



TRENDS IN  
TELECOMMUNICATION  
REFORM

2009

SUMMARY

Hands-on or  
hands-off?  
Stimulating  
growth through  
effective ICT  
regulation



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International Telecommunication Union

# **TRENDS IN TELECOMMUNICATION REFORM 2009**

## **HANDS-ON OR HANDS-OFF? STIMULATING GROWTH THROUGH EFFECTIVE ICT REGULATION**

### **SUMMARY**

FEBRUARY 2010





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# INTRODUCTION

The Telecommunication Development Bureau (BDT) of the International Telecommunication Union (ITU) is pleased to present the tenth edition of *Trends in Telecommunication Reform*, an integral part of ITU/BDT's ongoing dialogue with the world's ICT regulators. The theme of this edition of *Trends*, "Hands-off or hands-on?" derives from an important meeting organized last year: the 2009 Global Symposium for Regulators (GSR), held in November 2009 in Beirut, Lebanon. This edition presents an ICT industry in flux and poised for exciting change and growth.

The year 2009 began in the midst of repercussions of the financial crisis, which spilled over from the previous year, putting many telecommunications/ICT businesses and enterprises at risk. Although the global Information and Communication Technology (ICT) industry saw reduced sales in equipment and manufacturing, lower demand and curtailed investment, the sector confronted the crisis more successfully than did many other sectors<sup>1</sup>. Certain markets – namely mobile cellular and Internet – have been buoyant. Because of the business opportunities they represent, developing countries tend to remain attractive, especially those that have embarked on regulatory reform initiatives, as explored in Section 1 below.

Meanwhile, the crisis acted as a wake-up call on the importance of effective regulation and raised questions about the role of governments and the *laissez-faire* approach that had prevailed – especially in the financial sector. Governments were forced to reassess their roles and the need for state intervention in light of the economic downturn, to ensure, among other things, the development of the broadband economy.

ICT regulators need to maintain a delicate balance between a hands-on or hands-off approach to regulation. This is a critical exercise to ensure a healthy development of the sector, while meeting social goals. These innovative approaches, coupled with new expectations, call for strengthened regulators. This year's edition of *Trends* focuses on examining these new expectations and identifying the regulatory approaches taken throughout the world to stimulate ICT growth in a converged environment and increase access to broadband services.

This year's edition comprises ten chapters:

- Chapter 1 provides an overview of the latest ICT market and regulatory trends.
- Chapter 2 begins by examining the recent changes in telecommunication markets, which are transitioning to IP-based network platforms allowing a diversity of new services and applications, and the challenges facing regulators.
- Chapter 3 explores how regulators can act (or in some cases not intervene) to promote favourable investment climates, as the industry climbs out of a period of capital constraints.
- Chapter 4 elaborates on the theme of effective regulation as a "stimulus plan" for the ICT sector.
- Chapter 5 begins to closely review the maturation of IP-based networks, examining the issues raised by the future of interconnection in the packet-switched era.

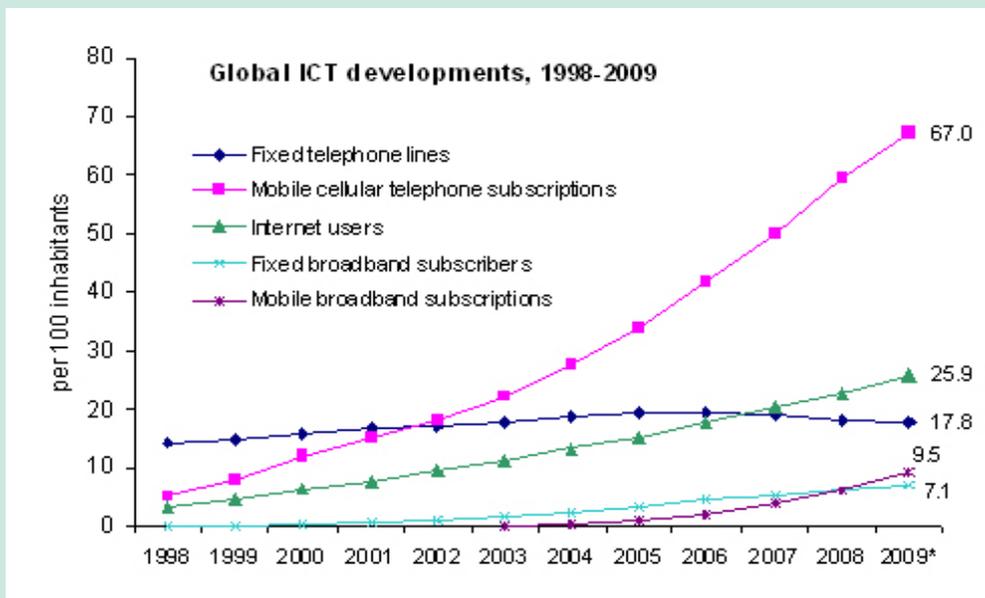
- Chapter 6 looks at whether and how to regulate mobile termination rates – another issue brought to the fore by the rapid growth of wireless services and roaming over the past decade.
- Chapter 7 looks at the specific question of interconnection of Voice over IP (VoIP) networks and services, which appears to be increasingly prevalent as the new decade dawns.
- Chapter 8 more fully explores the maturation of VoIP as a viable alternative to circuit-switched voice services.
- Chapter 9 focuses on the subject that most regulators ultimately focus on: consumers, exploring consumer protection approaches in the age of IP-based networks, as well as the Internet.
- Finally, Chapter 10 draws conclusions and looks at a brighter future.

# 1 ICT MARKET AND REGULATORY TRENDS

## 1.1 ICT Market Trends

Despite the global economic downturn, ICT markets continued to grow in all segments – from mobile cellular subscriptions to fixed and mobile broadband subscriptions (See Figure 1), and from TV to computer hardware market penetration. This trend certainly illustrates the essential role ICTs play in people’s everyday life.

**Figure 1: ICT Market Growth Undaunted**



Note: \*2009 data are estimates.

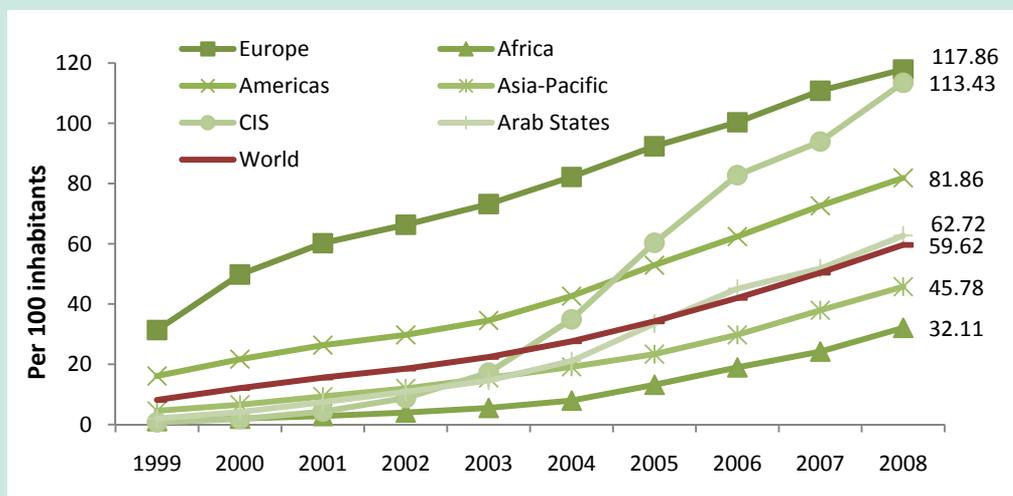
Source: ITU World Telecommunication/ICT Indicators Database

Although the ICT market growth trends are apparent across all regions, there are certain discrepancies within regions and within developed and developing countries.

While **fixed line** penetration decreased in the Americas and Europe, the number of fixed telephone lines in other regions continued to increase albeit at a slow pace.

**Mobile** growth continued unabated in 2009, with global mobile subscriptions reaching an estimated 4.6 billion by the end of the year. Strong growth in mobile cellular subscriptions worldwide has dramatically increased access to a telephone. Mobile broadband subscriptions topped 600 million, having overtaken fixed broadband subscriptions in 2008, highlighting the huge potential for the mobile broadband Internet industry. The Asia-Pacific and Europe regions had the greatest numbers of mobile broadband subscriptions (See figure 2).

**Figure 2: Mobile Cellular Subscriptions, by Region and World, 1999-2008**

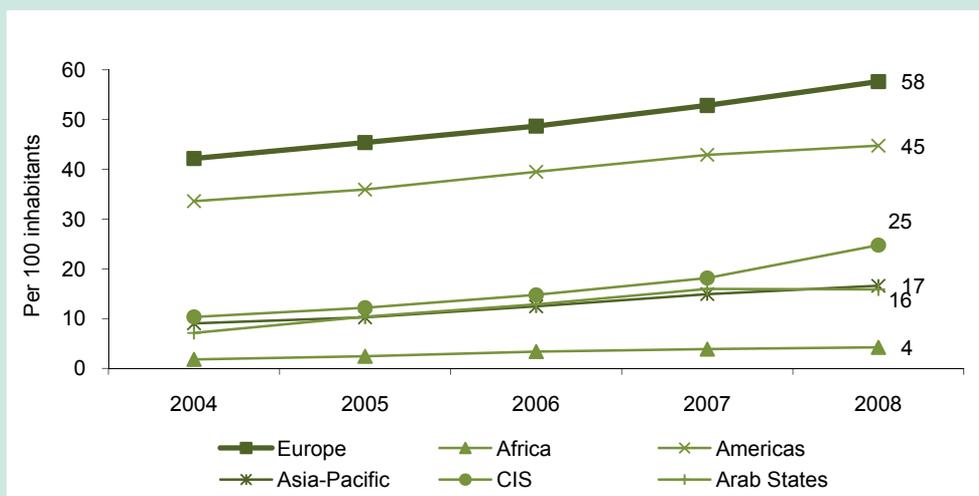


Source: ITU World Telecommunication/ICT Indicators database.

