Broadband Policies for Latin America and the Caribbean

A DIGITAL ECONOMY TOOLKIT



OECD IDB

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Preface

Digital technologies are profoundly changing our economies and societies. Broadband networks are essential in enabling this transformation. By reducing the cost of accessing information and by expanding the means for sharing knowledge, these networks can empower people, encourage greater civic engagement and improve the delivery of public services, as well as helping to create opportunities for new goods, services, business models and jobs. Nonetheless, these opportunities come with challenges, the first of which is to ensure that everyone has access to this extraordinary tool.

The capacity of broadband to accelerate economic and social development is recognised globally. Its importance for the three pillars of development – economic development, social inclusion and environmental protection – was recently acknowledged by the United Nations (UN), which set a provision of universal and affordable access to the Internet in least developed countries by 2020 as one of the targets of the Sustainable Development Goals (SDGs).

We are also mindful of the UN's call for sharing knowledge and expertise in the service of the SDGs. *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit* offers a clear example of partners coming together to share good practices. In setting out some guidelines for designing a whole-of-government approach to policies, this Toolkit aims to assist countries in the region enhance their digital prospects and make progress on international, regional and national policy objectives.

Today, Latin America and the Caribbean (LAC) is experiencing an economic slowdown, but the time is ripe for both implementing much needed structural reforms that can promote sustainable growth and for designing policies that seize the benefits of the digital economy. The first challenge is making sure opportunities are more evenly spread. An estimated 300 million people in the region, half of the population, still have no access to the Internet, with the situation varying greatly between countries, income groups, and those living in rural or urban areas.

Successful broadband policies, designed to improve social inclusion, productivity and governance, can be a catalyst for expanding the "digital dividends" which stem from broadband access and use. Policymakers and regulators have a variety of instruments at their disposal to stimulate and encourage investment, competition and network deployment. They can also assist in making services more affordable, relevant, usable and safer for individuals and businesses.

The OECD is committed to supporting accessible and affordable broadband. This joint publication with the Inter-American Development Bank (IDB), to be presented at the Digital Economy Ministerial meeting in Cancún, Mexico, is designed to generate fruitful

policy dialogue on how to achieve this goal. This will mean enlisting all stakeholders to make the most of the opportunities ahead and to tackle the evolving challenges of the digital economy to promote further social inclusion, increase productivity and enhance governance in the region. It is time to act together to put accessible, affordable broadband at the fingertips of all.



Angel Gurría,
Secretary-General OECD

Foreword

Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit *is the result of a partnership between the OECD and the Inter-American Development Bank (IDB). Its aim is to encourage the expansion of broadband networks and services in the region by assisting policy makers and regulators with the implementation of policies based on a coherent and whole-of-government approach. In order to do so, the publication puts forward good practices and case studies. It builds on the combined expertise of the OECD and IDB.*

The OECD has extensive experience in policy analysis associated with broadband access and usage, as well as in developing recommendations aimed at fostering deployment, investment and competition. Many of the policy and regulatory issues faced in the LAC region are common to those in OECD countries, and sharing good practices can be a valuable resource. The wide variety of issues covered by expert groups within the OECD, whether on education, health, government or taxation, make it possible to compile an extensive set of good practices on both supply and demand-side issues with a proven record of success.

The IDB has been a major supporter of LAC countries as they design and implement digital and broadband strategies and has assisted its member countries in the challenge of developing this critical technological infrastructure. This ranges from supporting the design of national broadband plans to nurturing public-private partnerships, where necessary, to expand broadband coverage.

This Toolkit draws on a wealth of information collected by the OECD and IDB using an extensive questionnaire on policy and regulatory issues that was distributed to all 26 LAC countries in 2014 and 2015. It has benefited from an up-to-date and comprehensive perspective of the region, thanks to this stocktaking exercise, which has also helped to identify a variety of good practices drawn from LAC countries.

The OECD/IDB Broadband Policy Toolkit for LAC will complement existing toolkits and regulatory references by drawing on extensive accumulated experience on policy making and regulation across different countries with a range of contexts and challenges. This Toolkit covers supply and demand-side broadband policy issues and hopes to offer a holistic overview of the subject that can help policy makers and regulators prepare for the future. Good practices included in this Toolkit rely on the IDB's experience in the LAC region and the OECD's recommendations and evidence-based analysis of broadband policy issues, which are referenced throughout each chapter.

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Executive summary

Broadband networks are the foundation of digital economies. Increased availability and effective use of the services enabled by broadband can advance social inclusion, productivity and good governance. A range of challenges has to be overcome, however, in providing readily accessible, universal and locally relevant broadband-based services in many parts of the world. In the Latin American and Caribbean (LAC) region, some 300 million people have no access to the Internet. While new generations of broadband networks are rapidly emerging, much remains to be done to expand the necessary infrastructure and to encourage individuals, business and governments to make the most of what broadband has to offer.

Increasing connectivity and the use of digital services in the LAC region will require policies and practices that address major supply and demand issues in a holistic and coherent manner. The *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit* sheds light on good practices and case studies, based on a whole-of-government approach. Its aim is to offer public authorities an overview of the policies, regulatory practices and options that can maximise the potential of broadband as a driver of economic and social development. The 15 chapters of this Toolkit cover a broad array of topics on broadband policy making, from digital strategies, regulatory frameworks and spectrum management, to competition, access, affordability and taxation, including education, skills and business uptake, as well digital security and privacy.

Key findings

The chief challenges for increasing broadband access and use in the LAC region relate either to supply-side issues, such as infrastructure deployment and provision of broadband services, or to demand-side issues, such as skills, entrepreneurship, local content and consumer protection. In these respects:

- Competition in communication markets in the LAC region tends to be weaker than in OECD countries, and pro-competitive regulation could be strengthened to actively encourage its development as a tool to meet policy goals.
- In some areas in the LAC region, insufficient incentives for infrastructure deployment are offered at the regional, national, and international level, which limits domestic and international traffic and leaves demand for broadband services unsatisfied.
- Affordability has been one factor holding back growth in broadband services in the LAC region, but the spread of mobile services suggests that this issue is far from insurmountable.
- As technologies and services converge, in many instances regulatory frameworks in the LAC region continue to operate in separate silos.

- The LAC region has not made the progress that it might in introducing broadband to local institutions such as schools, promoting ICT and broadband adoption in business, and encouraging governments to become more transparent, effective and responsive by using the services that broadband makes possible.
- Countries in the LAC region need to address an increasing range of issues related to trust as their digital economies develop, for example in the areas of consumer protection, privacy protection and digital security risk management.

Key recommendations

The task of increasing broadband access and usage is complex, involving major supply and demand-side issues. Extending broadband use cannot be addressed by policy makers and regulators alone. Broader structural issues must be addressed, with the help of all relevant stakeholders. Good practices in this respect include the following:

- Digital strategies and national broadband plans should seek to increase broadband access and usage by using a whole-of-government and multi-stakeholder approach.
- A stable and predictable regulatory framework is necessary to cultivate long-term investment in broadband infrastructure. Sound regulations can help expand infrastructure expansion by lowering the costs of deployment.
- Increased competition is a key element for disciplining prices, promoting innovation and improving responsiveness to demand. Independent agencies are needed to address dominance issues or impose wholesale regulation when necessary to lower the barriers to new entrants.
- Broadband should be made increasingly accessible and affordable to disadvantaged groups and people living in rural and remote areas. Sectoral over-taxation that deters broadband expansion and use should be avoided. Public authorities can also establish incentives and finance networks when markets alone are unable to meet the demand.
- Regulatory frameworks should make sure that authorities are in a favourable position to address competition and investment issues arising from the increasing convergence of networks and services.
- Regional co-operation arrangements, sharing of regulatory experiences, deployment of regional connectivity infrastructures, cross-border data flows and lowering the prices of international connectivity and roaming should be encouraged.
- Broadband services should be made available in schools, health care centres and other places of public access, along with the promotion of a skills system geared to the digital economy. Facilitating ICT adoption by businesses, creating digital content accessible to local populations, and the promotion of digital entrepreneurship can all increase demand and improve services.
- Digital governments should be actively promoted in the LAC region to allow for smarter organisation of cities and to help governments become more efficient, effective, open, transparent and accountable.
- Enhancing trust in digital services is critical to encourage the uptake of broadband. Consumer protection, digital security risk management and privacy protection should be ensured.
- Implementing systematic measurement frameworks to monitor the growth of broadband and digital services is critical for informing policy and regulatory decisions.

