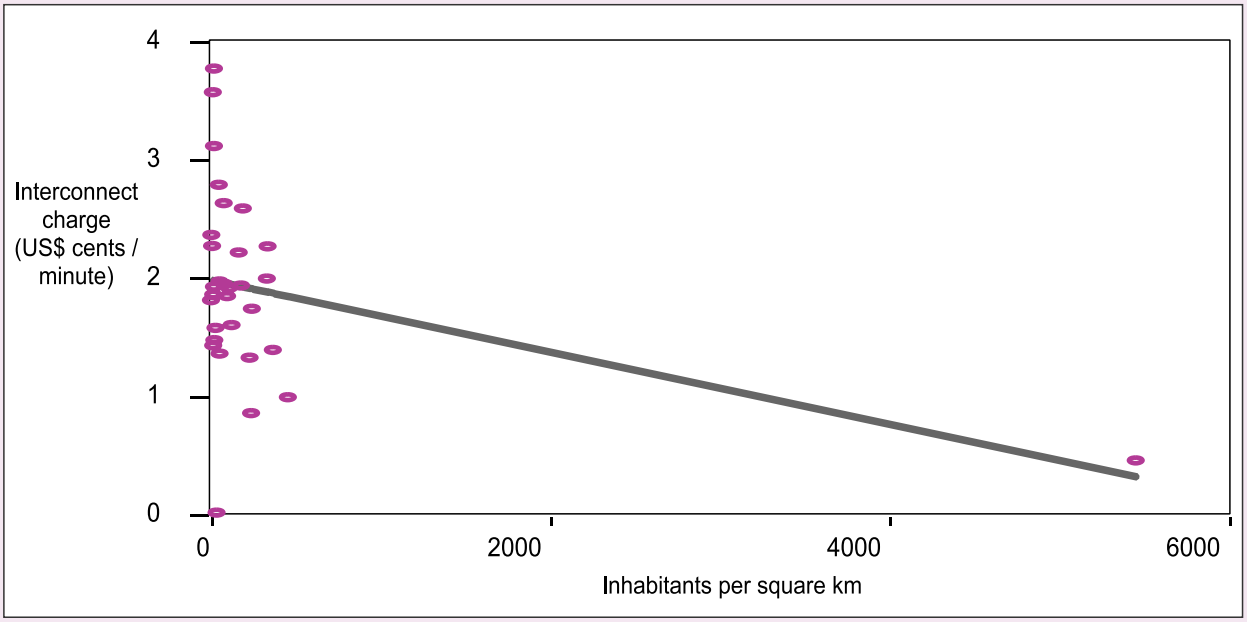
6.1.4 Technical and operational issues affecting interconnection

From a regulatory point of view, the technical and operational issues of interconnection may become a potential source of anti-competitive behavior, since they may be used by the incumbent operator to discriminate against the entrant or simply as a means to delay interconnection negotiations. The regulatory framework may help to achieve efficient and fair competition as long as some of the most relevant technical issues are prescribed under specific rules or procedures, which at the same time must be efficient and easy to enforce.

Some of the key information on technical and operational aspects that often are discussed during negotiations by interconnecting operators are:

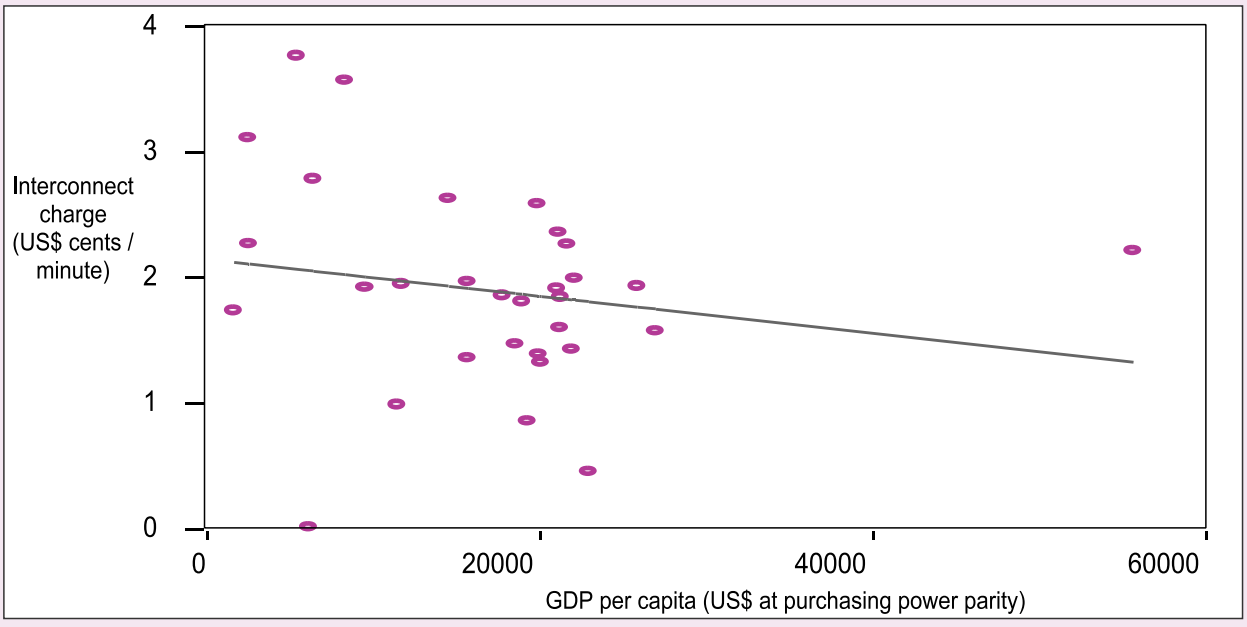
- the number and location of points of interconnection (POIs). It is crucial for the entrant to know in advance where it can interconnect its network with the incumbent network. And if so, at what level of the incumbent network hierarchy (i.e. remote, host, tandem switch) interconnection may take place;

Figure 6.3: Interconnection charges and population density in 31 countries, end 1998



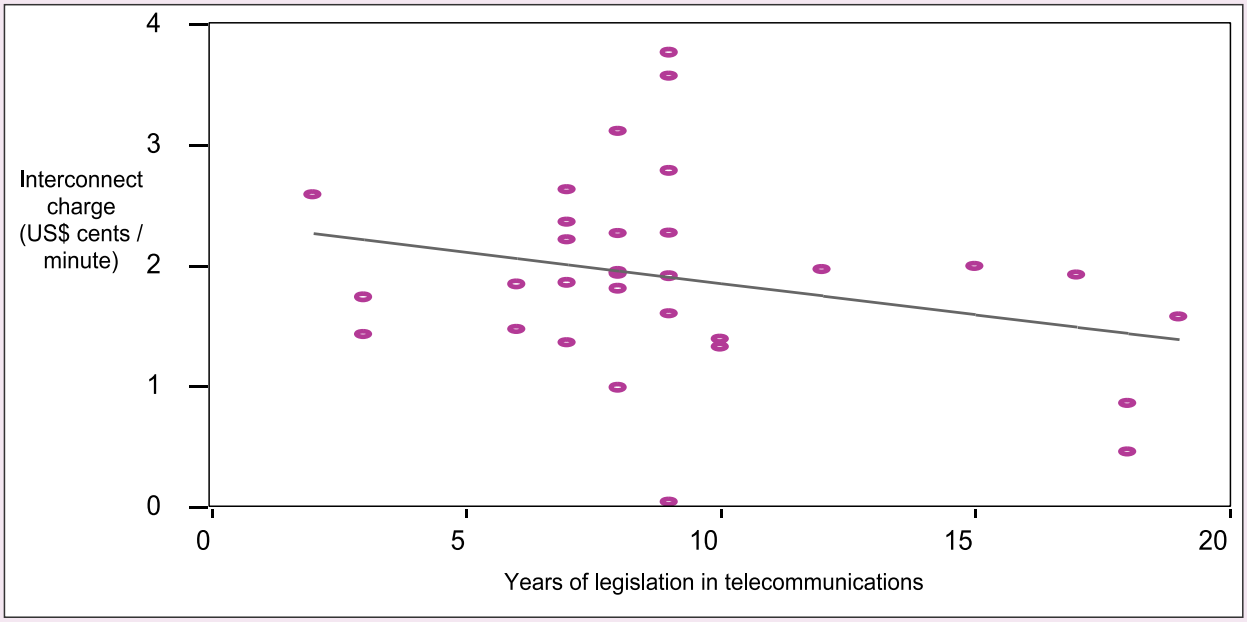
Source: Briceño *et al* (1999).

Figure 6.4: Interconnection charges and gross domestic product per capita in 31 countries, end 1998



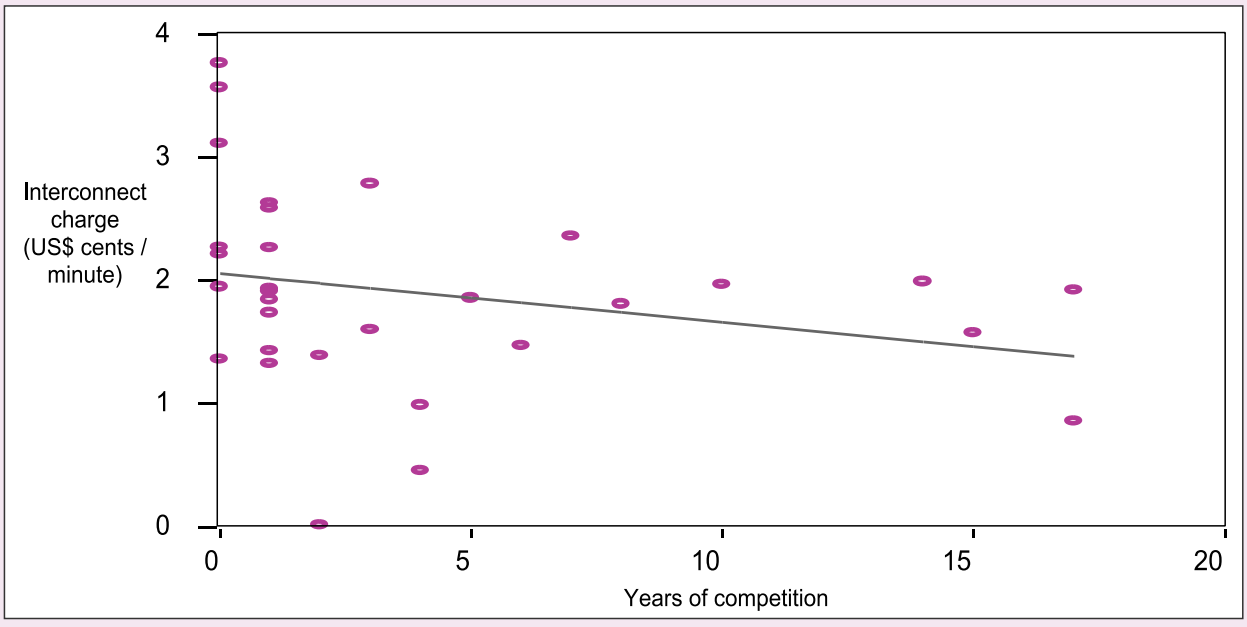
Source: Briceño *et al* (1999).

Figure 6.5: Interconnection charges and years of legislation in telecommunications in 31 countries, end 1998



Source: Briceño *et al* (1999).

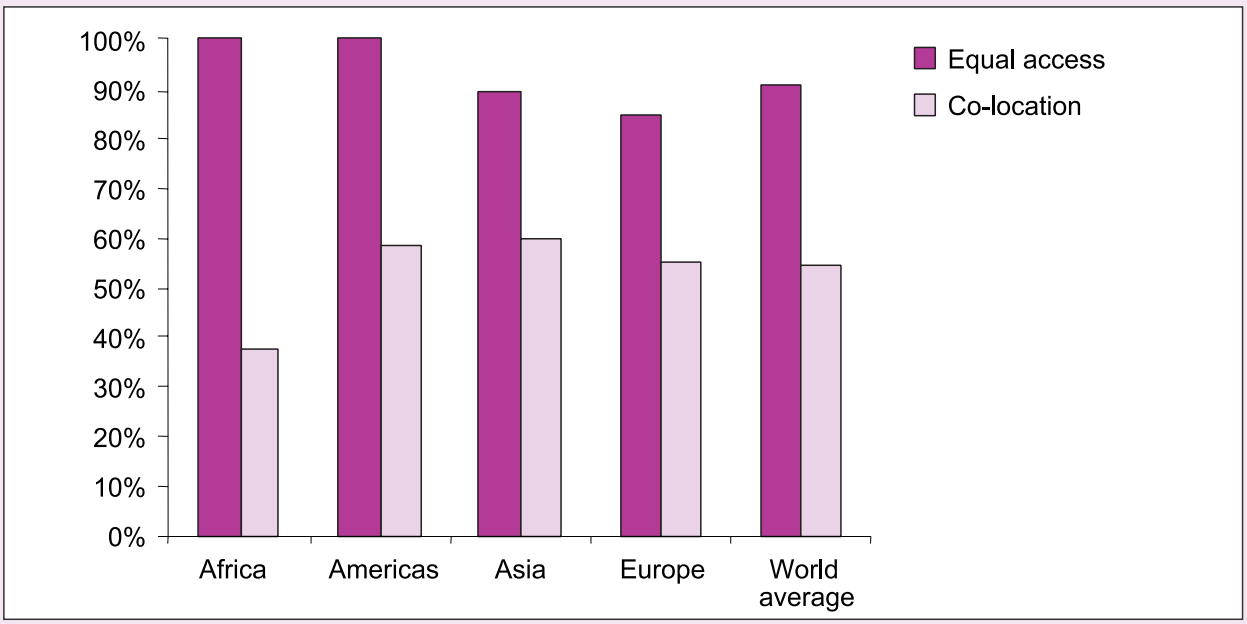
Figure 6.6: Interconnection charges and years of competition in fixed telephony in 31 countries, end 1998



Source: Briceño *et al* (1999).

Figure 6.7: Technical conditions to interconnect

Percentage of countries that allow equal access and co-location, by region, 1999.



Source: ITU World Telecommunication Regulatory Database.

- network management across points of interconnection. This refers to the network management information that has to be exchanged between the two interconnected operators. For instance, the technical interfaces, such as signaling systems that will be established at POIs.

A partial summary of some of the technical and operational issues among countries is presented in Table 6.3 and Figure 6.7. Some technical issues, such as the number and location of POIs and the network management information across POIs, are prescribed in most of the countries' regulatory frameworks. Usually the POIs define the boundaries for the rights and obligations between two interconnecting networks.

In a given local area, however, there are fewer numbers of points to interconnect, but the greater the distance over which traffic must be carried on the incumbent network to reach destination. A major issue for the determination of the location of POIs is who should make the determination: the incumbent, the entrant or the regulator.

The actual procedure varies between countries. However, almost all the surveyed countries have set some kind of requirement for points of interconnection or network management. Exceptions to this rule include, Cyprus, Denmark, Hongkong SAR, Kazakhstan, New Zealand, Saint Vincent and the Grenadines, and Uganda.

Equal technical access. The technical and operational conditions provided to the entrant have to be the same (in terms of type, quality and price) to those applied by the incumbent to itself. This is a very important non-discriminatory rule that the regulatory authority must enforce to assure fair competition.

The evidence among countries is that the great majority of regulatory frameworks of countries respect this principle: 100 per cent in Africa and the Americas, 90 per cent in the Asia-Pacific and 85 per cent in Europe.

Co-location. This is when the entrant is allowed to place equipment in the incumbent's central offices. Co-location may be physical or virtual. As an alternative to co-location, operators may interconnect their networks at a neutral physical place between incumbent and entrant central offices (in-span interconnection).

The evidence shows that in Africa only 38 per cent of countries prescribe some kind of co-location principle in their regulatory frameworks, while in the Americas, Asia-Pacific and Europe the proportion reaches 58, 60 and 55 per cent, respectively.

Quality of service. Both interconnecting operators must guarantee a degree of quality of service to assure fair competition.

Interconnect services. The interconnection services (functions, facilities) that will be exchanged between parties. It is very important to have a clear understanding of the characteristics of services to be rendered. Commonly, services are grouped into basic or essential, ancillary and optional services. Examples of functions and facilities are origination and termination of calls, transit of calls, calling line identification, signalling, forwarding of calling number, etc.

6.2 Interconnection of value-added networks

Technological developments are making possible the use of unified networks able to provide voice, data and video communications services over a single technological platform, such as the Internet Protocol (IP) platform, with important costs-savings and efficiency provisions in comparison with alternative technologies. Internet Service Providers (ISPs) and other telecommunications carriers are adopting these technological developments in order to provide several services that in many cases compete directly with those provided by traditional public-switched telephone networks (PSTN), which are traditional circuit-based platforms.

This competition may be looked at from several angles. For most traditional PSTN, the competition coming from any ISPs or any other carrier who does not have the concession to provide telephony services, is seen as unfair. Most of the firms providing these new services are not unhappy with the competition with traditional PSTN particularly since they are not required to comply with obligations of telecommunication providers.

The general regulatory response so far has basically been to ignore this issue arguing that "it is not needed to interfere with an infant industry", "any intervention may frustrate a newly-born industry", "Internet was born free, then it shall remain so", etc. However, this "wait and see" approach seems to be no longer valid, since regulatory problems seem to be rapidly developing, with participants asking regulators for specific regulatory decisions.

This section is organized as follows. The first part will cover some of the current trends on interconnection among ISPs themselves. The second part will deal with interconnection issues between ISPs and the public switched telecommunication network (PSTN), with special emphasis on the new relations between new entrants and incumbent local exchange carriers, or competitive local exchange carriers (CLECs) versus incumbent local exchange carriers (ILECs.) The third part will briefly review interconnection issues with other value-added providers.

6.2.1 ISPs interconnection

Continued Internet growth may only be sustainable if adequate interconnection agreements are in place. There are four main models of interconnection among ISPs:

1) peer-to-peer bilateral;

2) hierarchical bilateral;

3) third-party administrator; and

4) cooperative agreement.[18]

In the following paragraphs, the first two models are described in some details since they currently represent the dominant models of interconnection between ISPs.

Peer-to-peer bilateral. Up to now, the dominant model of Internet interconnection used to be the peer-to-peer bilateral model, by which two ISPs of similar size, experience, technology, and customer base agree to interconnect their networks under a "sender keeps all" agreement, i.e. on a settlement-free basis model or peering. The key incentive of the ISPs under this model of interconnection is that their customers may benefit from positive network externalities. Thus, two similar networks would be interested in interconnecting with the other since the existing customers of the first network would derive an additional positive benefit if they are able to exchange traffic to customers directly on the second network, and vice versa. It is important to note that the exchange of traffic is between two networks and there is no third network involved. Their network externalities are symmetric since both networks have roughly the same customer base.

Networks that meet with the similarity conditions are for instance the US Internet backbone providers such as NSFNET, UUNET, MCI, or Sprint, which have interconnection points in certain areas within US territory, known as Networks Access Points ("NAPs") or public peering points.

Hierarchical bilateral. As the Internet has grown dramatically over recent years, the proliferation of new ISPs has also risen at a dramatic pace. Since ISPs come in different shapes and sizes, the bigger networks have started adopting a hierarchical bilateral interconnection agreement with their smaller counterparts. The established relationship is provider-customer rather than peer-to-peer as in the previous model. This is the interconnection model that now appears to be dominating the Internet world.

The smaller network derives more positive externalities interconnecting to the bigger network than the other way around, because of the different customer base between networks. This means that in practice, the smaller network pays a larger amount of interconnection costs than its counterpart does.

The net transfer of funds from the smaller to the bigger network happens because the latter incurs a greater infrastructure investment and has a national reach which, in turn, allows it to transport traffic further thus decreasing intermediary networks in order to reach the final destination. This model of ISP interconnection means that the backbone providers act as "transit" networks between smaller networks, so a bilateral transit agreement is reached between the backbone and the smaller network.

Since there is not a public standard for being qualified as peer counterpart, a given ISP may have at the same time incentives to negotiate hierarchical interconnection agreements and peer-to-peer agreements with different ISPs, depending on the situation. In this way, ISPs may act as arbiters, trying to extract revenues in both directions depending on the situation.[19]

Besides this conduct of arbitrage, there may also be a danger of an abuse of market power by the dominant network. The possibility of this abuse of market power raises regulatory questions. Perhaps Internet interconnection should be regulated on the same principles that govern interconnection among public telecommunications carriers. In other words, mandatory interconnection under fair, reasonable, and non-discriminatory terms.[20]

Table 6.3: Technical interconnection issues and the regulatory framework

Selected countries by region, as of 1 January 1999

REGION Country	*Technical issues prescribed in the regulatory framework*	*Equal technical access*	*Co-location*
AFRICA			
Ghana	POI	Yes	Yes
Kenya	POI, Network management across POI	Yes	Yes
Morocco	POI, Network management across POI	Yes	No
Niger	N/A	N/A	No
Republic of Yemen	POI, Network management across POI	Yes	N/A
South Africa	POI at switch nearest to the point at which call originated	Yes	Yes (physical or virtual). Sharing infra-structure when regulator deems to be in the public interest
Uganda	Left for negotiation	N/A	No
Zambia	Harmonization of systems	N/A	No (but in case of need for increased capacity, the entrant and incumbent share the costs)
Zimbabwe	POI, Network management across POI	Yes	No
AMERICAS			
Argentina	POI (minimum one POI in each local area), Interconnection at any feasible technical network point	Yes	Yes (only virtual)
Bolivia	POI, Network management across POI	Yes	No
Canada	POI	Yes	Yes (physical or virtual)
Chile	POI (Regulator established 24 POI)	Yes	No (in-span interconnection)
Colombia	POI; Network management across POI; Nodes must be digital and meet minimum specifications	Yes	Yes (additional cost on incumbent's network are afforded by entrant)
Costa Rica	POI; Network management across POI	N/A	No
El Salvador	POI	Yes	No
Mexico	POI (regulator established over 100 POI during 1997-98); Network management across POI; Interconnection at any feasible technical network point	Yes	Yes (private negotiations, if not regulator decides)
Panama	N/A	N/A	Yes. (Facilities sharing for posts, ducts, buildings, etc.)
Peru	POI (minimum of 24 POI, one in each local area); Network management across POI; Interconnection at any feasible technical network point	Yes	Yes (physical)
St. Vincent and the Grenadines	No	N/A	No
United States	POI; Network management across POI	Yes	Yes (physical or virtual). Facilities sharing for ducts/trenches and poles/masts

Table 6.3: Technical interconnection issues and the regulatory framework *(cont.)*

Selected countries by region, as of 1 January 1999

REGION Country	*Technical issues prescribed in the regulatory framework*	*Equal technical access*	*Co-location*
ASIA-PACIFIC			
Azerbaijan	Network management across POI	No	Yes
Australia	N/A	Yes	Yes (physical, for interconnection equipment). Facilities sharing for ducts/trenches and post/masts.
Cyprus	No	N/A	N/A
Hongkong	No	Yes	Yes
Israel	POI, Customer service	Yes	No
New Zealand	No	Yes	No
Pakistan	POI	Yes	Yes
Philippines	POI	Yes	Yes
Republic of Korea	Network management across POI. POI are chosen by entrant	Yes	Yes (after joint inspection incumbent – carrier)
EUROPE			
Albania	POI; Network management across POI	Yes	Yes (if not space, incumbents create additional space or entrant builds its own premises. If disagreement regulator intervenes)
Republic of Armenia	POI; Network management across POI	Yes	No
Austria	Bilateral agreements under regulatory supervision	Yes	Yes (only virtual co-location at less than 10 km)
Belgium	POI; Network management across POI	Yes	Yes (physical). In-span interconnection is also offered
Czech Republic	Network management across POI	Yes	No
Denmark	No	Yes	Yes (virtual)
Estonia	N/A	No	No
Finland	N/A	No	Yes (collocation for local loop access). Facilities sharing for ducts/trenches, poles/masts
France	POI; Network management across POI	Yes	Yes (physical, for interconnection equipment). In-span interconnection is also offered. Facilities sharing for poles/masts.
Germany	POI	Yes	Yes (physical, for equipment and for local loop access)
Hungary	POI, seamless inter-working	Yes	No
Ireland	N/A	Yes	Yes (physical). In-span interconnection is also offered
Republic of Kazakhstan	No	Yes	No

Table 6.3: Technical interconnection issues and the regulatory framework *(end)*

Selected countries by region, as of 1 January 1999

REGION Country	*Technical issues prescribed in the regulatory framework*	*Equal technical access*	*Co-location*
***EUROPE** (cont.)*			
Latvia	Equivalent access for all operators (the incumbent monopolist has an umbrella agreement)	Yes	No
Macedonia	Technical standards	No	No
Netherlands	N/A	Yes	Yes (physical, for interconnection equipment). Facilities sharing for poles/masts
Norway	POI	Yes	Physical collocation. Facilities sharing for ducts and masts
Portugal	POI	N/A	N/A
Republic of Moldova	N/A	N/A	No
Slovak Republic	POI	Yes	Yes (physical)
Spain	POI	Yes	Yes (physical). In-span interconnection is also offered. Facilities sharing for poles/masts
Switzerland	Technical recommendations for the interfaces	Yes	No
Sweden	POI (13 POI areas at transit and local level)	Yes	Yes (physical). In-span interconnection is also offered
United Kingdom	No	Yes	No. But in-span interconnection is offered. Facilities sharing for poles/masts

Key: POI = Number and location of points of interconnection; N/A = not available

Note: This table is intended to be indicative rather than exhaustive.

Source: ITU World Telecommunication Regulatory Database, OVUM (1998).

6.2.2 ISPs and PSTN interconnection

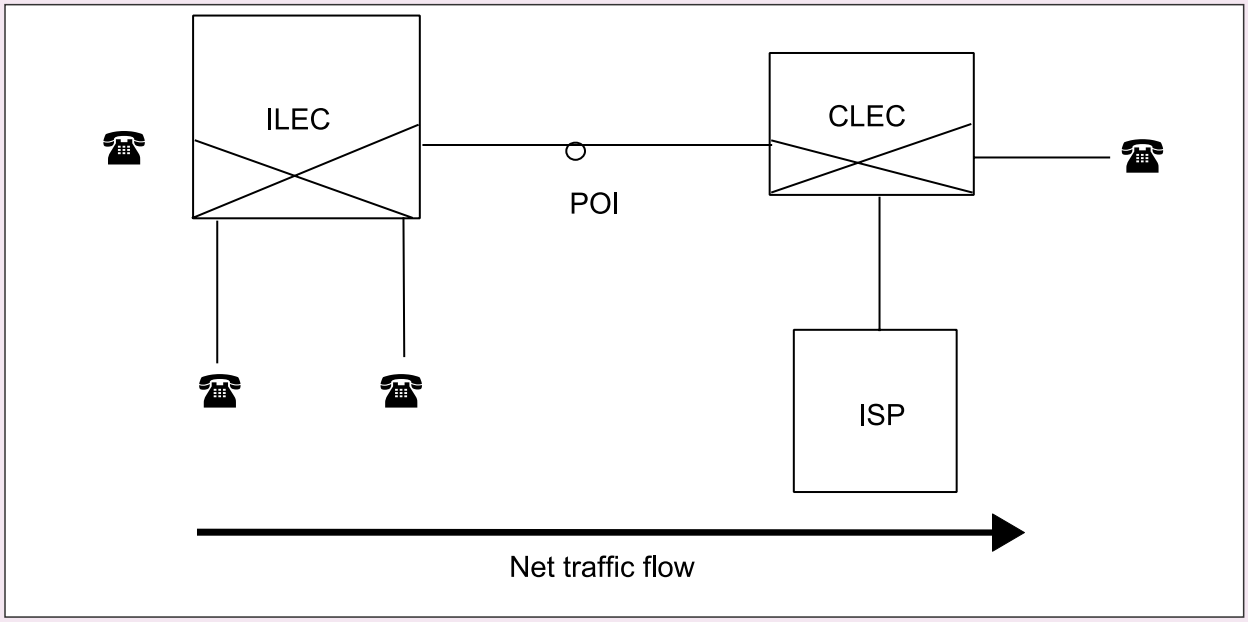
ISPs have been able to grow, in part, due to their ability to access local exchange carriers' networks. ISPs demand several inputs provided by PSTN networks, i.e. dedicated, switched lines, and other transport facilities. Several countries have started full liberalization of their telecommunications markets, such as local and long distance telephony. Competition in their local market has been developed by the presence of new local exchange carriers, also known as competitive local exchange carriers (CLECs) as opposed to the incumbent local exchange carrier (ILEC). With more alternatives to get access to local exchange telecommunication areas, ISPs now have the opportunity to get access through CLECs instead of ILEC.

This new commercial relationship, or CLECs-ISPs, is having a direct impact on the interconnection relationship between ILECs and CLECs where a reciprocal compensation of interconnection fees is mandated. Since ISPs receive more traffic than they send, especially in the cases in which they mainly perform the function of hosting web sites, there is a traffic imbalance in favour of the local exchange to which the ISP gains its access. This situation is depicted in Figure 6.8.

In the United States, the 1996 Telecommunications Act established that incumbent local carriers must pay reciprocal rates for call termination and transport between ILECS and among ILECs and CLECs. The level of reciprocal charge that ILECs pay to entrants is important, otherwise it may introduce barriers to efficient entry. If the charge is too high, entrants would have an incentive to sign up customers (e.g. large ISPs or paging companies) who receive more calls than they make.

The entrants may profit even if they have a higher cost than the established carrier, which leads to inefficient entry.[21] This situation may be exacerbated if the rates are also symmetrical, i.e., the incumbent carrier and the CLEC receive the same amount of reciprocal compensation per minute of use, since the CLEC may get half the money, while doing far less than half the work.

Figure 6.8: ISP interconnection model with PSTN carriers



Note: ILEC = Incumbent local exchange carrier; CLEC = Competitive local exchange carrier; POI = Point of Interconnection; ISP= Internet Service Provider.
Source: Briceño (1999).

One way to ameliorate this situation is for carriers to pay reciprocal compensation based on the use of network elements. Under such a system, a carrier would pay less reciprocal compensation if it delivered a call to the terminating exchange, rather than to the tandem exchange. Thus, a CLEC with a broad network would pay less reciprocal compensation per minute of use than a CLEC with a small localized network. Otherwise the pricing system provides strong incentives for CLECs to operate small localized networks and let the incumbent carrier do most of the work of carrying calls across their larger networks.

In some countries, ISPs offer free Internet services. In the United Kingdom, there are ISPs and telecommunications companies offering free access to the Internet and yet they are making profits. Generally they get their basic telecommunications services from a competing local exchange carrier (CLEC), which in turn is entitled to reciprocal compensation under the form of interconnection charge for terminating calls in its network. Since ISPs are generating significant incoming traffic to the CLEC, they have established revenue sharing arrangements between them for these terminating call revenues. This is an example of a *de facto* interconnection regime between telecommunications operators and ISPs.

In France, Germany, and Switzerland, some ISPs are also providing free Internet services. One strategy for incumbents is to reduce the interconnection charge they pay to the CLECs – ISPs, in order to remove the key financial incentive for delivering free Internet services. If the incumbent is able to discriminate data from voice traffic, it would be able to diminish the interconnection charge for data traffic, which flows to ISPs through CLECs.

6.2.3 Some anti-trust concerns in the provision of network access

There are anti-trust issues raised with the interconnection of value-added networks that are similar to those observed in the interconnection of traditional PSTN. This should not come as a surprise since value-added networks may also have positive network externalities and the nature of network economics may generate market power for incumbent providers. The following are a few examples:

1) In 1998, the telecommunications regulatory body in Peru, OSIPTEL, mandated local interconnection between Electronic Data Interchange (EDI) providers arguing that the benefits from the realization of positive network externalities more than offset the private costs of implementing interconnection (see Box 6.2).

2) Early this year, a United States' federal judge ruled Excite@Home Corp – a top provider of high-speed Internet access, which is majority owned by AT&T Corporation – must allow competitors to use its cable networks in certain regions of the state of Oregon. (Internet access through the use of cable-television lines is a recent technology that some ISPs are using to provide high-speed Internet access.)

3) AT&T has been purchasing cable companies and upgrading their networks to deliver local, long-distance, cable and Internet services over a single connection. When AT&T was approved to buy Tele-Communications Inc – the top cable television franchise in the United States – one of the conditions was that TCI's cable system be

Box 6.2: Mandatory interconnection for value added network operators

The case of Peru's Electronic Data Interchange providers

In 1998, the telecommunications regulatory body in Peru, OSIPTEL, mandated local interconnection between Electronic Data Interchange (EDI) providers arguing that the benefits from the realization of network externalities more than offset the private costs of implementing interconnection. The payments scheme approved for this type of interconnection was a "Bill and Keep" system. The key insights of this case were as follows.

In very simple terms, Electronic Data Interchange is a service to transmit formatted business information in a secure way. In 1997, GEIS, an entrant EDI provider, and a consumer association group called upon OSIPTEL's intervention because they argued that the two incumbent EDI firms, IBM and Limatel (a subsidiary of AT&T), refused to interconnect GEIS in Lima. In Peru, EDI providers are considered as one class of enhanced or value added services providers. Some of the obligations that providers of basic and carrier services have, such as mandatory interconnection was not imposed upon EDI firms.

IBM and AT&T had their point of interconnection in the United States. GEIS, the complaining firm, opted to locate its switch in Lima, and requested local interconnection to the incumbent firms. For GEIS, interconnection outside of Peru would have been too expensive due to the high tariffs of international long distance dedicated circuits in Peru. Whether EDI messages were sent to the United States and later retrieved using international transmission circuits was not an issue in itself on which OSIPTEL based on its decision. The decision based on OSIPTEL's evaluation of benefits that would arise from an increase in traffic and associated revenues due to interconnection and the costs imposed by local interconnection.

OSIPTEL identified the presence of strong positive network externalities in the EDI market. Every subscriber adds communications possibilities for all those already subscribed to the network. The more businesses that adopt EDI, the more value is added to those who have already adopted the standard. If there were not interconnection between firms, EDI's customers would have to subscribe to each and every firm, thus severely limiting consumer choice and opening the door for market abuses by EDI providers. Obviously, users viewed that situation as highly undesirable and inconsistent with the free market environment that guides economic policies in Peru. The presence of interconnection offers a multiplier effect in subscriptions and traffic, outweighing the private costs necessary to make interconnection effective.

OSIPTEL's insistence on mandatory interconnection allows the use of the local transmission data network or similar public network, so that any new EDI provider can easily hook on and interconnect with established EDI providers, thus reducing transaction costs. This lowers entry barriers, a policy that is consistent with the development of value added networks and services.

Moreover, the ruling stated that no interconnection charges were to be levied.

A "Bill and Keep" regime was instituted instead due to the fact that EDI traffic tends to be symmetric and in order to minimize transaction costs for value-added firms. Additionally, each firm was required to pay for their own technical adaptations necessary to make interconnection seamless and for their connection to the local data transmission network.

Source: Barrantes 1998.

opened for use by outside Internet companies. In his ruling, the federal judge interpreted that the open-access condition in AT&T cable network is necessary to allow fair competition in the Internet market.

4) In the third quarter of 1999, France Telecom, the incumbent telecom operator in France, won approval by the regulator for launching a new Internet calling plan using a flat-rate for Internet access. But the regulator gave its approval subject to the obligation that the incumbent has to provide access to all ISPs and implement indirect interconnection for Internet backbone providers. France Telecom has been willing to extend the offer to all ISPs who connect to the France Telecom Internet backbone. However, it has been reluctant to extend its offer to customers of ISPs that rely on competitor Internet backbone since the Internet user tariff is lower than the charge that France Telecom has to pay third operators to terminate its traffic into their IP networks.

5) Other anti-trust concerns in value-added networks are also present when incumbent telecommunications operators that provide basic services are also allowed to provide valued-added services. For instance, in Peru in 1998 the incumbent telecommunications operator was accused by a major ISP of behaving in an anti-competitive manner. It was alleged that the incumbent used discriminatory pricing schemes in the use of basic inputs utilized in the provision of Internet service. After a full investigation, the regulator found evidence that the incumbent had been acting anti competitively against competitors.[22]

6) In mobile telephone networks, national roaming is a bottleneck facility for new entrants, at least until they are

able to fully deploy their own infrastructure. If they are unable to get transitory roaming from incumbents, there is a high probability that competitive parity would not be achieved.

In the first half of the new decade, new mobile operators using the latest technology – Universal Mobile Telecommunication System (UMTS) – will be entering European markets, and they will be seeking roaming agreements with existing GSM networks. The new entrants will need maximum geographic coverage in order to compete under the same conditions that incumbents do. Regulators face policy issues similar to the ones that arise when dealing with interconnection with PSTN networks. Thus, regulators have to decide whether to make roaming mandatory. And if it were mandatory, what would the charges be for the roaming service? Also, what will the rules be for the negotiations in order to get an agreement to provide roaming?