The number of **Internet users** also grew steadily, with some 1.9 billion people having access to a computer worldwide by the end of 2009. This represented about a quarter of the world's population.

Europe has led the way, with 58 per cent of its population using the Internet by the end of 2008. Although Africa had made impressive gains, it remained far behind the ICT penetration levels of other regions with 4 per cent penetration rate, representing 45 million Internet users in 2008.

**Figure 3 Internet Users, by Region and World, 2004-2008**



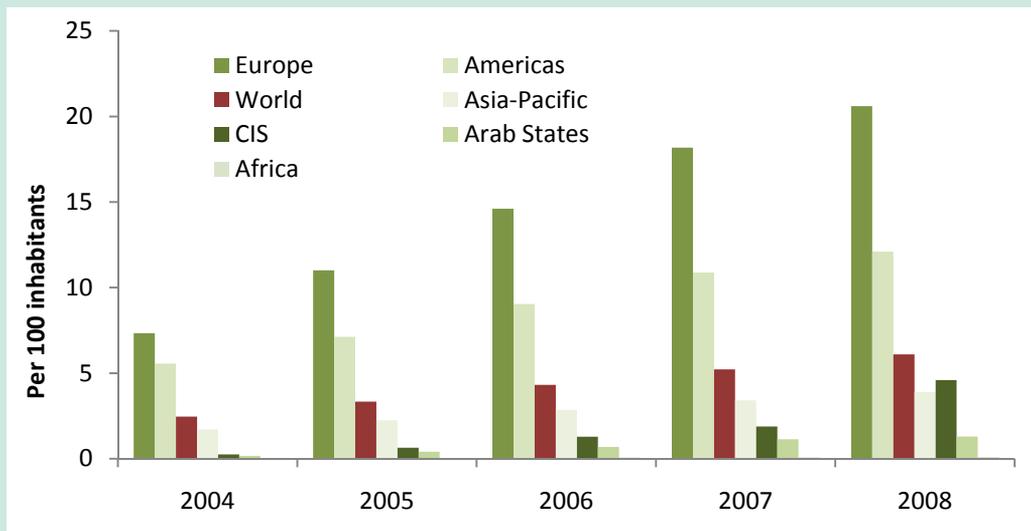
Source: ITU World Telecommunication/ICT Indicators database.

Over the past five years, the total number of **fixed broadband** subscribers grew more than threefold, from about 150 million in 2004 to almost 500 million by the end of 2009.

Fixed broadband penetration still remains very low in Africa (See Figure 4). The limited number of fixed telephone lines constrains the deployment of broadband access via xDSL. Compared with fixed broadband, third-generation (3G) mobile networks seem to hold greater potential for many countries in the region. Mobile broadband has the best chance of becoming Africa’s main broadband Internet access medium in the future.

There were 116 million fixed broadband subscribers throughout the Americas at the end of 2008. Three-quarters of those, however, were in the United States and Canada – exposing a large gap in broadband penetration between North American countries and the other countries in the region. The Arab States are still at the very early stages of broadband development. By the end of 2008, fixed and mobile broadband subscriptions had reached just 1 per cent and 3 per cent of population penetration, respectively. In the Asia- Pacific region, fixed and mobile broadband penetration also was rather low, at 3.9 per cent and 4.4 per cent respectively.

**Figure 4: Fixed Broadband Growth by Region and World, 2004-2008**



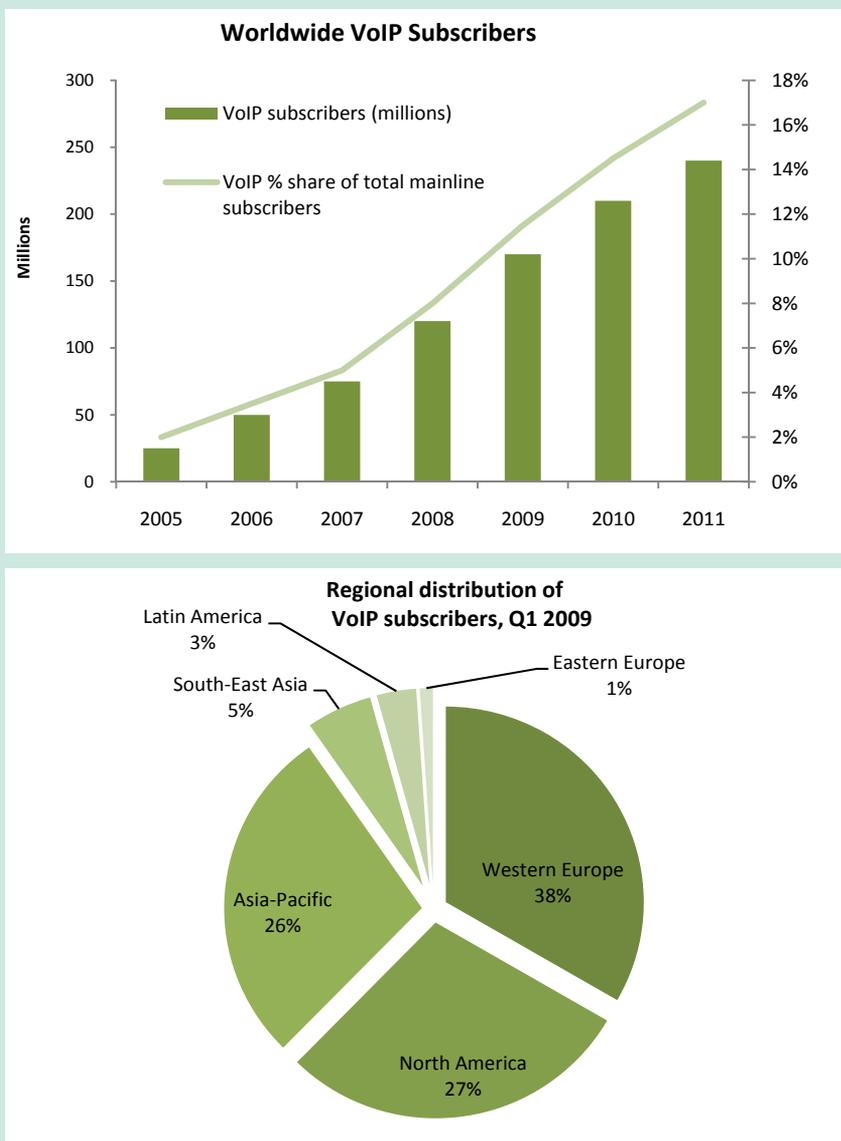
Source: ITU World Telecommunication/ICT Indicators database.

### VoIP Services<sup>2</sup>

Estimates of global Voice over IP (VoIP) service subscribership numbers are surprisingly rare, given the growth in the use of VoIP technologies. One reason for this may be the different definitions of VoIP in use across the world. It is also difficult to estimate the number of PC-to-PC or “pure” VoIP users (including regular Skype users), occasional users, or those using embedded VoIP in online game sessions. These difficulties mean that estimates of the total number of VoIP subscribers are almost always given as a range.

**Figure 5: VoIP Subscribers Worldwide**

Estimates of VoIP subscribers, as a total and as a proportion of main lines worldwide, 2005-2011 (top chart); and the distribution of VoIP subscribers worldwide, March 2009 (bottom chart).



Source: iDATE (top chart), Point Topic (bottom chart).

Estimates, therefore, range from some 80 million VoIP subscribers worldwide in 2007<sup>3</sup> to 87.8 million commercial VoIP subscribers<sup>4</sup> by the fourth quarter of 2008 and 92.2 million by the first quarter of 2009. Aggressive recent projections of VoIP subscribership<sup>5</sup> range from 200 million paying VoIP subscribers worldwide to 267 million residential VoIP subscribers globally by 2012.<sup>6</sup>

### IPTV<sup>7</sup>

The number of IPTV subscribers worldwide is steadily growing as well. There were 10 million to 15 million subscribers in 2008, according to different estimates.<sup>8</sup> Fixed-line incumbents and Internet Service Providers (ISPs) are launching commercial services in many regions, including in China, India, and throughout Europe. In fact, Europe accounted for most of the IPTV growth over the past year and now represents about half of all subscribers worldwide. The number of subscribers in Asia-Pacific and North America also doubled over the past 12 months. In South Asian and East Asian countries, the growth is slower but sustained, but in Latin America and Africa the IPTV market still hasn't quite taken off, although commercial services have been launched in a few countries.