Chapter 1

Broadband and beyond in Latin America and the Caribbean

This introductory chapter provides background for all other chapters in this Toolkit. It discusses the role of broadband in accelerating economic and social development, the need for holistic broadband policies and the objective of a regional broadband policy toolkit. It also provides an overview of the situation in the Latin America and Caribbean region, by presenting leading indicators as well as opportunities and challenges related to broadband deployment and adoption. This chapter concludes by summarising good practices identified throughout the Toolkit.

Broadband Internet access is playing an increasingly transformative role across all economic sectors and societies, in the Latin American and Caribbean (LAC) region. It has become a key digital tool for enabling **individuals**, **businesses** and **governments** to interact with and among each other. It empowers users in their daily lives, through its potential to expand **social inclusion** and facilitate communication for disadvantaged groups; it advances **productivity**, by increasing the information base, efficiency and innovation; and it improves **governance**, by reducing co-ordination costs and allowing greater participation and accountability.

While the potential benefits of using broadband networks are undeniable, several challenges lie ahead in the LAC region. First, **broadband networks must be readily and universally accessible**, and while progress has been made, much remains to be done. In the LAC region alone, an estimated 300 million people, half of the population, have no access to the Internet. Without access, the opportunities for economic and social development that broadband offers are denied to individuals, communities and businesses.

Second, policies and practices are needed not only to expand access, but to make possible the **continued improvement of networks**, so users can take advantage of the opportunities they offer. Broadband networks may one day reach a level where they meet all existing and foreseeable demand, but there is little sign that this will occur in the near future, even as demand continues to evolve and technological capabilities progress. New generations of wireless networks, for example, are advancing apace or are planned in the most developed countries of the world (e.g. 4G and 5G) and, in a small number of places, fixed services are commercially available that are 40 000 times faster than initial broadband offers (i.e. 10 gigabits per second vs. 250 kbits per second). Ever since the introduction of broadband, a range of capabilities has been available across different locations, countries and regions, and stakeholders are caught up in an ongoing process of network development rather than aiming for a single end point.

Individuals, business and governments need **the skills and capabilities to enjoy the dividends of broadband access** and to benefit from it over time. More than half of the 15-year-olds in the LAC region have not acquired the basic level of competences to perform well in the labour market (OECD, 2016). The skills gap in basic competences, as well as in digital literacy, prevents many from participating fully in the digital economy, reducing their chances in the labour market and blunting competitiveness.

Broadband networks need not only to be accessible and affordable but also sustainable, so they can continue to stimulate and meet demand. Policies and practices are called for that address issues of supply and demand in a holistic, coherent manner across all sectors of society. The *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit* (thereafter: the Toolkit) is intended to provide good practices and case studies to help inform policy makers of regulatory practices and options to maximise the potential of broadband as a driver of social inclusion, productivity and good governance.

Table 1.1. **Sustainable Development Goals (SDGs) and ICTs**

	Target 1.4: *By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services […], appropriate **new technology** and financial services, including microfinance."*		Target 9.c: *Significantly increase access to **information and communications technology** and strive to provide **universal and affordable access to the Internet** in the least developed countries by 2020.*
	Target 2.a: Increase investment […] in rural infrastructure, agricultural research and extension services, ***technology development*** and plant and livestock gene banks […]." Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets […] and facilitate timely ***access to market information***, including on food reserves, in order to help limit extreme food price volatility.		ICTs, especially through mobile-based services, can help reduce inequality by drastically **expanding access to information**, contributing to individual empowerment and social inclusion of individuals who used to fall outside the reach of traditional services. (*)
	The use of ICTs in the health sector can result in higher quality health care that is safer and more responsive to patients' needs. **E-health** can be particularly important in rural and remote areas, facilitating innovative models of care delivery, such as telemedicine and mobile health. (*)		ICTs can be leveraged to organise cities and communities more efficiently. **Smart cities** use ICTs and big data to improve public service delivery and to advance broad policy outcomes such as energy savings, safety, urban mobility and sustainable development. (*)
	Target 4.b: *By 2020, substantially expand globally the number of scholarships available to developing countries […] for enrolment in higher education, including vocational training and **information and communications technology**, technical, engineering and scientific programmes, in developed countries and other developing countries.*		ICTs, and especially broadband, have directly connected consumers and producers and given rise to **"on demand" markets** of products that can be customised and localised, which can save time, reduce transport costs and contribute to more efficient and sustainable consumption. (*)
	Target 5.b: *Enhance the use of enabling technology, in particular **information and communications technology**, to promote the empowerment of women.* 		 Use of the **Internet of Things** can help make monitoring the environment cheaper, faster and more convenient. (*)
	 ICTs can contribute to improving water and energy access by using **mobile solutions, smart grids and meters** to advance efficiency, manage demand and develop new ways to expand access. (*)		The use of ICTs in the public sector can improve the range and uptake of **digital government** services; strengthen the performance of public institutions and enhance transparency and the participation of all citizens. (*)
	Target 8.2: *Achieve higher levels of economic productivity through diversification, **technological upgrading and innovation**.* Target 8.3: *Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, **creativity and innovation**, and encourage the formalisation and growth of micro-, small and medium-sized enterprises, including through access to financial services.*		Target 17.8: *Fully operationalise the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular **information and communications technology**.*

Note: Not all SDGs had an ICT component officially included in a corresponding target by the UN. In those cases, identified by (*), examples were identified by the OECD to depict how ICT could contribute to that particular goal.

Sources: United Nations General Assembly (2015), "Transforming our world: the 2030 Agenda for Sustainable Development", *https://sustainabledevelopment.un.org/post2015/transformingourworld*; OECD.

Broadband is crucial for socio-economic development

Following the rapid spread of broadband world wide, a large body of evidence has been amassed to support the effect this key digital technology has had on GDP growth (Czernich et al, 2009; Koutroumpis, 2009; Qiang, Rossotto and Kimura, 2009; IDB, 2012a), efficiency (Thompson and Garbacz, 2008), firm-level productivity (Bartel, Ichniowski and Shaw, 2007; Fornefeld, Delaunay and Elixmann, 2008), labour gains (de los Rios, 2010) and employment

(Katz et al., 2009; Kolko, 2012). By reducing the costs of accessing information and expanding the channels of sharing knowledge, broadband is spurring productivity by creating new goods, services, business models and jobs.

A growing body of research shows that broadband also contributes to broader social development. It can help cultivate a more inclusive society and better governance arrangements, by improving the quality and coverage of public services and political participation and expanding the way that individuals collaborate, create content and benefit from a greater diversity and choice in products and from lower prices.

The role of broadband as an accelerator of development of information and communication technologies (ICTs) has been recognised globally. Its critical importance to the three pillars of development – economic development, social inclusion and environmental protection – was recently acknowledged by the United Nations (United Nations General Assembly, 2015). The task of making the Internet universal and affordable was approved as a target (Target 9.c) of the Sustainable Development Goals (SDGs), echoing the objective already elaborated by the UN Broadband Commission for Sustainable Development.[1] Policies that explore the full potential of ICTs can accelerate progress towards the Sustainable Development Goals (SDGs). The table above summarises the ICT components set as targets in the SDGs and includes others that can potentially contribute (Table 1.1).

Broadband policy making

Despite the rapid spread of broadband, and the increasing agreement on the opportunities it brings, nearly 60% of the world's population, or four billion people, are still offline. In the LAC region alone, it is estimated that around 300 million people do not have access to the Internet (ITU, 2015). These gaps in the availability and penetration of broadband persist, cutting a large portion of the population off from the digital dividends.