6.3 Conclusion

Regulatory intervention on interconnection shall be in direct proportion to the existence of economies of scale and scope, and the presence of network externalities. Economies of scale and scope may be sources of anti-competitive behaviour, performed by the owner of bottleneck facilities for interconnection against new entrants or competitors. Maximization of network externalities may even call for mandatory interconnection between value added providers. The key role of the regulator should be to "level the playing field" to mimic a competitive environment.

International evidence shows that the trend is to have some degree of regulatory intervention on interconnection. A light-handed approach may become a good model once competition has already started in the market. Economic and non-economic issues of interconnection should be regulated before the negotiation process of interconnection begins. For instance, dispute resolution mechanisms should be established in advance. Authorities should manage all the possible scenarios for the outcome of the negotiations. There is also a key role for authorities to diminish information asymmetries through the publication of charges and other interconnection conditions in order to avoid discriminatory practices.

Cost-based pricing in interconnection is an unavoidable trend across countries. It is just a matter of time for countries to adopt cost-based interconnection charges. Institutional factors, such as maturity of the telecommunications institutions and laws, are as important as purely economic factors in the development of interconnection regimes.

Digital convergence may increasingly question the role of regulation on interconnection. Contradictions may arise between the development of the technology that integrates many different services, and the need to intervene in different aspects of interconnection. The evolution of networks is not exempted from the probability of anti-competitive behaviour in the form of refusal to provide interconnection to lessen competition, or rise rival's costs. Anti-trust concerns will likely continue to dominate the evolution of networks, so regulatory intervention may be warranted.

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[1] See Vogelsang, Ingo and Bridger Mitchell. *Telecommunications Competition: The Last Ten Miles*. Cambridge, Mass.: MIT Press. 1997. Chapter 4.

[2] Even if there is private negotiation with a satisfactory outcome for both parties, it may not be a socially efficient result. A clear case is collusion to deter competition or avoid the entrance of new competitors. Such cases may call for government intervention, since consumers, the third party, have not been represented in the negotiation process.

[3] See Spiller, Pablo and Carlo Cardilli. *The Frontier of Telecommunications Deregulation: Small Countries Leading the Pack. Journal of Economic Perspectives*, Volume 11, Number 4, Fall 1997, pages 127-138.

[4] See Tyler et al (1995). Fourth Regulatory Colloquium. Interconnection: Regulatory Issues. ITU. (1995).

[5] See Ovum. Effective Interconnection in the APEC Region, a report for the APEC Telecommunications Working Group, Mimeo, March 1998, page 75.

[6] Spiller and Cardilli (1997) argue that a key advantage of the "final offer" arbitration is that the arbitrator does not have to elaborate any intermediate or compromise solution, and parties have an incentive for truthful revelation. Each party makes its offer marginally fairer than the opponents expected offer, giving both parties a strong incentive to make reasonable offers and reach a negotiated agreement.

[7] The sources on regulatory frameworks for interconnection in different countries have been: the 1998/99 ITU survey results; the OECD's Communication Outlook; OAS's CITEL; APEC's interconnection survey and the author's own information.

[8] See Mitchell, Bridger, Werner Neu, Karl-Heinz Neumann and Ingo Vogelsang. "The Regulation of Pricing of Interconnection Services", in *Toward a Competitive Telecommunications Industry: Selected Papers from the 1994 Telecommunications Policy Research Conference*, Gerald Brock, ed. New Jersey: Lawrence Erlbaum Associates, 1995, pages 95-118.

[9] Mitchell *et al* (1995).

[10] See Baumol, William, Janusz Ordover, and Robert Willig. *Parity Pricing and Its Critics: A Necessary Condition for Efficiency in the Provision of Bottleneck Services to Competitors*. Yale Journal on Regulation, Vol. 14:145, (1997): pages 145-163.

[11] However, the fact that the regulatory framework in a given country prescribes a specific cost-based standard does not imply necessarily that in practice that system is put in place.

[12] In addition to the recommendation that interconnection costs should be cost-based and obtained from accounting systems (top-down methodology), the Commission has launched a study on the preparation of an adaptable bottom-up costing model for interconnection. This could be used by regulatory authorities to understand and negotiate interconnection costs and oversee interconnection agreements.

Thus, countries that have not been able to derive interconnection costs from accounting systems, may rely on the bottom-up estimates included in the study. This means that 1999 should be a year in which considerable progress will be made towards forward-looking long-run incremental cost models.

[13] See Vogelsang and Mitchell (1997), page 56. They also argue that in telecommunications the denial for access to the bottleneck facility harms competition since the network externality would be denied.

[14] Grieve, Willie and Stanford Levin. *Telecom Competition in Canada and the United States: The Tortoise and the Hare. In Telephony, The Internet, and The Media: Selected Papers from the 1997 Telecommunications Policy Research Conference*, Jeffrey Mackie-Mason and David Waterman, eds. New Jersey: Lawrence Erlbaum Associates, 1998, pages 269-286.

[15] Chou Y. and Brock G. *An Econometric Analysis of Institutional Factors in Telecommunications Reform*. Paper presented at the 26th Telecommunications Policy Research Conference, Alexandria, Virginia, October 1998.

[16] See Briceño, Arturo, Eduardo Viñas and Sergio Sifuentes. International Comparison Study About Interconnection Charges, Preliminary working paper, Lima, OSIPTEL, February, 1999.

[17] According to Pablo Spiller we can not distinguish whether this irreversible decline is due to regulatory strength or competition, or both.

[18] Bailey (1997) classified these four models of Internet interconnection. An analysis of the interconnection agreements on the Internet in the United States can be found in Srinagesh (1997).

[19] See Cukier Kenneth. *Peering and Fearing: ISP Interconnection and Regulatory Issues*. Mimeo. 1998, page 20. (http://ksgwww.harvard.edu/edu/iip/iicompol/papers/).

[20] Supporters of this view are Bailey (1997), Frieden (1998), Cukier (1998), among others.

[21] See Rohlfs, J. *et al* (1996) for an early assessment of this problem in the US context. Rohlfs, Jeffrey, John Haring, Calvin Monson and Harry Shooshan. *Interconnection and Economic Efficiency*, Mimeo, Strategic Policy Research Inc., May 1996, page 25. (http://www.spri.com/).

[22] See Briceño (1999) for a full analysis on this case.

7 PRICING SERVICES ON DIGITAL NETWORKS

7.1 Introduction

Prices are extremely important to the development of products and services, industries and national economies. Inappropriate pricing structures can restrict development. Innovative pricing structures can stimulate demand and promote development. Prices are particularly important in telecommunications because of its network characteristics.

Virtually all services are provided over a common local, national and international facilities network. All providers, whether they are incumbent public telecommunications operators (PTOs), alternative network operators, mobile, satellite or Internet service providers, are part of the larger national and international telecommunications network. They must all co-operate, even if they are competitors, in order to serve all of their customers effectively. There are substantial economies of scale and scope to be achieved by the efficient development of the telecommunications network, and enormous benefits to be realized if the services provided over the network are priced so as to stimulate maximum efficient use of these services.

Prices are economically most efficient when they are based on the cost of supplying goods and services. If prices are much higher than costs, the higher prices simply transfer wealth like a tax from consumers to suppliers and deny service to those who cannot pay the higher prices, making universal service more difficult to achieve. If prices are much lower than costs, the supplier will not collect enough revenue to provide adequate service or expand it. There will be long waiting lists and little hope of achieving an effective national network rollout. And if the costs of providing services are much higher than they need to be to supply efficient service, many people will be denied service even if prices are based on costs. Price levels provide an indication of the efficiency of industries and economies. Price reductions based on cost reduction are essential for economic development.

Traditionally, in most countries there has been relatively little attention paid to the establishment of efficient prices for telecommunications services. Some countries have set telecommunications prices far above costs; others have a combination of prices for some services far above costs, and others far below costs. Moreover, efficiency in the provision of telecommunications sources has not been a priority in most countries until the relatively recent major telecommunications reform process movement took root. New polices, new technologies and new competitive market forces are requiring serious assessment of the relevance and appropriateness of inherited pricing policies and practices.

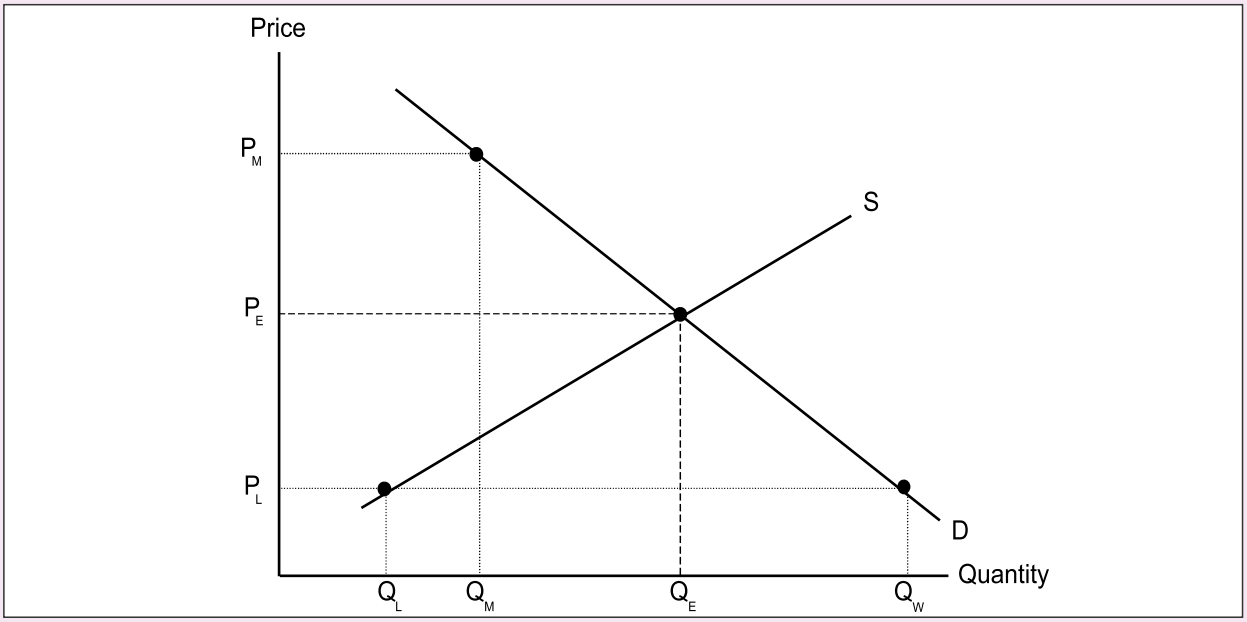
The design and structure of prices is as important to service and market development as the overall level of prices. The relatively simple determination of whether prices for a particular service should be variable (e.g., based on usage), or fixed (e.g., based on a reservation of capacity), can have a major influence on service development. In the early days of the telephone industry in the United States, a fixed monthly fee per local connection (i.e., a capacity charge) was established for unlimited local calls.

West European countries established usage charges based on the number, time and duration of local calls. This difference contributed significantly to the development of very different usage patterns. For the last half century the average United States household has used the telephone for local calls, five to ten times as much as the average West European household. This simple difference in local telephone pricing structure also is believed to be a key factor explaining why Internet usage from the house in the United States is so much greater than it is in Europe. The design of pricing structures will be a fundamentally important issue for PTOs, competitors and customers in the new telecommunications environment of the 21st century.

Until recently, telecommunications involved only a very limited number of telegraphic and voice communication services provided by national monopoly PTTs or PTOs which provided both the facility and the service networks. Over the past 20 years, the digitalization of telecommunications networks has opened up possibilities for providing a wide variety of voice, data, graphic, video and other services. The convergence of electronics, computing and telecommunications technologies is reducing the telecommunications network transmission path to the transfer of "bits" of data. This digital path can be used to communicate any form of information, thus providing the foundation for a massive expansion in the variety of information and communications services that can be provided over the same telecommunications network, as we are now seeing on the Internet.

Digital networks with enormously expanded capacity are introducing a new bandwidth telecommunications economy (i.e. bandwidth capacity) as an important new dimension in the supply of many new telecommunications services. During the era when analogue technologies and PTO voice services determined investment requirements and network capabilities in telecommunications, the distance called and the duration of telephone calls have been very important. For the future, telecommunications network bandwidth capacity will be the primary factor determining the development of most new services and network investment requirements. Distance is becoming less and less significant on digital networks, and the duration of network connections is growing in the direction of establishing permanent connections for some services.

Figure 7.1: The effects of prices upon levels of service



Note: D = demand; S = supply.
Source: W. Melody.

The development of high volume Internet and electronic commerce services requires efficient access to digital networks that provide access to bandwidth capacity, as now provided by leased line services. The new world of digital data networks is vastly different from the old world of analogue voice networks. The transition from the old to the new is a difficult and challenging adjustment for telecommunications operators and policymakers in all countries.

For developing countries, the process is doubly difficult as they are still attempting to achieve the objective of establishing a comprehensive national network that can provide a universal basic telephone service. In some ways these new developments seem to undercut this effort. But in other ways they open new opportunities to achieve a universal telephone service as part of a larger package of network information/communications services. In this dynamic environment, it is important that pricing policies and practices adapt to the changing environment so as to facilitate network development that will promote both universal telephone service and access to new digital information services. Both will be essential in 21st century information economies.

This chapter reviews the role of price setting and price regulation in the telecommunications reform process, examines recent experience in applying price regulation, and points to changes in pricing structures that will be required for new digital network services such as the Internet and electronic commerce.

7.2 The economic functions of prices

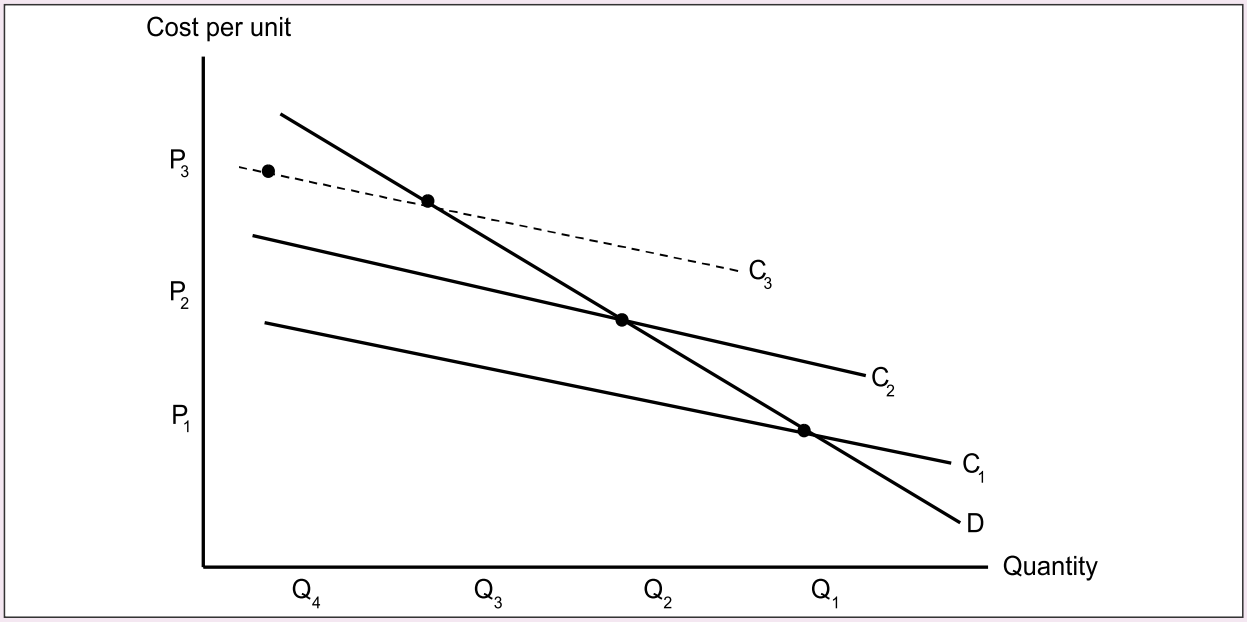
Prices serve a dual function. They stimulate producers to supply particular quantities of a good or service because the prices will cover at least the cost of providing them. They also stimulate consumers to purchase the good or service because they consider it good value at the price offered.

But prices are not always set appropriately to match the quantity supplied with the quantity demanded. This is illustrated in Figure 7.1. The "D" line represents the demand for service. As the price is lowered, more service will be demanded. The "S" line represents the supply of the service. The higher the price, the more service will be supplied. Ideally, a price P_E will bring about an efficient match of supply and demand at a service quality of Q_E. Economists conclude that for most goods and services in the economy, Q_E can best be found by the continuous trial and error experimentation of competitive markets.

However, historically telecommunications has never been subject to competitive market forces. Prices for services have not been set by the market, but by PTO managers or government regulators. In many developed countries, it has been recognized that consumers could be charged high monopoly prices for essential telecommunications services, P_M in Figure 7.1. But at price P_M consumers will only purchase quantity Q_M, and many people will not be served. Regulatory authorities attempt to place a maximum price, or price cap, at price P_E to promote maximum extension of the network under conditions where prices will cover the costs of supplying the services.

Many developing countries have faced the opposite problem. Recognizing the low incomes of most people, much lower prices have been set, at P_L in Figure 7.1. But the low prices have only generated enough revenue to produce a small quantity of service Q_L. The demand for service at the low price is much greater, at Q_W. But not enough revenue is generated to provide funds to expand the network to meet the demand.

Figure 7.2: The effects of efficiency and technology upon prices and levels of service



Note: C = cost line; D = demand.
Source: W. Melody.

The result is a long waiting list for service, illustrated by the large gap between Q_W and Q_L. A well-intentioned low pricing policy ends up providing relatively little service to relatively few people. In this situation, increased prices will provide funds for expansion of the network and a reduction of the waiting list. The challenge of rate rebalancing is to raise prices to P_E to ensure that the network is expanded so that all demands can be met, while at the same time reducing the cost of providing service so that the P_E price can be continuously reduced.

This presents a particularly difficult challenge for new telecommunications regulators, as the incumbent PTO has an incentive to raise basic monopoly service prices above P_E to P_M in the rebalancing process. In both developed and developing countries, the goal of price regulation is to establish maximum prices for the basic monopoly telecommunications services at P_E prices that reflect the most efficient supply of service and that are as universally affordable as possible.

7.3 Pricing implications of telecommunications reform

The telecommunications reform process now taking place in virtually all countries involves much more than establishing prices that approximate the balanced P_E price in Figure 7.1. Current reform attempts to create conditions where the P_E price will reflect maximum efficiency in the supply of telecommunications services. If greater efficiency is achieved, a higher quality of service can be produced at all possible price levels. This would be illustrated in Figure 7.1 by a movement of the "S" line to the right. Then balancing of supply and demand would occur at a lower P_E.

The telecommunications reform process is attempting to bring about significant improvements in the efficiency and pricing of a sector that historically has not needed to operate with the goal of maintaining economic efficiency. Telecommunications operations were often used for other purposes, such as subsidizing the post, the government's general budget or expanded employment far beyond the level required to provide efficient service.

The different steps of efficiency improvement are illustrated in Figure 7.2. The quantity of service, Q_4, represents the situation in many developing countries. The service supplied is very low and the cost per unit is very high, as illustrated by the cost line C_3. If prices can be balanced with costs and the waiting lists for service eliminated, the quantity supplied increases to quantity Q_3. The cost per unit is reduced because of the inherent economies of scale and scope in telecommunications networks.

But the cost line C_3 is not the most efficient way to provide the services. If the services are provided efficiently, the unit cost line is lowered from C_3 to C_2. The lower prices made possible by the improved efficiency stimulate increased demand, which, in turn, permits unit costs to be reduced further. Finally, new technologies allow unit costs to be lowered even further to cost line C_1. Again, if the reduced unit costs are reflected in reduced prices, the quantity of services demanded will be increased to Q_1, providing a stimulus for a further reduction in the unit cost.

Moreover, as telecommunications and information technologies are improving at a rapid rate, this process of continuous reductions in the unit cost and prices of telecommunications services can stimulate very large increases in the quantities of communications capacity that can be supplied and the new

services that can be developed. This is what makes the explosive growth of the Internet, electronic commerce and the telecommunications bandwidth economy possible.

By their respective processes of telecommunications reform, all countries are attempting to create conditions where they can improve their telecommunications sectors in the direction of Q_1 and C_1 in Figure 7.2. Most developed countries have begun the telecommunications reform process from a position illustrated by cost line C_3 and quantity Q_3, with a few leading countries closer to the C_2, Q_2 position. In these countries, all demand is being served. There are no waiting lists, but maximum efficiency is not being achieved and unit costs and prices are much higher than necessary to stimulate the new information economy services.

Most developing countries begin the reform process at Q_4 in Figure 7.2 with a waiting list for service and cost conditions illustrated by the C_3 line or even higher. This is a much more complex and difficult process of reform. The pricing issues are especially sensitive. In many cases, prices must be increased to stimulate investment in expanding the network, but in a way that subscribers are not driven off the network. This must be done as a first step in a process that will stimulate network development and be followed by declining prices so as to achieve both universal access to basic telephone service and access to the new information economy services. Price structures and price regulation will play an important role in the process.

7.4 Price regulation in the new market environment

Telecommunications reform policies everywhere have recognized the need to have many more participants than the incumbent PTO in the process of telecommunications network expansion and service development. These new participants will stimulate development of the sector and provide a degree of competition for the incumbent PTO, stimulating increasing efficiency improvement on the part of all operators and service providers.

However, in most countries, basic public telephone service will remain a monopoly at least for sometime. Competition will not extend service universally to everyone, and the new participants will be vulnerable to the monopoly power of incumbent PTOs for interconnection with, and access to its facility network. These all require price regulation to ensure the prices for these services are reasonable.

The basic standard for judging the reasonableness of prices is the cost of providing the service. Cost, in this economic sense, includes the cost of attracting all necessary economic resources including necessary capital for investment. The latter is usually measured as a rate of return on investment and often discussed as a reasonable level of profit. However, the economic cost standard for judging efficiency is not the actual cost of an inefficient operator, but the cost of providing services in the most efficient manner.

In addition, calculating the costs for an increasing variety of telecommunications services being provided on a common telecommunications network is a very complex and often very imprecise task that both telecommunications managers and regulators must confront. Thus, effective price regulation requires that regulatory authorities have highly informed and skilled staff in this area. Price regulation examines issues at four different levels of analysis:

- Specific individual prices, e.g., the line charge for a residential telephone;
- Relations between specific prices, e.g., a residential telephone line compared to a business line or an ISDN line. This raises issues of appropriate rate relations, the design of the rate structure and price discrimination;
- The general price or revenue level of a specific class of service involving several specific services, prices and rate structures, e.g., local telephone services;
- The overall price or revenue level of the company for all of its regulated services. Each approach attempts to develop standards and information that will permit an informed judgement about the reasonableness of prices.

Recognizing the inherent imperfections of all real world assessments, reasonableness is sometimes viewed as encompassing a range of possible prices, with maximum prices for monopoly services being judged as the top of the range of reasonableness. As competition has become more significant, claims are sometimes made that the monopoly PTO is charging prices for services subject to competition that are too low. In this circumstance, regulation and competition authorities are sometimes required to make judgements about minimum reasonable prices.

7.5 Price caps

The most commonly used standards for judging the overall reasonableness of an incumbent PTO's prices and profits are return on investment and productivity improvement. Although both standards establish a general cap on prices, the productivity improvement standard is widely known as the price cap standard. One or both of these standards has been, or is in the process of being adopted in most countries.

The return on investment standard is drawn from the economic theory of competition and monopoly markets. In competitive markets, firms are forced to operate efficiently and can earn only a normal rate of return on investment that approximates its cost of attracting capital. Regulators determine the overall level of prices by reference to the reasonableness of the rate of return. The weakness of this method is that if it is applied precisely and annually, using the actual costs of the PTO, it becomes a cost-plus standard, rewarding inefficiency rather than encouraging efficiency.

This is a criticism that has been levelled at United States regulation using this standard in the past. If the return on investment standard is to be most effective, there must be opportunities for the regulatory authority to exclude inefficient costs from the calculation, to allow for a range of reasonableness in making its rate of return judgements (e.g., 10-15 per cent), and to apply the standard over a period of years (e.g., three or four) rather than annually. This flexible application provides much stronger incentives for PTO efficiency.

In contrast, the productivity improvement standard does not attempt to examine the efficiency of the PTO. Rather it focuses attention on providing the strongest incentives for improving efficiency in the future. The existing general level of prices for a future period can be adjusted by the net effect of considering inflation and a reasonable expected productivity improvement. This is usually expressed as a formula, RPI (retail price index) minus x (productivity improvement). For example, if anticipated inflation is 3 per cent and a productivity improvement factor of 7 per cent is selected, then the overall level of prices must be reduced by 4 per cent. If actual PTO productivity exceeds 4 per cent during this period, it will earn a higher rate of profit.

As the level of general inflation (measuring what general consumers buy) has little or no relation to the inflationary impact of the goods and services purchased by a PTO, some regulators in the United States and Europe have replaced the RPI measure of inflation with an index of items purchased by the telecommunications sector. Unfortunately, there is no general agreement among economists as to the most appropriate concept of productivity to apply, or how it can best be calculated. Thus the productivity factor (X) is subject to a wide range of judgement and is often negotiated without reference to detailed productivity studies. In essence, it provides a guideline for determining a general cap on prices that will apply for a period of years, normally three or four.

The weakness of this standard is that it provides an incentive for the PTO to cut back on its service quality in order to increase its profits. In the UK, this problem resulted in the regulator, Oftel, imposing quality of service standards on British Telecom. Because each standard for applying general price cap regulation (rate of return and productivity improvement) has strengths and weaknesses, some regulatory authorities monitor both as useful benchmarks for making regulatory judgements.

7.6 Price caps for specific services

Overall price cap regulation is not sufficient to ensure that specific price levels for individual services are reasonable. In a market environment where the incumbent PTO has a monopoly in some services and must compete in other services, there is a powerful incentive to combine price increases in monopoly services with price decreases in competitive services so the overall level of prices stays within the price cap. Thus reasonable overall prices for a PTO can be associated with unreasonable prices for both monopoly and competitive services.

The monopoly services of primary concern for regulators are:

1) the basic public telephone services (including customer connection, access and usage prices for local service); and
2) the interconnection and network access services provided to alternative operators and value-added service suppliers, which are typically viewed as competitors by incumbent PTOs.

The former are retail prices for essential public services. The latter are wholesale prices for access and use of the PTO network.

The most common standard for judging the reasonableness of interconnection prices is cost. Since the actual costs of the PTO may include inefficiencies that both PTO management and the regulator are trying to eliminate, forward looking cost estimates are commonly employed, often called long run incremental cost (LRIC). In many countries, and particularly those where adequate cost information has not yet been developed, international price comparisons are used as well to judge a PTO's interconnection prices in reference to international best practice.

Initially, competitors to the PTO that provide long distance and/or value added services seek to interconnect their networks to the PTO network in order to reach their customers. The interconnection price is for access to the entire network. The next stage of market liberalization is to unbundle the local line connecting businesses and residences to the network from the services provided over the customer line.

Regulators in the United States, Canada and most West European countries now require unbundling of the customer line. In essence, this requires the PTO to offer to lease the local customer connection to service providers. In this circumstance, the PTO is offering a wholesale service of the capacity of the local line to service providers, who will use it to offer competitive retail services, including local telephone service to end users. Thus, the relationship between the PTO wholesale and retail prices becomes very important.

The United States Federal Communications Commission (FCC) has required that the local exchange networks of the United States PTOs be unbundled into their different functional elements, and a total element long-run incremental cost (TELRIC) be calculated for each element. Reasonable prices are to be determined by the United States regulatory authorities on the basis of the TELRIC of providing a particular network element, plus a reasonable share of forward-looking joint and common costs, including a reasonable return on investment.

For competitors who wish to use the PTO network to compete in the retailing of services to end users, the FCC requires that wholesale rates be established on the basis of the PTO retail price minus the attributable marketing, billing, collection, and other costs that will be avoided by the PTO if the service is retailed by a competitor.

The purpose of this continued unbundling of the main components of the network and service functions is to provide a broad range of choice to competitors in deciding where they can compete effectively against the PTO and where it is more efficient to lease network capacity or service functions from the PTO. Thus, effective price regulation of these wholesale network interconnection and access services is essential if the decisions of both PTOs and competitors are to be based on their respective efficiencies.[1]

Judging the reasonableness of prices for the essential basic monopoly service is more difficult because access to basic local service also provides access to long distance, international, and other services, whether or not a customer wants or uses them. Most costs are fixed and common across both services and

customers. Assigning only direct, avoidable costs results in a very low cost responsibility. Assigning all local network costs to local services results in very high costs that clearly have been incurred for the benefit of other services. Thus, judgements must be made about the proportion of the multi-service network fixed and common costs that will be allocated to basic local service. In most cases, the criteria for these judgements include the status of network development and the ability of residential customers to pay for access to the basic service.

Under the productivity improvement price cap standard, competitive services often are excluded from the basket of monopoly services to which the price cap is to be applied.

This raises two issues:

1) deciding when services can be declared competitive and moved out of the basket; and
2) the incentive provided for the PTO to allocate all the benefits of productivity improvement to some services and none to other.

In the United Kingdom, over the past decade Oftel has passed some services out of the price-cap basket, brought them back into the basket, and then began moving them out again. The existence of one or two competitors for a PTO service is often not sufficient to make a service competitive, as the smaller competitors will simply follow the lead of the dominant operator in setting their prices, an experience that has been documented in Australia, Canada, the United Kingdom, and the United States and other countries.

This experience has shown that many PTOs tend to raise prices for basic residential service and lower prices significantly for business services, within the overall price cap. This denies any productivity benefit from being recognized in the basic monopoly residential service, and has prompted some regulators to place a specific price cap on this essential service. Occasionally, concerns are raised (usually by new competitors) that an incumbent PTO is pricing a competitive service too low, e.g., a high volume network service for large businesses.

The issue is whether the regulator should establish a minimum price to prevent predatory pricing, a tactic of unfair competition that is sometimes used by large firms against smaller ones. The most commonly used standard for judging the reasonableness of such prices is LRIC, but in an industry characterized by continuously declining unit costs and prices, minimum price regulation runs a risk of restricting competition and efficiency.

Often a more effective regulatory pricing policy is to ensure that the price caps for the monopoly services are applied effectively to prevent cross-subsidy, to require the PTO to make its competitive services available to anyone, and to permit the resale of services. This prevents significant price discrimination in most, but not all cases.

Finally, the shift from regulated monopoly to competitive environments has important effects on the pricing of universal service obligations. For the former, cross-subsidization by monopoly services was permitted to compensate the PTO for extending the network to unprofitable areas and groups of customers. In a competitive environment, new options are made possible. In this instance, competitive bidding can lead to greatly expanded service coverage at much reduced cost. This has been demonstrated dramatically by local private company and co-operative extensions in rural areas of the United States in the 1940s, in Alaska in the 1970s and Chile in the 1990s, among other experiences.

Using competitive market forces to determine the cost of implementing USOs reveals the most efficient estimation of costs, disciplines the regulator from imposing an obligation with too low a subsidy, and, can also provide information about the markets to be served – especially with regards to a willingness to pay for service that had not been previously identified.

A common experience across all countries, developed and developing, that have implemented this approach is that most of the previously unserved sector can be served at a profit, and necessary subsidies are a fraction of those initially estimated.[2] The recent explosion in the demand for prepaid mobile services is further confirmation of the success of using competitive market forces to minimize the price of meeting universal service obligations.

7.7 Towards integrated fixed-mobile networks

Throughout the 1990s the growth of mobile services has been dramatic. Initially developed as a specialized niche market for analogue voice service, mobile services have become an integral component of the telecommunications network. In developed countries with rural and remote access challenges, such as Australia, wireless local loop operators are extending services to unserved areas.

For sectors of the population in all countries with low income and/or limited credit, in urban centres and remote locations, mobile phones are extending access to the telephone network through use of non-subscription prepaid services. In many countries with emerging telecommunications infrastructures the waiting list for fixed line service is being reduced more by cellular mobile options than fixed line connections. And, many developed and developing countries are moving in the same direction as Finland, where in 1998 mobile penetration rate exceeded the fixed line rate.

The new digital mobile services offer significantly expanded service possibilities including Internet access. Mobility has become a key characteristic of telecommunications facility and services networks, and for the future, regulation must consider them as integrated components of national and international telecommunications networks.

As niche markets subject to varying degrees of competition, the prices for mobile services to customers have not been regulated in most countries. Price regulation has been confined to ensuring mobile operators pay only reasonable interconnection prices for their connections to the fixed network to transmit and terminate calls. This has led to a situation in many countries where the price for terminating calls on the PTO fixed network is regulated, but the price for terminating calls on the mobile network is not.

As long as mobile is considered a luxury and lifestyle service subject to effective competition, this need not be a matter of regulatory concern. But as mobile increasingly becomes an important element in supplying public services, and evidence accumulates that the competition in mobile markets is not effective across all market segments, greater scrutiny of mobile market development by regulatory authorities becomes justified and may be required.

The experience of most countries suggests that mobile service competition involving two or three competitors does not lead to sustained price competition. Rather the market tends to function as a classic oligopoly where firms keep prices high enough that they all make excess profit. Only when competition reaches five to seven independent operators under conditions where customers can change service suppliers easily and inexpensively, including number portability and call-by-call allocation among competitors, does serious price competition unfold.

This evidence suggests that the licensing of additional mobile operators is the best way to stimulate increased efficiency and bring major price reductions for consumers. However, in some developing countries the market may not support five to seven mobile operators. One solution may be to license regional operators so as to enlarge the market, a trend that both the technology and market economics suggest is inevitable in any event. But even this may not be enough in many cases, especially if governments are intent on maximizing the fees charged for mobile licenses.

The significance of the potential of mobile services for extending telecommunications penetration rates in developing countries can be seen by examining the recent experience in the South African Development Community (SADC) region. Most countries have launched mobile services within the last five years, and all but one have introduced digital GSM cellular networks.

Growth has been greater than 100 per cent a year and has reached one-third of telephone subscribers in South Africa. It averages 15 per cent across the other countries. In only a few years, mobile subscribers will exceed fixed line subscribers in the region. Similarly, in Latin America, it is projected that the PCS market will increase from 20 million subscribers in 1998 to more than 80 million in 2005.

Tariffs for mobile service vary widely across the countries. These are illustrated for the SADC region in Figure 7.3 (left hand chart), which documents that the highest prices (in Mozambique) are more than five times the lowest prices. Figure 7.3 (right hand chart) illustrates the potential effect of price reductions on market growth.

At current prices the market is estimated to grow to about 5.5 times its current size of 1.1 million subscribers by 2005. But if all countries achieved prices at the level of current best practice for the region, this prediction is estimated to increase by more than four times as much to 4.5 million subscribers. Clearly, price reductions for mobile would provide a major stimulus to increasing penetration rates.

In the Latin American market where the mobile market is quite developed, moves toward increased competition – in addition to lowering prices in the region – has resulted in service providers concentrating on improved customer service, digitization upgrades and increased marketing in order to retain market share when new entrants begin operating. An additional significant factor contributing to mobile sector growth is the shift to "calling party pays" (CPP). In Argentina, for example, CPP was a significant positive influence in the cellular sector's 179 per cent growth rate in 1998.

One surprising aspect of mobile service development in the SADC countries, Latin America, and throughout the world has been the extraordinary growth in prepaid mobile service. In many countries, more than half the market subscribes to prepaid services. It has provided a new opportunity for network access for people who are excluded from fixed network service by location, income, or lack of credit. Prepaid mobile extends the limits of potential universal service by bringing into the market people who are excluded by traditional fixed network provisioning. In developing countries, it is now the most significant vehicle for implementing universal service goals.

Prepaid subscribers accounted for 16 per cent of the Latin American PCS subscriber base for 1998; projections are that by 2005 this sector will have increased to 38 per cent.[3] In Mexico, exponential growth of mobile telephony is strongly correlated with the introduction of pre-paid services in 1993. Mexico was the first Latin American country to introduce prepaid, and currently has the largest number of prepaid subscribers – estimated to be somewhere between 40-60 per cent of all mobile users.