### Next-Generation Network (NGN) Trends<sup>9</sup>

Although the current economic climate has posed challenges, Next Generation Networks (NGNs) are progressing, with investments being made in all regions of the world. In Europe, many operators have already migrated to NGN core networks; the majority of them have chosen an overlay strategy. Although Next-Generation Access (NGA) network developments in this region are mainly based on fibre, in comparison to Asia for instance, the rollout of *fibre to the home* (FTTH) has been rather slow. The preference for FTTH has become apparent in some of the more developed and high-income Asian economies, such as New Zealand and Singapore. But in rural regions, as well as scarcely populated areas, wireless access networks seem to be a more economical solution. Wireless networks are being considered for NGA deployment in Latin America and Africa (although the real focus in Africa has been on upgrading backbone networks).

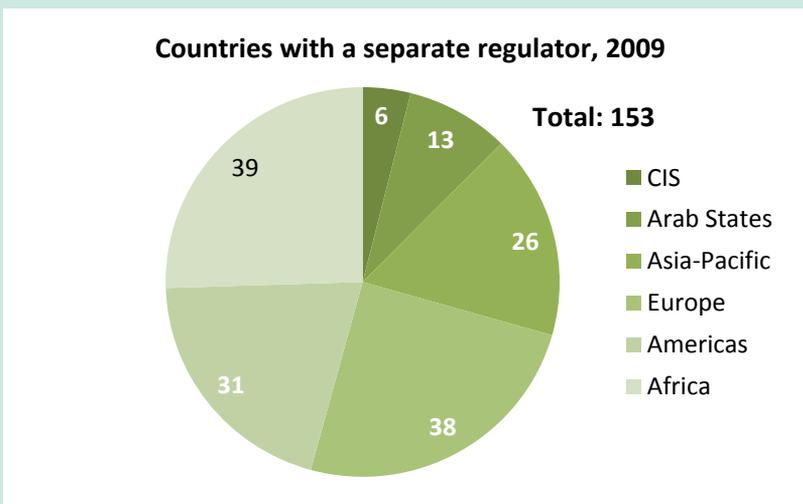
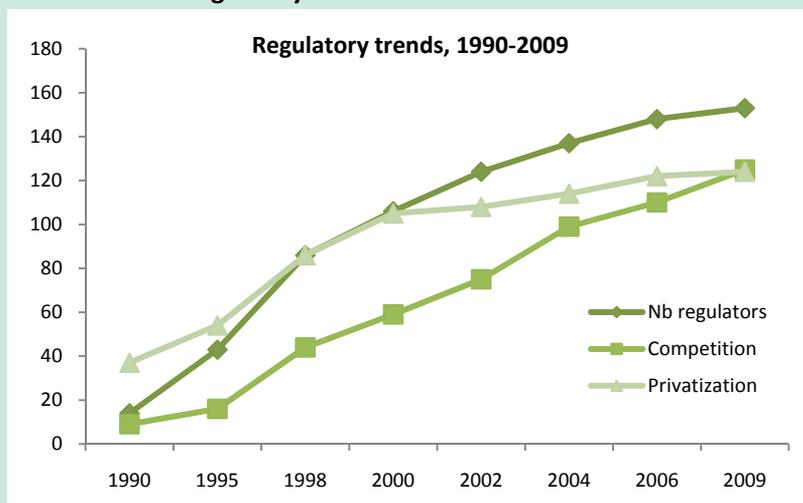
### 1.2 Regulatory Trends

The past two decades seem to confirm the power of the regulatory reform trinity: separate regulators, competition, and privatization (see Figure 6). By following, adapting and often reinventing any of these three, countries around the world have revitalized their telecommunication and information technology markets, kicking off the irreversible transformation into digital economies. Importantly, most countries have created separate regulatory authorities that are independent in their decision-making. The number of separate regulatory authorities has increased from only 12 in 1990 to 153 at the end of 2009.

The creation of separate ICT regulators has been one of the main building blocks of regulatory reform worldwide since the 1990s. Regulators have played a leading role in creating an enabling environment fostering innovation and investment. They have gradually opened fixed line services to competition totaling 124 competitive markets for basic fixed-line services as of 2009, almost inevitably privatizing the national fixed-line incumbent along the way. The overall objective of regulators has been to ensure that public policy objectives for the sector continued to be met and even exceeded.<sup>10</sup>

As the number of regulators globally is growing, so are their powers and their roles. Traditionally, regulators have been primarily in charge of *ex ante* regulation, regulating access to the telecommunication market through licensing, assigning spectrum and other scarce resources, dealing with interconnection issues and contributing to universal access support programmes.

Figure 6 Portrait of an Era in Regulatory Reform



Source: ITU World Telecommunication Regulatory Database.

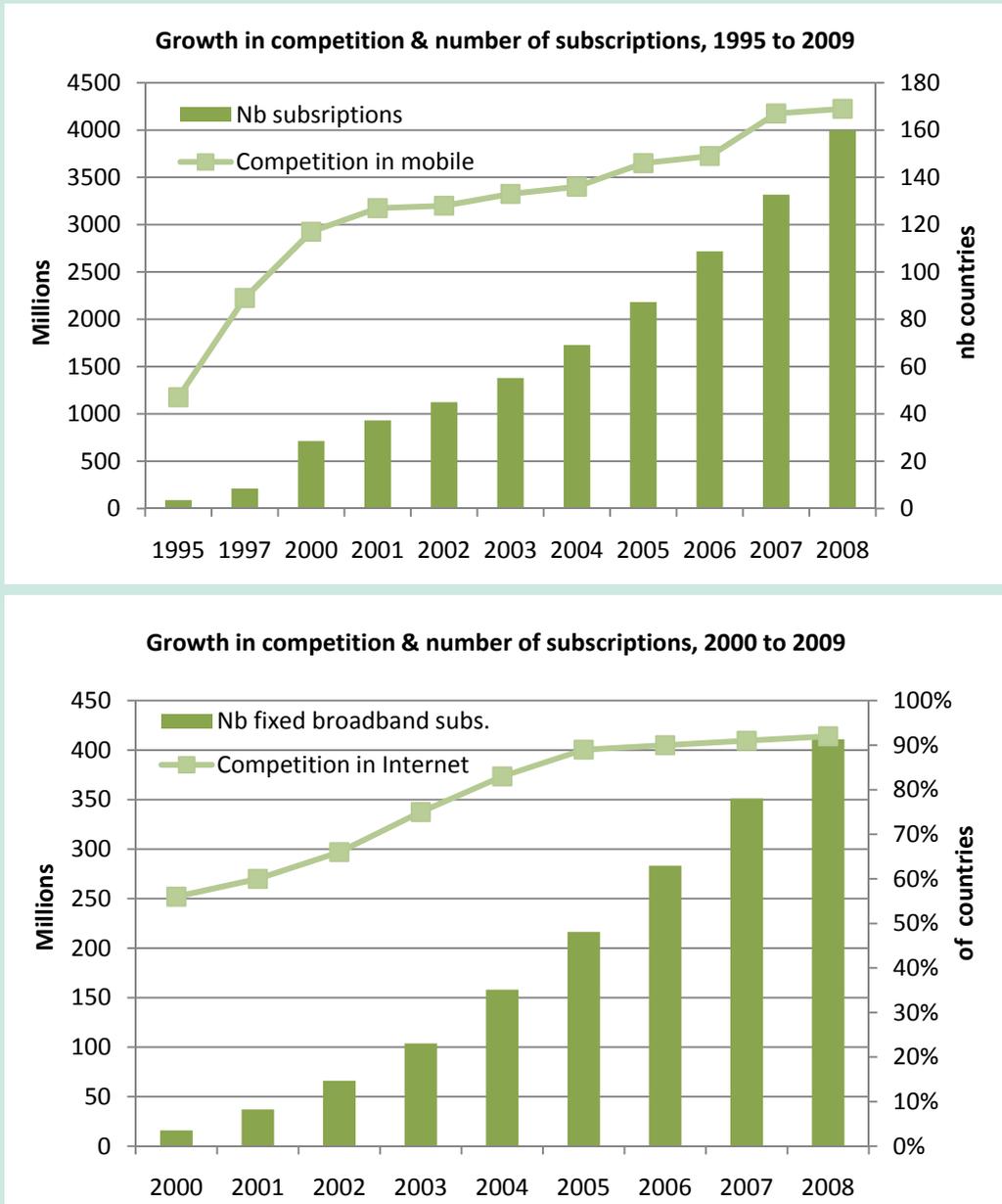
Today, however, regulators face increasing expectations. Recently, the focus has shifted toward creating an enabling environment for investment, fostering market growth and ensuring effective digital inclusion for all.

### Competition: the Holy Grail of Market Growth

Competition has been the “Holy Grail” of market growth in the telecommunication sector over the past two decades. It certainly has been one of the *raison d'être* of regulatory authorities. The absence of any competitor with significant market power can be seen as a guarantee for healthy market growth, as well as dynamic innovation in technologies and services. In short, competition in the ICT sector is the *sine qua non* prerequisite for “win-win” market development.

Look at the example of the two most successful ICT services of recent years – mobile cellular and broadband. There is extensive evidence of a strong correlation between opening markets to competition and the increase of number of subscriptions to these services (see Figure 7).