The task of closing the access and usage gaps is complex. It involves major supply-side challenges, notably encouraging investment and competition, extending broadband infrastructure into rural and remote areas and upgrading networks to match the rising demand. Additionally, demand-side issues, such as low levels of income, education and local content production, add new challenges of improving affordability and relevance of services to users.

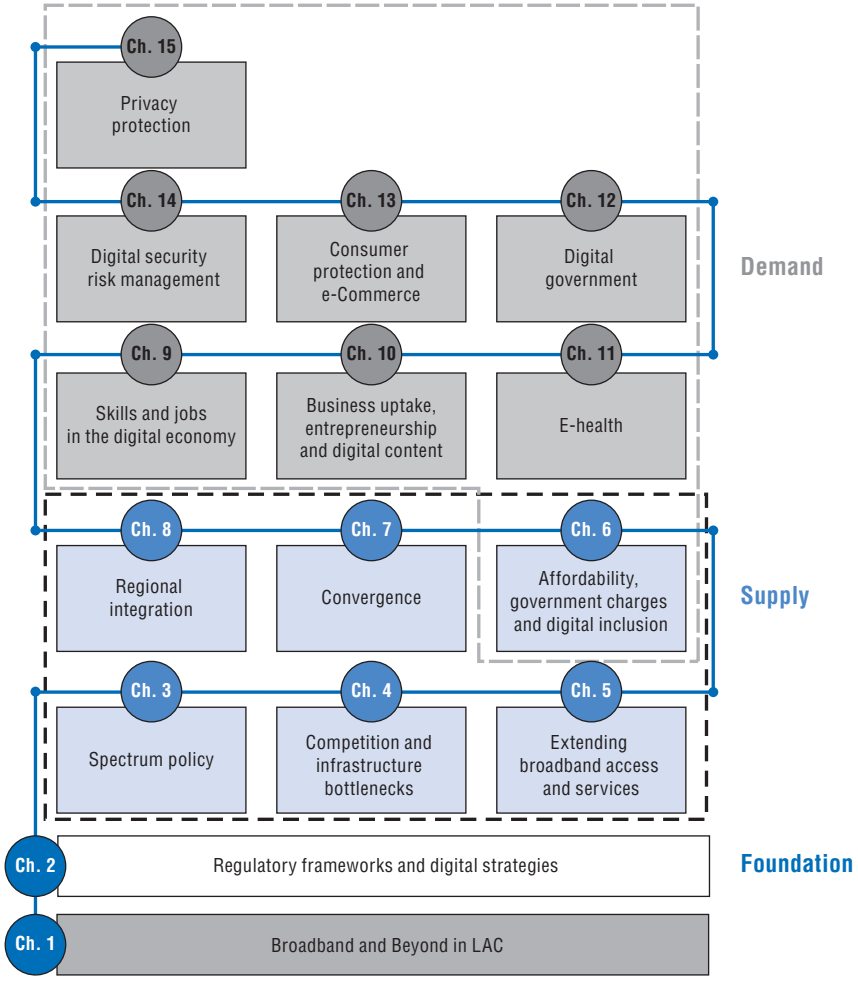
As the challenges are often substantial and the stakes so high, the task of designing and implementing sound broadband policies is a critical one. Policy makers and regulators have at their disposal a large variety of tools that can be used to stimulate and encourage investment, competition and network deployment, and help make services more affordable, relevant, usable and safer for individuals and businesses.

Not all the challenges for extending broadband use can be addressed by policy makers and regulators alone. Broader structural challenges in the LAC region remain, such as lack of basic electricity and road infrastructure in remote areas. However, improved communication can also help address and potentially substitute for deficiencies in essential services. It can offer business models for off-the-grid energy availability (e.g. prepaid solar energy) and help overcome distance and transport barriers to the delivery of public services and the exchange of commerce. Successfully implemented broadband policies, formulated to improve **social inclusion**, **productivity** and **governance** can act as catalysts for expanding the digital dividends of broadband access and use throughout the whole economy and society.

Achieving these policy objectives will require a broader understanding of both supply-side and demand-side issues, articulated by a holistic and cross-sectorial policy approach. Experience shows that well-designed regulatory tools, ambitious digital strategies and broadband policies that expand the potential of **individuals**, **business** and **governments** can make a substantial difference in increasing broadband deployment, investment, competition and use.

This Toolkit aims to encourage the expansion of broadband networks and services in the region. It offers policy makers and regulators a tool for implementing policies based on a coherent and whole-of-government approach. This Toolkit covers a broad array of topics on broadband policy making, including digital strategies, regulatory frameworks, spectrum management, competition and infrastructure bottlenecks, broadband access, affordability, sector taxation, inclusion, convergence, regional integration, education, skills, business uptake, entrepreneurship, local content, e-health, digital government, consumer policy, and digital security and privacy. The layout of the Toolkit is shown in Figure 1.1.

Figure 1.1. **Structure of the *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit***



Each chapter of this Toolkit follows the same internal structure, providing the main policy objectives, guidance for the measurement of these objectives, an overview of developments in the region, and a compilation of good practices in each area.

The good practices presented here are not exhaustive and should be complemented by other available resources (Box 1.1). The OECD/Inter-American Development Bank (IDB) Toolkit offers some additional components that can be useful for policy makers and regulators in the region:

- Good practices included in this Toolkit rely mainly on IDB's experience in the LAC region, OECD recommendations and evidence-based analysis of broadband policy issues, as noted throughout each chapter.
- The Toolkit draws on a wealth of information collected by the OECD/IDB team through an extensive questionnaire (with around 500 questions) sent to all 26 countries of the LAC region[2] between 2014 and 2015, which addressed the different policy/regulatory issues covered in this Toolkit. This stocktaking exercise has provided an updated and comprehensive perspective of the region, and highlights good practices drawn from LAC countries.
- Good practices from the OECD and LAC areas and evidence-based analysis have been applied to the specific condition of the LAC region, including the wide range of development levels in the region. This aspect has benefited from the advice of the IDB and LAC focal points, directly in these countries. Additionally, the OECD routinely reviews a number of LAC countries because they are OECD members (e.g. Mexico and Chile) or because they work closely with the OECD (e.g. Brazil, Colombia and Costa Rica).
- Finally, this Toolkit covers supply and demand-side broadband policy issues (Figure 1.1). This includes policy topics related to infrastructure deployment, investment and competition, as well as ICT skills, employment, e-health, digital government, consumer protection, privacy and security. The aim is to offer a holistic overview that can help policy makers and regulators prepare for the future.

Box 1.1. **This Toolkit and other ICT and broadband resources**

This is not the first resource to address the digital economy. Other excellent resources available online can be used in conjunction with the present Toolkit. The *OECD/IDB* Toolkit does not aim to replace but to complement existing toolkits and regulatory references, drawing on extensive experience of policy making and regulation in different countries with different contexts and challenges.

The World Bank's *Broadband Strategies Handbook*

The *Broadband Strategies Handbook* is a guide for policy makers, regulators and other relevant stakeholders on issues related to broadband development. It consists of seven chapters and two appendices that address broadband definitions, why broadband is important and how its development can be encouraged. The Handbook discusses the policies and strategies that government officials and others should consider when developing broadband plans, including the legal and regulatory issues, what technologies are used to provide broadband, how to facilitate universal broadband access, and how to generate demand for broadband services and applications.

Source: http://broadbandtoolkit.org/en/home.

ITU and InfoDev's ICT Regulation Toolkit

The *ICT Regulation Toolkit* produced by the Information for Development Program (InfoDev) of the World Bank and the International Telecommunication Union (ITU) is a web-based tool for policy makers, regulators, industry and consumers providing a global overview of telecommunications policy and practical materials highlighting experience and results.

Box 1.1. **This Toolkit and other ICT and broadband resources** *(Cont.)*

Module 1 provides an overview of the Toolkit, while Modules 2-7 cover specific topics including competition and pricing, authorisation, universal access, spectrum management, legal and institutional frameworks and new technologies. The Toolkit also contains extensive practice notes and reference materials.

Source: http://www.ictregulationtoolkit.org/.