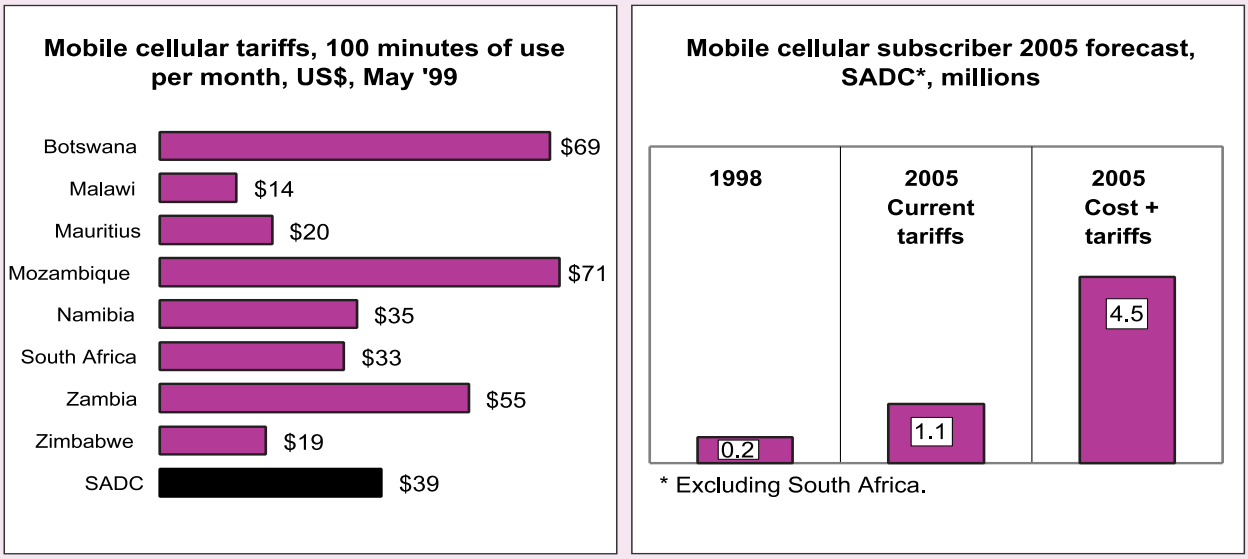
Yet, amidst this very positive development, there is compelling evidence that this segment of the mobile market is not benefitting to the same degree as the post paid contract segment. There are major cost savings in supplying prepaid service. Contracting, billing, and collection are unnecessary. Financial risk is zero, funds are received in advance of service provision, and some subscribers will fail to make use of all the service for which they have paid in advance. In contrast, there are few risks for service providers of prepaid mobile services, relating essentially to unanticipated short-term inflation and currency instability.

Where competition is effective, one would expect the growth of prepaid mobile to be associated with both lower and declining prices. The Strategis Group notes that the rapid growth of prepaid is causing a decrease in average revenue per user (ARPU) across Latin America: "Weighted ARPU for Latin America is expected to decline from around US$ 70 per month in 1999 to US$ 43 per month in 2005".[4]

Yet, most mobile operators charge higher prices for prepaid service than contract service. They are exploiting the vulnerability of a market segment that is not fully informed and is denied the range of choice that effective competition should provide. Cost-based pricing, whether applied by a competitive market or a telecommunications regulator would require that prepaid service be supplied at prices that are discounted from contract service prices. As prepaid is now fundamentally

Figure 7.3: Tariffs and demand, and market potential

Mobile cellular tariffs in selected SADC countries, May 1999 (left hand chart). Mobile cellular subscriber forecasts for the SADC region, 2005 (right hand chart).



Note: In the left hand chart, the mobile tariff shown is the cheapest available for 100 minutes of use a month (50 peak and 50 off peak). In the right hand chart, the forecast number of subscribers is calculated by estimating how many households could afford service with current tariffs and a tariff of US$ 15 per month (Cost + tariff) assuming that the tariff should not exceed more than 5 per cent of monthly household income.

Source: Minges, Michael. "Mobile cellular communications in the Southern African region." *Telecommunications Policy 23*, No. 7-8 (1999) forthcoming.

important to extending universal service to the poorer and more vulnerable members of the society in developing countries, regulatory authorities will want to monitor market developments to ensure public interest objectives are being served.

7.8 International services and revenue settlements

Competition has developed more rapidly in international telecommunications services than most others. As a result the traditional system for international revenue settlements (IRS) among correspondent national PTOs is being undermined in a variety of ways. Most traffic by transnational corporations is over leased lines and private networks that bypass the IRS system entirely. The resale and refilling of traffic is exploiting pricing disparities in the IRS system. More and more public services traffic is sold under discount service packages rather than at tariff prices. Additionally, "call-back" and Internet-to-phone schemes are available to the general public.

The United States FCC is attempting to drive IRS payment prices down for countries charging high prices. It is evident that the traditional IRS system will not last much longer. A useful guide to the remaining life of the IRS is provided in Figure 7.4. It shows that if current plans for new transoceanic cables and satellites over the Atlantic and Pacific oceans are completed on time, there will be an increase in current capacity of about 6.5 times by the end of 2000.

This will be accompanied by major price reductions reflecting the dramatic reduction in the unit costs for circuits, bandwidth capacity and telephone calls using the new technologies. This will launch the telecommunications bandwidth economy, which will be a huge leap for Internet services, the widespread use of electronic commerce and the decline of voice communication as the key service driver for continued telecommunications development. This will very likely be the final assault on the IRS.

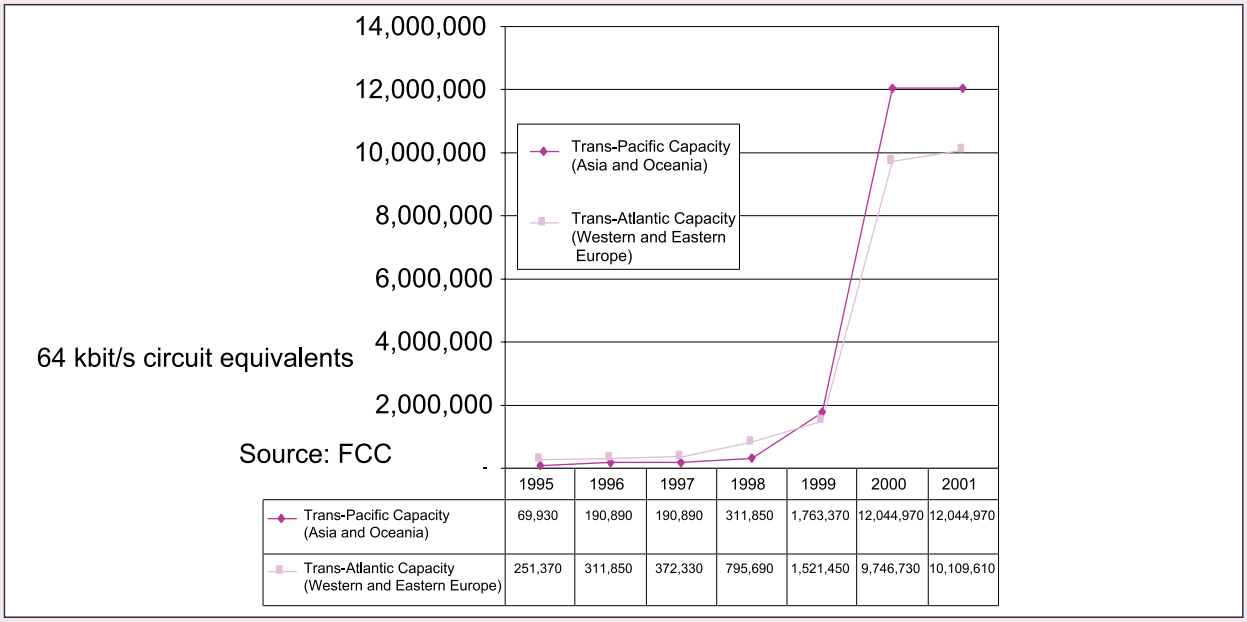
However, the effects on developing countries need not be as drastic as many fear. A new-cost based pricing structure for international traffic will likely provide separate pricing components for origination, transmission and termination for different usage-based and bandwidth-based services.

For countries with underdeveloped and high cost telecommunications networks, higher cost termination prices will be justified and enforceable in a highly competitive marketplace until efficiency improvements, new technologies and expanded services and usage require cost and price reductions.

The ITU has been assisting developing countries in taking steps to determine the costs of terminating traffic in their respective countries. These termination prices will apply to all traffic, including the major portion of traffic that already has been diverted and leaked away, and the significant domestic demand that has been repressed by high prices and deficient service.

The circumstances in Colombia, an extreme case of unbalanced revenue settlements, provide a good illustration. FCC data for 1996 indicates that Colombia sent 61.5 million minutes of traffic to the United States and received

Figure 7.4: The forthcoming explosion in international network capacity



	1995	1996	1997	1998	1999	2000	2001
Trans-Pacific Capacity (Asia and Oceania)	69,930	190,890	190,890	311,850	1,763,370	12,044,970	12,044,970
Trans-Atlantic Capacity (Western and Eastern Europe)	251,370	311,850	372,330	795,690	1,521,450	9,746,730	10,109,610

Source: *Building Capacity for Electronic Commerce-Leased line Developments and Pricing.* DSTI/ICCP/TISP(99)4, OECD, June 11, 1999. http://www.oecd.org/dsti/sti/it/index.htm.

284.8 million minutes from the US, a 1:4 ratio. Colombia received a net settlement payment of US$ 70/minute for the extra 223.3 million minutes it terminated for the United States, US$ 156.3. For these extra minutes, the United States collected revenue from United States customers averaging US$ 3.49/minute. Thus, the United States paid Colombia about 20 per cent of its average price to terminate this traffic.

Normally, national termination costs for international services in developed countries would be much higher than 20 per cent of total costs. For developing countries, they would be even higher. If Colombia had terminated incoming traffic from the United States on the basis of cost-based termination charges in 1996, it may have received an even larger payment from the United States. But instead of being called a subsidy, it would have been called payment for service.[5]

Indeed, international transmission costs/minute are a very small and declining portion of total cost. Almost all the costs are in origination and termination. In the future environment, the price/minute will decline significantly, stimulating very large increases in the volume of traffic, which in turn will lower unit costs. Colombia, and many other developing countries may find that when they shift to cost-based settlements, their net revenues (gross revenues minus costs) increase instead of decrease. Most countries may find it in their interest to change to a cost-based pricing structure sooner rather than later. All countries would be well advised to examine their costs of terminating international usage and bandwidth services in preparation for the changes to come.[6]

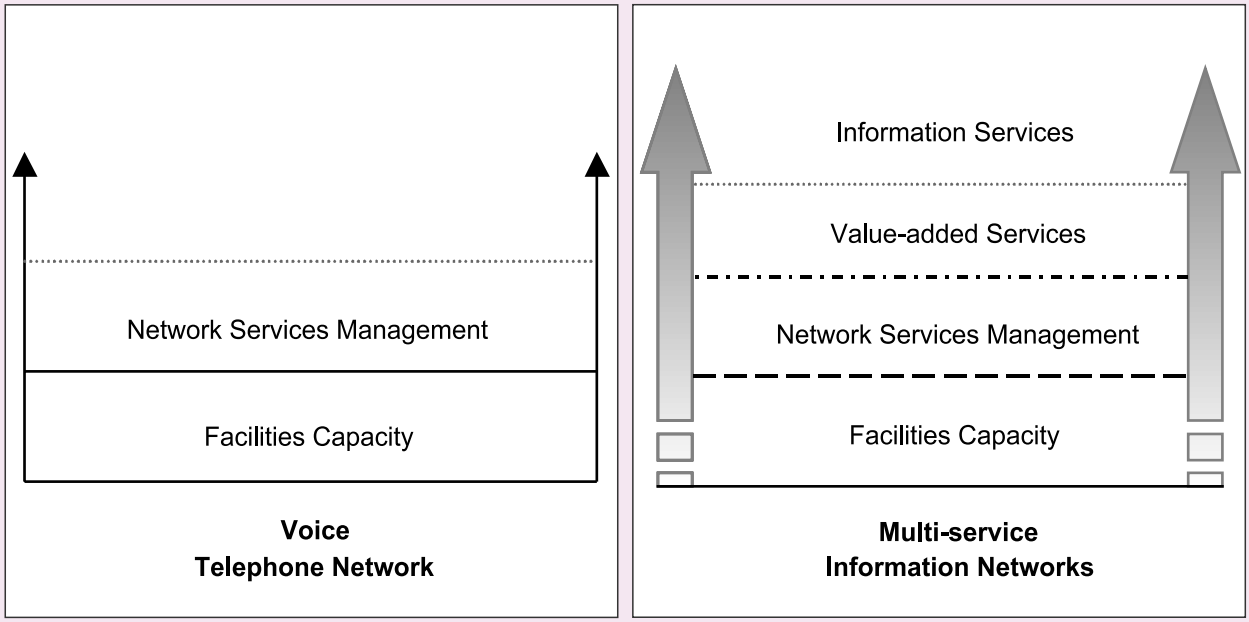
7.9 Responding to demand for new information services

Digital networks are providing the foundation for a wide range of new electronic services, many of which are currently provided on the Internet. In the supply of these services, bandwidth capacity can be extremely important, and control over the use of bandwidth capacity by information service providers and end users is often desirable and sometimes necessary.

A fixed monthly fee for a local residential telephone line, or an ISDN line, is a bandwidth capacity service. Broader bandwidth services are typically provided as leased lines of varying capacity, typically ranging from 64 kbit/s to 34 Mbit/s, but including both lower and higher ranges. These higher bandwidth networks enable the provision of the value-added and information services (e.g., electronic commerce), that will be applied throughout the entire economy and support the development of information societies.

Thus, leased line bandwidth prices are extremely important for the development of information economy services. The transformation of the telecommunications network from analogue voice to multi-purpose digital communication/information network is illustrated in Figure 7.5. Today the majority of circuits in use between the United States and Europe are used for digital data services other than telephony. Within a few years, non-voice services are expected to exceed voice services in traffic volume, and then later in revenue.[7] As Internet protocol (IP) telephony is expanded by

Figure 7.5: Transformation of the telecommunications network



Source: ITU.

both incumbents and new competitors, telephone services will become just one of many categories of services provided over a variety of bandwidth connections.

In many countries leased line prices have been kept artificially high by the incumbent PTOs because of concern that they would be used to provide competitive services. This has had a major impact on the development of Internet traffic. For example, European 2 Mbit/s leased line cross-border prices have been 15 times higher than United States prices. As a result, most Internet traffic between countries in Europe travels to the United States and back, making the United States the primary beneficiary of this intra-European traffic. Almost all countries, including developing countries, are experiencing this same phenomenon.

Moreover these international leased lines, which are used to communicate to the United States and back again, must be paid for by the users originating the communication, and this revenue is not subject to international revenue settlements. The only way to resolve this problem, and stop the negative financial consequences for most countries is for these countries to lower leased line prices and expand leased line capacity. Bandwidth capacity services will be needed by users at all levels, including small businesses and residential subscribers. As the multi-purpose information network is developed, users will need a choice of pricing structures for purchasing their desired services, including both usage and bandwidth capacity options. The growing demand for new information services must be harnessed to drive the telecommunications reform process forward in all countries by providing a stimulus to network expansion and efficiency in the supply of all services and the achievement of universal service goals.

As the services and pricing structures on the telecommunications network are increasingly driven by demand rather than supply considerations, pricing structures will be designed to respond to an increasing diversity of demand requirements. These will reflect the particular applications of telecommunications and information services in every sector of the economy. Electronic commerce will require very specific service characteristics, including new standards for security and privacy. Health and education applications will require other characteristics. There will be demands for lower quality and discount services. Overall pricing structures will begin to take on more dimensions, or characteristics as competitive service suppliers attempt to meet specific customer needs precisely.

The addition of bandwidth as a major new pricing dimension to the existing major dimensions of access and usage (call duration, distance and time) raises related issues such as priority services and quality of service as increasingly important dimensions of pricing structures. At the same time it introduces new problems of how best to manage different forms of congestion on the network that will inevitably arise. The recently developed spot markets in bandwidth will play an important role in applying the price mechanism to address conditions of capacity shortages and surplus.[8]

Historically, pricing structures have been very static. Growing networks and emerging services will require much more creativity and dynamism in approaches to designing pricing structures. Both service providers and service users are becoming more informed and innovative about the many different possibilities there are, and will be, for accessing and using the network and paying for it.

7.10 Conclusion

It is apparent that the task of designing the most appropriate pricing policies and structures in the new digital network economy will be complex and challenging for the managers of incumbent PTOs, new competitors and information service providers, as well as regulators. They must be sensitive to the reality that yesterday's pricing structures will not be sufficient to promote network expansion, new service development and universal service penetration in the new environment.

Competitive markets forces will continue to grow and be a driving force behind the development and application of new technologies, services and efficiency improvements. But they will not spread the benefits uniformly across all services and countries. For the foreseeable future, there will be an ongoing need for effective price regulation for the basic public monopoly service, for universal service extensions, and for interconnection and access to essential network facilities. However, it will have to be based, not on the preservation of inherited practices and pricing structures, but on promoting a multi-service information network that is inclusive in responding to the variety of new demands and needs of all sectors of society.

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1 See Melody, W.H. *Price Regulations and its Implications*, in W.H. Melody *Telecommunications Reform: Principles, Policies and Regulatory Practices*. Lyngby: Technical University Denmark, Den Private Ingeniør, 1997.

2 See Weller, D. *Auctions for Universal Service Obligations, Telecommunications Policy*, 23 (9) forthcoming October; and Wellenius, Björn, *Extending Telecommunications Service to Rural Areas – The Chilean Experience*, *Private Sector*, Note 105, World Bank Group, Washington DC., 1997.

3 The Strategis Group. *Prepaid Cellular / PCS in Latin America: Market Potential and Business Strategies*, 1999.

4 The Strategis Group. *Latin America Cellular / PCS Markets:* 1999.

5 Primo Braga C.A., Forestier, E. & Stern P.A., *Developing Countries and Accounting Rates Reform – A Technological and Regulatory El Niño? Viewpoint*, The World Bank, Washington, No. 173, January 1999. http://www.worldbank.org/html/fpd/notes/.

6 For further discussion see M. Cave and L. Waverman, *The Future of International Settlements in Telecommunications Policy,* 22 (11). Special issue devoted to: *The Future of International Settlements*, 1998.

7 FCC, *Report on International Circuit Status*, November 1998.

8 See for example Band-X (http://www.band-x.co.uk).

8 NUMBERING IN A DIGITAL WORLD

8.1 Name and address spaces: an introduction

Names and addresses are markers that guide the movement of information from a source to a destination. Once regarded as an obscure and rather uninteresting technical aspect of a network, numbering and addressing are now important aspects of telecommunications policy. In a networked economy and an information-saturated environment, names and addresses on networks can become public identifiers with important implications for marketing, visibility, and ease of use.

There are many different name and address spaces in telecommunications. Some examples include:

- The international telephone numbering plan (ITU-T E.164)
- The North American Numbering Plan for telephone service
- The Internet domain name system (DNS)
- The 32-bit Internet Protocol addresses established by the Internet Engineering Task Force (currently in transition to a 128-bit addressing scheme known as IPv6)
- Identifiers used in Internet inter-domain routing (currently Border Gateway Protocol autonomous system numbers).

This chapter focuses on only two of these spaces: telephone numbering plans and the Internet domain name system. The treatment of telephone number and domain name spaces highlights the differences between the two realms, but it also hints at the possibility of eventual convergence of the two systems of addressing. Both systems may eventually share a technological basis in distributed database referrals; both may eventually be global, or at least non-geographic in nature, although this will occur more slowly with telephone numbers; and in both the trend is toward memorable, mnemonic, easily identifiable addresses owned by the user rather than the system. As voice and data networks are increasingly interconnected, digital convergence will also force next-generation networks to devise ways of making telephone numbers and domain names or IP addresses interoperable.

To address something is to assign it a unique value from a bounded range of values. Indeed, uniqueness is critical to the functionality of an address. To ensure that addresses are unique, each assignment must be coordinated with all other assignments. The existence of this coordination problem usually means that names and numbers are administered by some form of collective action. That is, by groups rather than by individuals or a firm. Proprietary name and address spaces do exist, but the most interesting and difficult policy problems are created by the need for collective action among businesses and organizations that might otherwise be rivals or autonomous. The institutional agent for the exercise of collective choice can be a government, a coalition of private businesses, a non-profit association, an international treaty organization, or a standards-setting organization.

Names and numbers are economic resources, especially the former with their deep synergy with intellectual property and brands. For suppliers, they are inputs needed to construct a network. They may be bought and sold. For users they are identifiers in which substantial investments can be made. For both users and suppliers, addresses may be an important part of the interface that makes the network easier or harder to use. Addresses can be managed in a way that responds to supply and demand effectively. Conversely, policy can deliberately maintain scarcity so that allocation decisions can be exploited to enforce the objectives of whoever controls the supply.

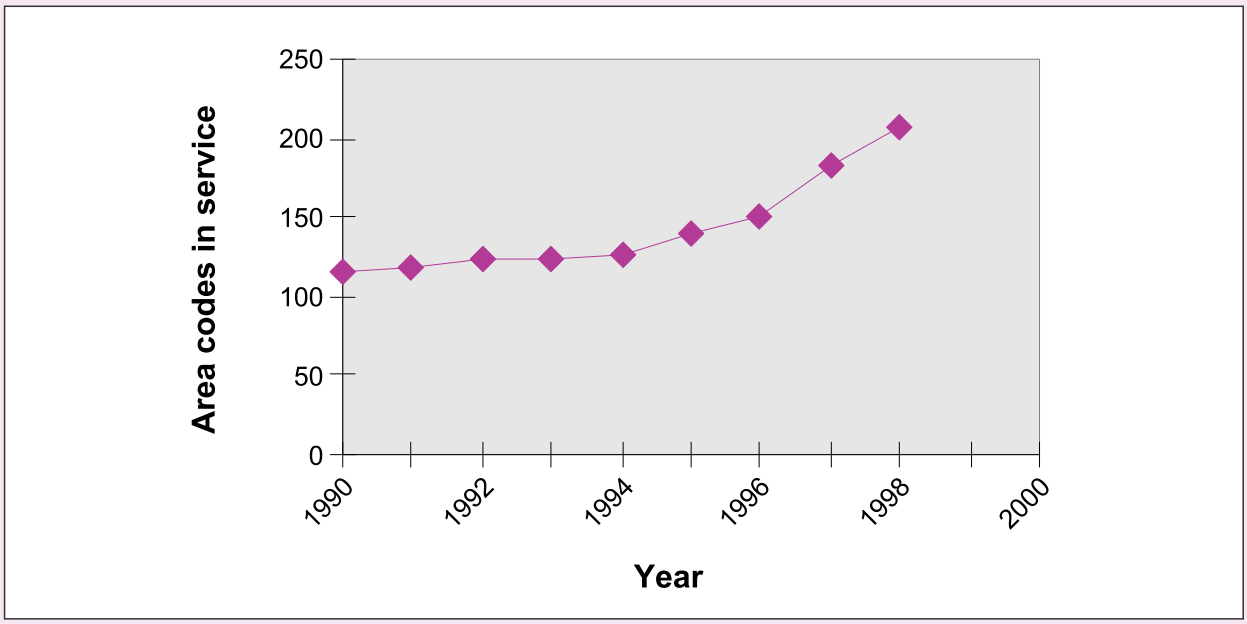
8.2 Telephone number spaces

Three major trends are shaping the evolution of telephone numbering spaces. One is rising demand caused by the popularity of new communications devices that require numbers, such as facsimile machines, pagers, satellite telephones and mobile phones. The second reason is the increase in new services, such as freephone (800 number), international premium rate and shared cost services, which require separate numbering domains. Many of these services require international and even global coordination of numbering. The third trend is the liberalization of the telecommunications sector. This requires the allocation of numbers to competing service providers, the addition of carrier access codes to numbering plans, and portability of numbers across service providers. In addition, global shared E.164 code resources are being assigned to international network services, such as Global Mobile Satellite Systems (GMSS) and others.

The graph below (Figure 8.1) indicates the impact of liberalization on the numbering plan for the United States and Canada. It shows the expansion in the number of area codes in the North American Numbering Plan (NANP) during the 1990s. In the first part of the decade, there was a slight upward trend, but growth accelerated as a result of the dialling parity and number portability provisions of the Telecommunications Act of 1996 in the United States.

While North America is not necessarily representative of the rest of the world, it does illustrate the effect that market and regulatory trends can have on the numbering space within a country. The doubling of area codes during the 1990s has caused the United States Federal Communications Commission (FCC) to study seriously the possibility of "number exhaust" within the next decade.

Figure 8.1: Area code expansion in North America



Source: FCC, United States.

Traditionally, telephone numbering has followed a geographic orientation. This allowed for simplicity and flexibility in both technical layout and administration. It also resulted in widespread familiarity with the logic of the system. The geographic orientation has given way to a system that has both geographic and functional elements. The functional orientation has allowed the incorporation of new services, such as mobile satellite telephone, as well as new telephone capabilities such as those provided by special use numbers for emergency services and numbers with 800 prefixes. Pakistan, for example, has instituted a new service which is called a Universal Access Number (UAN). It allows a company to use one number for all of its offices throughout the country. The trends identified above have put tremendous pressure on numbering regimes in developed countries. There is a growing realization that phone numbers are resources that require proactive administration. Because numbers are unique and limited in quantity, they can be considered economic resources or units of consumption. As number portability becomes more widespread, numbers may become more closely associated with the user than before, and may even become a traded commodity similar to Internet domain names.

Numerous initiatives involving numbering are underway. Almost 20 per cent of the countries responding to the ITU 1999 Regulatory Survey report that they mandate or are implementing number portability, including developing countries such as Brazil, Pakistan, Peru, and Namibia. Two international initiatives are being handled by ITU. Universal Personal Telecommunications Service (UPT) is a global extension of the personal communication services already implemented in several countries. The number used for UPT is essentially a personal number, and would be a central enabling feature of the service. Universal International Freephone Numbers (UIFNs) is a global, toll-free service modelled on similar national services available in many countries.

Studies are underway regarding the extension of number portability on a global scale. Another development is the application of Internet Protocol (IP) to voice applications (voice over IP, or VoIP, or Internet access over "smart" mobile phones). Should VoIP become more general in scope and be used in local service via cable lines? New issues related to the translation of IP addresses or domain names into telephone numbers will very likely arise.

Number portability (NP), now undergoing a phased implementation in many developed countries, is another initiative that will have a major impact on numbering spaces. It is seen as an enabling measure to increase competition in local service. The rest of this chapter will examine some of these issues.

8.2.1 Perspectives on numbering

Consumers, regulators and operators all have different interests in numbering plan changes. The following section surveys their perspectives.

8.2.1.1 Consumers

A telephone number is perceived to be a simple, easily understandable means of making contact. It has also become a means of identity. "Owners" of telephone numbers, whether individuals or businesses, have come to view the number as a way of identifying and distinguishing themselves. Many

businesses have taken great pains to entwine their corporate identity with their phone number. In some cases, businesses are uniquely known by their national freephone numbers (e.g., 1-800-Flowers in the United States).

The degree to which customers are concerned with maintaining their own numbers has been the subject of several studies.[1] Studies reveal that customers consider one of their local numbers to be their primary number, which they prefer not to change. The desire for permanent, portable numbers is not absolute, however. Customers with multiple numbers do not have the same retention preference for all of them. Customers may not prefer to retain the same number when they make major moves away from their current location. (In such cases, many other identifiers, such as the postal address, will also be changing.) Most studies confirm that users are reluctant to change service providers if it means they must change their primary number in the process. That reluctance can pose a barrier to entry for competition in local exchange services, which has formed the basis for the current effort to achieve number portability.

Customers dislike disruption of numbering schemes imposed upon them by regulators. For instance, dividing a geographic region into two area codes can be disconcerting to the user, especially if the user in question is a business that relies on the telephone for customer access.

As numbers get longer and coding schemes become more complex, customers lose their ability to easily remember them. This leads to greater reliance on directories and directory services. It also leads to a greater desire on the part of individuals and businesses to acquire numbers that are easily recognizable and memorable. As numbers take on this identifier function, some become more valuable than others. This is analogous to the market for Internet domain names, where users place more value on some identifiers than on others, especially when it confers a basic marketing advantage (e.g., generic identifiers such as drugs.com).

8.2.1.2 Providers

In many countries, the operators or providers are the *de facto* allocation authority. This has come about because:

1) there was simply no recognition of numbers as a strategic asset;
2) the technical nature of the numbering system;
3) the general unwillingness of the regulators to become immersed in the details of the system; and
4) the assumption that there was an adequate supply to accommodate expansion.

Over time, this has led to a tacit presumption of "ownership" of the numbering resource by the industry – or, at the very least, there has been the tacit assumption of a delegated authority to perform those functions. Service providers who control the numbering space, however, have a distinct advantage over other service providers. They can introduce new numbering-related features before their competitors can, and retard or restrict their competitors' access to number resources. They may also be able to increase the costs their competitors pay for numbers. The number space is essentially a monopoly asset and an operator in control of it could make its competition pay most of the costs of number administration. Entities in that position naturally tend to resist efforts to achieve parity or to turn over number administration to a neutral party.

8.2.1.3 Policy makers

Policy makers are generally concerned with balancing the needs of the consumers with the needs of the industry. In a liberalized environment they must also serve as an intermediary between competing industry interests. Recent trends have forced numbering into the public consciousness in many countries, and have forced policy makers to make more difficult decisions. As the strategic importance of numbering grows, policy makers respond by taking control away from service providers and administering it directly.

The 1999 ITU Regulatory Survey shows that responsibility for numbering plans is distributed rather evenly across Ministries, Regulators, and Operators. Countries with privatized telecommunication operators, however, almost always give regulatory bodies control of numbering plans, especially liberalized countries. In these situations, the regulator is expected to play a coordinating role and to guarantee equity and transparency in number allocation procedures.

Two recent pieces of legislation by Malaysia are examples of the new view of liberalization in the telecommunications industry as well as planning for convergence. This legislation provides the authority to implement number portability. It also provides for an "integrated public number database" or an "integrated electronic address database" which must provide for "non-discriminatory access". Similarly, Pakistan's recent legislation states that numbers are to be allocated in a way that does not cause any undue advantage or disadvantage to any licensee or operator.

8.2.2 Number Portability

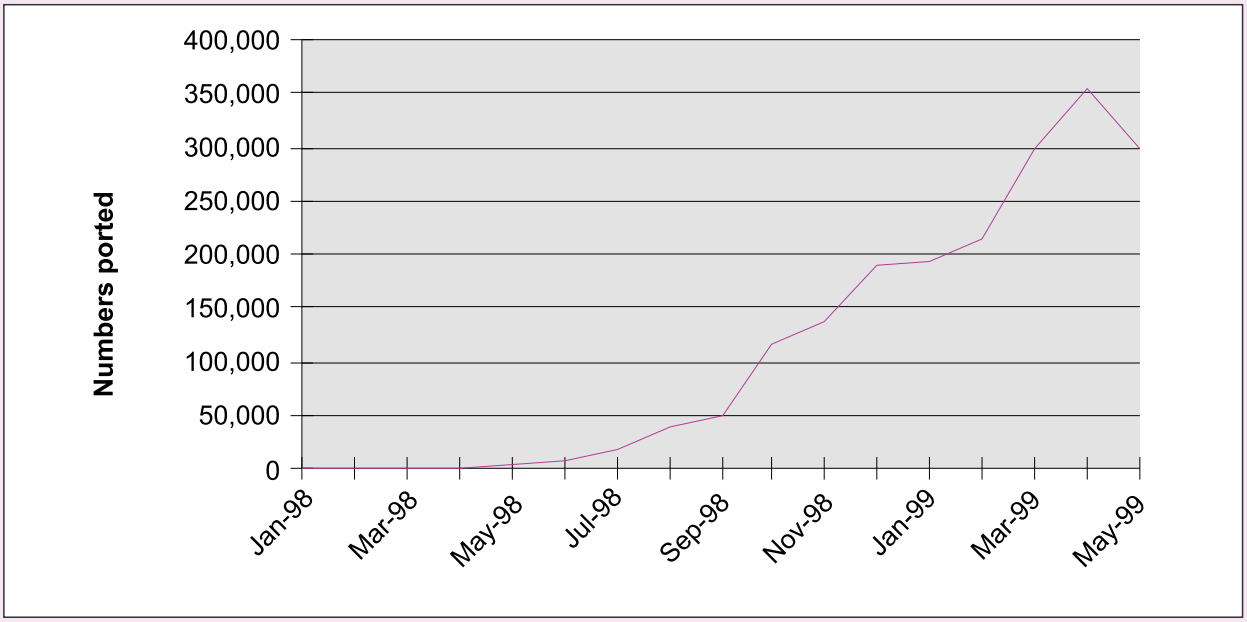
Number portability (NP) refers to the ability of customers to retain a specific number despite changes in their service provider, the network, or their location. The primary impetus for the move to NP has been to facilitate competition among service providers. There are also concerns that lack of portability impedes the relocation of businesses.

8.2.2.1 Implementation status and timetables

The implementation of number portability has begun in a number of countries around the world. Finland and Hongkong SAR have already implemented local number portability (LNP). Many others are right behind. The United States and Canada have implemented LNP in metropolitan areas. Australia will implement it in 2000. South Africa is undergoing a comprehensive study of number portability, and Malaysia has authorized it in legislation.

As mentioned previously, over twenty per cent of those responding to the 1999 ITU Regulatory Survey have a regulatory framework that mandates number portability. Forty

Figure 8.2: Local numbers ported in the United States



Source: Lockheed Martin Number Portability Administration Center.

per cent indicated that there was no mandate. Most of the countries undergoing mandated NP changes were in Europe.[2]

Figure 8.2 shows the numbers ported (by month) in the United States since January 98. This gives a relative indication of the demand for NP in a large market.

Table 8.1 shows the countries and timetables for implementation of number portability for 25 of the 43 member nations of the European Telecommunications Organization. This table illustrates that NP involves a phased implementation over many years. For the most part, NP will occur at the local level first before achieving broader geographic reach. Thus, NP has become virtually synonymous with the lesser stage of implementation known as local number portability (LNP). LNP should not be confused with location portability, which is the ability to port numbers beyond the local area. In general, NP has assumed three different forms:

- Provider portability (P) refers to the form of number portability where the customer keeps his number while changing to a new service provider within a local exchange area.
- Service portability (S) refers to number portability accomplished when the customer switches type of service within the same local exchange area.
- Location portability (L) refers to number portability when moving to a location outside the local exchange area.

Internationally, ITU has been involved in the development of standards needed to provide international service. The ITU's Standardization Sector Study Group 2 is responsible for numbering issues within the context of overall network operation. The E-series recommendations from ITU-T provide information on telephone numbering and international numbering plans. ITU-T Study Group II is responsible for the E.164 standard, and ITU has agreed to propose a new work programme to develop signalling requirements to support number portability.

8.2.2.2 Methods of number portability

The three major types of portability listed previously (provider portability, service portability, and location portability) constitute the three functions that must be accomplished with any portability plan. They accommodate the primary changes likely to be sought by consumers.

National and international number portability will require many years to implement. Not all sectors of the industry will accomplish number portability at the same time. For example, wireless services may require more time compared to fixed line.

8.2.2.3 Costs and benefits of portability

Experience has shown that local number portability can be achieved at a fairly low cost. Most of the world is proceeding on the assumption that the benefits of NP will outweigh the costs. An important related question, however, is how the costs are distributed. Distributing the costs fairly and in a way that encourages efficient service and investment is one of the key policy problems of implementation.

There are tangible and intangible costs associated with NP implementation. Tangible costs can be divided into the initial set-up costs and the continuing operating costs. In the United

Box 8.1: Technical methods of implementing number portability

- ***Onward routing (OR):*** The call is delivered first to the network to which the ported number belonged (donor network). The call is identified in the donor network as being a call to a ported number and the call is routed onward to the new destination.
- ***Call drop back (CDB):*** CDB is an enhancement of OR. When the donor network receives the call, it releases the call again and it returns a message indicating that the number has been ported and provides routing information. The drop back message is used by a transit network or an originating network to route the call to the new destination.
- ***Intelligent-network-related (IN-related):*** IN-related solutions use a database which is interrogated to identify whether the called number has been ported and, if so, to which destination. A range of IN-related solutions are possible.
- ***Signalling relay (SR):*** SR is a solution for GSM using existing GSM functions. The basic idea is that the donor network uses the signalling relay function to send a routing inquiry to the recipient network, which returns the routing information required to properly route the call.

These methods can be implemented in different ways depending upon the type and configuration of the network.

Table 8.1: NP implementation timetables, Europe

	1995	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Austria				P						
Belgium						P	S/L			
Cyprus							P			
Czech Republic							P/S/L			
Denmark					P		S/L			
Finland			P/S/L							
France				P			L			
Germany				P/S/L						
Greece									P	
Hungary								P/S/L	P	
Iceland							P			
Italy						P				
Luxembourg						P				
Netherlands					P/S					
Norway					P					
Poland								P		
Russia						P				
Slovak Republic									P/S	
Slovenia							P/S/L			
Spain						P				
Sweden					P					
Switzerland						P				
United Kingdom			P							

Note: P = Provider Portability; S = Service Portability; L = Location Portability.

Source: ETO.[3]

States, the Federal Communications Commission (FCC) categorized costs in three ways:

1) initial costs to the whole industry for regional databases and administration capabilities;
2) costs to carriers to modify their switches with new software to accommodate database queries; and
3) costs to carriers to upgrade other network components such as the signalling circuits to accommodate additional demand imposed by redirection of calls to ported numbers.

In the EU, costs are characterized as being either:

1) set-up costs;
2) extra conveyance costs; or
3) administration costs.

In general, the trend in competitive situations is to make all operators pay their own set-up costs and to provide for sharing of the operating costs.