**Figure 7: Growth in competition in selected services and number of subscribers**



Source: ITU World Telecommunication/ICT Indicators database and ITU World Telecommunication Regulatory Database.

## **2 CONNECTIVITY, OPENNESS AND VULNERABILITY: CHALLENGES FACING REGULATORS**

Policy-makers and regulators are focusing increasingly on achieving extensive, and even ubiquitous, availability of advanced ICT services, in order to address the “digital divide” and to reap the trans-sector benefits of network effects available from ICTs.

ICTs offer a platform for a new phenomenon of connectedness – changes in the ways information is created and shared that are producing an economic and social transformation. The more ubiquitous and open networks are, however, the more vulnerabilities they face. Some vulnerabilities are economic, arising from market structures and threats from service providers that have significant market power (SMP). At the customer end of the value chain, there are threats to privacy, the loss of control over data, and child protection concerns. ICT systems are vulnerable to cyber-security and cyber-crime threats even at a national level, as seen in Estonia and Georgia, for example.

The IP-based network model now defies the historical silos of voice telecommunications, data telecommunications, Internet access, and “enhanced” or “value-added” services. Similarly, it no longer matters whether the network is fixed or wireless.

The architecture of telecommunication networks and services is undergoing a revolution, and the initial challenge facing regulators is to understand what is happening.

The revolution can be seen in three dimensions, each of which has major implications for telecommunication regulation:

- 1** The emergence of a network architecture understandable in terms of a stack of horizontal layers;
- 2** A shake-up of network technologies and network management; and
- 3** A major redistribution of computing functions and content production across networks.

Understanding these dimensions and trends allows regulators to identify and analyze problems.

The sweeping change in transmission technology from a circuit-switched to a packet-switched architecture using the IP/TCP suite has altered the way networks are viewed in terms of design, service provision and regulation.<sup>11</sup>

The pioneering impact of IP-based networks lies in their “layering” and the “end-to-end argument.”<sup>12</sup> In IP-based networks, the logical layer riding “on top of” the physical infrastructure and equipment is comprised of several modular protocols, sometimes described as a stack of horizontal functional layers.<sup>13</sup> The modularity of the protocols makes it considerably easier to change parts of the network for different purposes without threatening the system as a whole. As a result, an IP-based network is by design open to any number of uses. In turn, despite retaining significant network management control, the network operator has less control over the purposes for which the network is used.

In contrast to the limited range of services that circuit-switched networks could support, protocol layering or modularity makes possible a huge, perhaps infinite variety of applications that can be carried across the common platform of the IP/TCP (IP-based) suite. Moreover, the end-to-end argument places the power to write the software code that drives applications in the hands of applications designers.<sup>14</sup> The network has become multi-purpose, with a potential for creativity beyond imagining.

The new network capabilities, however, pose challenges to regulators. Those changes can be analysed in terms of three themes:

- The economic and social value of increasingly high-speed network **connectivity** for ever larger segments of the population;
- The appropriate level of **openness** of networks that will achieve innovative and efficient use without undermining operational integrity or investment incentives; and
- The consumer **vulnerability** that stems from increasing dependence of economic and social activities and relations on connectivity to open networks.

In response to these challenges, regulators need to:

- Broaden their perspectives to take in the wider ICT ecosystem;
- Identify and apply durable regulatory principles;
- Cope with contentious markets that are in rapid transition; and
- Bring an open mind to all regulatory processes.

Regulators can no longer focus narrowly on classically defined telecommunication services. They must understand the wider ICT ecosystem and the evolving symbiotic relationship between computer processing and the transport of electromagnetic signals. This relationship is affected by technological and capacity differences among the diversifying means of transport.

Similarly, regulators need to understand better the role of manufacturing in the development of technologies and management of networks. The importance of standardization and patents requires regulators to engage with standard-setting bodies and processes. In many countries, the courts or a specific competition regulator may have primary responsibility in this area, but for regulators charged with developing access to ICT and innovation in networks and services, it is an important concern.

The field of vision for regulators is expanding, and the challenge is to understand it and apply regulatory principles that will endure. Yet many countries' regulators do not have effective powers to look beyond telecommunication and deal with the wider ICT sector. The changes occurring through convergence of technologies and networks expose regulators to new areas that were traditionally the domain of other government departments and agencies – or nobody's domain at all. Regulators' mandates to tackle some issues are not clear. For example, the role of regulators in dealing with cyber-security has not been clearly defined in most countries. Similarly, most countries have not converged responsibility for media content with jurisdiction over networks and services. So, traditional telecommunication regulators may find themselves struggling to address market power problems involving media content. Meanwhile, some regulators do not have power to enforce competition policies, which are overseen by a different agency.

### 3 THE IMPACT OF EFFECTIVE REGULATION ON INVESTMENT

The sudden appearance of a global financial crisis at the end of the third quarter of 2008 had a serious impact on both the overall appetite for international investment in the ICT sector and the manner in which such investments were evaluated and subsequently carried out.

Many of the telecom operators had just begun again to embrace growth through expansion after the dry spell that followed the bursting of the telecommunication bubble in 2000-2002. All too soon, they found themselves yet again in the position of examining their expansion strategies in light of the new global downturn and general scarcity of funds. Such operators were forced to examine the impact of the crisis not only on their international investment strategies, but also on the profitability of the operations in which they had already invested. There appear to be two major reactions to the current investment challenges:

- 1 Operators have either completely retrenched from investing or have severely scaled back their investment targets; or
- 2 Operators view the current crisis as an opportunity to invest in selected markets at a significantly reduced premium.

The ICT investment environment has undergone a startling transformation in the past year – a radical metamorphosis. According to the World Bank, a sharp pullback in syndicated bank lending has occurred, as commercial banks and other financial institutions in high-income countries aggressively attempt to shore up capital ratios by limiting new lending or by calling in existing lines of credit. In addition, initial public equity offerings from key emerging markets have dried up just as stock markets have collapsed. Exchange rates have also been severely affected. All of these developments have contributed to a very uncertain investment market in the ICT sector – one fraught with potential pitfalls and volatile conditions.

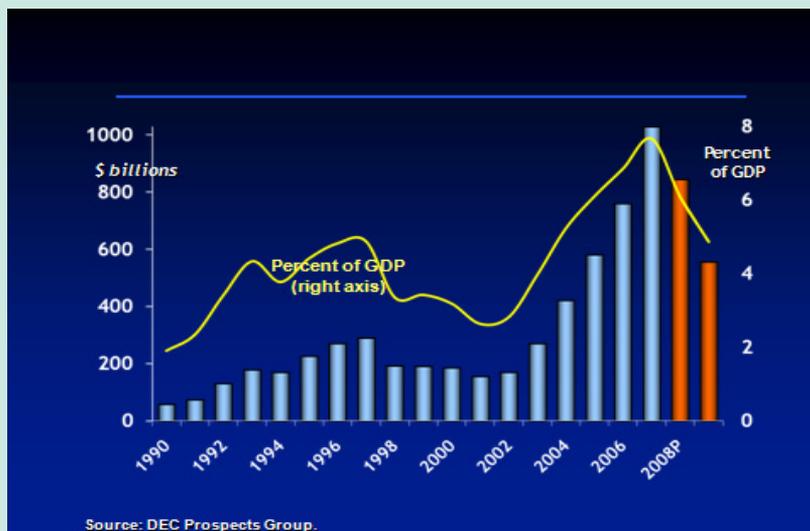
Clearly, the collapse of major investment banks such as Lehman Brothers has only added to the overall uncertainty and turmoil. The chart in Figure 8 illustrates the global net private equity and debt flows for all sectors for the period 1990 – 2007, followed by projections for 2008 and 2009. As can be seen, there is a sharp downturn in private capital flows. This is illustrated by the bars which show a peak in 2007, followed by a sharp downturn after that.

Along with careful judgment about potential risks and returns, any prospective investment obviously requires thorough due diligence. In the ICT sector, one of the critical aspects of due diligence is to analyze in detail the existing and future regulatory environment and to identify any elements of risk that may exist in that environment. In general terms, an investor in the ICT sector will be inclined to focus on:

- The independence of the regulator from the government;
- The transparency of the regulatory process;
- The legal processes for regulation; and

- Whether, in general, the framework achieves the correct balance between sustaining a fair competitive environment (and one that encourages and stimulates investment) and ensuring that there is not excessive competition or over-licensing.

**Figure 8: Private Debt and Equity Flows, 1990-2009**



Source: DEC Prospects Group

In principle, these investment criteria are paramount, irrespective of the state of the financial markets and the availability of funds for investment. It is the **weighting** of the regulatory risk in this current environment that is more likely to change, based on the investor's appetite for risk in the face of scarce capital. The higher the perceived regulatory risk, the duller the appetite for investment will be.

Regardless of changes in investment appetite, negative capital market conditions, and financial crises, the size of the investor universe and the diversity of investor objectives will ensure that ICT sector investment remains robust and varied. The ICT industry is highly capital-intensive, giving it a significant portion of the global equity and debt markets. There will always be investors in the sector. Furthermore, the ICT market is generally associated with slightly higher than average growth. But the health of investment activity at any given time will be driven by economic conditions and perceived regulatory risk. In other words, ICT investment will continue but not necessarily at the same volume or pace.