GSMA resources

The GSM Association, which represents the interests of mobile operators worldwide, has produced several resources to inform policy makers and regulators in mobile communication policies. These include the *Mobile Policy Handbook* (GSMA, 2016a) and the *Competition Policy in the Digital Age Handbook* (GSMA, 2015a), as well as specific work covering Latin American and Caribbean issues such as digital inclusion (GSMA, 2016b), content (GSMA, 2016c) and closing the coverage gap (GSMA, 2015b).

Source: GSMA.

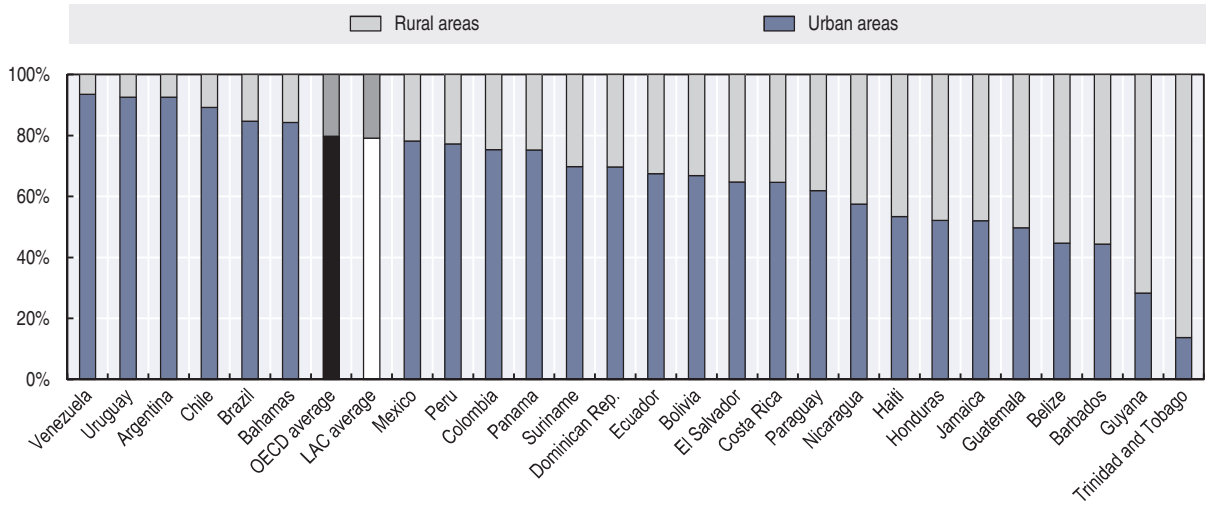
The Latin American and Caribbean region

The Latin American and Caribbean region has made notable progress in economic and social development in recent years, enabling tens of millions of poorer households to join the global middle class. This process has taken advantage of external environment and policy innovations such as Brazil's *Bolsa Família* and Mexico's *Oportunidades* (OECD, 2016a). Nonetheless, the LAC region still lags behind more developed areas in terms of standards of living, levels of income inequality, share of the informal economy, education, investment, government accountability, infrastructure, productivity and connectivity. To understand broadband policy making in the LAC region, it is helpful to consider some of the structural challenges the region faces, as well as characteristics that may assist further development.

LAC is a **large and diverse geographical region**, encompassing 27 countries[3] and more than 600 million people, and covering near 20 million square kilometres of forests, mountain ranges, glaciers, deserts, islands and urban centres. Despite the density of its urban areas, the average population of LAC in rural areas was 21%, a total of 122 million people in 2011 (Figure 1.2). The cost of connecting these populations, some of them in remote areas such as the Amazon forest, the Andes mountains or small islands in the Caribbean, is not negligible and must be taken into account when designing inclusive and ambitious broadband policies. At the same, time, the LAC area has particular characteristics that are potentially favourable to broadband development. It includes only two landlocked countries (the Plurinational State of Bolivia [hereafter "Bolivia"] and Paraguay), which offers easier access to submarine cables. Secondly, the widespread use of two languages, Spanish and Portuguese, is an advantage for communications, commerce and the development of content.

Between 2000 and 2014, average GDP growth in Latin America and the Caribbean was over 3% a year, and extreme poverty fell from 29% to 16% in 2013 (OECD, 2016). Notwithstanding these developments, income inequality in the LAC region (Figure 1.3) remains high compared not only to high-income countries (65% higher), but also compared to East Asian and sub-Saharan countries, (36% and 18% higher respectively) (UNDP, 2010).

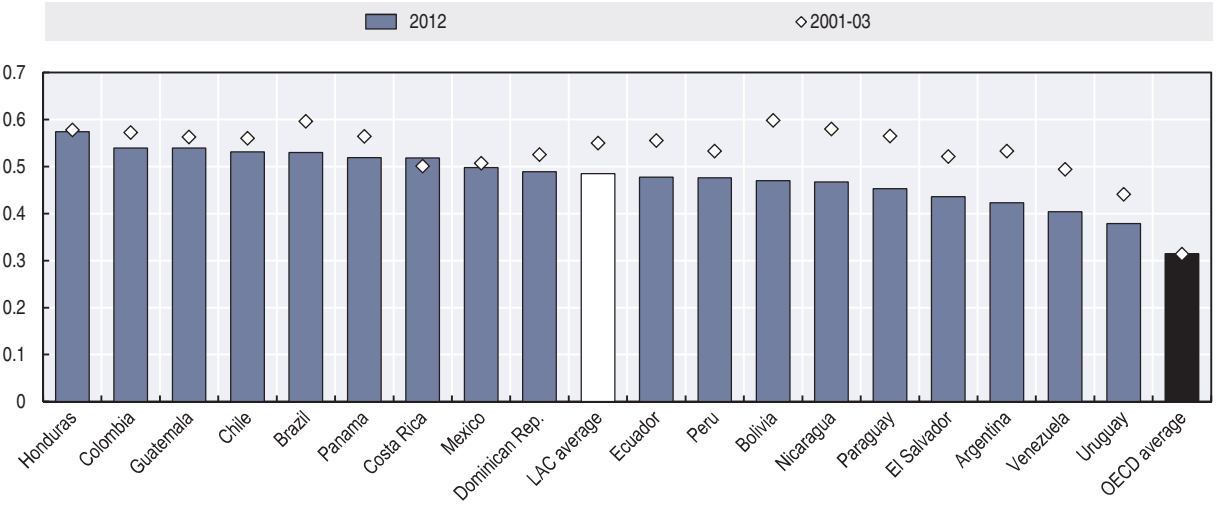
Figure 1.2. **Proportion of urban and rural populations in LAC (2011)**



Sources: OECD for OECD countries; ITU (2015), *ITU World Telecommunication/ICT Indicators Database*, *www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx* for LAC countries.

StatLink http://dx.doi.org/10.1787/888933354186

Figure 1.3. **Inequality income distribution in LAC (Gini coefficient)**



Note: LAC average is a population-weighted average. For Chile, the data used is for 2013, not 2012.

Sources: OECD (2016b), *OECD Income Distribution Database*, *www.oecd.org/social/income-distribution-database.htm*; IDB (2015), "Harmonized Household Surveys from Latin America and the Caribbean", *www.iadb.org/en/research-and-data//poverty,7526.html*.