Estimates of the total cost of NP implementation vary widely. Various analyses have suggested a cost of between US$ 5.50 and US$ 50 per line.[4] Perhaps the most telling indicator of cost, as well as cost allocation, has occurred in the United States where the FCC has authorized a charge of up to US$ 1 per line to allow providers to recover costs for NP. One of the petitioners for this added charge, BellSouth, estimated that the total cost to it alone was over US$ 400 million.

Intangible costs for the consumers include any service-related frustration caused by the change in service related to number portability. This would include call set-up delays for ported numbers, inability to make connections to ported numbers, inability to access a directory for help in making connections, and any delay in recording a ported number due to data administration delays. A long-term impact on the consumer could occur with the gradual loss of the geographic meaning provided by the old numbering system. There could also be an impact on low-income customers caused by the passing on of costs associated with number portability. Some solutions to number portability could involve the loss of some functionality in emergency services. In the United States, which uses the special number 911 for emergencies, this issue has been raised with the move toward what has been termed "enhanced 911 service".

Experience to date has shown that the benefits of NP can outweigh the costs. Included in the tangible benefits will be:

1) increased competition in local service;
2) increased ability to manage the number resource; and
3) improved incentive to develop intelligent networks (IN).

Intelligent networks use separate data networks to pass the signalling information required to set up a circuit. They also reference databases for number and account information. The IN approach to portability, while not the only approach, includes additional benefits:

1) more efficient network routing;
2) no adverse interaction between number portability and other customer services; and
3) no deterioration in network resources as more numbers are ported.

New IN approaches will also lead to the ability to provide new services to customers. IN approaches are expensive, however, and may not be practical in all situations.

Portability will give large enterprises more negotiating leverage over telecommunications service providers. With many competing providers, the enterprise need not worry about the costs and confusion associated with changing a business number. One result may be an increased ability to implement the convergence of voice and data networks. Many companies split their providers for voice and data and use a lower cost provider for data networks but retain their incumbent voice provider due to the costs associated with changing business numbers.

Intelligent networks are capable of managing the numbering resource more efficiently. Two of the biggest inefficiencies in the current method of allocation is that numbers are issued to competing carriers in blocks of no less than 10,000, and there is no method of sharing or pooling number blocks.[5] IN approaches provide the capability to accomplish number pooling and enable the allocation of numbers in smaller size blocks. The United States is experimenting with allocations in blocks of 1,000. This has the potential to slow the depletion of telephone numbers and reduce the need for area code splits.

Other, less tangible benefits include:

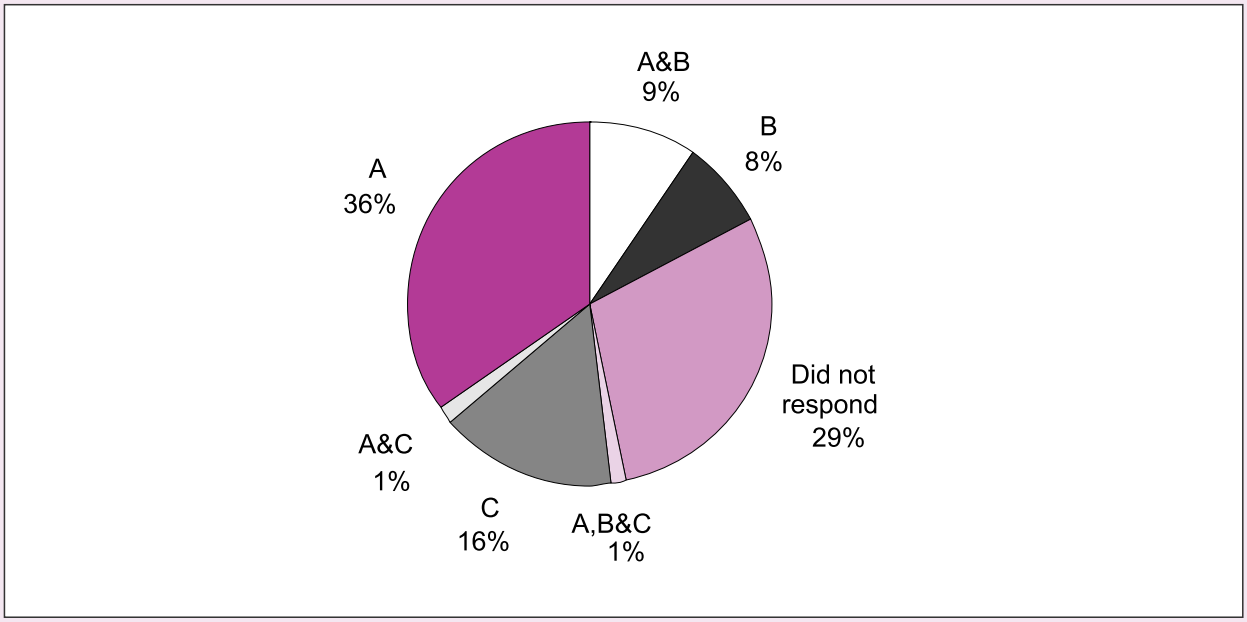
- customer satisfaction brought about by the ability to retain the same number when changing locations or services;
- continued validity of memorized numbers;
- continued validity of speed dialling and other stored functions;
- avoidance of "number not in service" messages and the related directory assistance problems; and
- avoiding the loss of customer goodwill brought about by the frustrations and wasted time caused by changing numbers.

LNP can have the side effect of forcing the telecommunications industry to update its infrastructure at a quicker pace. This will improve telecommunications across the board and make the transition to other convergence-related changes easier.

8.2.2.4 Policy and number portability

For regulatory agencies and policy makers, the road to full number portability can be long and strewn with innumerable small and large decisions. If NP is being pursued to increase competition, almost every decision related to costs, cost recovery, and information sharing has implications for competitive parity. Better performance must be traded off against higher costs for end users; for example, once the decision is made, end users may have little choice about whether they want it or not. The pace of implementation will have important implications for the viability of new telephone companies entering the market.

Figure 8.3: "How do customers access different carriers?"



Note: A = Carrier-selection prefixes; B = Carrier pre-selection (equal access); C = Other.
Source: ITU World Telecommunication Regulatory Database.

A mandate for NP implementation is a useful ingredient. It provides the impetus for change and serves as the basis for potential competitors to put together the resources to enter the market. It is also wise to conduct a feasibility study or a cost/benefit study to determine if the potential benefits to consumers will offset the cost of development. These studies should also provide early estimates of capacity and performance needs.

Policy-makers must be active in the choice of a method of NP implementation. Each method has implications for competition. Some of the particulars are discussed below. In general, however, it is helpful to adopt certain guidelines for implementation. The guidelines can be general or specific, but they are most helpful when they serve to aid in making decisions. A set of guidelines which foster competition might be: always minimize the impact on the user, eliminate dependencies on the incumbent, treat all service providers as equals, conserve the numbering resource as much as practicable, and provide for compatibility with anticipated forms of regional and international portability.

None of the methods used for implementing NP are free from anti-competitive features. The lower-cost methods such as onward routing and call dropback can cause service providers to depend on each other's exchanges to complete the call. The higher-cost methods based on intelligent networks can be implemented in ways inimical to competition, especially with respect to the portability database that is required.

Policy measures should be adopted to ensure that:

- information about ported numbers is shared equally;
- database administration is handled by a neutral party;
- users with ported numbers do not receive differential treatment or service;
- costs are shared in an equitable manner.

One of the policy decisions that can facilitate competition is how the users choose the competitive carriers. Users can either choose a carrier ahead of time, and the system defaults to that choice with each call (carrier pre-selection), or the users can choose the carrier for each call, usually by dialling an extra set of digits (selection prefix). The most competitive manner is for users to have a choice on every call, but this imposes an additional numbering burden on users.

Responses to the ITU Regulatory Survey regarding how numbers reflect carrier selection policies are shown in Figure 8.3. In general, those systems that allow the consumer more choices in the selection of a carrier provide for the most competition. There is usually the provision for one carrier per customer in the porting database.

From the chart, it can be seen that most countries provide for one method only. Only 11 per cent provide for more than one.

8.2.3 Emerging NP dilemmas

Policy-makers can expect to face a number of new issues that arise in the wake of widespread NP implementation.

One of the primary issues, especially for developing countries, is whether or not there is a need for NP. The costs of NP can be proportionately higher in smaller, more dispersed networks. From a competitive standpoint, number portability may encourage new entrants to focus on customers who are already served by the incumbent rather than on unserved

customers. More study is needed as to when the cost-benefit equation tips toward NP in the evolution of a developing country's telecommunication infrastructure. In some countries, the wireless telephone industry in particular has questioned the need for the provision of number portability. In general, NP for the wireless industry is taking longer to accomplish.

One of the biggest long-term issues is the changing status of telecommunications numbers. In addition to enhancing the functionality of personal communication services, number portability could stimulate consumer desires to "personalize" their phone numbers or to make them more memorable. This may lead to an active secondary market in desirable numbers, a change that has huge implications for regulators, consumers and producers. The litigation related to trademark rights in Internet domain names is one clear indicator of how complex this issue can become. As the telecommunication services market becomes global in scope, the possibility of specialized firms and highly organized secondary markets becomes likely. Regulators may have to decide whether to encourage or discourage such markets. Pakistan's numbering regulations, for example, make "non-transferable" all allocated numbers, whereas Hongkong SAR has held auctions for "lucky" telephone numbers.

A big issue for the future will occur when attempting to expand number portability beyond the local area – especially internationally. If countries implement number portability in different ways, it will be difficult to achieve global harmonization. Implementation that involves database translation from one number to another and one switch to another will facilitate national and global compatibility. Global harmonization may also mean that new codes for new, international services will have to be carved out of each country's numbering plans or new global prefix codes allocated. Policy-makers will need to decide how significant international harmonization is in their country's priorities. As Asia, Europe, and North America often take divergent standards paths, developing countries must also decide which group they want to harmonize with.

Finally, it should be recognized that full number portability undermines the functional and geographic interpretation of telephone numbers by users. The difference between a local and long distance number, for example, may disappear. This has profound implications for consumer expectations about call charges. Portability can mean that the tariff for a call is not what the caller might have anticipated. Regulators must decide when to prevent certain kinds of number portability (e.g., making a freephone number into a pay-per-minute number), when to require warning announcements before a call, and when to simply accept the results of unanticipated charges. Customers may be unhappy with the confusion generated by such changes.

8.3 The Internet domain name space

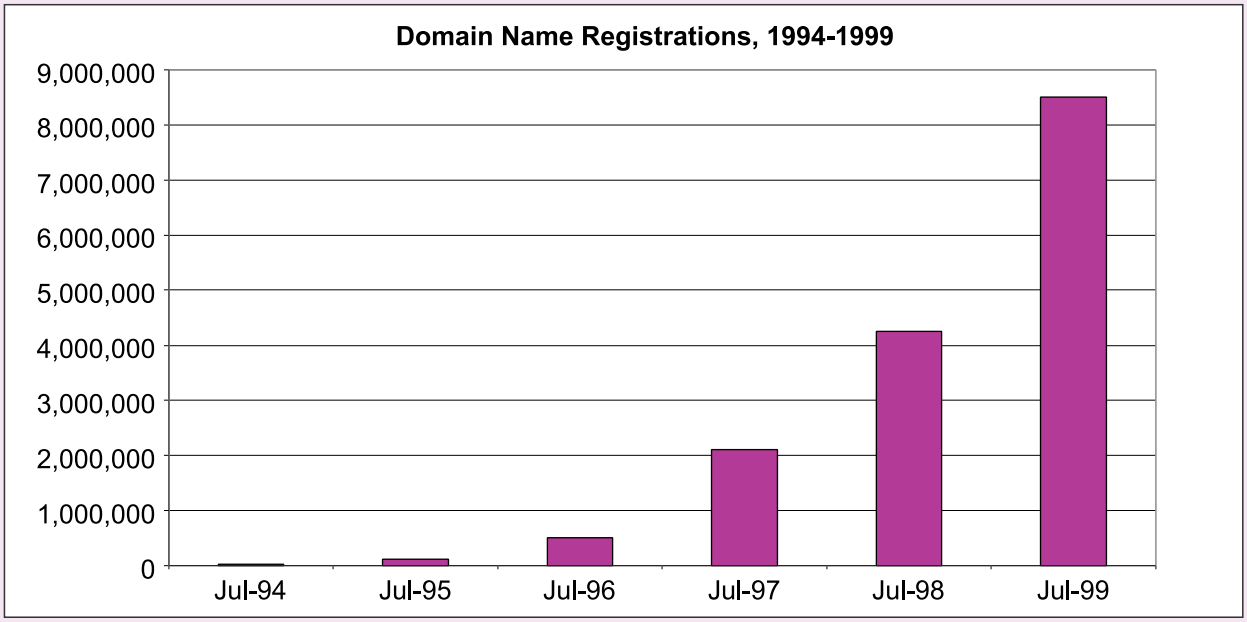
Many of the trends operating on telephone numbers are beginning to make telephone network addresses more like domain names on computer networks. Computer networks have the potential to create a far more flexible and user-friendly, but also more complicated, naming environment. This is because the Internet is not restricted to a purely numerical input of the telephone dial, and because the Internet Domain Name System (DNS) can almost instantly translate a name into a cryptic Internet Protocol (IP) address. The issues related to Internet domain names, therefore, provide a foretaste of the kinds of issues that may arise as the telephone system progresses to a fully portable, globally harmonized, intelligent network-based system of addressing.

Domain names are textual identifiers that serve as Internet addresses. They are composed of hierarchical sequences of character strings separated by dots. Domain names are visible in email addresses (e.g., username@itu.int) and in Web Uniform Resource Locators (URLs) (e.g., http://www.company-name.com).

In the period 1993-1995, domain name registrations began to grow very rapidly as the Internet's commercial potential was discovered (see Figure 8.4). The United States government, specifically the National Science Foundation, realizing that it could not afford to subsidize commercial registrations, permitted the InterNIC to begin charging for Internet domain name registrations.[6] Since then, this activity has evolved into a multi-billion dollar business. Interestingly, the commercialization of domain names and monopoly control over gTLD registrations has been a catalyst for global institutional change in the Internet. Numerous parties, from trademark owners to name speculators to prospective domain name registration services, have come into conflict over Internet governance primarily because of the perceived value of and control over domain name registrations. In order to resolve these conflicts, new international institutions such as the Internet Corporation for Assigned Names and Numbers (ICANN) and its Domain Name Supporting Organization (DNSO) have been established. The policies and methods of these organizations are still very much "under construction", and the jury is still out as to whether they will be effective, or meet any more success than numerous other earlier initiatives.

Distributed coordination is the key to the functionality of the DNS. In the early 1980s, all names of host computers attached to the Internet were contained in a single list. As the scale of internetworking grew, it became impossible for one central authority to coordinate all name assignments, resolve all names, and distribute an up-to-date list to all other network hosts in a timely fashion. The DNS solved that problem by distributing responsibility in a hierarchical fashion. RFC 819 established domains as "a region of jurisdiction for name assignment and of responsibility for name-to-address translation".[7] At the top of the hierarchy there are 13 computers known a "root servers" (sometimes called "the root" or "the dot") that store authoritative pointers to "name servers" for top-level domains (TLDs). Each TLD name server provides pointers to other name servers that contain authoritative lists (or "zone files") for second-level or third-level domain names registered under that TLD (depending on the substructure). For each second-level or third-level name there is a pointer to actual computers or other name servers that know how to resolve names registered in that domain.

Figure 8.4: Domain name registrations, 1994-1999



Source: ITU World Telecommunication Regulatory Database.

The root of the DNS is divided into approximately 250 TLDs. TLDs can be grouped into broad classes. The *country-code* TLDs (ccTLDs) are two-letter codes based on the ISO-3166 list of "codes for the representation of name of countries and their subdivisions".[8] The three *generic* TLDs (gTLDs) are based on a simple (and not surprisingly US-centric) taxonomy of organizations invented in the mid-1980s by Internet pioneers (see Table 8.2). Originally classified as gTLDs but now quite different in usage are .gov and .mil (available only to US government entities), .edu (only available to 4-year degree granting educational institutions in the US), and .int (available only for international treaty organizations and Internet infrastructure databases). Operationally, there is no distinction between ccTLDs, gTLDs or those with restrictive entrance requirements – it is solely an issue of semantics and policy. In fact, the original intent of use for many TLDs has basically collapsed. For example, there are now ccTLDs marketed as gTLDs (e.g. .tv, .to, .as, .md), "commercial" registrations in .org, and all vetting of registrations in .net for network providers has been abandoned as impossible to enforce. The authority to administer most ccTLDs was delegated to specific organizations in the referenced country by the US-based Internet Assigned Numbers Authority (IANA) beginning in the mid-1980s although some have now found themselves in the hands of entrepreneurs that are not even in the related country. The authority to administer gTLDs and .edu was contracted out by the United States National Science Foundation to Network Solutions, Inc. starting in 1993. The US-only TLDs, .gov and .mil, are now managed by the entities in the US government.

The hierarchical nature of the domain name space in theory creates an unimaginably large supply of unique addresses. For example, for second-level domain names (SLDs) registrations in gTLDs, there are 37 different combinations of character strings (37 different characters and 22 spaces long). Although there are now only about 250 top-level domain names, restrictions on the number and type of TLDs are primarily administrative constraints, not technical ones. Within the Internet technical community, there is a belief that there are not serious technical constraints for the addition of up to at least 1,000 new TLDs. Indeed, some argue that DNS could accommodate up to as many as 1,000,000 new TLDs.[9] However, at some point, expanding the number of TLDs might break down the hierarchical nature of the DNS and create routing and congestion problems. In addition, there is no technical reason to restrict the length of TLDs to two or three characters. TLDs could be complete words, although the need to type them and user-friendliness suggests that domain names be as short as possible.

The demand for names is far more constraining than the supply. The chief constraints are semantics, user convenience, and conflict with public policy issues such as intellectual property and fair competition. Random character strings have little value. Users want names that match or evoke specific concepts, abbreviations, tags or marks associated with their organization, products, personal names, or ideas. They also want names that are as simple and short as possible. In the "real world" and perhaps even more importantly, in the trademark world, names are commonly shared. However, in the Internet

Table 8.2: Top-level domains

Generic Top-level domains (gTLDs)	*Country Code Top-level domains (ccTLDs)**
• .com (commercial entities) • .org (general organizations, non-profits) • .net (ISP, network infrastructure providers)	• .af (Afghanistan) • .ch (Switzerland) • .dk (Denmark) • .fr (France) • .uk (United Kingdom) • .us (USA) • .zw (Zimbabwe)
"US-only" Top-level Domains	***"Restricted" Top-level Domain***
• .gov (US government) • .edu (US educational institutions) • .mil (US military)	• .int (treaty organizations and Internet infrastructure databases)

* *Note:* These are examples.

world there can only be one "name.tld" which has been a recipe for thousands of conflicts over the rights to names.

8.3.1 The business of domain name registration

The registration of second-level domain names generated somewhere around US$ 250 million in revenue in 1999.[10] The number of domains registered, now over 8.5 million, is expected to rise to 28 million by 2002. The world's biggest provider of domain name registration services is Network Solutions, Inc. (NSI). From 1993 to 1999, NSI held an exclusive contract with the United States government to operate the authoritative "A" root server and to register domain names ending in .com, .net, .org, and .edu.

NSI accounted for 75 per cent of the world's registered domain names in mid-1999 with the largest percentage registered in ".com".[11] NSI's market share is not surprising since it has a monopoly on registrations in gTLDs, which have proved to be the most popular. About 30 per cent of ccTLDs accept registrations from companies or individuals outside of their own country. Most have commercial subcategories at the second level where businesses can register (e.g., name.co.uk) for commercial registrations under the UK ccTLD.

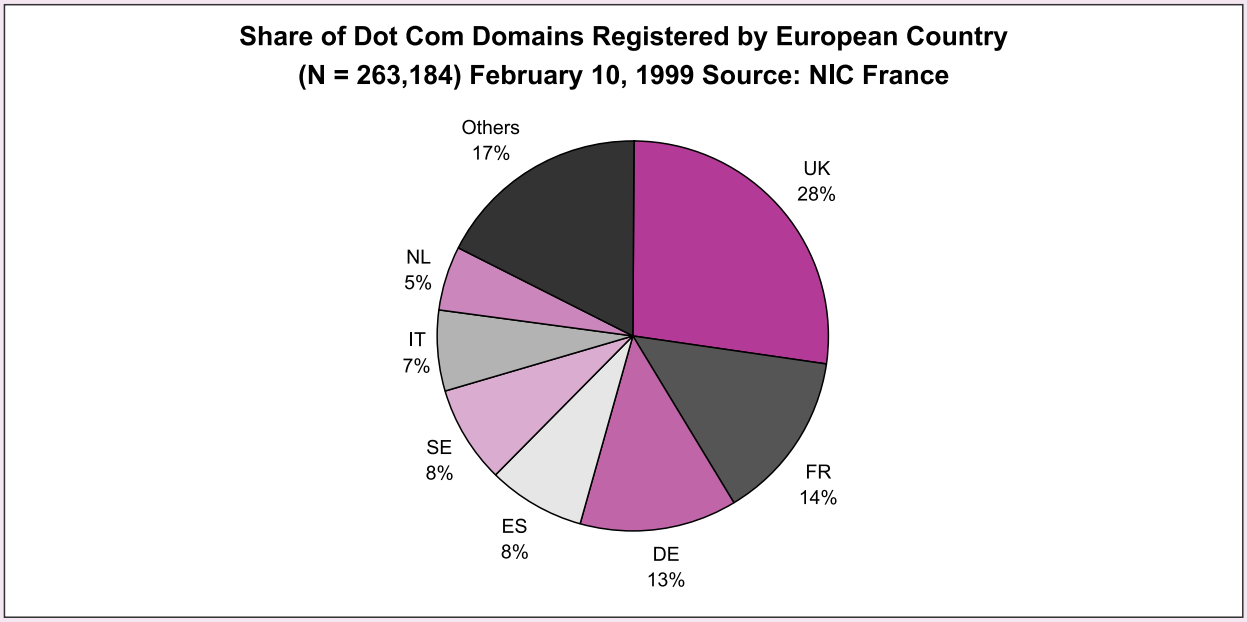
NSI's .com attracts many commercial registrations away from ccTLD registries. With only 37,000 domain name registrations under .FR as of March 1999, France was a market where slightly more than half of all domain name registrations are made under .com.[12] In Canada, Korea and Spain, the number of gTLD registrations outnumbered the ccTLD registrations in 1997. The impact of .com is felt in one of the largest and most commercially savvy European ccTLD registries, the United Kingdom (.UK). More than 71,000 British entities registered in .com as of early 1999, giving NSI about 25 per cent of all British registrations. Figure 8.5 shows the share of various European countries in .com registrations.

NSI's high market share stems from several factors. At US$ 35 per year, NSI's price is 50-60 per cent lower than many commercial ccTLDs, although that is considered to be well above its costs. More importantly, NSI imposes very few restrictions on registrants and sets up its procedures to encourage the registration of a large number of names. ccTLDs, on the other hand, often impose strict limits on the number of names an organization or person can register, and sometimes allow only one name per organization. Some restrict or prohibit transfers of names. Others require that the name match an officially registered company name.

A great deal of NSI's market share can be explained by the marketing advantages of gTLDs over ccTLDs. The generic identifier (.com) provides a global, geography-independent identity, and businesses seeking to maximize their online presence find this attractive. Businesses also tend to prefer short, flat names, whereas many ccTLDs require an additional layer or two of sub-domains before the country code to indicate a commercial registration (e.g., company.co.nz). However, there is now a trend for ccTLDs to be used for "localized" versions of well-known online services (e.g., http://amazon.de).

As the only global commercial identifier, .com has commanded a premium because of the restriction on the supply of new TLDs. This premium has become self-reinforcing over time. As users come to expect to find commercial entities in the .com domain, and as those expectations are reinforced repeatedly, the value of registering in .com as opposed to other TLDs is enhanced. The value of .com names was heightened even more by the decision of some browser software vendors to add .com as a default value to the end of whatever unadorned name users typed into their URL window. As the .com moniker becomes ever more strongly associated with the Internet, technology companies now work it into their branding strategy, further reinforcing the premium.[13]

Figure 8.5: Share of dot com domains registered by European countries



Source: NIC France.

The United States Department of Commerce and the Internet Corporation for Assigned Names and Numbers (ICANN) are currently engaged in a process of opening up the registration business in the .com, .net, and .org domains to other companies. These efforts and the policy issues related to them are discussed in the section on "Introducing competition in DNS".

8.3.2 New TLDs as the catalyst of change

Domain names have become the focal point of change in Internet governance arrangements. Sweeping global changes in Internet administration have been set in motion by a problem that may seem to be fairly simple: adding new top-level domains (TLDs) to the root of the Internet.

Decisions defining the original set of TLDs were made in the mid-1980s, when the Internet was a relatively small research and education network closed to commercial uses. When the Internet was commercialized in the early 1990s, the forces of supply and demand began to operate upon the domain name space. Existing Internet administration activities were clearly not ready for this transition.

From a purely technical standpoint, adding new TLDs is not complicated at all. The addition, however, raises complex economic and policy questions:

- Who has the authority to add names to the root?
- What names should be added?
- How many new TLDs should be or could be added?
- How does one decide who gets to administer a new TLD?
- Should the TLD administrator profit from the management of a new TLD?
- What are the property rights of the administrator of a TLD domain? Do they "own" the right to enter registrations under the TLD, or must they share it with other registrars?

The uncertain relation between domain name registrations and trademark rights made the issue of new TLDs even more contentious, as many trademark owners opposed the addition of *any* new TLDs until regulatory mechanisms or dispute resolutions mechanisms are in place to resolve disputes between trademark owners and domain name registrants.

These issues eventually led to a public proceeding by the US Department of Commerce. On June 3, 1998, the United States government issued a White Paper that defined the basic principles and procedures that would be used to transfer administration of generic top-level domain names to a new non-profit corporation.[14] ICANN was later recognized as the entity to which the functions would be slowly transferred. The White Paper also called upon the World Intellectual Property Organization (WIPO) to develop proposals to resolve disputes concerning trademarks and domain names.

8.3.3 Policy issues

This section identifies three policy areas related to domain names:

1) the issue of competition in domain name registration;
2) the relation between trademark rights and domain names; and

3) the relationship between country code TLDs and national governments.

8.3.3.1 Introducing competition in DNS

There are two distinct models that can serve to foster competition in domain name registration services. One model, known as the proprietary registry model, delegates to a company or organization the exclusive right to register names under a particular TLD. The holder of this exclusive right may be either a for-profit or a non-profit organization. The company integrates the "wholesale" function of maintaining and propagating authoritative zone files of registered second-level domain names with the "retail" function of accepting applications, executing registrations, and billing customers for the specific names they request. The registry also provides the front-end name lookup service that allows users to check whether a name is taken and if so, who registered it. Until mid-1999, NSI operated .com, .net and .org as a commercial, proprietary registry. Most ccTLDs also are operated as proprietary registries, albeit many under some formal or informal government regulatory oversight.

The other approach is the shared registry model. In this model, there is a single, registration database (known as the registry) that maintains the authoritative zone files for a specific TLD.[15] That registry is completely divested of any retail domain name registration functions, except perhaps the name lookup service. Instead, there are many competing companies known as registrars that receive applications for domain names from customers and check with the registry database to see if the name is taken. If it is not, they pass data to the registry to be added to the authoritative zone for the relevant TLD and then bill the customer for the name reservation on some periodic basis. Registrars must also compensate the registry for the "wholesale" cost of maintaining the central database functions and zone files. They may also offer innovative lookup and other front-end services. Registrars become the contact for end-user service inquiries regarding domain names.

Advocates of proprietary registries argue that they should have exclusive control of new TLDs (e.g., ".new") and be in complete control of the service features and quality of any name registrations ending in a specific TLD. The registry also would be able to establish its own policies and procedures for name registration and use them as a basis for competitive advantage. The unique name would allow customers to clearly differentiate between the service providers behind various TLDs. In theory, registries that provided bad service would develop a bad reputation and would lose business to better registries.

Critics of the proprietary registry model note that competition across registries is not competition at all. A name under .new is an inherently different product than a name under .com or .NZ. They argue that customers build up significant equity in a domain name by advertising it on their stationery, business cards, embedded hyperlinks in the global World Wide Web, and so on. Advocates of the non-proprietary model assert that registrants are essentially "locked in" to a registry with exclusive control of a TLD. For example, if .new is a proprietary registry, and one becomes dissatisfied with the service or price of that registry, changing service providers would also involve changing one's domain name. Users would have sunk costs in the old domain name and would be reluctant to switch even if the registry increased its fees significantly.

Advocates of shared registries have staked most of their claim on the lock-in argument. Others consider that the problem with this argument, however, is that separating the registry and the registrar does not really eliminate the lock-in problem. The shared model allows customers to change registrars and keep the same name, but it does not and cannot allow them to change registries. In *both* models, one of the most critical tasks is performed by the registry that interfaces with the registrar (who in turn deals with the actual customers). If a shared registry provides poor service, the customer is still stuck and has nowhere to go. The preferable model is probably where registrars jointly contract for registry functions to a neutral registry operator allowing the registrars to jointly recontract the registry services if there is poor performance. In fact, this is clearly the trend in the telephony world in order to achieve number portability, as discussed above.

In telephone service, number portability is an important step towards effective competition because phone numbers are technically bundled together with basic voice transmission services and facilities. In Internet service, on the other hand, the domain name has always been, in theory, portable across connectivity[16] and name resolution services.[17] Anyone who registers "name.com" with NSI is nominally able to use that domain name on any ISP, website host, or name resolution service they desire.[18] The most serious problems with "lock-in" and switching costs have often arisen not because of registrar-registry integration, but from the integration of registrar service and ISP service.

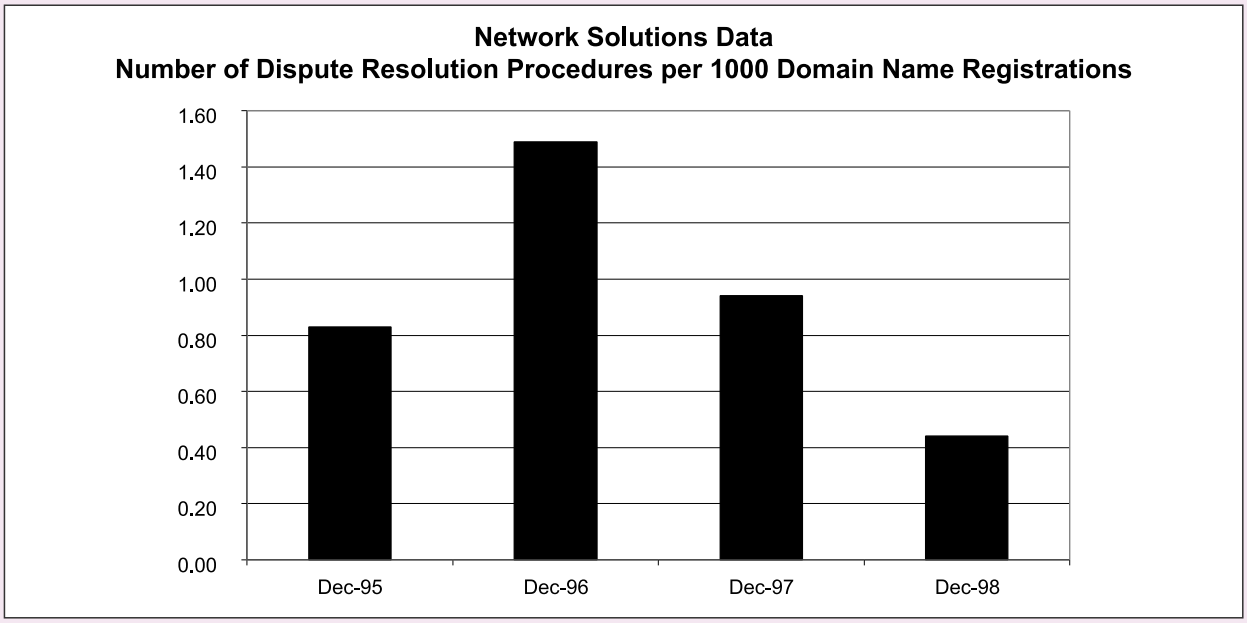
Some customers allow ISPs to register their domain name for them, which results in the ISP being listed as the technical contact for the domain. When customers want to change their ISP, the ISP can use its control of the domain name to prevent the change. Many Internet users have experienced problems extracting control of their domain names from ISPs.

The pioneer of the concept of shared registry for gTLDs with globally distributed competing registrars was the Internet Ad Hoc Committee (IAHC) which developed a plan[19] in 1996/1997 that culminated in the Generic Top Level Domain Memorandum of Understanding (gTLD-MoU).[20] This plan created a Council of Registrars (CORE) that would jointly contract on a non-profit basis for the central registry function for new gTLDs.

Since then, the gTLD-MoU activities related to revamping management of generic top-level domains have been jointly assumed by NTIA and a California-based entity that it helped to establish, the Internet Corporation for Assigned Names and Numbers (ICANN), based in California.

NTIA and ICANN are instituting a shared-registry scheme in the gTLDs .com, .net, and .org.[21] Following guidelines set out in the White Paper, NTIA signed contracts with NSI in October 1998 entered into an MoU with ICANN

Figure 8.6: NSI dispute resolution procedures decline



Source: Network Solutions, Inc.

in November 1998 to implement the plan.[22] NTIA negotiated a fixed "wholesale" price for access to NSI's registry service.

New registrars that are accredited by ICANN and sign an agreement with NSI can now register names in .com, .net and .org at a significant discount. Currently "registrars" must make a one-time payment of US$ 10,000 to NSI for software and pay ICANN a US$ 2,500 application fee and a US$ 5,000 annual accreditation fee. As accredited registrars, they can register domain names at a wholesale rate of US$ 9 per domain name per year. NSI will continue to be both a registry and a registrar for the time being.

One of the most contentious issues in domain name policy and economics pertain to how *registries* are operated and regulated. Little progress has been made on this issue because of both an extremely complex political environment and the economic interests of the parties. Despite several years of effort involving NTIA and ICANN, very little progress has been made in the fundamental question: "what is the appropriate competition model for registry/registrar relationships?" Because the adoption of an equitable competition model is a necessary prerequisite to the introduction of new top-level domains, it is very unlikely that any new top-level domains will be introduced soon.

8.3.3.2 Trademark and domain names

Trademark owners have become concerned about how their marks might be affected by registrations in new top-level domains. Consequently, the administration of the domain name space has become linked to issues of the rights of trademark holders and dispute resolution.

Some believe that cybersquatting is diminishing as a problem due to court decisions and the greater alertness of trademark holders in policing. Names registered under the NSI gTLDs are subject to a dispute resolution policy, and NSI has kept consistent statistics on its use. The NSI procedure was invoked in only 0.0004 of all registrations in 1998. Statistics show that both the absolute number of such disputes and the ratio of disputed names to the overall number of registrations is declining. (Figure 8.6) There are no consistent statistics for the ccTLDs, but a WIPO survey of 25 ccTLDs provides a rough indication of the scale of the problem. Estimates based on the WIPO survey suggest that disputes of all kinds (not limited to trademark) occurred in about 4,000 cases, or one third of a per cent (0.0033) of the 1.23 million domain name registrations in those ccTLDs.[23]

Issues relating from the link between the trademark system and domain name registrations have not been fully resolved. In providing adequate protection for domain name registrants, debate has arisen as to whether and how closely such protection should resemble those rights accorded to trademark owners.

One way to give trademarks an equivalent level of protection on the Internet as they receive elsewhere would be to allow all disputes about the relationship between trademarks and domain names to be resolved by national court systems in accordance with existing trademark laws. In fact, several national ccTLD registries adhere to this policy, and deny that registries have any role to play in trademark dispute resolution.[24]

Some trademark holders have rejected this option as too expensive, however. They point out that the registration of domain names that match or include trademarked names costs

very little and can take place in any of two hundred different jurisdictions in the world. Even if the offending registrant is in an obscure and distant jurisdiction, the domain name appears globally. Such a registrant may provide the domain name registry with false or incomplete contact information, and therefore be difficult to track down.

The cost of finding and litigating against such offending registrants on a global basis appears to be prohibitive to many trademark holders. From their point of view, reliance on traditional litigation in the Internet context gives trademark owners significantly less protection than they receive in the physical world.

Many of the proposals that have been advanced as an alternative to litigation, on the other hand, tend to give trademark owners more extensive rights in domain names than they receive under national laws and international treaties. Such proposals involve reengineering the domain name registration process and/or altering the contracts between domain name registrants and registries in ways that facilitate the policing and enforcement of trademark rights. Proposals of this type tend to create rights in names that are global rather than territorial. They encourage challenges based on simple registration of a name rather than on illegal uses of it, and they often give trademark owners pre-emptive rights or prior restraint over the use of names at the expense of many non-infringing uses and users.