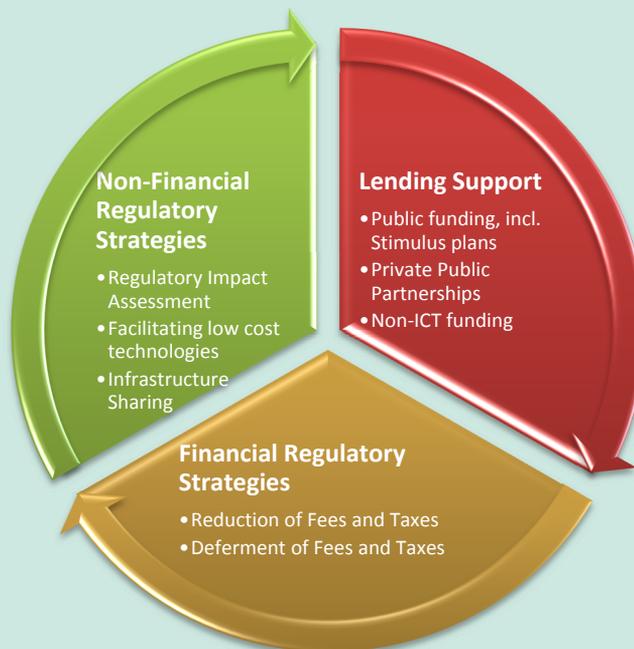
Regulatory risk will likely be considered in terms of prioritizing investments, overall valuation and the discount factors to be applied. In fact, realizing that financial risk is generally the foremost priority in any potential investment assessment, it is likely that regulatory risk is not far behind in the list of critical considerations. Presumably, the investment activities that unfold throughout the remainder of 2009 and 2010 will provide more quantifiable evidence as to the overall impact and weighting of regulatory risk in this era of financial challenges.

## 4 A “STIMULUS” PLAN FOR THE ICT SECTOR

The good news is that the ICT sector is on fairly solid ground with respect to the development of regulatory and institutional frameworks. Demand for ICT services, many of which are now considered necessities, will not wane disproportionately, although affordability may. In isolating the challenges that the economic downturn brings to the ICT sector, it becomes clear that the crisis is primarily one of funding and investment. Regulators and policy-makers can proactively address the problems inherent in the global downturn and avoid a knock-on effect in the ICT sector through a two-pronged approach that involves governments in:

- **Lending financial support** – offering mechanisms to provide alternative financial support to potential and existing investors and making available public sector financing, including through “stimulus packages” and Public Private Partnerships (PPPs); and
- **Lowering the costs of doing business** – recognising the need to reduce operators’ capital and operational costs, increasing operating margins and profits through direct financial incentives such as lower or deferred licence fees and taxes. Also, helping operators through non-financial means such as introducing regulatory measures that promote efficiency. Both the provision of financial incentives and the implementation of non-financial strategies will be explored.

Figure 9: Options for Supporting the ICT Sector



Source: M Msimang, Pygma Consulting

One of the lessons that governments, regulators and even members of the private sector have taken away from the global financial crisis is that there was ineffective regulation in the financial sector, especially in developed countries. As a consequence, confidence in financial markets collapsed, and the United States and many European Union (EU) Member States – such as Spain, Portugal, and the United Kingdom – have turned to “bail outs” and “recovery plans” to increase demand and create jobs. Many of these plans have included an increased role for national governments in these otherwise free markets.

The risk is that regulated industries, including the ICT sector, will interpret this as a debate between “too much” and “too little” regulation. The debate really should focus on effective regulation. As a “knee-jerk” response, some may turn to increased regulation to correct the situation without conducting a detailed analysis.

But it must be noted that the ICT sector is already more strictly and effectively regulated as a consequence of its socio-economic implications, the nature of investment in the sector, and the regulatory measures that were put in place following the late 1990s dot-com bubble. Since the 1990s, the ICT sector has shown a solid market reform agenda, sound institutional frameworks, grounded regulatory and policy principles, and significant international collaboration. In short, it has arguably been better regulated than the financial sector.

As a principle, governments have over the past decade left the private sector to spearhead ICT investment, stepping in only through the use of tools such as subsidies for universal access where a market gap was identified.<sup>15</sup> But in 2009, things changed. Reduced access to capital, changing perceptions of risk, and shifting definitions about what is economically viable all combined to limit operators’ ability to obtain financing.

State funding, however, can play an important counter-cyclical role. The state can augment private-sector investment in light of reduced capital flows, namely through:

- Public funding programmes and investments, including
  - “Stimulus packages,”
  - Public Private Partnerships (PPPs), and
  - Loan guarantees and grants.
- Facilitating investments by non-traditional ICT investors, such as banks and electricity companies.
- Closely monitoring the implementation of the various stimulus plans and recovery packages, PPPs, and alternative investments implemented to revive the sector.

In a constrained economic climate, one of the key contributions that regulators can make to create a favourable environment for new and existing investors is to reduce the investor’s operational and capital expenditure costs that are directly affected by the regulatory agency. This would include new regulations and mandates on issues such as number portability, local loop unbundling and carrier pre-selection. Regulations such as these, which require operator

investments to implement, should be reviewed properly before being introduced, so they can be implemented in the most cost-effective manner. The regulatory costs associated with these decisions affect the sustainability of companies and ultimately impact the pricing of services offered to consumers, who also are under pressure in the current economic climate. So everyone benefits from regulation that produces the desired results as efficiently as possible.

Often, regulatory action involves a trade-off between different possible uses of resources to maximize the benefits to society. A *regulatory impact assessment* (RIA) can be a useful *ex ante* measure to facilitate prudent regulatory decision-making, particularly in the context of budgetary constraints and in light of competing policy demands.<sup>16</sup>

## 5 THE COEXISTENCE OF TRADITIONAL AND IP INTERCONNECTION

The nature of networks themselves is undergoing a revolution from circuit-switched telephone networks to packet-switched next-generation networks (NGNs). Telecommunication operators can use these NGNs to deliver a package of voice, data and video offerings, all using the same core network hardware. The world is increasingly seeing an evolutionary stage that features two models:

- The operator-managed, closed network model, which is successor of the legacy, public-switched telephone network (PSTN); and
- The ISP-derived, decentralized, open network model, which is an improvement on the best-effort IP-based network.

Can these different types of networks coexist? Can they interconnect? How will they evolve? The answers to these questions are crucial – precisely because of the value that can be unlocked through interconnection and the resulting ubiquity of information and content. No government wants to strand thousands of people on a legacy network that can carry only voice – but which loses thousands of high-value customers yearly to broadband IP networks. Similarly, regulators want to avoid a perpetual NGN monopoly operated by an incumbent that will not interconnect with, or provide access to, ISPs.

Technology gives us the answers to some of those key questions. Different network models can coexist – and most importantly, they can interconnect. From a technical perspective, IP-based networks will hold true to their birthright: they still exist to interconnect. But from the business perspective – and therefore, as a regulatory issue – the era of IP network evolution and coexistence brings with it new regulatory challenges.

In contrast to open, IP-based networks, PSTN networks have service and transport layers that are closely linked. Here, interconnection is implemented with the idea of providing a particular service, such as voice telephony. PSTN networks, therefore, can be termed “service-specific”, because they are designed to provide particular services. Compared with the Internet, independent introduction of third-party services to PSTN end users is difficult, if not impossible; hence, legacy telco networks are usually called *closed networks*.

The most important point is that both legacy telco and IP-based networks can be seamlessly and relatively easily interconnected on a technical level. However, in contrast to closed telco networks, IP-based, open networks are designed to accommodate multiple services and applications.

The future interconnection regulatory framework will definitely extend beyond the regulation of voice interconnection. The emergence of IP-based networks and the co-existence of telco and Internet environments are putting pressure on existing regulatory practices. There are indications that established interconnection regulatory regimes may not be sufficiently flexible, and they may

not be able to solve problems in the market effectively. Some changes in interconnection practices already have taken place naturally (such as implementation of capacity-based interconnection), and more changes will be required in the future. It also seems clear that most of the changes in interconnection regulatory models are following Internet interconnection approaches.

The co-existence of substantially different network environments, however, raises challenges for regulators. Questions of whether the mechanisms that have sustained interconnection in the Internet to date will be able to ensure and sustain stable interconnection in the future, and whether the “hands off” regulatory approach remains the right approach, have become critical and remain open for discussion and further exploration.

It is clear that the telecommunication industry is evolving toward a future in which IP-based networks (NGNs) gradually replace circuit-switched networks, both for fixed and mobile (3G and 4G) services. Even as they do, however, there remains a strong incentive for regulators to ensure effective and reliable network interconnection, in order to maximize value and reach as many customers as possible. The separation of transport and service functions not only enables seamless interconnectivity, it provides maximum flexibility to drive services over multiple networks. In short, IP offers up a future of more interconnection, rather than less.

It also seems clear, however, that IP networks will coexist for the foreseeable future with older legacy networks, including 2G mobile and PSTN networks. That means that the need for legacy interconnection regulations will not dissolve – indeed, the complex interconnection environment may well call for greater oversight.