StatLink http://dx.doi.org/10.1787/888933354190

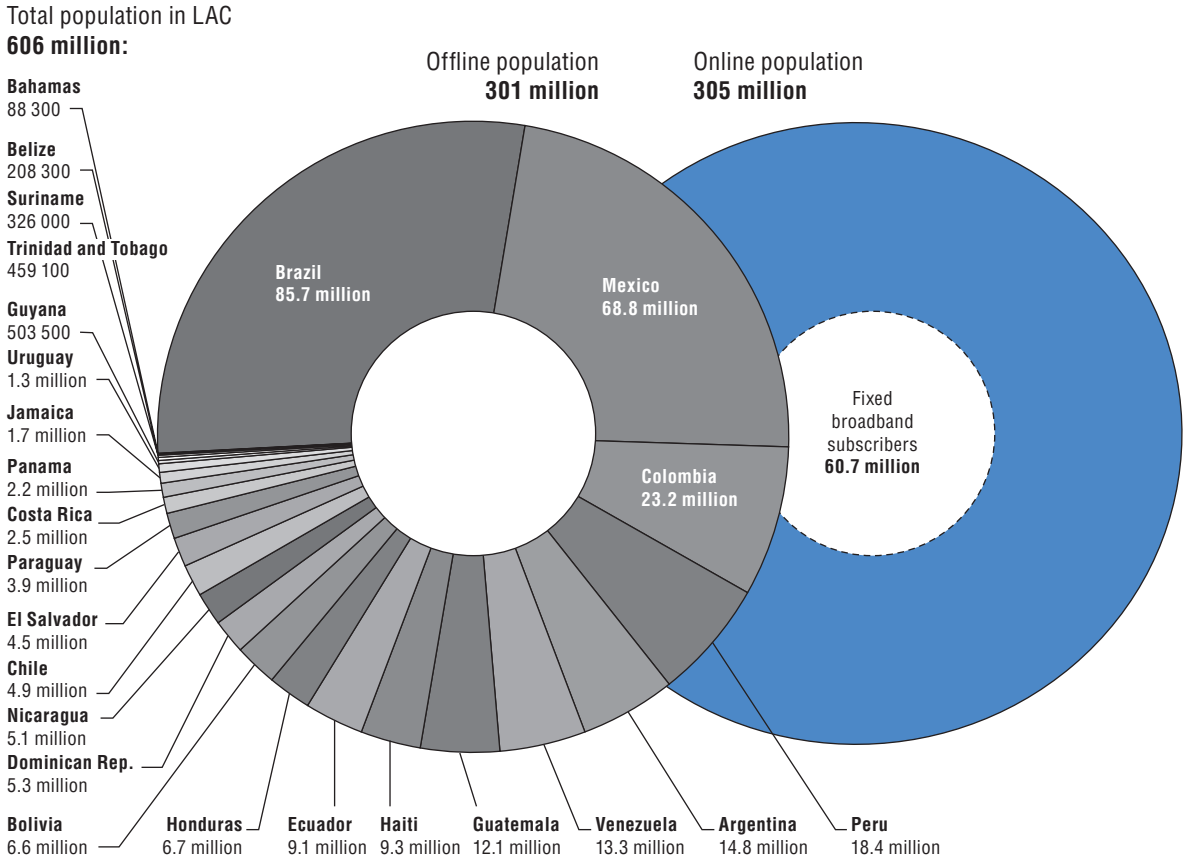
LAC countries continue to lag behind OECD countries in education outcomes. Despite improvements, school enrolment of both secondary and tertiary education and average school performance of 15-year-olds in LAC countries remain well below the OECD average (OECD, 2016). More than half of the 15-year-olds in LAC have not acquired the basic competences to perform well in the labour market, and only less than 2% of them are considered "top performers" in mathematics (the average is 13% in the OECD). Students' outcomes are largely dependent on broader socio-economic backgrounds in LAC, and this skills gap results in a fundamental constraint for business development, innovation and inclusive growth in the region (OECD, 2013).

The **skills gap** in the LAC region has profound implications for the labour market. Individuals with fewer skills are often confined to low-productivity jobs, with lower earnings, longer hours, higher insecurity, poorer working conditions and limited access to training. While the lack of jobs is not the most pressing issue in most LAC countries, the proportion of the informal labour market and the low quality and productivity of jobs are major barriers for development.

Overall, the quantity and quality of **infrastructure** in LAC countries remain an impediment for raising productivity and social inclusion levels. Despite advances in the provision of basic access to services, such as water supply and electricity, the quality of roads, ports, public urban transport and communication infrastructures is still inadequate (OECD/CAF/ECLAC, 2015). The results of these structural challenges ultimately impact productivity, social inclusion and governance in the region. They also affect how the benefits of the digital economy can be distributed across the society.

In **broadband access and use**, although advances have been made, there is still a long way to go. Almost half of the population of LAC is not connected to the Internet, with 301 million people considered to be offline. Brazil, Mexico and Colombia together, given their size and population, jointly still need to connect around 180 million people, almost three times the population of France. In addition, this estimate does not yet classify the type or quality of Internet access. Of the 305 million connected people in the LAC, for example, only one-fifth, or 60.7 million, had fixed-broadband subscriptions (Figure 1.4).

Figure 1.4. **An overview of the online and offline population in LAC**



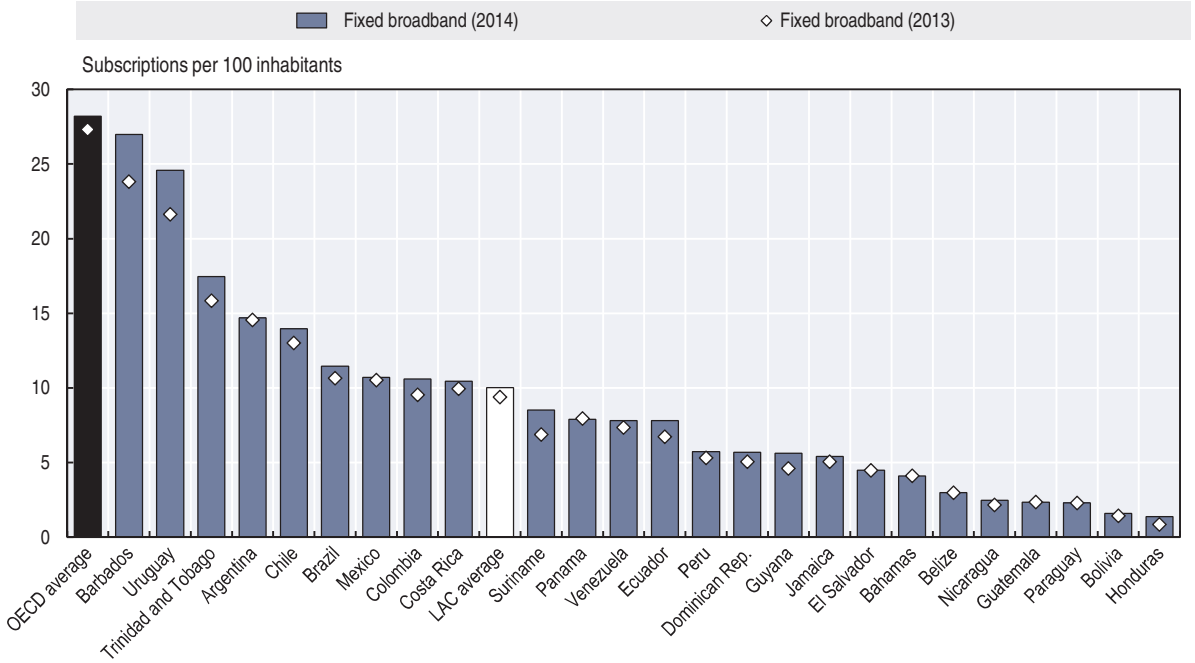
Sources: Based on ITU (2015), *ITU World Telecommunication/ICT Indicators Database*, *www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx*.

The numbers of mobile and fixed broadband subscriptions vary greatly among LAC countries. However, the regional averages remain much lower than OECD countries'. The LAC region has an average of 50% penetration for mobile broadband (i.e. SIM subscriptions per 100 inhabitants) and 10% of the population for fixed broadband for 2014, while OECD countries have 81% and 28%, respectively. Barbados, the country with the smallest area in the region, leads on both counts, while countries such as Peru, the Bahamas, Haiti, Paraguay, Nicaragua and Guyana lag behind (Figures 1.5 and 1.6).

Despite the relatively low penetration of broadband services, the high number of mobile telephone subscriptions in the region suggests that there is much untapped potential at least for mobile broadband services. The average for mobile telephone subscriptions per 100 inhabitants in the region is 116%, higher than the OECD average of 106%. The data also suggest that for reasons such as unequal coverage of mobile operators in national territories or high termination rates, individuals may choose to subscribe to two or more mobile telephone services (Figure 1.6).