The dispute resolution proposals recommended by the World Intellectual Property Organization (WIPO) were released April 30, 1999. The WIPO proposals consisted of three elements:

1) Binding measures to ensure that registrants provide accurate and complete contact information into a centralized and public database, thus giving trademark owners a means of rapid, automated surveillance of all domain name registrations and registrants.
2) Requiring, as a condition of obtaining a domain name, agreement to a mandatory arbitration procedure in the case of a dispute.
3) The exclusion of "famous and well-known" names from the database of available domain name registrations.

From the perspective of a developing country, the famous name exclusion policy raises special concerns. At present, there is no internationally accepted list of famous and well-known marks, despite long-term efforts by WIPO and other agencies to define one.

Any exclusion policy that is not confined to unique, coined brands would prevent many legitimate uses of names by individuals and smaller organizations. Terms such as "Cadillac" and "Nike" are famous brands, but *Cadillac* is also the name of a lake, a city, and a surname, and *nike* is a Greek term that could be used in a variety of legitimate ways. An exclusion policy would almost certainly be biased toward the brands and trademarks of currently developed economies. Existing multinationals would find it easier to get their names on the list of exclusions, and would be able to assert claims to character strings that might have entirely different meanings and uses in developing nations.

8.3.3.3 Delegation of ccTLDs

One of the tasks of Internet administration is to delegate the management of country code top-level domains to specific organizations within a country. The TLD taxonomy created by RFC 920 (October 1984) was originally intended to include only generic identifiers such as .com, .mil, and .gov.[25] Some of the networking researchers based outside the United States however, requested a country identifier. The ISO-3166 list of two-letter country codes was added to RFC 920 in response to this request. It must be emphasized that in this early, non-commercial stage of the Internet's development, country codes were incorporated into the list of TLDs for identification purposes only. The ISO-3166 list was used because it was a readily available, widely accepted list of country identifiers.

Under RFC 920 and other relevant guidelines, 130 ccTLD delegations were made between 1985 and 1994.[26] (Figure 8.7) Typically, applications came in from scientific and educational networking organizations within a country and were delegated by IANA on a first come first served basis, subject to some basic checks on the legitimacy and technical capabilities of the domain administrator.

The growing significance of the Internet and its gradual commercialization after 1991, however, began to make the delegation process contentious. Issues about which nationalities qualified for a country code began to arise. As charging annual fees for domain name registrations became common, the delegation of top-level domains also acquired important business implications.

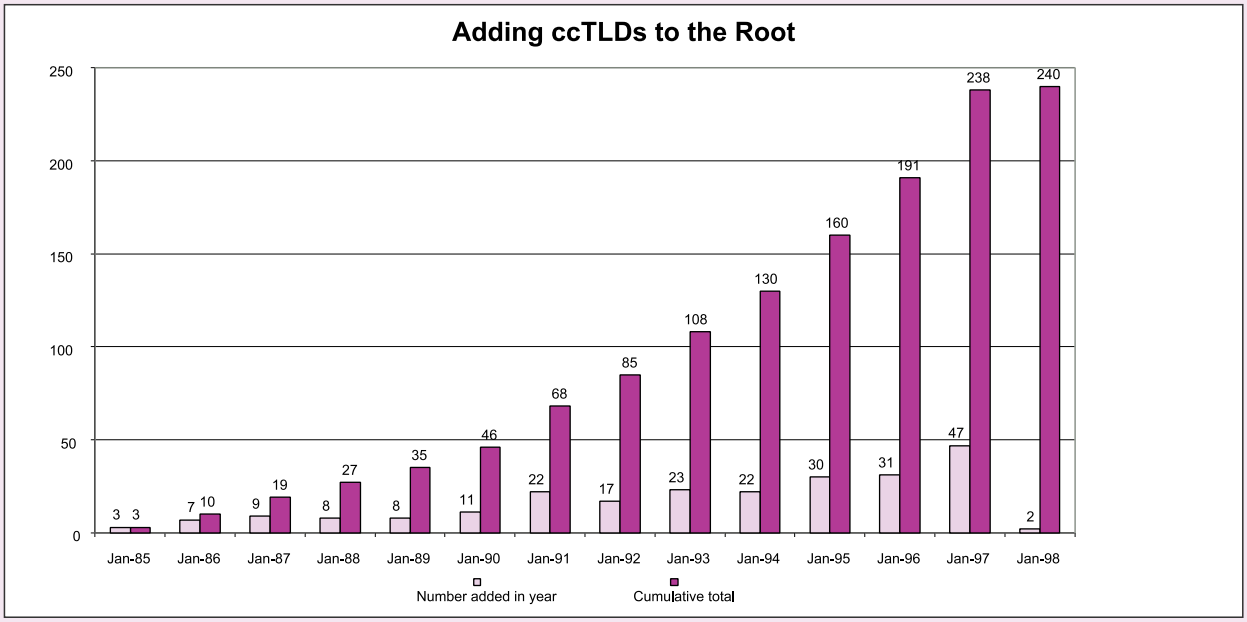
In an attempt to clarify the basis for making TLD delegations, IANA issued RFC 1591 in March 1994.[27] The document enumerated the following criteria for making a delegation:

- There must be a designated manager for supervising the domain's name space and the administrative contact must reside in the country.
- The designated manager is the trustee of the top-level domain for both the nation and the global Internet community.
- The designated manager must be equitable to all groups in the domain that request domain names.
- Significantly interested parties in the domain should agree that the designated manager is the appropriate party.
- The designated manager must do a satisfactory job of operating the DNS service for the domain.

The RFC clarified how disputes about delegations would be handled and also explicitly distanced IANA from the contentious problem of deciding what qualified as a "country".

In short, RFC 1591 accomplished two important things. First, it clearly articulated a "trustee" concept of delegation and gave IANA and the Internet stakeholders in a country the right to determine who qualified as a trustee. Interestingly, the RFC defined ccTLD delegates as trustees for *two* distinct communities: the country *and* the "global Internet community". Second, it used the ISO-3166 list – an official standard produced by the ISO 3166 Maintenance Agency based on a

Figure 8.7: ccTLD additions



Source: E. Porteneuve, NIC France.

statistical list from the UN – to shield IANA from political pressure to modify the list of available ccTLDs. After its adoption, from 1994 to 1997 country-code delegations were added to the root at an accelerating pace. (Figure 8.7)

The ISO-3166 list is one of the main factors protecting the integrity of the ccTLD delegation process from external pressures. There is an imperfect match between the ISO-3166 list and national sovereignty, however. The official list contains entries for many small territories and dependencies, such as the Marshall Islands, the Norfolk Islands, the Turks and Caicos Islands, etc. By virtue of their presence on the ISO-3166 list, many tiny countries and dependencies have been awarded their own TLD – a valuable right that commercial corporations in developed economies have sought unsuccessfully for years.

Some of these small territories have utilized this windfall as a revenue-generating source. The small nation of Niue (.NU), for example, allows its ccTLD to be administered and marketed by a non-profit foundation that provides free Internet service to all of the island's 2000 inhabitants. Both .NU and the ccTLD for the Cocos and Keeling Islands (.CC) are marketed commercially and globally as an alternative to gTLDs. In a few cases, a happy coincidence allows the ccTLD to function as a kind of generic TLD. The ISO code for Tuvalu, for example, is .TV; for Moldova the code is .MD. In both cases there are plans to administer the domain on an open, commercial basis and to exploit the semantic references to television and medical doctors, respectively, rather than using the domain as a country identifier. Many domain name users and Internet policy analysts welcome such developments as a form of competition and innovation in the market for domain names. However, others consider it an abuse of the domain name system to market ccTLDs for semantical value completely unrelated to the origin intent as a geographical identifier.

8.4 Conclusion

Names and addresses are key in any communications system, whether a traditional voice circuit switched network or an Internet with packet-switched data communications. Control of the issuing of the names and addresses effectively is tantamount to control of the communications system itself. At the same time, names and addresses are a valuable resource. Liberalization of the issuing of names and addresses or a numbering plan on a telephone network goes hand in hand with liberalization of telecommunications markets.

The explosion in services and resulting explosion in demand for names and addresses or numbers has shown that careful administration of the issuing of names and addresses is required. In some countries, there is serious concern that the supply of useful telephone numbers could be exhausted over the next ten years. Also, telephone numbers and other forms of addresses are no longer necessarily associated with geographic location. Demand is rising for classification by other attributes, such as type of organization or personal affiliations.

With the growing recognition of the importance of numbers, names and addresses, the question also arises who owns the number or address. Carriers have got used to having control of the allocation of numbers. But in a truly liberalized environment users must have ownership of their numbers.

Number portability is an increasingly important factor in telecommunications liberalization.

The future trend in telephone numbers is likely to emulate that of Domain names and Internet addresses. Domain names, which are intelligible and easier to remember than numbers, mask Internet addresses, which are in fact 32-bit numbers. Name servers translate the former into the latter. Users want names that match or evoke specific concepts, abbreviations, tags or marks associated with their organization, products, personal names, or ideas. They also want names that are as simple and short as possible.

The unexpectedly rapid rise of the Internet has highlighted a number of unresolved issues including who has the right to add top-level domain names, how many TLDs should there be, how should conflicts between domain name registrations and trademark rights be resolved? These are all issues which need addressing, but in such a way that the maximum amount of innovation can be encouraged while the rights of individuals and organisations are adequately protected.

[1] Summarized in T.H. Reinke, *Local number portability and loop competition: critical issues*. Telecommunications Policy 22, 1 (February 1998).

[2] To date, 95 of the 188 ITU Member States have responded to the survey.

[3] Data obtained from a survey conducted by the European Committee on Telecommunications Regulatory Affairs (ECTRA), established by the ETO with numbering issues as one of its key tasks.

[4] See Dunkley *et al* and Sticker and Weiss.

[5] This inefficiency is compounded in some numbering systems in that new competitors must be allocated several 10K blocks, one for each adjoining exchange area.

[6] For history, see R. Shaw, *Internet Domain Names: Whose Domain is This?*, 1996, at http://people.itu.int/~shaw/docs/dns.html

[7] Z. Su and J. Postel, RFC 819, *The Domain Naming Convention for Internet User Applications*, August 1982.

[8] The 3166 Maintenance Agency website is available at http://www.din.de/gremien/nas/nasd/iso3166ma/

[9] The configuration of the NSI root server as of December 1998 put all TLDs in the same file as the second-level domain names in the dot com TLD. The dot com TLD contained several million names, which suggests that the system could have handled at least that many TLDs.

[10] For the FY ended 12/98, revenues of Network Solutions Inc. (NSI) rose from US$ 45.3 million to US$ 93.7 million. Its revenues for 1999 are expected to double again.

[11] http://www.netnames.com/template.cfm?page=statistics&advert=yes

[12] NIC France, February 10, 1999. In June 1999, France announced plans to make registrations under .FR less restricted, easier and less expensive.

[13] Sun Microsystems now refers to itself as "the dot in dot com". Author Ellen Rony has quipped, "dot com is the pig Latin of the Internet age".

[14] United States Department of Commerce, National Telecommunications and Information Administration, *Management of Internet Names and Addresses*, Docket Number: 980212036-8146-02 June 5, 1998.

[15] There would be, of course, backup root servers that obtain authoritative lists from the main server.

[16] In the Internet industry, a "connectivity" provider provides the physical circuits, routers, and protocol installations required to connect to the Internet. Connectivity is the basic service offered by ISPs, although most ISPs offer a variety of ancillary products and services as well.

[17] Name resolution is the process of translating a domain name into its corresponding IP address. ISPs and other companies maintain name resolves and often the service is bundled with the price of a domain name.

[18] A website host is a service that stores the documents and data of a website. Many businesses that run websites use the servers of a third party rather than buying and maintaining them on their own.

[19] http://www.gtld-mou.org/draft-iahc-recommend-00.html

[20] http://www.gtld-mou.org

[21] NTIA is a branch of the US Department of Commerce.

[22] US Department of Commerce, Network Solutions Inc., Special Award Conditions, NCR-9218742 Amendments Nos. 11, 12, and 13. October 7, 1998. See http://www.nsiregistry.com/history/. Memorandum of understanding between the US Department of Commerce and Internet Corporation for Assigned Names and Numbers, 25 November 1998. http://www.ntia.doc.gov/ntiahome/domainname/icann-memorandum.htm

[23] WIPO ccTLD survey.

[24] Oggi vs. Internet Society of New Zealand, 12 November 1998, See http://www.domainz.net.nz/newsstand/stories/court4.html

[25] Jon Postel and Joyce Reynolds, RFC 920, Domain Requirements, October 1984.

[26] Both generic TLDs and country code TLDs are merely text entries in the root server database. There is no technical or legal basis for drawing a distinction between the delegation of ccTLDs and the delegation of gTLDs. The only differences – and they are very significant ones – are the *semantic* linkage between the code and the country, plus the fact that there is only one ccTLD delegation available for each country.

[27] Jon Postel, RFC 1591, *Domain Name System Structure and Delegation*, March 1994.

9 BRINGING IT ALL TOGETHER

The world is on the threshold of a new industrial revolution. A revolution which promises to be at least as significant as that which has brought about most of the growth of the world's economy in the past two centuries. A revolution which promises to have just as far reaching an impact on a wide variety of aspects of life. And a revolution with global reach. Telecommunications are at the epicentre of this revolution.

A new age is being born where goods are bought, delivered, used and paid for without ever leaving the information systems and communications networks on which they were created in the first place. In this networked economy, the investment capital is knowledge and the means of production the human intellect. This is the Information Age.

The Information Age brings threats. Established and well known names whose positions looked unassailable just a decade ago may soon be overtaken by others few would even recognize the name of now. The organizations that may be well respected by today's incumbents for their activities in other arenas could well turn out to be some of their toughest challengers. Collaborators of today could be the competitors of tomorrow.

But it also brings opportunities which are at least as great as the threats. Opportunities to get into other areas of the information business – content provision, electronic commerce. Opportunities to do what they do already but more cost-effectively – IP networking, Internet telephony. Opportunities to create new kinds of services that will help capture an even greater share of people's and organizations' spending – video on demand, Internet Service Provision.

The driving force behind all of these changes is digital technology. The common language of the new Information Age is not a human language but a machine language: the zeros and ones, highs and lows, ons and offs of binary code. It allows for the first time the automated handling of information creation, processing, distribution and communication in a common format at a common level.

Digital technology is what allows the convergence of media (from print to television) with telecommunications (fixed or mobile) and computing (hardware and software) to create "something" which will be greater than the sum of its parts. While promising great advantages, this "something", however, also challenges a safe and familiar status quo which it will take courage to abandon. This courage will be required of network operators and service providers, manufacturers and users as well as regulators and governments.

There appears to be plenty of courage around in this industry. The 1990s have witnessed the greatest period of policy reform the telecommunications world has ever seen. National carriers were privatized, new competitors licensed and new services allowed. The trend is likely to continue into the new century. Old orders are being overthrown by the pace of technological change. Even relatively new orders are finding it hard to keep up.

9.1 The institutional framework

In a growing number of countries, independent regulators are being appointed. In countries further down the liberalization path, more of the regulation burden for the sector is being moved to non-sector-specific bodies, such as monopoly and cartel supervision bodies. Nevertheless, it is proving very difficult to strike the right balance between maximizing the freedom for innovation among potential product and service providers, and protecting the interests of the consumer and the economy.

As the world shrinks – a process which itself is a consequence of the improvements in communications technologies – cross-border regulation is also becoming increasingly significant. There are a growing number of bodies with a cross-border supervisory or advisory function. In the past few years, there have been notable new additions in Africa, Asia, Europe and Latin America. This trend itself can be seen as a form of convergence – regional and even global telecommunications regulatory convergence.

There is also a regulatory convergence happening on a national level. An increasing number of countries are merging the regulatory bodies responsible for broadcasting and telecommunications. As the Internet's importance rises, many are also looking to bring its regulation under the same roof.

Not all countries are opting for the convergent regulatory approach, however. Some still prefer to see separate bodies responsible for broadcasting, telecommunications and the Internet. But even if there are separate regulatory bodies, great attention has to be paid to collaboration and cooperation between these agencies if wasteful duplication of effort or, worse still, contradiction and uncertainty are to be avoided.

Regulation of the Internet presents special problems. First, it is moving so fast that no matter how regulation of the Internet is undertaken, all countries appear to be having trouble keeping up with its innovations. This is particularly true when those innovations concern services or products which, if offered by conventional means, would be highly regulated.

The Internet community itself would prefer not to be regulated at all, bar a few technical conventions. The markets, its advocates argue, provide all the regulation needed. But incumbents in regulated areas cannot understand why they should face regulation while Internet rivals may not. The situation is further complicated by the global nature of the

Internet. Even if a national body were to decide to impose restrictions on an Internet company within its domain, what about those based abroad?

The challenge of regulators is to develop consistent and relevant technology-neutral regulations which not only do not inhibit growth of the sector but actively encourage innovation and serve the best interests of users.

This is very hard to achieve – and perhaps impossible to achieve to everyone's satisfaction. The global consensus is moving towards the position that open and fair competition between all players is probably the way forward with the best chances of achieving long-term success.

9.2 Opening markets to competition

Most countries that have already embraced competition in the telecommunication sector have adopted an initial approach of gradually opening up their markets. Incumbents have been allowed to keep some monopolies – particularly in basic fixed voice services.

Those areas where monopolies have been allowed to remain have, in most cases, shown slow growth. The result has sometimes been that even in those countries where liberalization policies were not designed to produce a rapid opening up of the market, competition has come to play a greater role more quickly than initially predicted.

The growth of data and mobile services, both areas which have tended to be more opened up to competition, has far outpaced that of basic fixed voice services. So much so, in fact, that an increasing number of incumbents now report that data traffic now exceeds voice traffic on their networks, and that the number of mobile phone users in some countries now exceeds the number of fixed phone lines. The Internet is in fact the area of the most widespread competition throughout the world.

Competition does not, however, automatically equate to lower prices. Lower prices in turn do not automatically equate to more customers or higher usage per customer. There is a great deal of variation between countries. But the general trends are along these lines. There are also distortions to the data such as free Internet services (where payment for the service is actually clawed back from the telephone network operator or service provider) and subsidized mobile phones.

In an area as complex as telecommunications, analyzing the level of competition and assessing its effectiveness can be quite difficult. The market is not by nature free and open. It faces regulatory and technical constraints, as well as the types of distortions encountered in many other markets.

A significant determinant of the openness of a market is the way interconnection issues are handled. In recent years, many regulators have developed adequate frameworks for handling interconnection issues. But interconnection terms and conditions change along with market evolution. Failure to adequately address a new interconnection issue can result in a significant handicap to the development of a fully competitive marketplace. Because of the nature of telecommunications, other regulatory instruments, such as price controls and number portability, can also have an effect on the level of competition in the market.

Formulas which place too strong a downward pressure on an incumbent's prices may, in fact, damage its new competitors more than the incumbent itself. Instead of promoting competition, such an instrument may ensure that no one else offers products or services in that segment of the market. Similarly, not requiring number portability may artificially restrict the flow of customers between vendors. At the same time, requiring too harsh a standard for transfer of numbers could have an adverse effect on prices for end-users.

9.3 Ownership trends

Who owns what in telecommunications is, of course, a key factor in maintaining competition in telecommunications. Despite over a decade of privatization and liberalization, governments still remain the owners of much of the world's telecommunication infrastructure.

In general, however, in all regions of the world, the number of privatized incumbents and the amount of foreign investment in the telecommunication industry have been increasing and will continue to do so in the future. Privatization developments have allowed countries to increase private investment in their telecommunication sectors and to benefit more easily from the rapid introduction of new technologies and services into their markets.

With the privatization and liberalization of the telecommunication industry, the risk of anti-competitive market dominance by private entities may arise. Mergers and alliances are a force which can have a significant impact on the competitiveness in any market. In telecommunications, it may be further complicated by the international dimension.

For example, a cross-border merger could produce a new entity which, while not dominant in either home market, could be judged to have an unreasonable share of the market for communications between the two countries. Therefore, monitoring the international implications of mergers and alliances is an area where regulators should exercise particular vigilance.

With the technological developments that have brought about convergence of services, telecommunications, broadcasting and information, service providers are now expanding into each other's markets. The service overlaps within these different markets are increasing and strategic partnerships among the participants of these markets have become more common. This is another area where regulators should exercise particular vigilance.

9.4 Licensing

One way regulators and governments can most easily exercise control is when it comes to the awarding of new operating licenses. Licensing in a liberalized market is a complex undertaking which serves a multitude of policies. There are enormous variations around the world but generally licensing regimes are structured around concerns for assuring access to public voice telephony, promoting the expansion of infrastructure used to provide public voice telephony, and controlling competitive conditions in voice telephony markets.

Licensing frameworks around the world are facing pressures for dramatic change, however. The future is uncertain but the voice telephony paradigm that defines the telecommunication industry is being overtaken and will inevitably disappear. It will be replaced with an IT paradigm that accommodates the multimedia characteristics, global seamlessness and virtuality that will characterize a pervasively IT-based global economy operating over converged technologies and services in cyberspace.

Regulatory regimes of the future will have to reflect different public interest concerns. Countries that embrace rather than resist the IT paradigm will shift their focus away from a concern for the assured availability of reasonably priced basic voice services provided over traditional public networks. Instead, they will focus more on promoting multiple outlets for voice telephony and ensuring that a reliable and universal virtual public network is maintained across a crazy quilt of interconnected technologies and applications.

Overall, this will likely mean decreased reliance on individual licensing of particular services and facilities and increased reliance on general rules. It will also involve greater coordination among authorities in different industry sectors. Telecommunications regulation will be less concerned with licensing and pricing and more concerned with continuous efforts to adapt standards of reliability and interoperability to unrelenting technology changes, as well as with frequency allocation and assignment, dispute resolution, and consumer protection. A lot more of the telecommunication industry will probably end up being regulated by the market.

9.5 Universal access

The provision of universal access is one area that will probably not be left to market forces alone. The provision of universal access or fulfilling a Universal Service Obligation (USO) entails significant investments on the part of a network operator. If universal access is to be promised, it will require its imposition by a regulatory mechanism or body of some sort or other.

It will also not be such an easy affair as to simply require universal access provision as a quid pro quo for obtaining a telecommunications license. If the requirement should be for universal access to basic services, definitions are required of what constitutes a basic service. In the Information Age, definitions may include Internet access, for example.

The same progress in technology, which may complicate the definition of a basic service, could serve to make its provision simpler and may be even cheaper, and therefore the imposition of a universal access requirement less onerous. Satellite, wireless local loop, mobile telephony and virtual telephony all have the potential to reduce the cost of providing universal access compared to conventional fixed technologies, as may the Internet in the not too distant future. The Internet may also help implement new types of services for special groups – e.g. speech to text conversion for the deaf.

Payment for the provision of universal access is – perhaps predictably – a controversial issue. Approaches in different countries vary from profitable customers subsidizing an operator's unprofitable customers to a universal access levy shared between all of a country's operators.

Ironically, however, while most agree that the market will not address the issue of universal access if left to itself, it has come up with a solution for some of those denied access to telecommunications because of their lack of credit worthiness. Prepaid cards, which can be bought by anyone regardless of their credit status, are in fact the fastest growing part of the mobile phone market in many countries.

9.6 Interconnection

As well as the universal access of the individual, a truly competitive market also demands that new carriers be allowed access to the networks of their more established rivals. Therefore, the regulation of interconnection is a major factor in the development of competition in the telecommunications sector. But the rapid advance of technology is again complicating the issue.

In general, the key to creating fair interconnection agreements appears to rely on taking a forward-looking rather than a historic approach. What costs the incumbent will face, rather than what have they been. Also, interconnection agreements should not be seen in isolation. A successful interconnection agreement also requires a successful price control regime.

9.7 Pricing services on digital networks

It is apparent that the task of designing the most appropriate pricing policies and structures in the new digital network economy will be complex and challenging for the managers of incumbent PTOs, new competitors and information service providers, as well as regulators. They must be sensitive to the reality that yesterday's pricing structures will not be sufficient to promote network expansion, new service development and universal service penetration in the new environment.

For the foreseeable future, there will be an ongoing need for effective price regulation for the basic public service, for universal service extensions, and for interconnection and access to essential network facilities. However, it may be based not on the preservation of inherited practices and pricing structures but on promoting a multi-service information network that is inclusive in responding to the variety of new demands and needs of all sectors of society.

9.8 Numbering in a digital world

The explosion in recent years in services, and the resulting explosion in demand for names and addresses or numbers have shown that careful administration of the issuing of names, addresses and numbers is required. In some countries, there is serious concern that the supply of useful telephone numbers could be exhausted over the next ten years. Also, telephone numbers and other forms of addresses are no longer necessarily associated with geographic location. Demand is rising for classification by other attributes, such as type of organization or personal affiliations.

With the growing recognition of the importance of numbers, names and addresses, the question also arises of who owns the number or address. Carriers have been accustomed to having control of the allocation of numbers. But in a truly liberalized environment, users must have ownership of their numbers. Number portability is an increasingly important factor in telecommunications liberalization.

The future trend in telephone numbers is likely to emulate that of Domain names and Internet addresses. Domain names, which are intelligible and easier to remember than numbers, mask Internet addresses. Name servers translate the former into the latter. Users want names that match or evoke specific concepts, abbreviations, tags or marks associated with their organization, products, personal names, or ideas. They also want names that are as simple and short as possible.

The unexpectedly rapid rise of the Internet has thrown up a number of unresolved issues, including who has the right to add top-level domain names, how many TLDs should there be, how should conflicts between domain name registrations and trademark rights be resolved? These are all issues which need addressing, but in such a way that the maximum amount of innovation can be encouraged while individuals and organizations rights are adequately protected.

9.9 Conclusion

The wild card, in any prediction about the future, is the Internet, and in particular, the impact of the Internet suite of protocols on all aspects of the convergent technologies. A fairly safe prediction is that it will have a major impact even if the detail of that impact is not so clear. Another fairly safe prediction is that it will not prove easy to regulate.

In some areas of the world, the initial regulatory approach has been to treat Internet Service Providers (ISPs) as enhanced services or value-added providers, as opposed to common telecommunication carriers. This legal distinction is crucial as common telecommunication carriers are obliged to comply with a whole set of conditions such as mandatory interconnection, prohibition of discriminatory behaviour, disclosure of interconnection information, the levying of reasonable interconnection charges for transport and termination of calls, and universal service.

Yet of course it is quite clear now that ISPs will soon be able to use Internet technologies to provide services virtually indistinguishable from those of conventional telecommunication companies.

In some countries, the approach has been to impose the same requirements on ISPs as on the conventional telecommunication companies when it comes to the former offering comparable types of services to the latter. In yet others, the approach has been to ban IP telephony altogether.

But for many countries, the decision has still not been made whether or not to impose regulatory restrictions on telecommunication services provided by ISPs. The result of this has, in some cases, been legal disputes and court cases between those parties aggrieved at having paid high license fees to operate services which these newcomers are able to offer without paying any license fee at all.

No part of the world has really managed to come up with what looks like a permanent regulatory solution for Internet-based telecommunication services. Developments in the area are coming too thick and too fast. In the end, the sheer momentum of innovation it has created and its global nature may ensure that the Internet community ends up with what it would really like: virtually no or little regulation at all. But where would that leave the rest of telecommunications regulation?

REGULATORY TABLES

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Afghanistan

Policy Maker	*Regulator*
Ministry of Communications	Ministry of Communications
Kabul	Kabul
Phone:	Phone:
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Email:	Email:
Website:	Website:

Albania

Policy Maker	*Regulator*
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Tirana	Tirana
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Fax: +355 42 33772	Fax: +355 42 329 54
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Website:	Website:

Algeria

Policy Maker	*Regulator*
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Alger	Alger
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Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Angola

Ministério dos Correios & Telecomunicaçoes	Direcçao National de Correios e Telecomunicaçoes
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Luanda	Luanda
Phone: +244 2 33 77 77	Phone: +244 2 338 352
Fax: +244 2 33 07 76	Fax: +244 2 397 189
Email:	Email:
Website:	Website:

Antigua & Barbuda

Ministry of Public Works and Communications	Ministry of Public Works and Communications
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St. John's	St. John's
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Fax: +1 268 462 4622	Fax: +1 268 462 4622
Email:	Email:
Website:	Website:

Argentina

Secretaría de Comunicaciones	Comisión Nacional de Comunicaciones
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Fax: +54 11 318 7509	Fax: +54 11 347 9546
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Website: http://www.secom.gov.ar	Website: http://www.cnc.gov.ar/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Armenia

Ministry of Post & Telecommunications	Ministry of Post & Telecommunications
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Fax: +3742 15 1446	Fax: +3742 15 1446
Email: armoc@acc.am	Email: armoc@acc.am
Website:	Website:

Australia

Department of Communications and the Arts	Australian Communications Authority
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Canberra, ACT 2601	Melbourne, Victoria 3004
Phone: +61 6 279 1822	Phone: +61 3 9963 6800
Fax: +61 6 279 1890	Fax: +61 39963 6899
Email:	Email:
Website: http://www.dca.gov.au	Website: http://www.aca.gov.au

Austria

Federal Ministry for Science and Transport, Section IV	Telecom Control
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A-1030 Wien	A-1060 Wien
Phone: +43 1 79 731-0	Phone: +43 1 580 58 0
Fax: +43 1 79 731 4009	Fax: +43 1 580 58 9191
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Website: http://www.bmv.gv.at	Website: http://www.tkc.at/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Azerbaijan

Ministry of Communications	Ministry of Communications
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Bahamas

Ministry of Tourism and Public Utilities	Ministry of Tourism and Public Utilities
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Nassau	Nassau
Phone: +1 242 356 4400-7	Phone: +1 242 356 4400-7
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Email:	Email:
Website:	Website:

Bahrain

Ministry of Transportation	Telecommunications Directorate Ministry of Transportation
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Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Bangladesh

Policy Maker	*Regulator*
Ministry of Post & Telecommunications	Ministry of Post & Telecommunications
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Fax: +880 2 866670	Fax: +880 2 866670
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Barbados

Policy Maker	*Regulator*
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St. Michael	St. Michael
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Fax: +1 246 228 6167	Fax: +1 246 437 3542
Email: mtbbar@caribsurf.com	Email: pub@caribsurf.com
Website:	Website:

Belarus

Policy Maker	*Regulator*
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10 F, Skaryna Ave.	10 F, Skaryna Ave.
220050 Minsk	220050 Minsk
Phone: +375 17 227 3861	Phone: +375 17 227 3861
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1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Belgium

Policy Maker		Regulator	
Cabinet du Ministre de l'Economie et des Télécommunications		Institut Belge des Services Postaux et des Télécommunications	
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Website:		Website:	http://www.ibpt.be/

Belize

Policy Maker		Regulator	
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Fax:	+501 8 2 3317	Fax:	+501 2 31550
Email:		Email:	
Website:		Website:	

Benin

Policy Maker		Regulator	
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Cotonou		Cotonou	
Phone:	+229 31 22 27	Phone:	+229 31 22 27
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Website:		Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Bhutan

Policy Maker	*Regulator*
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Thimphu	Thimphu
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Email:	Email:
Website:	Website:

Bolivia

Policy Maker	*Regulator*
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La Paz	La Paz
Phone: +591 2 377 230	Phone: +591 2 416 641
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Email: mtctrans@caoba.entelnet.bo	Email: supertel@ceibo.entelnet.bo
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Bosnia

Policy Maker	*Regulator*
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Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Botswana

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Brazil

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Brunei Darussalam

Ministry of Communications	Jabatan Telekom Brunei Darussalam (JTB)
Ministry of Communications Building	Ministry of Communications Ministry of Communications Building
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Fax: +673 2 380 127	Fax: +673-2-382 445
Email:	Email: dirjtb@brunet.bn
Website:	Website: http://www.brunet.bn/telecom/jtb/regu.htm

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1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Bulgaria

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Burkina Faso

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Burundi

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Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Cambodia

Policy Maker	*Regulator*
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Phnom Penh	Phnom Penh
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Email:	Email:
Website:	Website:

Cameroon

Policy Maker	*Regulator*
Ministère des Postes et des Télécommunications	Ministère des Postes et des Télécommunications
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Phone: +237 23 2055	Phone: +237 23 2055
Fax: +237 23 1510	Fax: +237 23 1510
Email:	Email:
Website:	Website:

Canada

Policy Maker	*Regulator*
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Phone: +1 613 990 4225	Phone: +1 819 997 0313
Fax: +1 613 952 1231	Fax: +1 819 994 0218
Email:	Email:
Website: http://info.ic.gc.ca/	Website: http://www.crtc.gc.ca

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Cape Verde

Ministério das Infraestructuras e Habitação	Direcção Geral das Comunicações
Ponta Belém, CP 07	Ponta Belém, CP 07
Praia	Praia
Phone: +238 61 5699	Phone: +238 61 5779
Fax: +238 61 4141	Fax: +238 61 3069
Email: mit@mail.cvtelecom.cv	Email: vidgom@mail.cvtelecom.cv
Website:	Website:

Central African Rep.

Ministère des Postes et Télécommunications	Ministère des Postes et des Télécommunications
BP 939	BP 939
Bangui	Bangui
Phone: +236 61 30 32	Phone: +236 61 30 32
Fax: +236 61 28 19	Fax: +236 61 28 19
Email:	Email:
Website:	Website:

Chad

Ministère des Postes et Télécommunications	Ministère des Postes et Télécommunications
B.P. 154	B.P. 154
N'Djaména	N'Djaména
Phone: +235 52 15 25/1579	Phone: +235 52 15 79/1525
Fax: +235 52 15 00	Fax: +235 52 15 00
Email:	Email:
Website:	Website: http://www.tit.td

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Chile

Ministerio de Transportes y Telecomunicaciones	Subsecretaría de Telecomunicaciones, Ministerio de Transportes y Telecomunicaciones
Subsecretaría de Telecomunicaciones Amunátegui 139, Piso 5	Amunátegui 139, Piso 5
Santiago de Chile	Santiago de Chile
Phone: +56 2 672 6503	Phone: +56 2 672 6503
Fax: +56 2 699 5138	Fax: +56 2 699 5138
Email:	Email:
Website: http://www.mtt.cl/	Website:

China

Ministry of Information Industry (MII)	Telecommunications Administration Bureau
13 , West Chang'an Ave.,	13, West Chang'an Ave.,
Beijing 100804	Beijing
Phone: +86 10 660 21335	Phone: +86 10 660 33870
Fax: +86 10 660 11370	Fax: +86 10 660 24197
Email:	Email:
Website: http://www.mii.gov.cn	Website:

Colombia

Ministerio de Comunicaciones	Comisión de Regulación de Telecomunicaciones
Carrera 7 entre calles 12 y 13	Cra 11 #93-46 Pisos 2 y 3
Santafé de Bogotá	Santafé de Bogotá
Phone: +57 1 284 9090	Phone: +57 1 635 55 50
Fax: +57 1 286 1185	Fax: +57 1 635 5551
Email:	Email: crtcol@www.crt.gov.co
Website: http://www.mincomunicaciones.gov.co/	Website: http://www.crt.gov.co/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Comoros

Ministère des Transports, du Tourisme, des Postes et Télécommunications	Société Nationale des Postes et Télécommunications
B.P. 97	B.P. 5000
Moroni	Moroni
Phone: +269 74 42 42	Phone: +269 74 43 00
Fax: +269 74 42 41	Fax: +269 73 10 79
Email:	Email:
Website:	Website:

Congo

Ministère des Postes et des Télécommunications	Office National des Postes et des Télécommunications
Rond-point, du Centre Culturel Français	Avenue Patrice Lumumba B.P. 703
Brazzaville	Brazzaville
Phone: +242 81 40 19	Phone: +242 83 16 86
Fax: +242 81 00 03	Fax: +242 83 59 38
Email:	Email:
Website:	Website:

Congo (Dem. Rep.)