## 6 MOBILE TERMINATION RATES – TO REGULATE OR NOT TO REGULATE?

Over the past few years, mobile termination rates (MTRs) have become a concern in many countries throughout the world.<sup>17</sup> The move toward “hands on” regulation of MTRs is especially evident in Europe, where in 2001, the European Commission (EC) set up a regulatory framework requiring regulators to review interconnection markets. As a result, many European countries introduced price controls for mobile interconnection charges – most commonly on mobile termination.<sup>18</sup> Yet, according to the EC, efforts to bring these charges down were insufficient. In 2008, MTRs ranged from EUR 2 cents per minute in Cyprus to almost EUR 16 cents per minute in Bulgaria.<sup>19</sup>

In May 2009, the EC adopted a recommendation on the regulatory treatment of fixed and mobile termination rates throughout the European Union (EU). In the recommendation, the EC set out clear principles for NRAs to follow when setting fixed or mobile termination rates. The recommended methodology is a Long Run Incremental Cost (LRIC) model, which should ensure that termination rates are based on the costs of an efficient operator. Meanwhile, the deadline to reduce wholesale charges across the EU was set for the end of 2012. According to the EC, this will lead to mobile termination rates across the EU of between EUR 1.5 cents and EUR 3 cents per minute by 2012.<sup>20</sup>

The EU is not alone. Formal or informal regulatory pressures have been applied to mobile termination rates in many other countries, including Nepal, India and New Zealand. Not everyone is moving in the same direction. Some regulators are moving from “hands on” to “hands off” regulation, such as the Office of the Telecommunications Authority (OFTA) of Hong Kong, China. In April 2009, OFTA announced the deregulation of fixed-mobile interconnection charges, leaving them to be settled among operators by commercial agreement, without any *ex ante* regulatory intervention.<sup>21</sup>

Increasingly, regulators are asking:

- Is regulation of MTRs needed, and if so, when it is needed?
- What are benefits of MTR regulation?
- Should regulators consider symmetric or asymmetric regulation of MTRs?
- Which wholesale services should the regulation cover: voice only or SMS as well?
- How will the development of NGNs and the transition to IP networks change the situation?

Decisions to pursue regulatory intervention should not be taken lightly, and the timing of intervention may depend on a number of factors, including:

- The degree of market power enjoyed by the different players, and the overall degree of price competition in the marketplace;
- The potential delays that would be incurred by sole reliance on negotiations;
- The resources available to the regulator; and
- The level of consumer and commercial complaints about retail prices.

In addition, regulators should keep in mind a range of market-based solutions. Although perhaps not sufficient in themselves, such solutions remain a necessary component in solving interconnection-related problems. They include:

- Permitting more operators to enter the market, including virtual mobile network operators;
- Encouraging measures that facilitate customers' ability to choose and change service providers; and
- Ensuring tariff transparency so that consumers can compare rates between operators and between countries.
- Another subject that generates substantial debate and controversy is whether all market players should be subject to the same extent of regulation. Several types of symmetry and asymmetry are discussed in this chapter

Regulators should take into account the generally acknowledged fact that the existence of high fees for access to competitors' networks (termination rates) can distort competition by decreasing off-net calls and increasing on-net calls, become a barrier to new entrants and finally be harmful to end users. Eliminating unnecessarily high termination rates among operators could lower consumer prices, spur investment and innovation in the entire telecommunication sector.

## 7 THE FUTURE OF VOIP INTERCONNECTION

In recent years one technology, Voice over IP (VoIP), has left regulators and businesses wondering what the future of communications will hold. Voice over IP does away with some of the truths that were held to be self-evident in the sector. The most striking change is probably the separation between providing voice as a service and providing the physical network infrastructure. Another possibility enabled by VoIP technology is that consumers can have voice telephony without actually getting it from a telephony service provider. What VoIP promises, therefore, is a reduced role for the traditional telephone companies in the provision of voice, and a declining role for traditional telephony in the revenue stream of the telecommunication industry.

The dramatic change that VoIP can bring with it also has its effects on interconnection. This includes the following:

- VoIP by itself doesn't bring dramatic changes to the process of interconnection and its technical implementation. Many of the changes that VoIP is expected to bring might already be possible in circuit-switched networks.
- VoIP interconnection can support the same business and regulatory practices that exist in the current market. Combined with changes to business models and regulatory regimes, VoIP can, however, greatly decrease the cost of voice service and increase its use and usefulness.
- Interconnection in itself is easy to understand, but is made more difficult by business regimes and regulatory arrangements.

The role of the regulator is to guarantee the competitiveness of the telecommunication market and to ensure the consumer's trust.<sup>22</sup> With regard to the future of VoIP interconnection, that role is to see:

- If VoIP interconnection will stimulate competition; and
- Whether the consumer's trust in the telecommunication market can be upheld by VoIP interconnection.

When the answer to these two questions is yes, regulators will have to ask themselves:

- Are there any regulatory barriers to the introduction of VoIP interconnection that will need to be removed, or can the government enable the introduction of VoIP interconnection in other ways?
- Are there any anti-competitive barriers restricting the move to VoIP interconnection?
- Does the government have an active role in promoting VoIP interconnection, or should the move to VoIP interconnection be left to the market?
- How can consumers' trust in VoIP interconnection be guaranteed?

The analysis of the business of interconnection shows that voice has now become a service much like email or the World-Wide Web. Its costs, and the customers' willingness to pay, are converging to the same price level as other IP services. There is a great difference in the price of interconnecting IP traffic and the price for interconnection of a telephone call. This will lead to a continuing downward pressure on the price of interconnection and will continue to give opportunities for arbitrage.

Regulators will appreciate the opportunities VoIP and VoIP interconnection offer to increase competition in the telephony service market, with new market players entering, new services being enabled and the possibility for cheaper services. ENUM offers possibilities to build a national number database with number portability integrated into it. In order to enable these possibilities, some regulatory reform may be necessary to remove the codification of old business practices that now block the introduction of new business practices. Technological and business model neutrality should be the norm.

## 8 VOIP: ENEMY OR ALLY?

VoIP has now gained broad market acceptance among service providers, consumers and businesses alike. The traditional perception of VoIP has been as a vehicle for new market entrants to compete with traditional public telecommunication operators (PTOs). Increasingly, however, the reality is that most incumbent PTOs are now using wholesale VoIP to carry international traffic over their networks, as the transmission of traffic over IP-based networks can yield tangible cost savings. Many PTOs are also deploying VoIP in their access networks in ways that are not always evident to end-users.

What are the forces driving the transition to VoIP? In a few words, they are *cost* and *market liberalization*. Transmission over IP-based networks can cost as little as a quarter of equivalent PSTN transmission.<sup>23</sup> Moreover, it can save 50-60 per cent in maintenance costs, because an IP call can require just 10 per cent of the bandwidth required for a PSTN call.<sup>24</sup>

As they review these cost advantages, many operators realize that they have to respond to competitors (domestic and foreign) and position themselves in a truly global communication industry. IP-based networks often appear to be the best foundations for business-critical applications, as operators integrate voice and data networks. Consumer VoIP applications can run over a range of devices, offering flexibility in the first step towards seamless communications. For some operators, IP-based transmission is the first step in implementing an NGN strategy, although true NGN is a broader concept that involves specific QoS guarantees and generalized mobility not offered by most types of VoIP.<sup>25</sup>

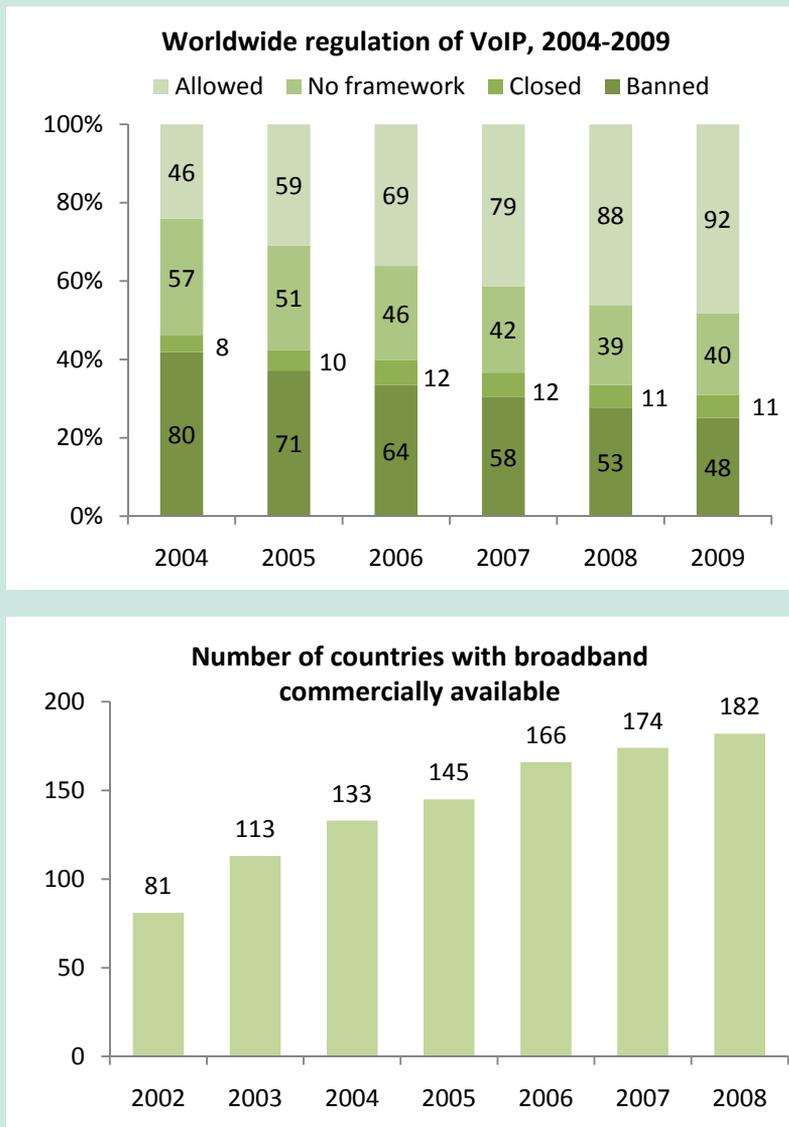
Progress in VoIP adoption and legalization is closely connected with market liberalization. VoIP can be seen as a technology for introducing competition – and gaining a competitive advantage – in liberalized national and international telecommunication markets. VoIP is changing the industry irrevocably by opening up new markets and bringing different players into competition. Converged technologies are boosting facilities-based competition. VoIP lets broadband, cable modem and wireless service providers compete directly with each other. It also promotes service-based competition by enabling new service providers to compete without owning their own network infrastructure. In many markets, Skype and Vonage are now competing directly with the incumbent operators. The entry of new service providers could result in new and improved services and greater incentives for domestic and foreign investment.