A considerable effort is needed to connect more people in the LAC region. The task involves not only Internet service, but high-quality broadband services that help businesses, individuals and governments to become more efficient and innovative. This requires infrastructure, open and competitive markets, and demand stimulated by policies that tackle issues of affordability, entrepreneurship, skills and trust.

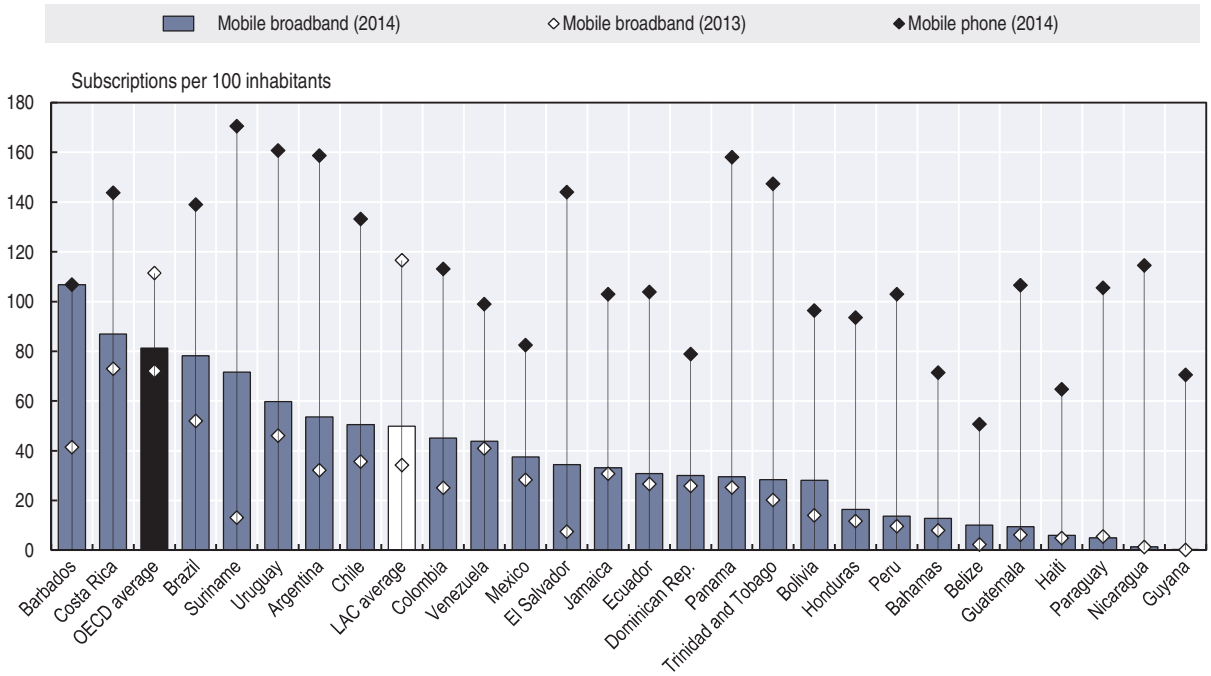
Figure 1.5. **Fixed broadband penetration in LAC (2013-14)**



Sources: OECD for OECD countries; ITU (2015), *ITU World Telecommunication/ICT Indicators Database*, *www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx* for LAC countries.

StatLink http://dx.doi.org/10.1787/888933354205

Figure 1.6. **Mobile broadband and telephone penetration in LAC (2014)**



Sources: OECD for OECD countries; ITU (2015), *ITU World Telecommunication/ICT Indicators Database*, *www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx* for LAC countries.

StatLink http://dx.doi.org/10.1787/888933354212

Main challenges

The key challenges for broadband access are to improve the availability of service, affordability, penetration and use. A number of inhibiting factors are particular to the LAC region, some of them mentioned above. They are related to either supply-side issues, such as infrastructure deployment and provision of broadband services, or to demand-side issues, such as skills, entrepreneurship, local content, consumer protection. More specifically, the main challenges for broadband policy making are:

- There is a **lack of incentives for infrastructure deployment**. The LAC region has a daunting topography, with rainforest, deserts, mountain ranges, small islands and remote areas. The deployment of communication infrastructure is very expensive and in many cases, positive return on investment is unlikely. As is typical of such geographical areas, basic infrastructure, such as adequate roads or stable electricity grids, is lacking, which makes it challenging to install broadband infrastructure. Suburban areas too in many cities often lack basic infrastructure for telecommunications providers, and management of rights of way is frequently a major hindrance for network deployment and infrastructure co-investment.
- Despite differences across the region, overall, **competition in communication markets in LAC tends to be weaker** than in OECD countries. This is often due to regulation that does not favour or actively discourages competition, incomplete liberalisation of telecommunications markets and, consequently, lower investment.

- As is often the case elsewhere, **regulatory frameworks in the LAC region are sometimes organised around separate "silos"**, corresponding to what were traditionally distinct networks and services. Today, however, technologies and services are converging. The challenges this presents must be addressed with policy and regulatory frameworks that promote competition along the entire value chain, and that provide incentives and remove barriers for all players to innovate.
- **The lack of national, regional and international backbones** is holding back the growing domestic and international traffic in the LAC region. Improving critical broadband infrastructure, including Internet Exchange Points (IXPs) is fundamental for ensuring that demand is met and that competition can lead to lower prices. Encouraging local content creation and exchange would increase the relevance of content, stimulating demand for broadband adoption.
- The lower incomes of a large proportion of the LAC population make **affordability of broadband services** a major barrier for broadband use. Wide income inequalities exacerbate the situation, as low-income households tend to have a much lower income than the average. Moreover, sectoral over-taxation is an issue in some LAC countries.
- **Connecting schools with broadband is an unfinished task** in the LAC region. Many schools in LAC countries are not connected to electricity. Connecting schools and training centres is essential if ICTs are to equip citizens for the digital economy.
- The LAC lags **behind other regions in the use of ICTs and broadband adoption in business**. It also invests less in research and development (R&D) and other forms of innovation, which slows productivity, a major hurdle in LAC countries.
- Encouraging **more transparent, accountable, effective, and responsive governments** is a key challenge in the LAC region. Progress has been made, but governments still need to improve overall public service delivery, participatory processes and accountability mechanisms. In general, LAC countries also need to promote adoption of whole-of-government approaches and a more effective culture of measurement and evaluation. Improvements in areas supported by broadband use could advance e-government and e-health initiatives, which would in turn support increased demand for broadband services.
- Building trust is crucial to promote broadband use, but capacity levels vary in the LAC region for **dealing with the evolving trust issues** associated with broadband services. Consumer protection, privacy and digital security risk management are relatively novel topics in many LAC countries, and policy approaches are still being developed. This process could benefit from shared good practices.

Leading good practices

The main recommendations for broadband policy making in the LAC region are organised in the Toolkit in the Good Practices section included in each chapter. These are complemented by country cases that provide concrete examples of application and further reference for these good practices. In general, examples from LAC countries have been selected, but in some cases, experiences in OECD countries considered especially useful for LAC countries, have also been provided.

- Overall, good practices focus on two key aspects: **rolling out networks and supply of broadband services** by private investors, complemented by the public sector when necessary, and **encouraging demand** for broadband by making it more affordable, relevant, usable and safer for individuals and businesses.