Ministère des Postes et des Télécommunications	Secrétariat Général Ministère des Postes et Télécommunications
4484 , Av. Huileries	4484, Av. Huileries
Kinshasa	+243 12 21 339
Phone: +243 12 21 339	Phone: +243 880 2651
Fax: +243 12 880 2651	Fax:
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Costa Rica

Policy Maker		*Regulator*	
Ministerio del Ambiente y Energía		Autoridad Reguladora de Servicios Públicos (ARESEP)	
Apartado Postal 10104		Apartado Postal 936	
1000 San José		1000 San José	
Phone:	+506 233 4533	Phone:	+506 220 0102
Fax:	+506 257 0697	Fax:	+506 220 0374
Email:		Email:	aresepde@sol.racsa.co.cr
Website:		Website:	

Côte d'Ivoire

Policy Maker		*Regulator*	
Ministère des Infrastructures Economiques		Agence des Télécommunications de Côte d'Ivoire	
BP V 06		18 B.P. 2203	
Abidjan		Abidjan 18	
Phone:	+225 34 73 15	Phone:	+225 34 4255
Fax:		Fax:	+225 34 42 58
Email:		Email:	atci@africaonline.co.ci
Website:		Website:	

Croatia

Policy Maker		*Regulator*	
Ministry of Maritime Affairs, Transport and Communications		Ministry of Maritime Affairs, Transport and Communications	
Sector of Post and Telecommunications Prisavlje 14		Prisavlje 14	
HR-10 000 Zagreb		HR-10 000 Zagreb	
Phone:	+385 1 616 9110	Phone:	+385 1 616 9110
Fax:	+385 1 619 6662	Fax:	+385 1 6196662
Email:	dominic.filipovik@mppv-tk.tel.hr	Email:	dominik.filipovic@mppv-tk.tel.hr
Website:		Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Cuba

Policy Maker	*Regulator*
Ministerio de Comunicaciones	Ministerio de Comunicaciones
Plaza de la Revolución "José Marti"	Plaza de la Revolución "José Marti"
La Habana	La Habana
Phone: +53 7 574079	Phone: +53 7 574091
Fax: +53 7 335253	Fax: +53 7 335190
Email: mc204@mc.etecsa.cu	Email: mc101@mc.etecsa.cu
Website: http://www.mc.etecsa.cu	Website: http://www.mc.etecsa.cu

Cyprus

Policy Maker	*Regulator*
Ministry of Communications and Works	Ministry of Communications and Works
Directorate of Telecommunications	Directorate of Telecommunications
CY-1424 Lefkosia (Nicosia)	CY-1424 Lefkosia (Nicosia)
Phone: +357 2 30 22 78	Phone: +357 2 30 22 78
Fax: +357 2 46 54 62	Fax: +357 2 46 54 62
Email: dirtelecom@mcw.gov.cy	Email: dirtelecom@mcw.gov.cy
Website:	Website:

Czech Republic

Policy Maker	*Regulator*
Ministry of Transport and Communications	Czech Telecommunications Office
Nabrezi Ludvíka Svobody 12	Ministry of Transport and Communications Klimentská 27
110 15 Praha 1	225 02 Praha 1
Phone: +420 2 514 11111	Phone: +420 2 2400 4111
Fax: +420 2 248 10596	Fax: +420 2 2422 5890
Email:	Email:
Website: http://www.mdcr.cz	Website: http://www.ctupraha.cz

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

D.P.R. Korea

Policy Maker	*Regulator*
Ministry of Posts and Telecommunications	Ministry of Posts and Telecommunications
Oesong-dong Central District	Oesong-dong Central District
Pyongyang	Pyongyang
Phone: +850 2 381 3180	Phone: +850 2 381 3180
Fax: +850 2 381 4418	Fax: +850 2 381 4418
Email:	Email:
Website:	Website:

Denmark

Policy Maker	*Regulator*
Ministry of Research and Information Technology	National Telecom Agency
Bredgade 43	Holsteinsgade 63
DK - 1260 Köbenhavn K	DK-2100 Köbenhavn Ö
Phone: +45 33 92 97 00	Phone: +45 35 43 03 33
Fax: +45 33 32 35 01	Fax: +45 35 43 14 34
Email: fsk@fsk.dk	Email: tst@tst.dk
Website: http://www.fsk.dk	Website: http://www.tst.dk/

Djibouti

Policy Maker	*Regulator*
Ministère de la Communication et de la Culture, chargé des Postes et Télécommunications	Office des Postes et Télécommunications
Rue de Moscou	Boulevard de la République
Djibouti	Djibouti
Phone: +253 353928	Phone: +253 350 669/351110
Fax: +253 353957	Fax: +253 355757
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Dominica

Ministry of Communications, Works and Housing
Roseau
Phone: +1 809 448 2401
Fax: +1 809 448 2883
Email: mincomwh@tod.dm
Website:

Ministry of Communications, Works and Housing
Roseau
Phone: +1 809 448 2401
Fax: +1 809 448 2883
Email: mincomwh@tod.dm
Website:

Dominican Rep.

Dirección General de Telecomunicaciones (DGT)
Calle Isabel La Católica
Santo Domingo
Phone: +1 809 682 2244
Fax: +1 809 682 3493
Email:
Website:

Instituto Dominicano de las Telecomunicaciones
Edificio Oficinas Gubernamentales
Bloque C, 2do Piso
Ave. México esq. Dr. Delgado
Santo Domingo, DN
Phone: (809) 221-2977
Fax: (809) 221-2980
Email: reftel@tricom.net
Website: www.indotel.org.do

Ecuador

Secretaria Nacional de Telecomunicaciones
Av.12 de Octubre 1561 y Madrid, Casilla 17-07-09777
Quito
Phone: +593 2 501 524
Fax: +593 2 225 030
Email:
Website:

Consejo Nacional de Telecomunicaciones (CONATEL)
Av. 12 de Octubre 1561 y Madrid, Casilla 17-07-9777
Quito
Phone: +593 2 545 032
Fax: +593 2 225 030
Email:
Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Egypt

Policy Maker	*Regulator*
Ministry of Transport and Telecommunications	Telecommunication Regulatory Authority
	National Institute of Transport Building
Cairo	Cairo
Phone: +202 355 5566	Phone: +202 404 7800
Fax: +202 574 4215	Fax: +202 404 8200
Email:	Email:
Website:	Website:

El Salvador

Policy Maker	*Regulator*
Ministerio de Economía	Superintendencia General de Electricidad y Telecomunicaciones (SIGET)
	Kilómetro 10 1/2, carretera a Nueva San Salvador, Centro Financiero SISA, Edificio 4, Primera Planta Local No.9
San Salvador	San Salvador
Phone:	Phone: +503 288 0066
Fax:	Fax: +503 288 0069
Email:	Email: siget@sal.gbm.net
Website:	Website: http://www.siget.gob.sv/

Equatorial Guinea

Policy Maker	*Regulator*
Ministerio de Transportes, Correos y Telecomunicaciones	Ministerio de Transportes, Correos y Telecomunicaciones
Malabo	Malabo
Phone: +240 9 2843	Phone: +240 9 2843
Fax: +240 9 2515	Fax: +240 9 2515
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Eritrea

Ministry of Transport and Communications	Communications Department
P.O. Box 569	P.O.Box 4918
Asmara	Asmara
Phone: +291 1 114 307	Phone: +291 1 115 847
Fax: +291 1 127 048	Fax: +291 1 126 966
Email:	Email:
Website:	Website:

Estonia

Ministry of Transport and Communications	National Communications Board
Viru str. 9	Ädala 4d St.
15081 Tallinn	10614 Tallinn
Phone: +372 6 397 613	Phone: +372 6 9311054
Fax: +372 6 397 606	Fax: +372 6 9311055
Email:	Email: postbox@sa.ee
Website: http://www.tsm.ee/	Website: http://www.sa.ee

Ethiopia

Ministry of Transport and Communications	Ethiopian Telecommunications Agency (ETA)
P.O. Box 1238	P.O. Box 1238
Addis Ababa	Addis Ababa
Phone: +251 1 51 82 92	Phone: +251 1 53 00 86
Fax: +251 1 51 56 65	Fax: +251 1 53 1255
Email:	Email: tele.agency@telecom.net.et
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Fiji

Ministry of Communications, Works and Energy	Telecommunication Unit
P.O. Box 2264 Government Buildings	Ministry of Communications, Works and Energy P.O. Box 2264 Government Buildings
Suva	Suva
Phone: +679 315 133	Phone: +679 211 257
Fax: +679 307 950	Fax: +679 313 747
Email:	Email:
Website:	Website:

Finland

Ministry of Transport and Communications	Telecommunications Administration Centre
P.O. Box 235	P.O.Box 313
FIN-00131 Helsinki	FIN-00181 Helsinki
Phone: +358 9 1601	Phone: +358 9 69 661
Fax: +358 9 160 2596	Fax: +358 9 6966 410
Email: into@vn.lm.fi	Email: into@thk.fi
Website:	Website: http://www.thk.fi/

France

Ministère de l'Economie, des Finances et de l'Industrie	L'Autorité de Régulation des Télécommunications
Direction des Postes et Télécommunications 20, avenue de Ségur	7, Square Max Hymans
75354 Paris 07 SP	75015 Paris
Phone: +33 1 43 19 60 61	Phone: +33 1 40 47 7124
Fax: +33 1 43 19 45 00	Fax: +33 1 40 47 7192
Email:	Email:
Website: http://www.telecom.gouv.fr	Website: http://www.art-telecom.fr

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Gabon

Policy Maker	Regulator
Ministère de la Défense Nationale, de la Sécurité et de l'Immigration, chargé des Postes et des Télécommunications	Ministère de la Défense Nationale, de la Sécurité et de l'Immigration, chargé des Postes et des Télécommunications
Boîte postale 2280	Boîte postale 2280
Libreville	Libreville
Phone: +241 76 01 09	Phone: +241 76 01 09
Fax: +241 76 34 35	Fax: +241 76 34 35
Email:	Email:
Website:	Website:

Gambia

Policy Maker	Regulator
Ministry of Works, Communications and Information	Ministry of Works, Communications and Information
Half-Die	Hagan Street
Banjul	Banjul
Phone: +220 227 449	Phone: +220 227 449
Fax: +220 222 066	Fax: +220 222 066
Email:	Email:
Website:	Website:

Georgia

Policy Maker	Regulator
Ministry of Telecommunications and Posts	Ministry of Telecommunications and Posts
9 April St. No. 2	9 April St. No. 2
Tbilisi 380008	Tbilisi 380008
Phone: +995 32997 777	Phone: +995 32997 777
Fax: +995 32001 000	Fax: +995 32001 000
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Germany

Federal Ministry of Economics	Regulatory Authority for Telecommunications and Posts
Referat VII A 4	Heinrich-Von-Stephan F Str. Postfach 8001
53107 Bonn	D-53105 Bonn
Phone: +49 228 615 0	Phone: +49 228 14 0
Fax: +49 228 615 2964	Fax: +49 228 14 8872
Email: 100536.2544@compuserve.com	Email: poststelle@bapt.de
Website: http://www.bmwi.de	Website: http://www.regtp.de

Ghana

Ministry of Transport and Communications	National Communications Authority
PO Box M.41	P.O. Box C1568 Cantonments
Accra	Accra
Phone: +233 21 229 870	Phone: +233 21 763344
Fax: +233 21 229 786	Fax: +233 21 763449
Email:	Email: nca@ghana.com.gh
Website: http://www.communication.gov.gh/	Website:

Greece

Ministry of Transport and Communications	National Telecommunications Commission
49, Avenue Syngrou	60 Kifissias Avenue
GR - 11780 Athinai	GR-151 25 Maroussi
Phone: +30 1 921 5279	Phone: +30 1 680 5040
Fax: +30 1 923 7133	Fax: +30 1 680 5049
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Grenada

Ministry of Works, Communications & Public Utilities Works	Ministry of Works, Communications, & Public Utilities
Calizigny	Young Street
St. George's	St. George's
Phone: +1 473 440 2181	Phone: +1 809 440 2271
Fax: +1 473 440 4122	Fax: +1 809 440 4122
Email:	Email:
Website:	Website:

Guatemala

Ministerio de Comunicaciones, Transportes, Obras Públicas y Vivienda	Superintendencia de Telecomunicaciones
8 avenida y 15 calle zona 13 Finca Nacional La Aurora	14 Calle 3-51, Zona 10, Ed. Murano Center, Nivel 16
Ciudad de Guatemala	Ciudad de Guatemala
Phone: +502 362051-5	Phone: (502) 366-5880
Fax: 502 3626059	Fax: (502) 366-5890
Email:	Email: supertel@sit.gob.gt
Website:	Website: http://www.sigloxxI.com/SIT_GUA/

Guinea

Ministère de la Communication	Direction Nationale des Postes et Télécommunications
	7º Avenue Bis
Conakry	Conakry
Phone: +224 41 36 39	Phone: +224 41 13 31
Fax: +224 41 35 77	Fax: +224 45 31 16
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Guinea-Bissau

Policy Maker	*Regulator*
Ministério da Informaçao e das Telecomunicaçoes	Ministério da Informaçao e das Telecomunicaçoes
Direcçao General dos Correios e das Telecomunicaçoes C.P. 200	Direcçao General dos Correios e das Telecomunicaçoes CP 200
Bissau	Bissau
Phone: +245 21 2914	Phone: +245 21 2914
Fax: +245 20 1137	Fax: +245 20 1137
Email:	Email:
Website:	Website:

Guyana

Policy Maker	*Regulator*
Ministry of Public Works, Communications and Regional Development	National Frequency Management Unit
Wight's Lane	PO Box 12174 68 Hadfield Street Lodge
Kingston	Greater Georgetown
Phone: +592 2 669 55	Phone: +592 2 639 76
Fax: +592 2 675 73	Fax: +592 2 676 61
Email:	Email:
Website:	Website:

Haiti

Policy Maker	*Regulator*
Ministère des Travaux Publics, Transports et Communications	Organe Exécutif du Conseil National des Télécommunications
Palais des Ministères Rue des Ministères	Cité de l'Exposition Boîte postale 2002
Port-au-Prince	Port-au-Prince
Phone: 509 223 240	Phone: 509 22 0300
Fax: 509 234 798	Fax: 509 23 0579
Email:	Email: Conatel@haitiwold.com
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Honduras

Ministerio de Finanzas	Comisión Nacional de Telecomunicaciones
Avenida Cervantes	Col. Palmira Paseo República de Argentina Casa # 354
Tegucigalpa	Tegucigalpa
Phone: +504 222 1211 / 222	Phone: +(504) 221-3500
Fax: +504 238 2309	Fax: +(504) 221-3511
Email:	Email:
Website:	Website: http://www.conatel.hn

Hungary

Ministry of Transport, Communications and Water Management	Communication Authority
Dob u. 75-81	Ostrom u. 23-25
H-1400 Budapest	H-1005 Budapest
Phone: +36 1 322 0220	Phone: +36 1457 7185
Fax: +36 1 322 3480	Fax: +36 1 457 7121
Email:	Email: contact@hif.hu
Website: http://www.mav.hu/khvm/default.htm	Website: http://www.hif.hu/

Iceland

Ministry of Communications	Post and Telecommunication Administration
Hafnarhusid v/ Tryggvagoetu	Smidjuvegur 68-70
IS-150 Reykjavik	200 Kópavogur
Phone: +354 5 60 96 30	Phone: +354 510 1500
Fax: +354 5 62 17 02	Fax: +354 510 1509
Email:	Email:
Website:	Website: www.pta.is/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

India

Policy Maker	Regulator
Ministry of Communications	Telecommunication Regulatory Authority of India (TRAI)
Sanchar Bhawan 20 Ashoka Road	16th Floor, Jawahar Vyapar Bhawan 1, Tolstoy Marg
New Delhi 110001	New Delhi 110001
Phone: +91 11 371 9898	Phone: +91 11 3357815
Fax: +91 11 371 1514	Fax: +91 11 3738708
Email:	Email: trai@del2.vsnl.net.in
Website:	Website: http://www.trai.gov.in

Indonesia

Policy Maker	Regulator
Ministry of Communication	Directorate General of Posts and Telecommunications
JL. Medan Merdeka Barat	JL. Medan Merdeka Barat No. 17
Jakarta 10110	Jakarta 10110
Phone: +62 21 345 6779	Phone: +62 21 383 8501
Fax:	Fax: +62 21 386 0754
Email:	Email:
Website:	Website:

Iran (I.R.)

Policy Maker	Regulator
Ministry of Posts, Telegraph and Telephone	Telecommunication Company of Iran
P.O. Box 11365-931 Dr. Ali Shariati Avenue	Bisam Building °5 Ali Shariati Avenue
Tehran 16314	Tehran 16314
Phone: +98 21 843 612	Phone: +98 21 8111
Fax: +98 21 867 999	Fax: +98 21 829 177
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Iraq

Policy Maker		Regulator	
Ministry of Transport and Communications		Ministry of Transport and Communications	
P.O. Box 2450		P.O. Box 2450	
Baghdad		Baghdad	
Phone:	+964 1 718 0400	Phone:	+964 1 718 0400
Fax:	+964 1 718 2125	Fax:	+964 1 718 2125
Email:		Email:	
Website:		Website:	

Ireland

Policy Maker		Regulator	
Office of the Minister for Public Entrerprise		Director of Telecommunications Regulation	
44, Kildare Street		1st & 2nd Floors Blocks D, E & F Abbey Court Irish Life Centre Lower Abbey Street	
Dublin 2		DUBLIN 1	
Phone:	+353 1 6041042	Phone:	+353 1 804 9600
Fax:	+353 1 6622150	Fax:	+353 1 804 9665
Email:		Email:	
Website:	http://www.irlgov.ie/tec	Website:	http://www.odtr.ie

Israel

Policy Maker		Regulator	
Ministry of Communications		Ministry of Communications	
23 Jaffa St.		23 Jaffa St.	
91999 Jerusalem		91999 Jerusalem	
Phone:	+972 2 270 6304	Phone:	+972 2 230 222
Fax:	+972 2 624 0321	Fax:	+972 2 624 0321
Email:	intmocil@moc.gov.il	Email:	
Website:	http://www.moc.gov.il	Website:	http://www.moc.gov.il

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Italy

Ministero delle Comunicazioni	Autorità Garante nelle Comunicazioni
Segretariato Generale Ufficio Relazioni Internazionali Viale America, n. 201	Centro Direzionale, Isola 85 Palazzo Torre Francesco
00144 - Roma	80143 Napoli
Phone: +39 6 595 595 81	Phone: +39 081 750 76 05
Fax: +39 6 5942405	Fax: +39 081 750 76 16
Email:	Email:
Website: http://www.info.fi.it/bibliompt.htm	Website: http://www.comune.napoli.it/agcom/

Jamaica

Ministry of Commerce and Technology	Office of Utilities Regulation (OUR)
4th Floor, PCJ Resource Centre, 36 Trafalgar Road.	5th Floor, PCJ Resource Centre, 36 Trafalgar Road
Kingston	Kingston
Phone: +1 876 754 5501	Phone: +1 876 968 6053
Fax: +1 876 929 8103	Fax: +1 876 929 3635
Email:	Email: office.our@cwjamaica.com
Website: www.mct.gov.jm	Website: http://www.cwjamaica.com/~office.our/index.htm

Japan

Ministry of Posts and Telecommunications	Ministry of Posts and Telecommunications
1-3-2, Kasumigaseki Chiyoda-ku	1-3-2, Kasumigaseki Chiyoda-ku
Tokyo 100-90	Tokyo 100-90
Phone: +81 3 3504 4792	Phone: +81 3 3504 4792
Fax: +81 3 3504 0884	Fax: +81 3 3504 0884
Email:	Email:
Website: http://www.mpt.go.jp	Website: http://www.mpt.go.jp

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Jordan

Policy Maker		*Regulator*	
Ministry of Post and Communications		Telecommunications Regulatory Commission	
P.O. Box 9903		P.O. Box 850967	
Amman 11191		Amman 11185	
Phone:	+962 6 858 883	Phone:	+962 6 586 3020
Fax:	+962 6 858 882	Fax:	+962 6 586 3641
Email:		Email:	webmaster@trc.gov.jo
Website:		Website:	http://www.trc.gov.jo

Kazakhstan

Policy Maker		*Regulator*	
Ministry of Transport and Communications		Telecommunications and Post Dept.	
49 Abai Street		71, Auezova street	
473000 Akmola		473000 Astana	
Phone:	+7 3172324951	Phone:	+7 3172324951
Fax:	+7 3172324965	Fax:	+7 3172324975
Email:		Email:	
Website:		Website:	

Kenya

Policy Maker		*Regulator*	
Ministry of Transport & Communications		Communications Commission of Kenya	
P.O. Box 52692		P.O. Box 14448	
Nairobi - Kenya		Nairobi - Kenya	
Phone:	+254 2 729200	Phone:	+254 2 49111
Fax:	+254 2	Fax:	+254 2 448418
Email:		Email:	skchepkonga@eafix.net
Website:		Website:	http://cck.go.ke/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Kiribati

Policy Maker	Regulator
Ministry of Information, Communications and Transport	Ministry of Information, Communications and Transport
PO Box 487	PO Box 487
BETIO, TARAWA	BETIO, TARAWA
Phone: +686 26003	Phone: +686 26003
Fax: +686 26193	Fax: +686 26193
Email:	Email:
Website:	Website:

Korea (Rep.)

Policy Maker	Regulator
Ministry of Information and Communication	Ministry of Information and Communication
100 Sejong-ro Chongro-ku	100 Sejong-ro Chongro-ku
Seoul 110-777	Seoul 110-777
Phone: +82 2 750 2002	Phone: +82 2 750 2002
Fax: +82 2 750 2009	Fax: +82 2 750 2009
Email:	Email:
Website: http://www.mic.go.kr	Website: http://www.mic.go.kr

Kuwait

Policy Maker	Regulator
Ministy of Communications	Ministy of Communications
P.O. Box 318 Safat	P.O. Box 318 Safat
11111 Kuwait	11111 Kuwait
Phone: 965 484 5666	Phone: 965 484 5666
Fax: 965 484 7888	Fax: 965 484 7888
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Kyrgyzstan

Ministry of Transport and Communications	National Communications Agency
42, Isanova Str.	7, B "Sovietskaya Str."
Bishkek	Bishkek
Phone: +7312 662145	Phone: 312 544103
Fax: +7312 213667	Fax: 310 544105
Email:	Email:
Website:	Website:

Lao P.D.R.

Ministère des Communications, Transports, Postes et de la Construction	Direction des Postes et Télécommunications
Département des Postes et Télécommunications 1, rue Jawaharlal Nehru	Ministère des Communications, Transports, Postes et de la Construction 1, rue Jawaharlal Nehru
0100 Vientiane	0100 Vientiane
Phone: +856 21 412 280	Phone: +856 21 412 280
Fax: +856 21 412 279	Fax: +856 21 412 279
Email:	Email:
Website:	Website:

Latvia

Ministry of Transport Department of Communications	Ministry of Transport Department of Communications
3 Gogola Street	3 Gogola Street
Riga, LV-1190	Riga, LV-1190
Phone: +371 7242321	Phone: +371 724 2321
Fax: +371 7820636	Fax: +371 782 0636
Email: tatjanam@sam.gov.lv	Email: tatjanam@sam.gov.lv
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Lebanon

Policy Maker	*Regulator*
Ministère des Postes et des Télécommunications, en la personne du Ministre des Postes et Télécommunications	Ministère des Postes et des Télécommunications Direction de l'exploitation et de la maintenance (DEM)
Avenue Sami el Solh	Avenue Sami el Solh
Beyrouth	Beyrouth
Phone: +961 1 888100	Phone: +961 1 424400
Fax: +961 1 423005	Fax: +961 1 423111
Email:	Email:
Website: http://www.mpt.gov.lb	Website: http://www.mpt.gov.lb

Lesotho

Policy Maker	*Regulator*
Ministry of Transport and Communications	Lesotho Telecommunications Corporation (LTC)
P.O. Box 413	P.O. Box 1037
MASERU 100	MASERU 100
Phone: +266 311006	Phone: +266 211101
Fax: +266 310264	Fax: +266 310183
Email:	Email:
Website:	Website:

Liberia

Policy Maker	*Regulator*
Ministry of Posts and Telecommunications	Ministry of Posts and Telecommunications
Carey Street	Carey Street
Monrovia	Monrovia
Phone: +231 22 6079	Phone: +231 22 6079
Fax: +231 22 6000	Fax: +231 22 6000
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Libya

Policy Maker	*Regulator*
General Directorate of Posts and Telecommunications	General Directorate of Posts and Telecommunications
P.O. Box 81686	P.O. Box 81686
Tripoli	Tripoli
Phone: +218 21 360 41 01	Phone: +218 21 360 41 01
Fax: +218 21 360 41 02	Fax: +218 21 360 41 02
Email:	Email:
Website:	Website:

Liechtenstein

Policy Maker	*Regulator*
Office pour les Affaires Etrangères de la Principauté de Liechtenstein	Office pour les Affaires Etrangères de la Principauté de Liechtenstein
Heiligkreuz 14	Heiligkreuz 14
FL-9490 Vaduz	FL-9490 Vaduz
Phone: +41 75 236 66 75	Phone: +41 75 236 66 75
Fax: +41 75 236 65 80	Fax: +41 75 236 65 80
Email:	Email:
Website:	Website:

Lithuania

Policy Maker	*Regulator*
Ministry of Transport Department of Communications	Ministry of Transport- Department of Communications/Communications Regulatory Service (CRS)
Vilniaus 33	Vilniaus 33
2001 Vilnius	2001 Vilnius
Phone: +370 2 22 77 61	Phone: 370 2 22 77 61
Fax: +370 2 22 50 70	Fax: 370 2 22 50 70
Email:	Email:
Website: http://www.transp.lt/	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Luxembourg

Ministry of Communications		Institut Luxembourgeois des Télécommunications (ILT)	
18, Montée de la Pétrusse		45a, avenue Monterey	
L-2945 Luxembourg		2922 Luxembourg	
Phone:	+352 478-1	Phone:	+352 458 845 1
Fax:	+352 408 940	Fax:	+352 458 845 88
Email:		Email:	ilt@ilt.etat.lu
Website:	http://www.etat.lu/MZ/	Website:	http://www.ilt.lu

Madagascar

Ministère des Postes et Telecommunications		Office Malagasy d'Etudes et de Régulation des Télécommunications	
Antaninarenina		19, rue Refotaka, Anbatomena	
101 Antananarivo		101 Antananarivo	
Phone:	+261 2022 23267	Phone:	+261 2022 20456
Fax:	+261 2022 35894	Fax:	+251 202221516
Email:		Email:	omert@dts.mg
Website:		Website:	

Malawi

Ministry of Information, Broadcasting, Posts and Telecommunications		Malawi Communications Regulatory Authority	
P/Bag 310, Capital City		P.O. Box 537	
Lilongwe 3		Blantyre	
Phone:	+265 783 233	Phone:	+265 620 977
Fax:	+265 784 568	Fax:	+265 620 188
Email:		Email:	
Website:		Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Malaysia

Ministry of Energy, Communications and Multimedia	Malaysian Communications and Multimedia Commission
1st Floor, Wisma Damansara Jalan Semantan	Level 11 Menara Dato' Onn, Putra World Trade Centre, 45 Jalan Tun Ismail
50668 Kuala Lumpur	50480 Kuala Lumpur
Phone: 603-2575000	Phone: +603-2942121
Fax: 603-2533485	Fax: +603-2940943
Email: Webmaster@ktkm.gov.my	Email: webmaster@cmc.gov.my
Website: http://www.ktkm.gov.my	Website: http://www.cmc.gov.my/

Maldives

Ministry of Communication Science & Technology	Post and Telecommunication Section
BML Building, 5th Floor	Ministry of Communication Science & Technology, Telecom Building
Male'	Male'
Phone: +960 33 1696	Phone: +960 32 3344
Fax: +960 33 1694	Fax: +960 32 0000
Email: officegen@comscitec.gov.mv	Email: telecom@dhivehinet.net.mv
Website:	Website:

Mali

Ministère de la Culture et de la Communication	Société des Télécommunications du Mali
B.P. 116	Direction générale des télécommunications Route de Koulikoro Boîte postale No.740
Bamako	Bamako
Phone: +223 222 647	Phone: +223 225280
Fax: +223 228 319	Fax: +223 223022
Email:	Email: sotelma@sotelma.nt
Website:	Website: http://www.sotelma.net

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Malta

Ministry responsible for Telecommunications	Telecommunications Regulator c/o The Director, Wireless Telegraphy
Auberge de Castille	Office of the Prime Minister Evans Building Merchants Street
Valletta CMR 02	Valletta CMR 02
Phone: +356 225 231	Phone: +356 227 224
Fax:	Fax: +356 247 229
Email:	Email:
Website:	Website:

Marshall Islands

Board of Directors, National Telecommunication Authority	The Cabinet
P.O.Box 1169	PO Box 2
Majuro 96960	Majuro 96960
Phone: +692 625 3852	Phone: 692 625 3445
Fax: +692 625 3952	Fax: 692 625 4020
Email:	Email:
Website:	Website:

Mauritania

Ministère de l'Intérieur, des Postes et Télécommunications	Office des Postes et Télécommunications
P.O. Box 195	P.O. Box 7000
Nouakchott	Nouakchott
Phone: +222 2 52 094	Phone: +222 2 52 340
Fax: +222 2 52 020	Fax: +222 2 51 700
Email:	Email: kerkoub@opt.mr
Website:	Website: http://www.opt.mr/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Mauritius

Ministry of Telecommunications and Information Technology	Telecommunications Authority
Level 9 Air Mauritius Centre, President John Kennedy St.	6th Floor Blendax House Dumas Street
Port Louis	Port Louis
Phone: +230 201 1089	Phone: +230 212 9252
Fax: +230 212 1673	Fax: +230 211 2871
Email:	Email:
Website: http://ncb.intnet.mu/mtit.htm	Website:

Mexico

Secretaría de Comunicaciones y Transportes	Comisión Federal de Telecomunicaciones
Av. Universidad y Xola	Bosque de Radiatas 44
03028 MEXICO, D.F.	México D.F 05120
Phone: +52 5 519 1993	Phone: +52 5261 4203
Fax: +52 5 530 1816	Fax: +52 5261 4055
Email: llcelaya@sct.gob.mx	Email: sjalife@cft.gob.mx
Website: http://www.sct.gob.mx/	Website: http://www.cft.gob.mx

Micronesia

Department of Transport and Communications	Department of Transport and Communications
P.O. Box PS#2	P.O. Box PS#2
Palikir, Pohnpei State	Palikir, Pohnpei State
Phone: +691 320 2865	Phone: +691 320 2865
Fax: +691 320 5853	Fax: +691 320 5853
Email: TransFSM@mail.fm	Email: TransFSM@mail.fm
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Moldova

Policy Maker	*Regulator*
Ministry of Transports and Communication	Ministry of Transports and Communication
134 Stefan cel Mare Av.	134 Stefan cel Mare Av.
MD-2012, Chisinau	MD-2012, Chisinau
Phone: +373 2 221001	Phone: +373 2 221001
Fax: +373 2 241 553	Fax: +373 2 241 553
Email: ieseanu@mci.gov.md	Email: ieseanu@mci.gov.md
Website: http://www.mci.gov.md	Website: http://www.mci.gov.md

Monaco

Policy Maker	*Regulator*
Direction des Télécommunications	Direction des Télécommunications
25, boulevard de Suisse	25, boulevard de Suisse
MC - 98000 Monaco	MC - 98000 Monaco
Phone: +377 97 985 656	Phone: +377 97 985 656
Fax: +377 97 985 657	Fax: +377 97 985 657
Email:	Email:
Website:	Website:

Mongolia

Policy Maker	*Regulator*
Ministry of Infrastructure Development, Communications Department	Communications Regulatory Body
Government Bldg-2 United Nations Str. 49	Government Bldg-2 United Nations Str. 49
210646 Ulaanbaatar	210646 Ulaanbaatar
Phone: +976 1 329 236	Phone: +976 1 327 720
Fax: +976 1 310 612	Fax: +976 1 327 720
Email: holboo@magicnet.mn	Email: MOID@magicnet.mn
Website: http://www.pmis.gov.mn/mid/	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Morocco

Secrétariat d'Etat chargé de la Poste & Technologie de l'Information		Agence Nationale de Réglementation des Télécommunications	
Avenue Moulay El Hassan		2, Rue Al Kahalil, IMM A	
Rabat		Rabat 10000	
Phone:	212 7 70 56 27	Phone:	212 7 20 38 69
Fax:	212 7 73 70 79	Fax:	212 7 20 3862
Email:	poutfi@septi.gov.ma	Email:	info@anrt.net.ma
Website:	http://www.septi.gov.ma	Website:	http://www.anrt.net.ma

Mozambique

Ministério dos Transportes e Comunicaçoes		Instituto Nacional das Comunicaçoes de Moçambique	
Av. Eduardo Mondlane 123		Av. Eduardo Mondlane N° 123	
Maputo		Maputo	
Phone:	+258 1 49 0131	Phone:	+258 1 49 01 38
Fax:	+258 1 490131	Fax:	+258 1 49 44 35
Email:	+258 1 492728	Email:	
Website:		Website:	

Myanmar

Ministry of Communications, Posts and Telegraphs		Posts and Telecommunications Department	
Corner of Theinbyu Road and Mechant Street		125, Pansodan Street	
Yangon		Yangon	
Phone:	+95 1 29 2019	Phone:	+95 1 253 585
Fax:	+95 1 29 2977	Fax:	+95 1 251 911
Email:		Email:	
Website:		Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Namibia

Ministry of Information and Broadcasting
Private Bag 13344
Windhoek
Phone: +264 61 283 9111
Fax: +264 61 222343
Email:
Website:

Namibia Communications Commission
Private Bag 13309
Windhoek
Phone: +264 61 222 666
Fax: +264 61 222 790
Email:
Website:

Nauru

Directorate of Telecommunications
Ministry of Island Development and Industries
Nauru Island
Phone: +674 444 3324
Fax: +674 4443111
Email:
Website:

Directorate of Telecommunications
Ministry of Island Development and Industries
Nauru Island
Phone: +674 444 3324
Fax: +674 444 3111
Email:
Website:

Nepal

Ministry of Information and Communications
Singh Durbar
Kathmandu
Phone: +977 1 228 830
Fax: +977 1 221 729
Email:
Website:

Nepal Telecommunication Authority
Singha Durbar
Kathmandu
Phone: +977 1 221 944
Fax: +977 1 260 400
Email: ntra@mos.com.np
Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Netherlands

Ministry of Transport and Public Works	Independent Posts and Telecommunications Authority (OPTA)
PO Box 20901	PO Box 90420
2500 EX The Hague	2509 LK The Hague
Phone: +31 70 351 6171	Phone: 31 70 3153 500
Fax: +31 70 351 6505	Fax: 31 70 3153 501
Email:	Email:
Website: http://www.minvenw.nl	Website: http://www.opta.nl

New Zealand

Ministry of Commerce	Ministry of Commerce
Resources and Networks Branch P.O. Box 2847	Resources and Networks Branch P.O. Box 1473
Wellington	Wellington
Phone: +64 4 472 0030	Phone: +64 4 472 0030
Fax: +64 4 499 0797	Fax: +64 4 499 0797
Email:	Email:
Website: http://www.moc.govt.nz	Website: http://www.moc.govt.nz/comms

Nicaragua

Dirección General de Telecomunicaciones y Correos	Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)
Edificio TELCOR Villa Fontana Apartado 232	Edificio del INSS, V-VI Piso
Managua	Managua C.A.
Phone: +505 2 78 4444	Phone: +505 222 7348
Fax: +505 2 227 328	Fax: +505 222 7644
Email: A.Fuentes@TMX.COM.NI	Email: A.Fuentes@TMX.COM.NI
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Niger

Ministère de la Communication		Direction de la réglementation des postes et télécommunications (DRPT)	
MCC BP 452		DRPT / BP 452	
Niamey		Niamey	
Phone:	+227 722 874	Phone:	+227 733 3097
Fax:	+227 733 685	Fax:	+227 725 028
Email:		Email:	
Website:		Website:	

Nigeria

Ministry of Communications		Nigerian Communications Commission	
Federal Secretariat, Shehu Shagari Way		19, Aguata Close, Garki II	
Abuja		Abuja	
Phone:	+234 9 523 0506	Phone:	234 9 234 4589-92
Fax:		Fax:	234 9 234 4593
Email:		Email:	ncc@cyperspace.net.ng
Website:		Website:	http://www.ncc.gov.ng

Norway

Ministry of Transport and Communications		Norwegian Post and Telecommunications Authority	
Akersgata 59 (R5) Postbox 8010 Dep		P.O. Box 447 Sentrum	
N-0030 Oslo		N-0104 Oslo	
Phone:	+47 22 34 90 90	Phone:	+47 22 82 46 00
Fax:	+47 22 34 95 70	Fax:	+47 22 82 46 40
Email:	odin@ft.dep.telemax.no	Email:	firmapost@npt.no
Website:	http://odin.dep.no/sd/	Website:	http://www.npt.no

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Oman

Ministry of Posts, Telegraphs and Telephones	Ministry of Posts, Telegraphs and Telephones
PO Box 338 Ruwi	PO Box 338 Ruwi
Muscat 112	Muscat 112
Phone: +968 697 888	Phone: +968 697 888
Fax: +968 696 817	Fax: +968 696 817
Email:	Email:
Website:	Website:

Pakistan

Government of Pakistan	Pakistan Telecommunications Authoriry (PTA)
Block "D" Pak Secretariate	H-9/4, CTRL Building
Islamabad	Islamabad
Phone: +92 51 921 7275	Phone: +92 51 441000
Fax: +92 51 9209785	Fax: +92 51 446443
Email:	Email:
Website: http://www.pak.gov.pk/govt/comm.htm	Website: http://www.pta.gov.pk

Panama

Ministerio de Gobierno y Justicia	Ente Regulador de los Servicios Públicos
Apartado Postal 1628	Calle 50, Frente a los Seguros ASSA
Panamá 1	Panamá
Phone: +507 262 3197	Phone: +507 265 3555
Fax: +507 262 9594	Fax: +507 2653510
Email:	Email:
Website:	Website: http://www.sinfo.net/ente_reg/telecomunicaciones.HTM