The global growth of VoIP raises a host of issues for regulatory frameworks that were, after all, designed mainly for the PSTN world. Some of these issues impact all markets – for example, QoS concerns – while other issues vary and evolve with the level of market maturity. These variable issues may relate initially to universal service, licensing, numbering and access to emergency services. Later on, net neutrality, market size, and pro-competition concerns come to the fore.

The main regulatory issues, however, involve whether or not to regulate VoIP as a substitute for PSTN telephony, and whether VoIP regulation should differ from regulation of traditional telephone services. Regulators may want to ensure a “level playing field” between existing operators and new

VoIP market entrants in the areas of universal service, access to emergency services, and numbering portability. At the same time, however, many regulators are anxious to avoid disproportionate regulatory interventions that could stifle innovation, dissuade entry by new competitors, or dampen investment in new services and networks.

**Figure 10: The Global Growth of VoIP & Broadband**



Source: ITU. This time series of data is available for 191 countries for 2004-2009.

Note: 'Closed' means countries where wholesale VoIP is permitted, but retail VoIP is banned, as well as those countries where only the incumbent is licensed to provide VoIP. Broadband services are defined as Internet access at speeds of 256 kbit/s or more.

The growth of VoIP services is changing the telecommunication landscape, bringing new players into competition with incumbents and rewriting the sector's economics. While governments and regulators move to embrace the growing reality of VoIP, operators are adapting to the altered competitive landscape and the emergence of new business models. Regulators are responding in flexible and measured ways to address and resolve these issues, pointing the way toward bringing all of the benefits of IP-based voice services to consumers. The track record bodes well for further integration of networks, services and applications in the era of convergence.

## 9 CONSUMER PROTECTION FOR THE CONNECTED CONSUMER

The need to be connected and “always-on” impacts the way consumers live and the way business is transacted. Whether it’s through a high-speed broadband or dial-up connection, access to the Internet has become synonymous with access to markets, information, social networks and education.

In order to ensure that consumers benefit fully from the services the Internet has to offer, regulators need to ensure that networks are efficient and reliable, widely accessible (including in remote, rural areas) and affordable. The challenge is to promote favorable market conditions for competition and innovation, while at the same time ensuring that consumers’ interests are protected.

If competition is to benefit consumers, they must be able to exercise choice.<sup>26</sup> If consumers are well-informed about their choices, the market will work effectively through increased competition between suppliers, providing favourable prices, quality and product choices. In short, the assumption is that competition benefits consumers.

Yet, consumers are vulnerable, because their sensitive personal data is shared across networks, often for advertising purposes. The “traditional” practice of advertising through the media has shifted toward more direct personalized marketing through the Internet, email and texting. While some consumers have welcomed tailored marketing, others may feel it invades their personal privacy. Increasingly, there are demands on telecommunication and ICT regulators to define personal privacy in the online space, and to find ways to protect consumers from potential threats. Regulators may have to develop a security framework and act as enforcers for various measures designed to protect privacy.

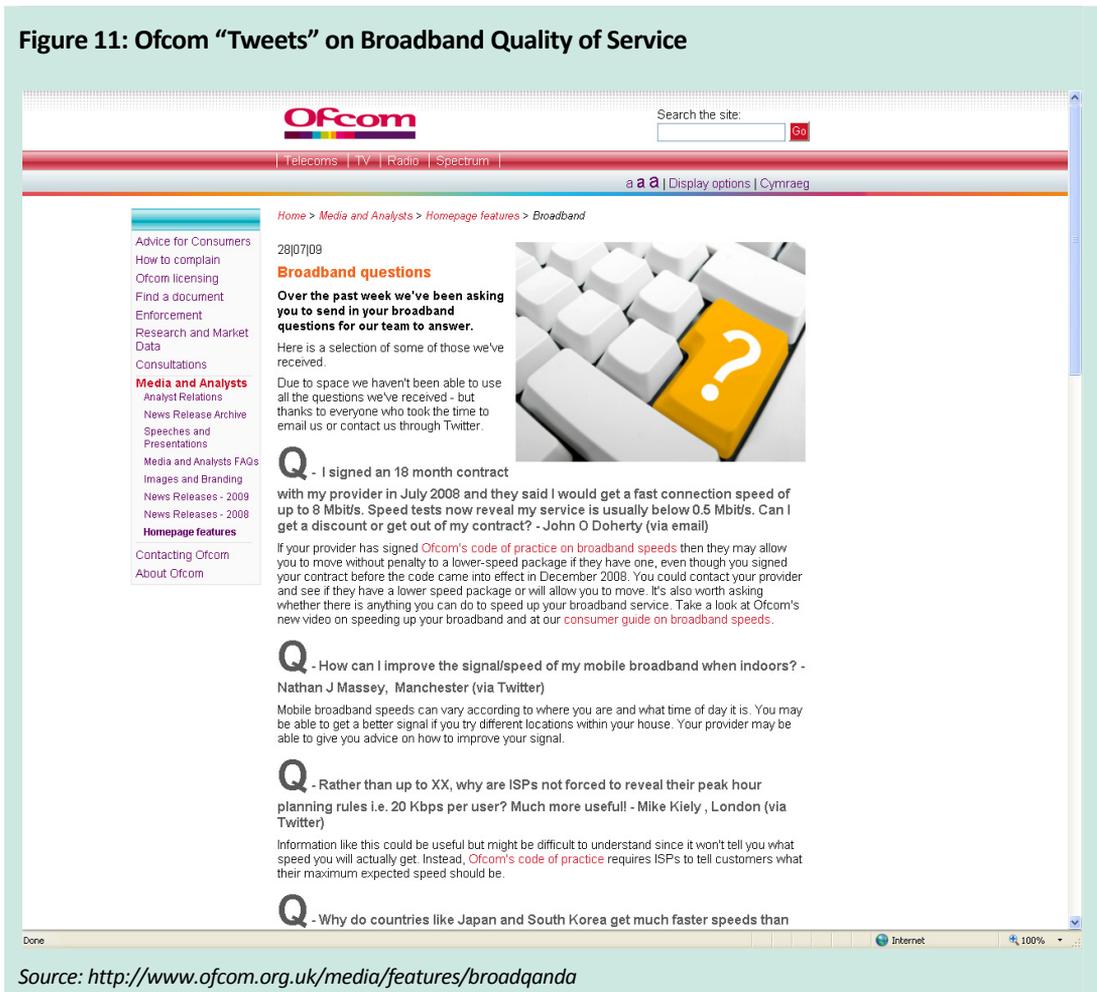
A growing number of countries have developed specific consumer protection laws and regulations for ICT customers. In some cases, the ICT regulatory authority has primary responsibility for enforcement, while in others the responsibility is shared with, or assigned to, a designated consumer protection agency.

To avoid regulatory intervention, regulators may want to explore the potential for devolving some consumer protection responsibilities to the service providers themselves. Reliance on complete self-regulation is likely to be effective only where ICT providers share the same consumer and social protection agenda as the government. More commonly, regulators will tend to adopt a “co-regulatory” approach to consumer protection.

In order to ensure that consumers’ needs and expectations are met, regulators need to be confident that consumers are aware of their rights (and responsibilities) and have the right information to make rational choices, especially where resources are scarce and incomes are low. Consumers should have enough information to make educated trade-offs between price and

quality-of-service. Information must be easy to understand, easy to access and easy to compare. The regulator's role is to ensure that the right information is available, accurate and reliable. One innovative way of maintaining a direct, interactive link with consumers, is to use one of the latest global on-line instant messaging tools, such as Twitter. Figure 13 provides a screenshot of a free service provided by Ofcom in the United Kingdom.

**Figure 11: Ofcom "Tweets" on Broadband Quality of Service**



Access to a fair and transparent complaint process is an essential part of an effective consumer protection framework. Consumer complaints have an important role to play in regulation, because they provide a useful barometer of market practices. Access to a fair and transparent complaint process, with sanctions for non-compliance, remains an essential part of an effective consumer protection framework. With the Internet generating many small, cross-border transactions, regulators also need to consider ways of securing collective redress (as is currently being explored by the European Commission).