- Public sector policies to increase broadband access and reduce use gaps should design **digital strategies and national broadband plans** using a whole-of-government approach. Built on collaboration with stakeholders and clear leadership, these should incorporate regular collection of data to evaluate progress and make any revisions necessary. *Chapters 2 and 5 address these issues*.
- **Encouraging investment** to reduce infrastructure bottlenecks, by setting sound policy and regulatory incentives, should be a policy priority. A stable and predictable regulatory framework is needed to attract long-term investment in broadband infrastructure. *Chapters 2, 3 and 4 of this Toolkit address these issues*.
- **Lowering deployment costs** to stimulate competition, as well as infrastructure investment and expansion, may require regulatory reforms. Facilitating access to rights of way and spectrum and incentivising the sharing of infrastructure, especially passive infrastructure, for example, can help expand broadband provision. *Chapters 3 and 4 focus on these issues*.
- **Competition** is crucial for reducing prices, improving responsiveness to demand and ensuring innovation in broadband services. Independent and adequately funded regulatory agencies are needed to address, among other such issues, dominance. Wholesale regulation should be imposed when necessary to facilitate access to essential facilities and lower barriers for new entrants. *Chapter 4 focuses on regulatory issues related to competition*.
- **Expanding broadband access** to disadvantaged groups and rural and remote areas is essential. Public authorities can establish incentives and finance national backbone networks, when markets are unable to meet demand. *Chapter 5 explores mechanisms for expanding broadband access*.
- **Making broadband services affordable and accessible** is vital for maximising the benefits of the digital economy. To increase investment and competition, policy makers should avoid sectoral over-taxation in telecommunications services, especially for broadband. High government charges on telecommunications services or on importing telecommunications equipment and handsets can deter broadband expansion and use, affecting individuals, businesses and governments. *Chapter 6 further explores questions of taxation, affordability and inclusion*.
- Policy makers and regulators should **prepare for the convergence of networks and services**. This, and new offerings, have already presented challenges in the LAC region. Regulatory frameworks should ensure that independent regulatory authorities are well positioned for the growing converged landscape, providing adequate powers and scope of regulatory authority to address competition and investment over the full value chain of converged services. *Chapter 7 addresses some of the emerging issues involving convergence*.
- **Regional co-ordination** can help implement policies that encourage economies of scale, investment and competition. LAC policy makers and regulators should encourage sharing of regulatory experiences, deployment of regional connectivity infrastructures, cross-border data flows and lowering the prices of international connectivity and roaming. Regional co-operation arrangements and national regulatory frameworks need to facilitate existing transborder services and should be prepared for the demands of emerging cross-border services, for example, the Internet of Things (IoT). *Chapter 8 addresses regional integration and cross-border issues*.
- **Promoting a skills system** geared to the digital economy can help increase interaction between broadband use, labour markets, productivity, innovation and inclusive economic

growth. Most importantly, it is crucial to ensure the availability of broadband services in schools, training and community access centres, and other places of public access that can provide a platform for digital skills. *Chapter 9 addresses these skills and jobs issues for the digital economy*.

- **Increasing ICT adoption by businesses and digital entrepreneurship** is essential to encourage companies to scale up quickly and compete with other firms, both nationally and globally. Digital entrepreneurship should be encouraged by strengthening entrepreneurial access to digital services, reviewing regulatory barriers to setting up new businesses and promoting e-commerce. The creation of digital content, including local content, should be promoted to increase demand. *Chapter 10 discusses issues of ICT adoption in businesses, digital entrepreneurship and content*.
- Policy makers should **use ICTs to improve access to and improve the quality of health care**. This can contribute significantly to efficiency gains and cost reduction in the health sector. They can also improve performance, expanding access through tele-health, advancing data sharing and monitoring, and contributing to better diagnostics and treatment. *Chapter 11 analyses how to enhance e-health initiatives*.
- **ICTs can enhance governments**. New digital technologies (e.g. social media platforms, smartphones) and new approaches to using technology (e.g. open government data and "big data") offer new, more collaborative ways of working within and across administrations, and better ways to engage with the public and promote the smarter organisation of cities. Governments can become not only more efficient and effective, but also more open, transparent and accountable to citizens. *Chapter 12 addresses ways to encourage digital governments*.
- **Enhancing trust in digital services** encourages uptake by individuals, business and governments. Consumer protection and education not only helps consumers make more informed choices, but drives and sustains a competitive market. Managing digital security risks and protecting privacy and personal data, in policy frameworks based on multi-stakeholder collaboration, promotes a safer, more robust digital ecosystem. *Chapters 13, 14 and 15 address consumer protection, digital risk management and privacy*.
- Finally, **implementing systematic measurement frameworks** on broadband and digital services is central for informing policy and regulatory decisions. Data should be collected from market players and consumers, and impact assessments prepared from open, transparent processes that give all stakeholders the opportunity to provide feedback. *The need for effective measurement is addressed in each chapter of this Toolkit*.

Notes

1. The Broadband Commission for Sustainable Development was established in May 2010 by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Broadband Commission unites industry executives, government leaders, policy experts and international organisations to promote the rollout of broadband and development. To date, the commission has published a number of high-level policy reports, best practices and case studies. See *http://broadbandcommission.org/*.
2. They include the 26 member countries of the IDB (Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay and Venezuela).
3. They include the 26 LAC members of the IDB and Cuba.

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Chapter 2

Regulatory frameworks and digital strategies

This chapter provides guidance for policy makers on ways to encourage investment, competition and the use of broadband access services within their regulatory frameworks and digital strategies. Regulatory frameworks lay out the playing field for all players, including operators and application/content providers, as well as national, regional and municipal governments and regulatory agencies. Digital strategies initiate and co-ordinate public and private involvement in programmes and projects to extend broadband access and increase its use both by individuals and by businesses.

This chapter focuses on two key elements of the broadband policy toolkit: the regulatory framework and the broader strategic framework. These are essential to help develop broadband access and use. On the one hand, the regulatory framework includes the division of powers among the different institutions involved in the governance of telecommunications markets. On the other hand, the broader strategic framework, usually referred to as "digital strategies", "digital agendas" or "national information and communications technology (ICT) strategies", aims to extend the availability and use of broadband. It should be noted that Chapters 3 and 4 outline good practices for encouraging competition and investment through regulatory measures.

This chapter addresses the division of powers between different telecommunications and ICT national authorities, governing their organisation, scope and co-ordination. An adequate regulatory framework sets a clear separation of powers, articulates collaboration among different institutions and provides a sound legal basis for policy definition and implementation. This is essential to encourage investment and competition, and to co-ordinate public and private initiatives for consumers' benefit. The aim of this chapter is not to prescribe how institutional structures should be, but to outline the relative advantages and disadvantages of different institutional arrangements (e.g. lack of independence of regulators and separation of concerns between policy making and regulatory issues aimed to encourage competition).

In addition to setting a stable pro-investment and pro-competitive regulatory framework, governments should articulate digital agendas designed to include, in a co-ordinated fashion, all the different issues related to digital economy and ICT promotion – from supply-side policies designed to encourage broadband coverage, to demand-side policies targeted at promoting ICT skills, affordability, e-government, e-health, e-commerce and ICT use by business and citizens. This chapter also offers guidance, recommendations and good practices on how best to articulate a governance model for broadband policy.

Digital strategies are examined in this chapter from the perspective of ensuring co-ordination among different public administrations involved in collecting input and feedback from stakeholders. Specific issues on broadband national plans are explored in Chapter 5. The design of specific plans and actions on other aspects addressed in digital agendas, such as e-government and e-health promotion, are also addressed in separate chapters.

Policy objectives for the LAC region

Key policy objectives for the regulatory frameworks

- **Encouraging the expansion of broadband services**. Regarding broadband access, the main objective of national regulatory frameworks is to encourage choice for consumers and enable them to benefit from innovative services at competitive rates. Experience shows that encouraging private investment and competition is a key way of ensuring this objective. Thus, the aim of regulatory frameworks should be to ensure effective

competition and provide an incentive for investment, allowing the market where possible to do the heavy lifting. This means deploying networks and offering competitive services, and acknowledging that public intervention may be required. This does not mean that the market should not be regulated. On the contrary, encouraging investment and competition in communication markets often requires well-designed regulation.