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Papua New Guinea

Department of Trade and Industry	Papua New Guinea Telecommunications Authority
PO Box 639	P.O. Box 8444
WAIGANI, National Capital District	Boroko, National Capital District
Phone: +675 327 6797	Phone: +675 325 8633
Fax: +675 323 0976	Fax: +675 300 4829
Email:	Email:
Website:	Website: http://www.pangtel.gov.pg/pangtel/index.html

Paraguay

Ministerio de Obras Públicas y Comunicaciones	Comisión Nacional de Telecomunicaciones
Oliva y Alberdi	Yegros No. 437 y 25 de Mayo Edif. San Rafael - 2o Piso
Asunción	Asunción
Phone: +595 21 49 66 66	Phone: +595 21 440 020
Fax: +595 21 44 36 25	Fax: +595 21 498 982
Email:	Email:
Website:	Website:

Peru

Ministerio de Transportes y Comunicaciones, Viviendas y Construcción	Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)
Av. 28 de Julio, No. 800	Calle de la Prosa 136 - San Borja
Lima 1	Lima 41
Phone: +51 1 4330752	Phone: +511 2251313
Fax: +51 1 4331450	Fax: +511 4751816
Email: mosaki@mtc.gob.per	Email:
Website: www.mtc.gob.pe/Comunicaciones/comunica.htm	Website: http://www.osiptel.gob.pe

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Philippines

Department of Transportation and Communications	National Telecommunications Commission
16/F, Columbia Tower Brgy, Wack-Wack, Ortigas Avenue 1555 Mandaluyong City	NTC Building, BIR Road, East Triangle, Diliman
Metro Manila	Quezon City
Phone: +63 2 723 1245	Phone: +63 2 924 4008
Fax: +63 2 726 7130	Fax: +63 2 921 7128
Email: pvarilla@mnl.sequel.net	Email: ccad-ntc@dcn002.bayantel.com.ph
Website:	Website:

Poland

Ministry of Posts and Telecommunications	Ministry of Posts and Telecommunications
Pl. Malachowskiego 2	Pl. Malachowskiego 2
00-940 Warszawa	00-940 Warszawa
Phone: +48 22 656 50 00	Phone: +48 22 656 50 00
Fax: +48 22 826 73 66	Fax: +48 22 826 73 66
Email: integrac@ml.gov.pl	Email: integrac@ml.gov.pl
Website: http://www.ml.gov.pl	Website: http://www.ml.gov.pl

Portugal

Ministério do Equipamento, Planeamento e Administração do Território	Instituto das Comunicaçôes de Portugal
Secretaría de Estado de Habitação e das Comunicações Palácio Penafiel Rue de São Mamede ao Caldas, No. 21	Avenida José Malhoa Nº 12
1100 Lisboa	1070 Lisboa
Phone: +351 1 886 11 19	Phone: +351 1 721 1000
Fax: +351 1 886 21 54	Fax: +351 1 721 1001
Email: correio@min-plan.pt	Email: info@icp.pt
Website: http://www.min-plan.pt/	Website: http://www.icp.pt

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Qatar

Policy Maker		*Regulator*	
QATAR TELECOM Q.S.C (Q-TEL)		QATAR TELECOM Q.SC. RADIO REGULATORY & INT'L AFFAIRS	
P.O. Box 217		P.O. Box 217	
Doha		Doha	
Phone:	+974 400 400	Phone:	+974 400 678
Fax:	+974 413 904	Fax:	+974 830 630
Email:		Email:	wfakhroo@qtel.com.qa
Website:	http://www.qatar.net	Website:	

Romania

Policy Maker		*Regulator*	
National Agency for Communications and Informatics		National Agency for Communications and Informatics	
Blvd. Libertatii , 14		Blvd. Libertatii	
Buscharest		Bucharest	
Phone:	+40 1 400 1190 -	Phone:	40 1 400 1190
Fax:	+40 1 400 1329	Fax:	40 1 400 1329
Email:	comisie@cni.ro	Email:	comisie@info.cni.ro
Website:	http://www.cni.ro	Website:	http://www.cni.ro

Russia

Policy Maker		*Regulator*	
State Committee for Communications and Informatization		State Committee for Communications and Informatization	
7, Tverskaya Street		7, Tverskaya Street	
103064 Moscow		103064 Moscow	
Phone:	+7 095 92 55108	Phone:	+7 095 92 55108
Fax:	+7 095 23 02097	Fax:	+7 095 23 02097
Email:		Email:	
Website:		Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Rwanda

Policy Maker	*Regulator*
Ministère des Transports et des Communications	Ministère des Transports et des Communications
B.P. 720	B.P. 720
Kigali	Kigali
Phone: +250 74128	Phone: +250 74128
Fax: +250 77474	Fax: +250 77474
Email:	Email:
Website:	Website:

S. Tomé & Principe

Policy Maker	*Regulator*
Ministerio do Equipamento Social e Ambiente	Ministerio do Equipamento Social e Ambiente
P.O. Box 130	P.O. Box 130
SAO TOMÉ	SAO TOMÉ
Phone: +239 12 21492	Phone: +239 12 21492
Fax: +239 12 22 824	Fax: +239 12 22 824
Email:	Email:
Website:	Website:

San Marino

Policy Maker	*Regulator*
Direzione Generale Poste e Telecomunicazioni	Direzione Generale Poste e Telecomunicazioni
Contrada Omerelli, 17	Contrada Omerelli, 17
San Marino A-2 47031	San Marino A-2 47031
Phone: +378 882 555	Phone: +378 882 555
Fax: +378 992 760	Fax: +378 992 760
Email: dirposte@omniway.sm	Email: dirposte@omniway.sm
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Saudi Arabia

Policy Maker	Regulator
Ministry of Post, Telegraph and Telephone	Ministry of Post, Telegraph and Telephone
Riyadh 11132	Riyadh 11132
Phone: +966 1 452 2 333	Phone: +966 1 452 2 333
Fax: +966 1 450 4 382	Fax: +966 1 450 4 382
Email:	Email:
Website:	Website:

Senegal

Policy Maker	Regulator
Ministère de la Communication	Direction des Etudes et de la Réglementation de la Poste et des Télécommunications
Boîte postale 4027	Boîte postale 4027
Dakar	Dakar
Phone: +221 823 10 65	Phone: +221 823 31 39
Fax: +221 821 45 04	Fax: +221 821 45 04
Email:	Email:
Website:	Website:

Sierra Leone

Policy Maker	Regulator
Ministry of Information, Communication, Tourism and Culture	Sierra Leone Telecommunications Company (SIERRATEL)
Youyi Building Brookfields	PO Box 80 7, Wallace Johnson Street
Freetown	Freetown
Phone: +232 22 240911	Phone: +232 22 222 804
Fax: +232 22 241757	Fax: +232 22 224 439
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Singapore

Ministry of Communications and Information Technology	Telecommunication Authority of Singapore
#39-00 PSA Building 460 Alexandra Road	35 Robinson Road TAS Building
Singapore	Singapore
Phone:	Phone: +65 323 3888
Fax:	Fax: +65 323 09 64
Email: mcit@mcit.gov.sg	Email: mailmaster@www.tas.gov.sg
Website: http://www.gov.sg/mcit/pr/index.html	Website: http://www.tas.gov.sg/

Slovak Republic

Ministry of Transport, Posts and Telecommunications	Telecommunications Office
Námestie Slobody 6	Jarosova 1
810 05 Bratislava 15	830 08 Bratislava
Phone: +421 7 5273 1434	Phone: +421 7 254 328
Fax: +421 75273 1437	Fax: +421 7 259 577
Email: telecom@telecom.gov.sk	Email: secretary@teleoff.gov.sk
Website: http://www.telecom.gov.sk	Website: http://www.teleoff.gov.sk

Slovenia

Ministry of Transport and Communications	Telecommunication Administration Ministry of Transport and Communications
Sector for Post and Telecommunications Langusova 4 P.P./P.O. Box 425	Kotnikova 19a
SI-1535 Ljubljana	SI-1000 Ljubljana
Phone: +386 61 1788 000	Phone: +386 61 1734 900
Fax: +386 61 1788 142	Fax: +386 61 1328 036
Email: mpz.info@gov.si	Email: urst.box@gov.si
Website: http://www.sigov.si/mpz/	Website: http://www.sigov.si/urst

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Solomon Islands

Ministry of Transport, Works, Aviation and Communications	Ministry of Transport, Works and Communications
P.O. Box G25	P.O. Box G25
Honiara	Honiara
Phone: +677 21 821	Phone: +677 21 821
Fax: +677 21 472	Fax: +677 21 472
Email:	Email:
Website:	Website:

Somalia

Ministry of Posts and Telecommunications	Ministry of Posts and Telecommunications
Mogadishu	Mogadishu
Phone: +252 1 29 005	Phone: +252 1 29 005
Fax:	Fax:
Email:	Email:
Website:	Website:

South Africa

Ministry for Posts, Telecommunications and Broadcasting	South African Telecommunications Regulatory Authority (SATRA)
Department of Communications	Pin Mill Farm, Block B 164 Katherine Street
Pretoria 0001	Sandton - Private Bag X1 Marlboro 2063
Phone: +27 12 427 8000	Phone: +27 11 448 2497
Fax: +27 12 427 8016	Fax: +27 11 448 2499
Email: pmg@cis.co.za	Email: npgosa@icon.co.za
Website: http://www.doc.gov.za/	Website: http://satra.gov.za

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Spain

Ministerio de Fomento	Comisión del Mercado de las Telecomunicaciones (CMT)
Secretaría General de Comunicaciones Alcalá 50	C/Velazquez, 164- 2 planta
28071 Madrid	28002 Madrid
Phone: +349 1 521 6500	Phone: +349 1 3 72 41 20
Fax: +349 1 531 1051	Fax: +3491 3 72 42 05
Email:	Email:
Website:	Website: http://www.cmt.es/

Sri Lanka

Ministry of Posts, Telecommunications & Media	Telecommunication Regulatory Commission
Lotus Road	276, Elvitigala Mawatha Manning Town
Colombo 1	Colombo 08
Phone: +94 1 29 567	Phone: +94 1 689 345
Fax: +94 1 541 531	Fax: +94 1 689 341
Email: sectel@slt.lk	Email: dgtsl@slt.lk
Website:	Website: http://www.trc.gov.lk

St. Lucia

Ministry of Communications, Works, Transports and Public Utilities	Ministry of Communications, Works, Transports and Public Utilities
Micaud Street	Micaud Street
Castries	Castries
Phone: +1 758 452 2611	Phone: +1 758 452 2611
Fax: +1 758 453 2769	Fax: +1 758 453 2769
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

St. Vincent

Policy Maker		Regulator	
Ministry of Communications and Works		Ministry of Communications and Works	
Ministerial Building, Halifax Street		Ministerial Building, Halifax Street	
Kingstown		Kingstown	
Phone:	+1 809 457 2031	Phone:	+1 809 457 2031
Fax:	+1 809 456 2168	Fax:	+1 809 456 2168
Email:		Email:	
Website:		Website:	

Sudan

Policy Maker		Regulator	
Ministry of Roads and Communications		National Telecommunication Council	
P.O. Box 1130		P.O. Box 2869	
Khartoum		Khartoum	
Phone:	+249 11 779493	Phone:	+249 11 779559
Fax:	+249 11 780507	Fax:	+249 11 772385
Email:		Email:	Itisalat@email.sudanet.net
Website:		Website:	

Suriname

Policy Maker		Regulator	
Ministry of Transport, Communications & Tourism		Telecommunicatiebedrijf Suriname (Telesur)	
Prins Hendrikstraat No. 26-28		Heiligenweg No. 1 P.O.Box 1839	
Paramaribo		Paramaribo	
Phone:	+597 4 11951	Phone:	+597 474 242
Fax:	+597 4 20425	Fax:	+597 404800
Email:	tctper@sr.net	Email:	secriz@sr.net
Website:		Website:	http://www.sr.net

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Swaziland

Ministry of Transport and Communications	Swaziland Posts and Telecommunications Corporation (SPTC)
P.O. Box 2652	P.O. Box 125
Mbabane	Mbabane
Phone: +268 46420	Phone: +268 43131
Fax: +268 46438	Fax: +268 43130
Email:	Email:
Website:	Website:

Sweden

Ministry of Transport and Communications	National Post and Telecom Agency
Vasagatan 8 - 10	Post 8 Telestyrelsen Box 5398
S - 10333 Stockholm	S - 10246 Stockholm
Phone: +46 8 405 1000	Phone: +46 8 678 55 00
Fax: +46 8 411 8943	Fax: +46 8 678 55 05
Email:	Email: pts@pts.se
Website: http://naring.regeringen.se/	Website: http://www.pts.se

Switzerland

Département Fédéral de l'Environnement, des Transports, de l'Energie et de la Communication	Office Fédéral de la Communication (OFCOM)
Secrétariat général Palais Fédéral Nord	44, rue de l'Avenir
CH-3003 Berne	2501 Bienne
Phone: +41 31 322 5511	Phone: +41 32 327 55 11
Fax: +41 31 322 9576	Fax: +41 32 327 55 55
Email: info@gs-uvek.admin.ch	Email:
Website: http://www.admin.ch/eved/e/index.html	Website: http://www.bakom.ch

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Syria

Ministry of Communications	Board of Directors of Syrian Telecommunication Establishment headed by Director General
Al-Magles Al-Niyabi Street	Mazee Autostrad
Damascus	Damascus
Phone: +963 11 332 0807	Phone: 963 11 612 2400
Fax: +963 11 224 6403	Fax: 963 11 622 4 000
Email:	Email:
Website:	Website:

Tajikistan

Ministry of Communications	Ministry of Communications
Rudaki Avenue 57	Rudaki Avenue 57
734000 Dushanbe	734000 Dushanbe
Phone: +7 3 772 23 22 84	Phone: +7 3 772 23 22 84
Fax: +7 3 772 21 29 53	Fax: +7 3 772 21 29 53
Email: inbox@mocdir.td.silk.org	Email:
Website:	Website:

Tanzania

Ministry of Communications and Transport	Tanzania Communications Commission (TCC)
PO Box 9144	P.O. Box 474
Dar-Es-Salaam	Dar-Es-Salaam
Phone: +255 51 112 858	Phone: +255 51 118 947
Fax: +255 51 112 751	Fax: +255 51 116 664
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

TFYR Macedonia

Policy Maker	*Regulator*
Ministry of Transport and Communications	Ministry of Transport and Communications
"Crvena Skopska Opstina" 4	"Crvena Skopska Opstina" 4
Skopje	Skopje
Phone: +389 91 123 292	Phone: +389 91 123 292
Fax: +389 91 126 228	Fax: +389 91 126 228
Email:	Email:
Website:	Website:

Thailand

Policy Maker	*Regulator*
Ministry of Transport and Communications	Post and Telegraph Department
38 Ratchadamnoen Nok Avenue Pom Prab Sattru Phai District	87 Soi Sailom, Phaholyothin Road
Bangkok 10100	Bangkok 10400
Phone: +662 283 3000	Phone: +66 272 6888
Fax: +662 281 3959	Fax: +66 271 3512
Email:	Email:
Website: http://www.motc.go.th/	Website: http://www.ptd.go.th

Togo

Policy Maker	*Regulator*
Ministère des Mines, de l'Energie et des Postes et Télécommunications	Ministère des Mines, de l'Energie et des Postes et Télécommunications
B.P. 389	B.P. 389
Lomé	Lomé
Phone: +228 212528	Phone: +228 212528
Fax: +228 216812	Fax: +228 216812
Email: mmetpt@togotel.net.tg	Email: mmetpt@togotel.net.tg
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Tonga

Ministry of Telecommunications	Satellite Unit
Prime Minister's Office	Prime Minister's Office
Nuku'alofa	Nuku'alofa
Phone: +676 21 300	Phone: +676 21 300
Fax: +676 23 888	Fax: +676 23 888
Email:	Email:
Website:	Website:

Trinidad & Tobago

Office of Prime Minister, Telecommunications Division	Office of Prime Minister, Telecommunications Division
17A Abercromby Street	17A Abercromby Street
Port-of-Spain	Port-of-Spain
Phone: +1 809 623 8060	Phone: +1 809 623 8060
Fax: +1 809 624 3869	Fax: +1 809 624 3869
Email:	Email:
Website:	Website:

Tunisia

Ministère des communications	Ministère des communications
3 bis, rue d'Angleterre	3 bis, rue d'Angleterre
1030 Tunis	1030 Tunis
Phone: +216 1 33 34 36	Phone: +216 1 33 34 36
Fax: +216 1 35 23 53	Fax: +216 1 33 26 85
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Turkey

Ministry of Transport and Communications	Türk Telekomünikasyon A.S.
General Directorate of Communications 90.Sok.No.5	Turgut Özal Bulvan Ziraat Mahallesi
06338 Emek - Ankara	06103 Ankara
Phone: +90 312 212 8088	Phone: +90 312 313 2900
Fax: 90 312 212 1775	Fax: +90 312 313 2940
Email: soytas@ubak.opr.tr	Email: erturk@tgm.gov.tr
Website: http://www.ubak.gov.tr/	Website:

Turkmenistan

Ministry of Communications	Ministry of Communications
Zhitnikova St. 36	Zhitnikova St. 36
ASHGABAT	ASHGABAT
Phone: +7 3632 35 21 53	Phone: +7 3632 35 21 53
Fax: +7 3632 39 04 20	Fax: +7 3632 39 04 20
Email:	Email:
Website:	Website:

Tuvalu

Ministry of Works, Energy & Communications	Ministry of Works, Energy & Communications
Private Mail Bag	Private Mail Bag
Funafuti	Funafuti
Phone: +688 20052	Phone: +688 20052
Fax: +688 20800	Fax: +688 20800
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Uganda

Policy Maker	*Regulator*
Ministry of Works, Housing and Communications	Uganda Communications Commission
P.O. Box 10	P.O. Box 7376
Entebbe	Kampala
Phone: +256 41 20580	Phone: +256 41 348 830
Fax:	Fax: +256 41 348 832
Email:	Email:
Website:	Website:

Ukraine

Policy Maker	*Regulator*
The State Committee of Posts and Telecommunications	The State Committee of Posts and Telecommunications
Phone: +380 44 2262140	Phone: +380 44 2262140
Fax: +380 44 228 6141	Fax: +380 44 228 6141
Email:	Email:
Website:	Website:

United Arab Emirates

Policy Maker	*Regulator*
Ministry of Communications	Ministry of Communications
P.O. Box 900	P.O. Box 900
Abu Dhabi	Abu Dhabi
Phone: +971 2 651 900	Phone: +971 2 651 900
Fax: +971 2 668 180	Fax: +971 2 668 180
Email: Mincom@Emirates.net.ae	Email: Mincom@Emirates.net.ae
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators — World

Policy Maker	*Regulator*

United Kingdom

Department of Trade and Industry		Office of Telecommunications (OFTEL)	
151 Buckingham Palace Road		50 Ludgate Hill	
London SW1W 9SS		London EC4M 7JJ	
Phone:	+44 1 71 215 5000	Phone:	+44 171 634 8700
Fax:	+44 1 71 215 2909	Fax:	+44 171 634 8943
Email:		Email:	
Website:	http://www.dti.gov.uk/	Website:	http://www.oftel.gov.uk/

United States

The United States Congress *		Federal Communications Commission	
		1919 M Street, N.W.	
WASHINGTON DC 20510		Washington DC 20554	
Phone:		Phone:	+1 202 418 0200
Fax:		Fax:	+1 202 418 0232
Email:		Email:	fccinfo@fcc.gov
Website:		Website:	http://www.fcc.gov/

*The National Telecommunications and Information Administration (NTIA) of the Department of Commerce serves as the President's principal advisor on telecommunications and information policy matters. The Department of Justice is responsible for telecommunications matters that raise possible antitrust issues. The Department of State is responsible for formulation and coordination of foreign policy related to international communications and information policy. Major telecommunications laws are made by the United States Congress and the President.

Uruguay

Dirección Nacional de Comunicaciones		Dirección Nacional de Comunicaciones	
Calle Boulevar Artígas 1520		Calle Boulevar Artígas 1520	
Montevideo		Montevideo	
Phone:	+598 2 707 3662	Phone:	+598 2 707 3662
Fax:	+598 2 707 3591	Fax:	+598 2 707 3591
Email:	dnc@netgate.com.uy	Email:	dnc@netgate.com.uy
Website:	http://dnc.comintur.com.uy/	Website:	http://dnc.comintur.com.uy/

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Uzbekistan

Policy Maker	Regulator
Posts and Telecommunications Agency of Uzbekistan (UPTA)	Posts and Telecommunications Agency of Uzbekistan (UPTA)
1, Tolstoj Street	1, Tolstoj Street
Tashkent 700000	Tashkent 700000
Phone: +7 3711 336 503	Phone: +7 3711 336 503
Fax: +7 3711 335 227	Fax: +7 3711 335 227
Email:	Email:
Website:	Website:

Vanuatu

Policy Maker	Regulator
Minister for Public Works, Communications, Transport and Civil Works	Minister for Public Works, Communications, Transport and Civil Works
Managing Director Telecom Vanuatu Ltd. P.O. Box 146	Managing Director Telecom Vanuatu Ltd. P.O. Box 146
Port-Vila	Port-Vila
Phone: +678 22 185	Phone: +678 22 185
Fax: +678 22 628	Fax: +678 22 628
Email:	Email:
Website: Http://www.tvl.net.vu	Website: http://www.tvl.net.vu

Vatican

Policy Maker	Regulator
Governatorato Administration des PTT	
V-00120 Citta' del Vaticano	
Phone: +39 6 6982	
Fax: +39 6 698 85378	
Email:	
Website:	

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Venezuela

Ministerio de Transporte y Comunicaciones	Comisión Nacional de Telecomunicaciones
Av. Lecuna Torre Este, Piso 51 Parque Central	Av. Veracruz con Calle Cali Edificio MTC, Piso 1 Urbanización Las Mercedes Apartado No. 612274
Caracas 1020	Caracas 1030
Phone: +58 2 509 1001	Phone: +58 2 993 0261
Fax: +58 2 509 1718	Fax: +58 2 500 3512
Email:	Email:
Website:	Website: http://www.conatel.gov.ve

Viet Nam

Department General of Posts and Telecommunications	Department General of Posts and Telecommunications
18 Nguyen Du Street	18 Nguyen Du Street
Hanoi 10000	Hanoi 10000
Phone: +84 4 8226580	Phone: +84 4 8226580
Fax: +84 4 8226590	Fax: +84 4 8226590
Email:	Email:
Website:	Website:

Western Samoa

Posts and Telecommunications Department	Posts and Telecommunications Department
APIA	APIA
Phone: +685 23456	Phone: +685 23456
Fax: +685 24000	Fax: +685 24000
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Yemen

Policy Maker	*Regulator*
Ministry of Communications	Ministry of Communications
P.O. Box 25237	P.O. Box 25237
Sana'a	Sana'a
Phone: +967 1 33 14 56	Phone: +967 1 33 14 56
Fax: +967 1 33 14 57	Fax: +967 1 33 14 57
Email:	Email:
Website:	Website:

Yugoslavia

Policy Maker	*Regulator*
Federal Ministry of Telecommunications	Federal Ministry of Telecommunications
Bulevar Lenjina 2	Bulevar Lenjina 2
11070 Belgrade	11070 Belgrade
Phone: +381 11 311 42 40	Phone: +381 11 311 42 40
Fax: +381 11 603 645	Fax: +381 11 603 645
Email:	Email:
Website:	Website:

Zambia

Policy Maker	*Regulator*
Ministry of Communications and Transport	Communications Authority
P.O. Box 50065	P.O.Box 36871
Lusaka	Lusaka
Phone: +260 1 251444	Phone: +260 1 241236
Fax: +260 1 253530	Fax: +260 1 246701
Email:	Email: caz@zamnet.zm
Website:	Website: http://www.zamnet.zm/zamn

Source: ITU World Telecommunication Regulatory Database

1. List of Policy Makers and Regulators

World

Policy Maker	*Regulator*

Zimbabwe

Ministry of Information, Posts and Telecommunications	The Postmaster General
P.O. Box CY 825	Posts and Telecommunication Corporation Headquarters 107 Union Avenue Runhare Hse PO Box CY 331 Causeway
Harare	Harare
Phone: +263 4 706 328	Phone: +263 4 728811
Fax: +263 4 707 213	Fax: +263 4 731683
Email:	Email:
Website:	Website:

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Albania						
Telecommunications Regulatory Entity	1998	Yes	Yes	Head of State	License fees	Yes: 5 members
Angola						
Direcçao National de Correios e Telecomunicaçoes	1985	Yes	No	Ministry	Other: Government Central Budget	No: Director-General
Argentina						
Comisión Nacional de Comunicaciones	1996			Other: Ministry of Communications (Presidency of the Republic)	Other: The National Telecommunications Fund	No: Directors
Australia						
Australian Communications Authority	1997			Ministry	License fees	No: Chairman (+ 2 members)
Austria						
Telecom Control	1997	Yes	Yes	Other: Parliament	License fees	Yes: 6 members
Bahrain						
Telecommunications Directorate Ministry of Transportation	1996	Yes	No	Ministry	Government appropriation	No: Director
Belgium						
Institut Belge des Services Postaux et des Télécommunications	1993	Yes	No	Ministry	License fees	No: General Administrator
Bolivia						
Superintendencia de Telecomunicaciones	1995	Yes	Yes	Other: The Sectoral Regulatory Superintendencia	Other: Through regulation charges	No: Superintendent
Botswana						
Botswana Telecommunications Authority	1996	Yes	Yes	Ministry	License fees	Yes: 5 members

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Brazil						
Agência Nacional de Telecomunicações (ANATEL)	1997	Yes	Yes	Ministry	License fees	Yes: 5 members
Bulgaria						
State Telecommunications Commission	1998	Yes	Yes	Ministry	License fees	Yes: 5 members
Burundi						
Agence de Régulation et de Contrôle des Télécommunications (ARCT)	1997	Yes	Yes	Other: Ministry of National Defense	License fees	No: Director-General
Canada						
Canadian Radio-Television and Telecommunications Commission	1976	Yes	Yes	Other: Parliament through department of Heritage	Other: Fees charged to regulated carriers	Yes: 12 members
Cape Verde						
Direcção Geral das Comunicações	1992	Yes	No	Ministry	Government appropriation	No: Director-General
Central African Rep.						
Ministère des Postes et des Télécommunications	1996	Yes	No	Ministry	License fees	Yes
Colombia						
Comisión de Regulación de Telecomunicaciones	1994	Yes	Yes	Head of State	Other: Contribution by regulated firms	Yes: 5 members
Costa Rica						
Autoridad Reguladora de Servicios Públicos (ARESEP)	1996	Yes	Yes	Legislative Branch	Other: Contributions paid by operators	Yes: 5 members
Côte d'Ivoire						
Agence des Télécommunications de Côte d'Ivoire	1995	Yes	No	Ministry	License fees	Yes: 12 members
Czech Republic						
Czech Telecommunications Office	1993	Yes	No	Ministry	Government appropriation	No: Director-General

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Denmark						
National Telecom Agency	1991	Yes	Yes	Ministry	Government appropriation	No: Director-General
Dominican Rep.						
Instituto Dominicano de las Telecomunicaciones	1998					
Ecuador						
Consejo Nacional de Telecomunicaciones (CONATEL)	1995			Head of State	License fees	Yes
Egypt						
Telecommunication Regulatory Authority	1998	Yes	No	Ministry	License fees	Yes: 11 members
El Salvador						
Superintendencia General de Electricidad y Telecomunicaciones (SIGET)	1996	Yes	No	Head of State	License fees	Yes: 3 members
Eritrea						
Communications Department	1998	Yes	No	Ministry	License fees	No: Director-General
Estonia						
National Communications Board	1998	Yes	Yes	Ministry	Other: State budget	No: Director-General
Ethiopia						
Ethiopian Telecommunications Agency (ETA)	1996	Yes	No	Ministry	License fees	No: General Manager
Finland						
Telecommunications Administration Centre	1988	Yes	Yes	Ministry	Numbering Fees	No: Director-General (Chief Executive Officer)
France						
L'Autorité de Régulation des Télécommunications	1997	Yes	Yes	It is independent	Government appropriation	Yes: 5 members

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Germany						
Regulatory Authority for Telecommunications and Posts	1998			Other: Parliament	License fees	Yes
Ghana						
National Communications Authority	1997	Yes		Ministry	License fees	No: Chairman of the Board
Greece						
National Telecommunications Commission				Other: Supervised by the Ministry of Transport and Communications but financially independent.	Other: Regulatory fees	Yes: 7 members
Guatemala						
Superintendencia de Telecomunicaciones	1996			Ministry	Other: Private funds made up of: 30%of the proceeds of frequency auctions, the proceeds of numbering auctions and the collection of administrative charges for service provision.	No: Superintendent
Guinea						
Direction Nationale des Postes et Télécommunications	1995	Yes	No	Ministry	Government appropriation	No: National Director of Posts and Telecommunications
Guyana						
National Frequency Management Unit	1992			Other: Prime Minister	License fees	No
Honduras						
Comisión Nacional de Telecomunicaciones	1995			Ministry	Other: Credit assigned by the Ministry of Finance	Yes: members
Hongkong SAR						
Office of the Telecommunications Authority	1993			Ministry	License fees	No: Director-General

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Hungary						
Communication Authority	1990	Yes	No	Ministry	License fees	No: President
Iceland						
Post and Telecommunication Administration	1996	Yes	Yes	Ministry	License fees	No: Director-General
India						
Telecommunication Regulatory Authority of India (TRAI)	1997			Other: Parliament	Government appropriation	Yes
Ireland						
Director of Telecommunications Regulation	1997			Other: It is independent but reports annually to the government.	Other: Levy payable by licensed providers	No
Italy						
Autorità Garante nelle Comunicazioni	1998			It is independent	License fees	Yes
Jamaica						
Office of Utilities Regulation (OUR)	1995	Yes	No	Ministry	Other: Public Utility companies	No: Director-General
Jordan						
Telecommunications Regulatory Commission	1995			It is independent	License fees	No: Director-General
Kenya						
Communications Commission of Kenya	1999	Yes	Yes	Ministry	License fees	Yes: 11 members
Kyrgyzstan						
National Communications Agency	1997	Yes	Yes	Head of State	License fees	No: Director

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Latvia						
Ministry of Transport Department of Communications	1992	Yes	No	Ministry	Government appropriation	Yes: Departement of Communications: 12, Tariff Council: 7
Luxembourg						
Institut Luxembourgeois des Télécommunications (ILT)	1997			It is independent	Other: Fees charged upon the operators and any other person whose activities are monitored by the ILT.	No: Director
Madagascar						
Office Malagasy d'Etudes et de Régulation des Télécommunications	1997	Yes	Yes	Ministry	License fees	No: Director-General
Malawi						
Malawi Communications Regulatory Authority	1998			It is independent	License fees	Yes: 7 members
Malaysia						
Malaysian Communications and Multimedia Commission	1999	Yes	No	Ministry	Government appropriation	Yes
Malta						
Telecommunications Regulator c/o The Director, Wireless Telegraphy	1998					
Mauritius						
Telecommunications Authority	1988			Other: The Prime Minister's Office	Government appropriation	No: Chairman
Mexico						
Comisión Federal de Telecomunicaciones	1996	Yes	No	Ministry	Government appropriation	Yes: 4 members
Mongolia						
Communications Regulatory Body	1996			Ministry	License fees	Yes

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Morocco						
Agence Nationale de Réglementation des Télécommunications	1998	Yes	Yes	Other: Prime Minister	License fees	No: Director-General
Mozambique						
Instituto Nacional das Comunicaçoes de Moçambique	1992	Yes	No	Ministry	License fees	No: Director-General
Namibia						
Namibia Communications Commission	1992	Yes	No	Ministry	Government appropriation	Yes: 7 members
Nepal						
Nepal Telecommunication Authority	1998	Yes	Yes	Ministry	License fees	Yes: 5 members
Netherlands						
Independent Posts and Telecommunications Authority (OPTA)	1997			It is independent	Other: To a large extent by the market players.	Yes
Nicaragua						
Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)	1995			Head of State	License fees	No: Director-General
Nigeria						
Nigerian Communications Commission	1992	Yes	No	Ministry	License fees	No: Director-General
Norway						
Norwegian Post and Telecommunications Authority	1987	Yes	Yes	Ministry	License fees	No: Director-General
Pakistan						
Pakistan Telecommunications Authoriry (PTA)	1996	Yes	Yes	Ministry	License fees	Yes: 3 members
Panama						
Ente Regulador de los Servicios Públicos	1996	Yes	Yes	Ministry	Other: Regulatory fees	Yes: 3 members

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Papua New Guinea						
Papua New Guinea Telecommunications Authority	1997			Ministry	License fees	No: Director-General
Paraguay						
Comisión Nacional de Telecomunicaciones	1995	Yes	No	Ministry	License fees	Yes: 7 members 5 officials and 2 substitutes
Peru						
Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)	1994	Yes	Yes	It is independent	Other: Provision of supervisory services	Yes
Philippines						
National Telecommunications Commission	1979	Yes		Other: Sector Department	Government appropriation	Yes: 3 members
Portugal						
Instituto das Comunicaçôes de Portugal	1989	Yes	Yes	Ministry	License fees	No: A Board
Romania						
National Agency for Communications and Informatics	1998					
Singapore						
Telecommunication Authority of Singapore	1992	Yes	Yes	Ministry	License fees	No: Director-General
Slovak Republic						
Telecommunications Office	1993	Yes	No	Ministry	Government appropriation	No: Director-General
South Africa						
South African Telecommunications Regulatory Authority (SATRA)	1997	Yes	Yes	Other: Parliament	Other: Parliamentary appropriation	Yes: 6 members

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
Spain						
Comisión del Mercado de las Telecomunicaciones (CMT)	1996	Yes			Other: Properties and goods which constitute its assets and the proceeds and income therefrom; income obtained from the settlements of charges and rents, consumer charges and penalties imposed in the context of service provision activities and management of the public numbering domain; also tranfers which are effected by the Ministerio de Fomento from the general State budgets.	
Sri Lanka						
Telecommunication Regulatory Commission	1997			Ministry	License fees	Yes
Sudan						
National Telecommunication Council	1996	Yes	No	Ministry	License fees	Yes: 15 members
Switzerland						
Office Fédéral de la Communication (OFCOM)	1992	Yes	Yes	Ministry	License fees	No: OFCOM: Director
Tanzania						
Tanzania Communications Commission (TCC)	1994			Ministry	License fees	Yes
Uganda						
Uganda Communications Commission	1997	Yes	Yes	Ministry	License fees	Yes: 7 members 6 are part-time and 1 full-time Executive Director
United Kingdom						
Office of Telecommunications (OFTEL)	1984	Yes	Yes	Other: Parliament	License fees	No: Director-General

Source: ITU World Telecommunication Regulatory Database

2. Countries with a separate Regulatory Authority

World

Country / *Name of Authority*	*Year created*	*Independent from the incumbent*	*Independent from political power*	*Reports to*	*Financing of the Authority*	*Is it a collegial body?*
United States						
Federal Communications Commission	1934	Yes	Yes	Other: It is independent with Congressional oversight and budget control.	License fees	Yes
Venezuela						
Comisión Nacional de Telecomunicaciones	1991			Ministry	License fees	No: Director-General
Zambia						
Communications Authority	1994	Yes	Yes	Ministry	License fees	Yes: 9 members

Source: ITU World Telecommunication Regulatory Database

3. Services subject to licensing

World

country	*Local services*	*Domestic long distance*	*Int'l*	*Data*	*Telex*	*Leased lines*	*Mobile*	*Paging*	*Cable TV*	*Fixed satellite*	*Mobile Satellite*	*GMPCS*	*ISP*
Afghanistan													
Albania	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y
Algeria													
Andorra													
Angola							Y	Y		Y	Y	Y	Y
Antigua & Barbuda													
Argentina	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		
Armenia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Australia	N	N	N	N	N	N	N	N	N	N	N		
Austria	Y	Y	Y	Y	N	Y	Y	Y	N	N	N	N	N
Azerbaijan	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y
Bahamas								Y		Y	Y		
Bahrain	N	N	N	N	N	N	N	N			N		N
Bangladesh	Y	Y		Y	Y	Y	Y	Y	Y	Y			
Barbados	Y		Y	Y	Y	Y	Y	Y	Y	Y			
Belarus	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Belgium	Y	Y	Y	N	Y	N	Y	Y		Y	Y	Y	
Belize	Y	Y	Y	Y	Y	Y	Y	Y	Y				
Benin				Y			Y						
Bhutan													
Bolivia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Bosnia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Botswana	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Brazil	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Brunei Darussalam	Y	Y	Y	Y	Y	Y	Y	Y					
Burkina Faso													
Burundi	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Cambodia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Cameroon	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Canada	N	N	Y	N	N	N	Y	Y	Y	Y	Y		N
Cape Verde	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y
Central African Rep.						Y	Y					Y	Y
Chad	N	N	N	N	N	Y	Y			Y	Y		N
Chile	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
China							Y	Y		Y	Y		Y
Colombia	N	Y	Y	Y		N	Y	Y	Y	Y	Y	Y	Y
Comoros													
Congo							Y	Y		Y	Y		