Can regulators simply rely on consumer education, industry co-regulation and self-regulation, and general consumer-protection laws to meet the needs of connected consumers? It seems unlikely. The success of codes of practice relies in part on consumers' taking an interest in them, which may prove difficult. Success also partly relies on the willingness and power of regulators to enforce agreed-upon standards where necessary. On the other hand, regulatory intervention needs to be justified by balancing costs and consumer benefits.

## 10 CONCLUSION: A BRIGHTER FUTURE

This edition of *Trends in Telecommunication Reform* finds the industry in the midst of a generational shift from legacy telephone networks to the new IP-based NGNs and broadband wireless networks of the future. When that future has fully arrived, the world may look back on this period as just a blip in the otherwise steady growth of an industry that has come to define “high-tech” – an industry that went through its growing pains in the 2000-2002 recession and bounced back with a new maturity. As the world’s economy returns to positive growth over the next year, the ICT sector will be clearly poised to once again chase the demand for mobility, broadband download speeds and new functionalities and applications.

Whether the infrastructure is a next-generation network (NGN), or a 3G (or 4G) mobile phone system, packet-switching and multi-layer networks are coming to define the new, more open paradigm of the future. Alongside traditional closed telephone networks of the PSTN, there are going to be increasing alternatives for core networks and access networks. Gone are the days when discrete twisted-pair copper networks defined the user experience.

In countries around the world, customers are simply dropping standard fixed lines and replacing them with mobile connections of all kinds, through handsets, PDAs, dongles, netbooks and other devices that were unheard of 20 years ago. The convergence of platforms erodes the previously bright lines between broadcasting, telephony and data services, as users increasingly download television programming to their laptops and mobile phones – and broadcasting increasingly resembles file sharing and mesh networking. Cloud computing replaces hard drives, and telephone calls are routed over the Internet. All the verities are seemingly in flux.

This “bonfire of the verities” – the erosion of boundaries among networks and the convergence of content in IP-based transmission – will shake up regulatory regimes enormously. It will redefine markets, pitting previously separate industries against each other. What will happen to the “broadcasting” sector, for example, when programming can be downloaded on demand over mobile devices and desktop PCs? Who will regulate video content that is uploaded to computers and sent over the Internet?

Is investment the missing piece? Even in the darkest hour of the global downturn, plans have been finalized, funding has been secured and husbanded, and networks have been rolled out. But more financing will be needed over the next decade to complete the quantum jump to the era of ubiquitous IP-based networks and advanced broadband wireless capabilities. Much of that investment will have to come from the private sector and international sources.

Governments can help improve their chances in the sweepstakes by taking actions to minimize regulatory risk. This entails proactively responding to new technological and market realities. But more fundamentally, it means reinforcing the independence, professionalism and technical prowess of their regulatory authorities. The decade of the 2000s witnessed a steady march of progress in these areas, by governments around the world. In the final analysis, what is needed is more of what governments have been providing: stable regulatory frameworks and fairness and equity under the rule of law. If governments continue to build on that, then the investment will come.

### Notes

- <sup>1</sup> [http://www.itu.int/osg/csd/emerging\\_trends/crisis/confronting\\_the\\_crisis\\_2.pdf](http://www.itu.int/osg/csd/emerging_trends/crisis/confronting_the_crisis_2.pdf)
- <sup>2</sup> This section is based on research carried out by Ms. P. Biggs, ITU, author of Chapter 8 on Voice over Internet Protocol: Enemy or Ally?
- <sup>3</sup> Infonetics Research, through VoIP News, 1 march 2008, at: [www.voip-news.co.uk/2008/03/01/80-million-worldwide-voip-subscribers-in-2007/](http://www.voip-news.co.uk/2008/03/01/80-million-worldwide-voip-subscribers-in-2007/)
- <sup>4</sup> According to Point Topic <http://point-topic.com/>
- <sup>5</sup> For example, Infonetics Research estimated that there were some 80 million VoIP subscribers worldwide by 2007, far more than earlier predictions forecasting 55 million subscribers by 2009. In 2006, In-Stat predicted that the global market for consumer VoIP services has arrived, with total VoIP subscribers worldwide at 16 million in 2005 projected to grow to over 55 million in 2009 ([www.in-stat.com](http://www.in-stat.com)).
- <sup>6</sup> Point Topic, 23/10/2008: [http://point-topic.com/content/bmm/profiles/BMMIPT081021.htm&comp\\_id=4685&g=2](http://point-topic.com/content/bmm/profiles/BMMIPT081021.htm&comp_id=4685&g=2).
- <sup>7</sup> Adapted from Developments of Next Generation Networks (NGN): country case studies, ITU, 2009, see <http://www.itu.int/ITU-D/treg/Documentation/ITU-NGN09.pdf>
- <sup>8</sup> TMG; Point Topic
- <sup>9</sup> Adapted from Developments of Next Generation Networks (NGN): country case studies, ITU, 2009, see <http://www.itu.int/ITU-D/treg/Documentation/ITU-NGN09.pdf>.
- <sup>10</sup> ITU-infoDev ICT Regulation Toolkit, [www.ictregulationtoolkit.org](http://www.ictregulationtoolkit.org).
- <sup>11</sup> The TCP/IP suite was one of several protocol suites that were used in the development of the Internet, including Digital Equipment Corporation's DECNet, the Xerox Network Services (XNS) architecture, the Open Systems Interconnection (OSI). The TCP/IP became widely adopted with the establishment of the World Wide Web.
- <sup>12</sup> The pioneering work setting this vision out was Vinton G. Cerf and Robert E. Kahn, "A Protocol for Packet Network Intercommunication", IEEE Trans. On Comms, Com-22, No. 5 (May 1974).
- <sup>13</sup> These are often roughly described as the utility layer, the transport layer, the network protocol layer and the link layer interfacing with the physical network. Put simplistically and abstractly, each layer within the IP/TCP suite deals with its own problems, carries out its own tasks, and interacts with the layers above and below it, allowing it to be modified without changing the other layers. Of course, the reality is more complex than this, since the various layers are not neatly distinct. Application protocols are used as middleware for other applications; many applications may serve one another and carry out more than one of the functions, blurring the boundaries between the various functions. See Richard Bennet, *Designed for Change: End-to-End Arguments, Internet Innovation, and the Net Neutrality Debate*, Information Technology and Innovation Foundation (September 2009), 31. Available at <http://www.itif.org/files/2009-designed-for-change.pdf>
- <sup>14</sup> Timothy Wu, "Application-Centered Internet Analysis", 85 Va. L. Rev. (1999) 1163, 1192.
- <sup>15</sup> In this paper Universal Access Funds (UAF) include Telecommunications Development Funds, Rural Development Funds, and any other funds established to support and finance ICT access in underserved areas.
- <sup>16</sup> *Building and Institutional Framework For Regulatory Impact Analysis (RIA)*, OECD, 2008.
- <sup>17</sup> Littlechild, S.C. (2006). Mobile termination charges: Calling Party Pays versus Receiving Party Pays. *Telecommunications Policy*, Vol. 30, Issues 5-6, p. 242-277.
- <sup>18</sup> In the majority of EU countries mobile origination market is being considered as a fully competitive market and mobile origination rates are left without regulation.
- <sup>19</sup> <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/222&format=HTML&aged=0&language=EN&guiLanguage=en>
- <sup>20</sup> <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/222&format=HTML&aged=0&language=EN&guiLanguage=en>
- <sup>21</sup> <http://www.itu.int/ituweblogs/treg/Hong+Kong+++Deregulation+Of+Fixed+Mobile+Interconnection+Charge.aspx>
- <sup>22</sup> Taken from the mission statement of the Dutch Regulator OPTA
- <sup>23</sup> Slide 4, "Defining VoIP", presentation by Josua Turaganivalu, Ministry of Commerce, Industry, Investment & Communications of the Government of Fiji, at the workshop held on 12 July 2007, available at: <http://www.fiji.gov.fj/uploads/DEFININGVOIP.pdf>
- <sup>24</sup> "VoIP Deployment and Regulation in Asia" (2006), Konrad L. Trope, Novo Law Group.

- <sup>25</sup> See the ITU-T definition of NGN as “a packet-based network able to provide Telecommunication Services to users and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent of the underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and services of their choice. It supports generalised mobility which will allow consistent and ubiquitous provision of services to users” (ITU-T Recommendation Y.2001 (12/2004), available at: <http://www.itu.int/ITU-T/ngn/definition.html>)
- <sup>26</sup> A recent report commissioned by the OECD, which set out to examine the available evidence of consumer behaviour and analyse the implications for policy and regulation. Exploring the evidence of actual consumer behaviour, the report makes a number of recommendations for policy-makers and regulators, designed to promote the consumer interest. See: Organisation for Economic Co-operation and Development, Directorate for Science, Technology and Industry, Committee for Information, Computer and Communications Policy: Working Party on Communication and Infrastructures and Services Policy, Enhancing Competition in Telecommunications: Protecting and Empowering Consumers, London 24-25 May 2007, DSTI/ICCP/CISP(2007).



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