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

3. Services subject to licensing

World

country	*Local services*	*Domestic long distance*	*Int'l*	*Data*	*Telex*	*Leased lines*	*Mobile*	*Paging*	*Cable TV*	*Fixed satellite*	*Mobile Satellite*	*GMPCS*	*ISP*
Congo (Dem. Rep.)	Y	Y	Y	Y	Y		Y		Y	Y	Y		Y
Costa Rica								Y	Y				
Côte d'Ivoire	N	N	N	Y	N	Y	Y	Y		N	Y	Y	Y
Croatia	N	N	N	Y	N	N	Y	Y	Y	N	N		Y
Cuba	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cyprus	N	N	N	N	N	N	N	N	N	N	N	N	N
Czech Republic	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
D.P.R. Korea													
Denmark	N	N	N	N	N	N	Y	Y	N	N	N	N	N
Djibouti	N	N	N	N	N	N	Y	N	Y	N	N	N	Y
Dominica	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Dominican Rep.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Ecuador	Y	Y	Y	Y	Y	Y	Y	Y		Y			
Egypt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
El Salvador	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Equatorial Guinea													
Eritrea	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Estonia	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N
Ethiopia	Y	Y	Y	Y	Y		Y	Y		Y		Y	Y
Fiji	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Finland							Y						
France	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	N
Gabon													
Gambia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Georgia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Germany	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y		
Ghana	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Greece	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Grenada	N		N	N	N	N	N	N	Y	N	N		
Guatemala	N	N	N	N	N	N	N	N	N	Y	Y		
Guinea	Y		Y	Y			Y		Y	Y	Y	Y	Y
Guinea-Bissau													
Guyana	N	N	N	N	N		Y	Y					
Haiti	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y		
Honduras	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Hungary	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Iceland	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N		N
India	Y						Y						
Indonesia	Y	N	N	Y	N	Y	Y	Y	N				Y

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

3. Services subject to licensing

World

country	Local services	Domestic long distance	Int'l	Data	Telex	Leased lines	Mobile	Paging	Cable TV	Fixed satellite	Mobile Satellite	GMPCS	ISP
Iran (I.R.)													
Iraq													
Ireland	Y	Y	Y			Y	Y		Y				
Israel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Italy	Y	Y	Y	N	N	Y	Y		Y	Y	Y		
Jamaica	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N
Japan	Y		Y	Y		Y	Y						
Jordan	Y	Y	Y	Y	Y	N	Y	Y		Y	Y		
Kazakhstan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Kenya	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y
Kiribati	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Korea (Rep.)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N
Kuwait	N	N	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Kyrgyzstan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lao P.D.R.	Y	Y	Y	Y		Y	Y	Y		Y	Y		
Latvia	N	N	N		N	N	Y	Y	Y	Y	Y		N
Lebanon	N	N	N	Y	N	Y	N		N	N	N	N	Y
Lesotho							Y						
Liberia													
Libya													
Liechtenstein													
Lithuania	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y		
Luxembourg	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Madagascar	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Malawi	N	N	N	Y	N	N	Y	Y	Y	Y	Y		
Malaysia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Maldives	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Mali	N	N	N	N	N	N	N	N	N	N	N	N	N
Malta	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
Marshall Islands	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Mauritania	N	N	N	N	N	N	N	Y	N	N	N	N	Y
Mauritius	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		
Mexico	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N
Micronesia	N	N	N	N	N	N	Y	Y	Y	Y	Y		
Moldova	Y	Y	Y		Y	N	Y	Y	Y	Y			Y
Monaco													
Mongolia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Morocco	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N
Mozambique	N	N	N	Y	N	N	N	Y	Y	N	N		Y

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

3. Services subject to licensing

World

country	Local services	Domestic long distance	Int'l	Data	Telex	Leased lines	Mobile	Paging	Cable TV	Fixed satellite	Mobile Satellite	GMPCS	ISP
Myanmar													
Namibia	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	N
Nauru	N	N	N	N	N	N	N			N	Y		
Nepal	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Netherlands	N	N	N	N	N	N	Y	Y	Y	Y	N		
New Zealand	N	N	N	N	N	N	Y	Y	N	Y	Y		
Nicaragua	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		
Niger	N	N	N	Y	N	Y	Y	Y				Y	Y
Nigeria	Y	Y	Y	Y		Y	Y	Y	Y	N	N	N	Y
Norway	Y	Y	Y			Y	Y	Y	Y				
Oman	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y		
Pakistan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Panama	N	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y
Papua New Guinea	Y	Y	Y	N	N		Y	Y	Y	Y	N		
Paraguay	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Peru	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Philippines	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Poland	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
Portugal	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y		N
Qatar	N	N	N	N	N	N	Y	Y	Y	N	Y	Y	Y
Romania	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Russia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rwanda	N	N	N	Y	N	N	Y	Y	N	Y	Y		
S. Tomé & Principe													
San Marino	Y	Y	Y	Y		Y	Y	Y		Y			
Saudi Arabia	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		
Senegal	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Sierra Leone	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Singapore	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y
Slovak Republic	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y
Slovenia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Solomon Islands													
Somalia													
South Africa	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Spain	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sri Lanka	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		
St. Lucia	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y
St. Vincent	Y	Y	Y				Y	N	Y			Y	N
Sudan	Y	Y	Y				Y	Y		Y	Y	Y	Y

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

3. Services subject to licensing

World

country	*Local services*	*Domestic long distance*	*Int'l*	*Data*	*Telex*	*Leased lines*	*Mobile*	*Paging*	*Cable TV*	*Fixed satellite*	*Mobile Satellite*	*GMPCS*	*ISP*
Suriname	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Swaziland							Y	Y	Y				
Sweden	Y	Y	Y			Y	Y	Y					
Switzerland	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
Syria	Y												
Tajikistan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Tanzania	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y		
TFYR Macedonia				Y									Y
Thailand	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Togo	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	N
Tonga	N	N	Y	N	N	N	N	N	Y	Y			
Trinidad & Tobago	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y		
Tunisia									Y	Y	Y		
Turkey	N	N	N	Y	N	Y	Y	Y	Y	Y	Y		
Turkmenistan	Y						Y	Y		Y	Y		
Tuvalu	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Uganda	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ukraine	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
United Arab Emirates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
United Kingdom	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
United States	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Uruguay				Y		Y	Y	Y	Y	Y	Y		
Uzbekistan	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Vanuatu													
Vatican													
Venezuela	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Viet Nam	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Western Samoa	N	N	N	N	N	N	Y			Y	Y		
Yemen	N	N	Y		N	N	Y	N		Y	Y	Y	Y
Yugoslavia	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Zambia	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
Zimbabwe	N	N	N	N	N	N	Y						

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

4. Status of the Incumbent Operator: State-owned

World

Country	*Postal and telecommunication services separated*	*Year*	*The incumbent operator is corporatized?*	*Year*
Afghanistan	N		N	
Albania	Y	1992	Y	1999
Algeria	N		N	
Andorra	Y		Y	
Antigua & Barbuda	Y			
Azerbaijan	N		N	
Bahamas	Y		Y	1966
Bangladesh	Y		N	
Belarus	Y		Y	
Benin	N		Y	
Bhutan	Y		N	
Bosnia	N		Y	
Botswana	Y		Y	1980
Brunei Darussalam	Y		N	
Bulgaria	Y	1992	Y	1992
Burkina Faso	Y		Y	1994
Burundi	Y	1979	Y	
Cambodia	N		N	
Cameroon	N		N	
Chad	N		Y	
China	Y	1998	N	
Colombia	Y		Y	1958
Comoros	N		Y	
Congo	N		Y	1964
Congo (Dem. Rep.)	Y	1997	Y	1968
Costa Rica	Y	1963	N	
Croatia	Y	1999	Y	1999
Cyprus	Y		N	
D.P.R. Korea	N		N	
Djibouti	N		Y	1957
Ecuador	Y		Y	1974
Egypt	Y		Y	1998
Eritrea	Y	1996	N	
Ethiopia	Y	1952	Y	1996
Fiji	Y		Y	1990
Gabon	N			
Gambia	Y		Y	1984
Honduras	Y		Y	
Iceland	Y	1997	Y	1997
Iraq	N			
Jordan	Y		Y	1997
Kenya	Y	1999	Y	1977
Kuwait	N		N	
Kyrgyzstan	Y		Y	
Lebanon	Y		Y	
Lesotho	Y		Y	1979
Liberia	Y		Y	
Libya	N		N	
Liechtenstein	Y			

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

4. Status of the Incumbent Operator: State-owned

World

Country	*Postal and telecommunication services separated*	*Year*	*The incumbent operator is corporatized?*	*Year*
Luxembourg	N		Y	1992
Madagascar	Y		Y	1994
Malawi	N		Y	1994
Mali	Y		Y	1989
Mauritania	N		Y	1990
Mauritius	Y		Y	1988
Micronesia	Y		Y	1981
Moldova	Y	1993	Y	1999
Monaco	Y		Y	
Morocco	Y	1998	Y	1998
Mozambique	Y	1981	Y	1992
Myanmar	N		N	
Namibia	Y	1992	Y	1992
Nauru	Y		N	
Nepal	Y	1960	Y	1975
Nicaragua	Y		Y	
Niger	Y		Y	1998
Nigeria	Y	1985	Y	1992
Norway	Y		Y	1992
Oman	Y		N	
Papua New Guinea	Y		Y	1996
Paraguay	Y		N	
Saudi Arabia	N		Y	1998
Sierra Leone	Y	1987	Y	1987
Slovak Republic	Y	1993	N	
Suriname	Y			
Swaziland	N		Y	1983
Sweden	Y		Y	1993
Syria	Y		N	
Tanzania	Y		Y	1994
TFYR Macedonia	Y	1996	Y	1997
Thailand	N		N	
Togo	Y	1997	Y	1996
Tonga	Y		Y	1984
Tunisia	Y		Y	
Turkey	Y		N	
Turkmenistan	Y		Y	1992
Tuvalu	Y		Y	1994
Uganda	Y	1998	Y	1998
Ukraine	Y		Y	
Uruguay	Y		N	
Uzbekistan	Y		Y	
Viet Nam	N		N	
Western Samoa	N		N	
Yemen	Y	1982	Y	1982
Zambia	Y	1994	Y	1975
Zimbabwe	N		Y	

Note: Y = Yes, N = No

Source: ITU World Telecommunication Regulatory Database

5. Status Incumbent Operator: Private

World

Country	*Postal and telecommunication operations separated*	*Year*	*Private ownership*	*Date of first privatization tranche*
Angola	Yes			
Argentina	Yes		Fully privatized	1990
Armenia	Yes	1994	Partially privatized	1998
Australia	Yes		Partially privatized	1997
Austria	Yes	1998	Partially privatized	
Bahrain	Yes		Partially privatized	1981
Barbados	Yes		Fully privatized	
Belgium	Yes		Partially privatized	1996
Belize	Yes		Fully privatized	
Bolivia	Yes		Partially privatized	1995
Brazil	Yes	1997	Fully privatized	1998
Canada	Yes		Fully privatized	
Cape Verde	Yes	1992	Partially privatized	1995
Central African Rep.	Yes	1982	Partially privatized	
Chile	Yes		Fully privatized	
Côte d'Ivoire	Yes	1984	Partially privatized	1997
Cuba	Yes	1995	Partially privatized	1994
Czech Republic	Yes	1993	Partially privatized	1994
Denmark	Yes	1980	Fully privatized	1991
Dominica	Yes		Partially privatized	
Dominican Rep.	Yes		Fully privatized	
El Salvador	Yes	1963	Partially privatized	1997
Equatorial Guinea	Yes		Partially privatized	
Estonia	Yes	1991	Partially privatized	1993
Finland	Yes	1998	Partially privatized	1998
France	Yes		Partially privatized	1997
Georgia	Yes		Partially privatized	
Germany	Yes		Partially privatized	1996
Ghana	Yes	1995	Partially privatized	1997
Greece	Yes		Partially privatized	1996
Grenada	Yes		Partially privatized	
Guatemala	Yes		Fully privatized	1998
Guinea	Yes	1992	Partially privatized	1996
Guinea-Bissau	Yes		Partially privatized	
Guyana	Yes		Partially privatized	1991
Haiti	Yes		Partially privatized	
Hungary	Yes	1990	Fully privatized	1993
India	Yes		Partially privatized	
Indonesia	Yes		Partially privatized	1995
Iran (I.R.)	Yes		Partially privatized	1994
Ireland	Yes		Partially privatized	
Israel	Yes	1984	Partially privatized	1990
Italy	Yes		Partially privatized	1997
Jamaica	Yes		Partially privatized	
Japan	Yes		Partially privatized	
Kazakhstan	Yes	1994	Partially privatized	1994
Kiribati	Yes		Partially privatized	
Korea (Rep.)	Yes	1981	Partially privatized	1993

Source: ITU World Telecommunication Regulatory Database

5. Status Incumbent Operator: Private

World

Country	*Postal and telecommunication operations separated*	*Year*	*Private ownership*	*Date of first privatization tranche*
Lao P.D.R.	Yes		Partially privatized	
Latvia	Yes	1992	Partially privatized	1994
Lithuania	Yes		Partially privatized	
Malaysia	Yes		Partially privatized	1990
Maldives	Yes		Partially privatized	1988
Malta	Yes		Partially privatized	1998
Marshall Islands	Yes		Partially privatized	
Mexico	Yes		Fully privatized	1990
Mongolia	Yes		Partially privatized	1995
Netherlands	No		Partially privatized	1994
New Zealand	Yes		Fully privatized	1990
Pakistan	Yes	1962	Partially privatized	1994
Panama	Yes		Partially privatized	1997
Peru	Yes		Partially privatized	1994
Philippines	Yes		Fully privatized	
Poland	Yes	1991	Partially privatized	1998
Portugal	Yes		Partially privatized	1995
Qatar	Yes		Partially privatized	1998
Romania	Yes	1991	Partially privatized	1997
Russia	Yes	1996	Partially privatized	1997
Rwanda	Yes		Partially privatized	
S. Tomé & Principe	Yes		Partially privatized	
San Marino	Yes		Partially privatized	
Senegal	Yes		Partially privatized	
Singapore	Yes	1992	Partially privatized	1993
Slovenia	Yes	1995	Partially privatized	1996
Solomon Islands	Yes		Partially privatized	1988
Somalia	Yes		Fully privatized	
South Africa	Yes	1991	Partially privatized	1997
Spain	Yes		Partially privatized	1992
Sri Lanka	Yes		Partially privatized	1997
St. Lucia	Yes		Fully privatized	
St. Vincent	Yes		Fully privatized	
Sudan	Yes		Partially privatized	1994
Switzerland	Yes	1997	Partially privatized	1998
Tajikistan	Yes		Partially privatized	1995
Trinidad & Tobago	Yes		Partially privatized	
United Arab Emirates	Yes		Partially privatized	
United Kingdom	Yes		Fully privatized	1984
United States	Yes		Fully privatized	
Vanuatu	Yes		Partially privatized	
Vatican				
Venezuela	Yes		Partially privatized	
Yugoslavia	Yes		Partially privatized	

Source: ITU World Telecommunication Regulatory Database

6. Level of Competition — World

Country	*Local services*	*Long distance*	*Int'l*	*Cellular*		*Leased lines*	*Data*	*Telex*	*Paging*	*Mobile sat.*	*Fixed sat.*	*Cable TV*	*GMPCS*	*ISP*
				Analog	*Digital*									
Afghanistan	M	M	M			M		M			M			
Albania	M	M	M		M	C	C	M	C	C	C	C	C	C
Algeria	M	M	M	M	M	M	M	M	M		M	M		
Andorra	M	M	M	M	M	M	M	M	M	M		D		
Angola	M	M	M	M		M	M	M						
Antigua & Barbuda	M	M	M	M	M	M	M	M						
Argentina	M	M	M	C	C	C	M	M	C	C	D	C		
Armenia	M	M	M		M	C	C	C	M	M	M	C	M	C
Australia	C	C	C	C	C	C	C	C	C	C	C	C		
Austria	C	C	C	M	C	C	C	C	C	C	C	M	D	C
Azerbaijan	M	M	M	C	C	M	M	M	C	M	M	C	M	C
Bahamas	M	M	M	M	M	M	C		C			M		
Bahrain	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Bangladesh	D	M	M	C	C	M	C	M	M		M			
Barbados	M		M	D	D	M	M	M	C					
Belarus	C	M	M	M	C	M	C	M	C	C	C	C		
Belgium	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Belize	M	M	M	M		M	M	M	M	M	M	C		
Benin	M	M	M	M	M	M	D	M						
Bhutan	M	M	M			M	M	M			M			
Bolivia	M	M	M	D	D	M	C	C	C	M	M	C		C
Bosnia	M	M	M	M	M	M	M	M	M	M	M	M		
Botswana	M	M	M		C	M	M	M	M					C
Brazil	D	D	D	D	D	C	C	C	C	C	C	C	C	C
Brunei Darussalam	M	M	D	M	M	M	M	M	M					
Bulgaria	M	M	M	M	M	M	C	M	C			C		C
Burkina Faso	M	M	M	M	M	M	M	M			M			
Burundi	M	M	M	C	C	D	C	M	C	C	C	C	C	C
Cambodia	C	M	M	C	C	M	C	M	C					
Cameroon	M	M	M	M	M	M	M	M		M	M			
Canada	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Cape Verde	M	M	M	C	C	M	M	M		M	M		C	C
Central African Rep.	M	M	M	C	C	C	C	M				C	C	C
Chad	M	M	M		D	M	M	M		C	M		C	M
Chile	C	C	C	C	C	C	C	C	C	C	C	C		
China	D	D	M	C	C	D	D	C	C	M		M		
Colombia	D	C	C	D	D	C	C	M	C	C	C	C		C
Comoros	M	M	M			M		M			M			
Congo	M	M	M	M	M	M		M	C	C				
Congo (Dem. Rep.)	C	C	C	C	C	C	C	C		C	C			C
Costa Rica	M	M	M	M	M	M	M	M	C		M	C		M
Côte d'Ivoire	M	M	M		C	C	C	M	C	C	M		C	C
Croatia	M	M	M	C	C	M	C	M	C	C	M	C		C
Cuba	M	M	M	M		M	M	M	M		M	M		C
Cyprus	M	M	M	M	M	M	M	M	M		M			C
Czech Republic	C	M	M	M	D	C	C	M	D	C	C	C		C
D.P.R. Korea	M	M	M											
Denmark	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Key: M = Monopoly; D = Duopoly; C = Competition

Note: This table reflects what is legally permissible; therefore it may not reflect the actual number of operators in the market.

Source: ITU World Telecommunication Regulatory Database

6. Level of Competition World

Country	Local services	Long distance	Int'l	Cellular Analog	Cellular Digital	Leased lines	Data	Telex	Paging	Mobile sat.	Fixed sat.	Cable TV	GMPCS	ISP
Djibouti	M	M	M	D		M	M	M	M	M	M			M
Dominica	M	M	M	M	M	M	M	M	M	M	M	C		
Dominican Rep.	C	C	C	C	C	C	C	C	C	C	C	C		
Ecuador	M	M	M	C		M	M	M	C		D			
Egypt	M	M	M	M	D	M	M	M	C	M	M		C	C
El Salvador	C	C	C	C	C		C		C	C	C	C	C	C
Equatorial Guinea	M	M	M	M										
Eritrea	M	M	M	C	C	M	C	M	C	C	C	C	C	C
Estonia	D	M	M	M	C	C	C	M	C	C	C	C	C	C
Ethiopia	M	M	M	M	M	M	M		M		M			M
Fiji	M	M	M		M	M	M	M	C	C	M	M		
Finland	C	C	C	M	C	C	C	C	C	C	C	C	C	C
France	C	C	C	D	C	C	C	C	C	C	C	M	C	C
Gabon	M	M	M	M	M	M	M	M		C	M			
Gambia	M	M	M	M	M	M	M	M	M	M	M	C		
Georgia	M	D	D	C	C	M	D	M	C	D	D	C		
Germany	C	C	C	M	C	C	C	C	D	C	C	C		
Ghana	D	D	D	C	C	D	C	D	C	C	C	C	C	C
Greece	M	M	M		C	C	C	C	C	C	C	C		
Grenada	M	M	M	M	M	M	M	M	M	M	M			
Guatemala	D	M	D	M		C	C	M	C		M	C		
Guinea	M	M	M	C	C	M	C	M	C	C	C	C	C	C
Guinea-Bissau	M	M	M											
Guyana	M	M	M		C	M	D	C	C					
Haiti	M	M	M			M	C	M	C			D		
Honduras	D	D	M	C		M	C	C	C	C	C	C		
Hungary	M	M	M	M	D	C	C	C	D	C	C	C		C
Iceland	M	M	D	M	D	M	D	M						C
India	C	M	M		C		C	C	C					
Indonesia	M	M	D	C	C	M	C	M	C		M	C		C
Iran (I.R.)	M	M	M		M	M	M	M	M		M			
Iraq	M	M	M											
Ireland	M	M	M	M	C	C	C					C		
Israel	M	M	C		C	M	M	M	C	C	C	M		C
Italy	C	C	C	C	C	C	C	C	C	C	C	C		
Jamaica	M	M	M	C	C	C	C	M	C	C	C	C	C	C
Japan	C	C	C	C	C	C	C	C	C	C	C	D		
Jordan	M	M	M		M	M	C	M	D		M			
Kazakhstan	C	C	C	C	D	C	C		C		C	C	C	
Kenya	M	M	M	M	M	C	C	M	D		M			C
Kiribati	M	M	M			M	M	M						
Korea (Rep.)	C	C	C	C	C	C	C	C	C		C	M		C
Kuwait	M	M	C	M	D	M	C	C	D	D	D		M	D
Kyrgyzstan	C	M	M	C	C	M	C		C	C		C	C	C
Lao P.D.R.	M	M	M	M	M	C		M	M		M			
Latvia	M	M	M	M	D	M	C	M	C	C	C	C		C
Lebanon	M	M	M	D			C	C			M			C
Lesotho	M	M	M		M		D							

Key: M = Monopoly; D = Duopoly; C = Competition

Note: This table reflects what is legally permissible; therefore it may not reflect the actual number of operators in the market.

Source: ITU World Telecommunication Regulatory Database

6. Level of Competition World

Country	*Local services*	*Long distance*	*Int'l*	*Cellular*		*Leased lines*	*Data*	*Telex*	*Paging*	*Mobile sat.*	*Fixed sat.*	*Cable TV*	*GMPCS*	*ISP*
				Analog	*Digital*									
Liberia	M	M	M											
Libya	M	M	M		M	M		M		M	M			
Liechtenstein	M	M	M											
Lithuania	M	M	D	C	C	C	C	C	C	C	C	C		
Luxembourg	C		C	C	C	C	C	C	C	C	C	C		
Madagascar	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Malawi	M	M	M		M	M	C	M	C	D	M	C		
Malaysia	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Maldives	M	M	M	M		M	M	M	M	M	M			
Mali	M	M	M	M	M	M	M	M	M	M	M	M	M	C
Malta	M	M	M	M	M	M	M	M	M		D	M		
Marshall Islands	M	M	M	M		M	M	M		M	M	C		
Mauritania	M	M	M	M	M	M	M		M	M	M	M	M	C
Mauritius	M	M	M	C	M	M	M	M	C	M	M			
Mexico	C	C	C	D	D	C		M	C	M	C	C	C	C
Micronesia	M	M	M	C	C	M	M	M	C	C	C	C		
Moldova	M	M	M		C	M	C	M	C			C		C
Monaco	M	M	M	M	M									
Mongolia	M	M	M		M	M	C	M	C	C	M	C		
Morocco	M	M	M	M	M	M	M	M	M			M		C
Mozambique	M	M	M	M	M	M	C	M	C	M	M	C		C
Myanmar	M	M	M	M	M	M	M	M	M	M	M			
Namibia	M	M	M		M	M	C	M	C	C	C	C	C	C
Nauru	M	M	M	M		M	M	M		M	M			
Nepal	M	M	M		M	M	C	M	C			C		C
Netherlands	C	C	C	C	C	C	C	C	C	C	C	C		
New Zealand	C	C	C	M	C	C	C	C	C	C	C	C		
Nicaragua	M	M	M	C		M	C	M	C	C	C	C		
Niger		M	M	C	C	C	C	M		M	M		C	C
Nigeria	C	C	C	M	C	M	C	M	C	M	M	C	C	C
Norway	C	C	C	M	D	C	C		C	C	C	C	C	C
Oman	M	M	M	M	M	M	M	M	M		M			
Pakistan	M	M	M	C	C	M	C	M	C	C	C		C	C
Panama	M	M	M		D	M	D	D	C	C		C	D	C
Papua New Guinea	M	M	M	M	M	C	C	C	C		D			
Paraguay	M	M	M	D	D	M		M	D			D	D	D
Peru	C	C	C	D	D	C	M		C	D		C	D	C
Philippines	C	C	C	C	C	C	C	C	C			C		
Poland	D	M	M	C	C	C	C	C	C		M	C		C
Portugal	M	M	M	C	C	C	C	C	C		C	C	C	C
Qatar	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Romania	M	M	M	M	C	M	C	M	C			C		C
Russia	D	D	D	C	C	M	C	D	C	D	D	C		
Rwanda	M	M	M		M	M	C	M		C	C			
S. Tomé & Principe	M	M	M			M	M				M			
San Marino	M	M	M	C	C	D	D	M	D		D			
Saudi Arabia	M	M	M	M	M	M	M	M	M		M			
Senegal	M	M	M	C	C	M	M	M	D	D	D			

Key: M = Monopoly; D = Duopoly; C = Competition

Note: This table reflects what is legally permissible; therefore it may not reflect the actual number of operators in the market.

Source: ITU World Telecommunication Regulatory Database

6. Level of Competition — World

Country	Local services	Long distance	Int'l	Cellular Analog	Cellular Digital	Leased lines	Data	Telex	Paging	Mobile sat.	Fixed sat.	Cable TV	GMPCS	ISP
Sierra Leone	M	M	M	C	C	M		M	C					
Singapore	D		D	C	C	D	D	D	C			M		C
Slovak Republic	M	M	M	M	D	C	C	C	C	C	C	C	C	C
Slovenia	M	M	M	M	D	C	C	M	C			C		C
Solomon Islands	M	M	M	M			M	M						
Somalia	C	C	C											
South Africa	D	D	D	M	C	C	C	D	C	M		M		
Spain	C	C	C	M	C	C	C	C	C	C	C	D	C	C
Sri Lanka	C	C	M	C	C	C	C	C	C					
St. Lucia	M	M	M	M	M	M	M	M	C	M	M	C	M	M
St. Vincent	M	M	M		M		M	M	C			M		C
Sudan	C	C	M		M	M	M	M	C	C	C			C
Suriname	D	D	D	D	D	D	D	D	C	D	D	C	D	C
Swaziland	M	M	M			M	M	M	C					
Sweden	C	C	C	C	C	C	C	C	C	C	C	C		
Switzerland	C	C	C	M	C	C	C	C	C	C	C	C	C	C
Syria	M	M	M	M		M	M	M						
Tajikistan	M	M	M	C		M	D	M	D	D	D	D		
Tanzania	D	D	D	C	C	D	C	D	C		C	C		
TFYR Macedonia	M	M	M		M	M	C	M			M			C
Thailand	D	M	M	C	C	D	D	M	C	M	M	C	C	C
Togo	M	M	D		D	M	D	M					C	
Tonga	M	M	M	M		M	D	D	M		M			
Trinidad & Tobago	M	M	M	C		D	D	D	C	C	C	C		
Tunisia	M	M	M	M		M	M	M						
Turkey	M	M	M	M	C	M	M	M	M	M	M	M		
Turkmenistan	C	M	M	C	C	D	M	M	D	D	D			
Tuvalu	M	M	M	M	M	M	M	M	M					
Uganda	D	D	D		D		C	C	C	D	D	C	C	D
Ukraine	D	M	C	C	C	M	C	M	C	C	C	C		
United Arab Emirates	M	M	M	M	M	M	M	M	M	D		M		
United Kingdom	C	C	C	C	C	C	C	C	C	C	C	M	C	C
United States	C	C	C	C	C	C	C	C	C	C	C	C		
Uruguay	M	M	M	C	C	D	D	M	C	D	D	D		
Uzbekistan	D	D	D	C	C	D	D	D	C	D	D	C		
Vanuatu	M	M	M	M			M	M						
Vatican														
Venezuela	D	M	M	C	C	C	C	M	C	C	C	C		
Viet Nam	C	M	M		C	M	M	M	C	M	M			C
Western Samoa	M	M	M	M		M	M	M			M			
Yemen	M	M	M	M	C	M	M	M	M				C	M
Yugoslavia	C	C		C	C	C	C	C	C		M	C		
Zambia	M	M		C	C	M			C				C	C
Zimbabwe	M	M	M	C	C	M	M	M		C	M			C

Key: M = Monopoly; D = Duopoly; C = Competition

Note: This table reflects what is legally permissible; therefore it may not reflect the actual number of operators in the market.

Source: ITU World Telecommunication Regulatory Database

GLOSSARY OF TERMS*

The following definitions are included to assist the readers of this report. They are adapted from non-definitive reference sources and are not intended to replace or contradict the terms and meanings used by each Member country in its national laws and regulations or in international agreements.

Access charges: Fees paid for use of the lines or other facilities operated by another carrier.

Analogue network: A telecommunication network in which information is conveyed as a continuously varying electronic signal (see also *digital* network).

Bandwidth: The rate, measured usually in bits per second, at which data can be carried through a transmission circuit.

Basic service: Refers to the provision and carriage of voice telephony service, though some definitions also include telex and telegraph services.

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".

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 site of which is independent of redundancy or framing techniques.

Build-Operate-Transfer (BOT): A project whereby a private company is awarded a concession to build a telecommunication network or service and operates it for a certain period of time before handing over ownership to the national telecommunication administration or PTO.

Build-Lease-Transfer (BLT): A project whereby a private company is awarded a concession to build a telecommunication network or service and leases it for a certain period of time before handing over ownership to the national telecommunication administration or PTO.

Build-Transfer-Operate (BTO): A project whereby a private company is awarded a concession to build a telecommunication network or service, hands over ownership to the national telecommunication administration or PTO, and operates it for a certain period of time.

Certificate Authority (CA): A trusted third-party organization or company that issues digital certificates used to create digital signatures and public-private key pairs. The role of the CA in this process is to guarantee that the individual granted the unique certificate is, in fact, who he or she claims to be. CAs are a critical component in data security and electronic commerce because they guarantee the identities of parties exchanging information.

Competition: Refers to introducing competition among national service suppliers and/or foreign suppliers without any limitations. In the case of mobile cellular, the number of licensees is dependent on spectrum availability. Therefore, all countries allowing more than one operator have been listed in this report as "competitive".

Connectivity: The capability to provide, to end users, connections to the Internet or other communication networks.

Corporatization: Corporatization involves legal changes to grant the telecommunication operator administrative and financial autonomy from central government.

* *Source:* ITU, World Telecommunication Development Report, 1995. ITU, Challenge to Network, Internet Development, 1999.

Domain Name: The registered name of an individual or organization eligible to use the Internet. Domain names have at least two parts and each part is separated by dot. The name to the left of the dot is unique for each top-level domain name, which is the name that appears to the right of the dot. For instance, the International Telecommunication Union's domain name is itu.int. "ITU" is a unique name within the gTLD "int".

Digital network: A telecommunication network in which information is converted into a series of distinct electronic pulses and then transmitted as a digital bitstream (see also *analogue* network).

Electronic Data Interchange (EDI): Electronic Data Interchange (EDI) is the computer-to-computer exchange of business documents between companies, using a public standard format. Rather than preparing paper and sending it through the mail, or using other communications methods such as fax, EDI users exchange business data directly between their respective computer systems.

Encryption: The translation of data into a secret code. Encryption is the most effective way to achieve data security. To read an encrypted file, one must have access to a secret key or password that enables it to be decrypted.

End user: The individual or organization that originates or is the final recipient of information carried via the Internet (i.e., the consumer).

Fixed-link network: Basic telephone network comprising subscriber lines, exchanges and inter-exchange lines. More correctly, this should be called the Public Switched Telephone Network (PSTN) but it is referred to here as the fixed-link network to distinguish from cellular radio and satellite networks.

Information infrastructures, Information super-highway: High-speed communication networks capable of carrying voice, data, text image and video (Multimedia) information in an interactive mode.

Interconnection: Technical, organizational and financial standards which allow the interconnection of two or more distinct networks, for instance the *cellular radio* network and the *fixed-link* network within a country.

Internet: The collection of interconnected networks that use the Internet protocols (IP).

Internet Backbone: The high-speed, high capacity lines or series of connections that form a major pathway and carry aggregated traffic within the Internet.

Internet Content Provider: A person or organization that provides information via the Internet either with a price or free of charge.

Internet Service Provider (ISP): ISPs provide end users, and other ISPs, access to the Internet. ISPs may also offer their own proprietary content and access to online services such as e-mail.

Intranet: An intranet is a network, based on TCP/IP protocols, accessible only by the organization's employees, or other authorized users. Intranet websites are similar to other websites, but are surrounded by firewalls that prevent unauthorized access.

IP numbers: An IP number (also referred to as Internet address number) are the addresses of hosts or other intelligent devices on the Internet. All servers and users connected to the Internet have an IP number.

Joint venture: Arrangement in which public and private partners form a new enterprise, invested by all partners, for example to construct and operate a network.

Leased line: A point-to-point communication channel or circuit that is committed by the network operator to the exclusive use of an individual subscriber. Under national law, leased lines may or may not be permitted to interconnect with the public switched network.

Licensing: An administrative procedure for selecting operators and awarding franchises for the operation of particular telecommunication services, for instance cellular radio.

Local Area Network (LAN): 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).

Local loop: The network of lines linking the subscriber to the local exchange.

Main telephone line: Telephone line connecting a subscriber to the telephone exchange equipment. This term is synonymous with the terms *main station*, *Direct Exchange Line (DEL)* and *access line*.

Mobile cellular service: A communication service in which voice or data is transmitted by radio frequencies. The service area is divided into cells, each served by a transmitter. The cells are connected to a controlling switching exchange which is connected to the worldwide telephone network.

Multimedia: The presentation of more than one medium, typically images (moving or still), sound and text in an interactive environment. Multimedia requires a significant amount of data transfer and invariably requires computational facilities. This report concerns networked multimedia, involving the transmission of multimedia information over a communications link, but there also exist standalone multimedia, such as CD-ROMs.

Packet: An information block identified by a label at layer 3 of the OSI reference model. (*Source*: CCITT Blue Book, Volume 1, Fascicle 1.3, Terms and Definitions).

Packet-Switching: The function of handling, routing, supervising and controlling user packet data, as required, by an exchange. (*Source*: CCITT Blue Book, Volume 1, Fascicle 1.3, Terms and Definitions).

Paging: A mobile radiocommunication service offering – usually one-way – numeric or textual information to small pocket terminals.

Partial Competition: When countries maintain certain "non-technical" restrictions which can lead to limits on the number of operators or on geographical coverage.

Post, Telegraph and Telephone Administration (PTT): The traditional organization of the communication sector in many countries is the PTT (the Post, Telegraph and Telephone administration) wherein the government owns and operates both telecommunication and postal services.

Private ownership/Privatization: The transfer of control of ownership of a state enterprise to private parties, generally by organizing the enterprise as a share company and selling share to investors. More generally, the term is sometimes used to refer to a wide range of modalities whereby business is opened to private enterprise and investment.

Private network: A network based on leased lines or other facilities which are used to provide telecommunication services within an organization or within a closed user group as a complement or a substitute to the public network.

Protocol: A set of formal rules and specifications describing how to transmit data, especially across a network.

Public Telecommunication Operator (PTO): A provider of telecommunication infrastructure and services to the general public. The term *public* relates to the customer rather than the ownership of the PTO.

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 software that makes the process of serving information possible.

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.

Teledensity: Number of main telephone lines per 100 inhabitants.

Transmission Control Protocol/Internet Protocol (TCP/IP): The suite of protocols that defines the

Internet and enables information to be transmitted from one network to another.

Type approval: An administrative procedure of technical tests and vetting applied to items of telecommunication equipment before they can be sold or interconnected with the public network. Also known as *homologation*.

Value-added network services: Telecommunication services provided over public or private networks which, in some way, add *value* to the basic carriage, usually through the application of computerized intelligence – for instance, reservation systems, bulletin boards, information services. Also known as *enhanced services*.

Website/Webpage: A website (also known as an Internet site) generally refers to the entire collection of HTML files that are accessible through a domain name. Within a website, a webpage refers to a single HTML file, which when viewed by a browser on the World Wide Web could be several screen dimensions long. A "home page" is the webpage located at the root of an organization's URL.

World Wide Web (WWW): (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 including: HTTP, Gopher, FTP, Telnet, USENET, and WAIS.

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