- **Lowering barriers for investment in broadband networks and services**. Policy objectives focused on increasing investment should be based on regulations aimed at lowering barriers. Telecommunications markets need long-term investment, and this requires that all stakeholders know in advance the applicable rules in a regulatory framework. One of the key policy objectives in setting a regulatory framework is to promote stability and predictability of regulation and its implementation, minimising the burden for market actors, while encouraging competition among them, using only *ex post* measures when possible.
- **Encouraging public initiatives that complement private initiatives when necessary**. Notwithstanding the key role played by private initiatives in deploying networks and providing broadband services, in certain cases, public investment may be needed to ensure that all people and geographical areas benefit from ICT services. The regulatory framework must set clear rules for public intervention to ensure adequate interplay between public and private initiatives (including public-private partnerships), aiming to facilitate public action when needed, but also preserving competition and incentives for private-sector investment.
- **Upholding a consistent and effective policy framework for all market actors**. Any regulatory framework for ICTs should be based on defining clear, general rules for all market actors involved across the value chain, based on competitive principles, and ensuring consistency and effectiveness of regulatory policies. The application of general competition principles in the regulatory framework allows for stability, as these principles are valid for all technologies, as well as predictability in the evolution of the regulatory framework.
- **Ensuring independence of regulators**. A key objective of a sound regulatory framework should be to ensure independence for regulators entrusted with the application, transparency and accountability of the regulatory process, and to ensure multi-stakeholder co-operation in the policy development processes to help achieve objectives. Collaboration between the public and private sector is necessary to reach sectoral goals.

Key policy objectives for digital strategies

Digital strategies are cross-sectoral programmes addressing the different policy objectives involved in the digitisation of economies and societies. This includes developing initiatives to achieve policy objectives on the supply side, such as broadband access extension to ensure digital connectivity for individuals and businesses (Chapter 5); deployment of infrastructure aimed to improve regional and international connectivity; and co-ordination with policy makers and regulators in other countries (Chapter 8). On the demand side, digital strategies include areas such as affordability (Chapter 6); developing ICT skills (Chapter 9); business ICT uptake and entrepreneurship (Chapter 10); e-health and e-government applications (Chapters 11 and 12); and increasing consumers' trust in the digital economy (Chapters 13, 14 and 15).

The key policy objective of digital strategies is to **maximise the dividends of ICTs**, and especially the Internet, a vital medium of economic and social activities. This can be considered under different specific sub-objectives (Box 2.1).

Box 2.1. **Key pillars of digital strategies**

- Develop telecommunications infrastructure (e.g. access to broadband and telecommunication services) and preserve an open Internet.
- Promote the ICT sector, including its internationalisation (encouraging international trade of ICT services).
- Strengthen e-government services, including enhanced access to public sector information (PSI), services and data (i.e. open government data).
- Strengthen trust (digital identities, privacy and security).
- Encourage the adoption of ICTs by businesses and SMEs in particular, with a focus on key sectors such as i) health care; ii) transport; and iii) education.
- Advance e-inclusion, with a focus on the ageing population and disadvantaged social groups.
- Promote ICT-related skills and competencies, including basic ICT skills and ICT specialist skills.

Tackle global challenges such as Internet governance, climate change and development co-operation.

Source: OECD (2015), *Digital Economy Outlook*, *http://dx.doi.org/10.1787/9789264232440-en*.

Tools for measurement and analysis in the LAC region

Regulatory frameworks

Regular assessment of the goals of the regulatory framework helps ensure that it is leaving room for competition, investment and innovation in broadband services. Regular assessment will also allow for adjusting the framework to new challenges, while general principles of competition ensure predictability.

A first set of tools for assessing if a regulatory framework is sound is by collecting information and preparing key indicators, such as the level of prices, competition, investment and infrastructure deployment. These allow regulators to detect trends, bottlenecks and other issues as they review the regulatory framework. This information should be published regularly to inform stakeholders and let them provide feedback and any proposals for changes.

Regular public consultations should be carried out on the effectiveness and adequacy of the regulatory framework. This also includes any policy proposals to improve or adapt the regulatory framework to new situations or to correct existing problems. Well-designed public consultations allow for feedback from all stakeholders and anticipate potential issues before enacting new regulations.

Regular benchmarking with reference countries is valuable, to identify areas of improvement and different regulatory models. Active participation in the LAC regulatory networks in the region, as well as other fora, is also a good source of information for developing regulatory frameworks. Peer and third-party independent reviews are useful for providing comprehensive external views of areas where the regulatory framework can be improved. The peer reviews undertaken by the OECD of the telecommunications markets in Colombia (OECD, 2014) and Mexico are examples of this approach (OECD, 2012).

Digital strategies

Establishing an effective oversight mechanism for digital strategies is important to: i) provide appropriate incentives for performance from managers and stakeholders; ii) evaluate how the digital strategy affects targeted beneficiaries; iii) determine resource allocation and improve planning, and iv) to provide input for decisions regarding its strategic direction.

Digital strategies usually involve plans for different policy areas. This means that the tools and measurements to assess the overall objective of national strategies must be based on key performance indicators for each of the different plans in a digital strategy. Although monitoring each plan on the agenda is important, comprehensive monitoring that brings together information on overall progress is necessary. This allows national authorities to identify potential problems when objectives in one policy area (e.g. increasing Internet skills) are associated with other goals on which their success depends (e.g. the availability of Internet access).

One useful tool for assessing and improving digital strategies is to perform comparisons with a peer group of broadly comparable countries. For example, the Nordic countries tend to benchmark their progress with other Nordic countries, Chile with other Latin American countries, and South Africa with the other BRICS countries (Brazil, Russia, India, the People's Republic of China and South Africa). In the United States, the Federal Communications Commission (FCC) is required to provide comparative data for at least 25 countries in its annual report on advanced services. The digiLAC website (*www.iadb.org/digilac*), maintained by the Inter-American Development Bank (IDB), allows for comparisons among countries in the LAC region, as well as with OECD countries, with a specific focus on broadband policies and broadband key indicators.

The OECD has established models for reviewing policies, including a peer-review method. Spain's digital strategy, the *Plan Avanza*, for example, was subject to a voluntary peer review in late 2009, key elements of which referred to policies and actions on the availability and use of broadband (OECD, 2010).

Overview of the situation in the LAC region

All the countries in the LAC region have a regulatory framework in force specifically designed for telecommunications, addressing the main issues on distribution of powers among different institutions and outlining the main principles for promoting competition and investment. Annex 1 shows the existing regulatory frameworks for the countries in the LAC region. Detailed country comparisons of broadband policies and regulation can be found at the IDB's digiLAC website (*www.iadb.org/digilac*).

Most countries have a Communications Regulatory Authority, with varying levels of independence from the government (Annex 3 shows the policy/regulatory bodies in the region). However, despite the existence of ICT and telecommunication plans, only less than half, have comprehensive national digital strategies that includes many measures to promote the supply and demand of broadband infrastructures, services, applications and skills. Annex 2 lists all the digital strategies in the LAC region, identifying key policy objectives and the bodies responsible for their implementation. While these strategies are generally co-ordinated by the ministry in charge of telecommunications policy, with several countries have also involved the communications authority in the design and co-ordination of the national digital strategy, some countries in the region do not yet have an adequate governance model to monitor and control implementation.

Among the issues in the LAC region seen as needing improvement is the lack of stability of the communications regulatory framework in countries that institute changes too frequently, reducing regulatory certainty for investors. In some countries, the division of responsibilities and authority between the government, the communications authority and/or the competition authority is not clear, with overlapping powers or intersecting management. This makes regulatory action more complex and cumbersome, which can result in inaction and give dominant operators more opportunities to circumvent the regulatory measures needed for competition. Annex 4 shows the distribution of power among policy/regulatory bodies in the LAC region.

In some LAC countries, the communications authority is controlled by the government and/or its decisions can be vetoed. This undermines the independence of the communications authorities and may have negative consequences for regulatory initiatives intended to promote competition and private investment.

Although advances have been made in recent years in enhancing the independence of regulatory authorities, the nominations to the communication authority's boards could still be improved in terms of transparency and use of criteria based on experience and professional competence. Mandates for members of the board are also in some cases too long, exceeding six years, for example.

One key aspect of ensuring the independence of communications authorities is to ensure separate and adequate budgeting for the regulatory agency responsible for applying sector-specific regulation. Budgeting for the regulatory agency is sometimes set by the government without clear rules, and in a number of cases, the regulatory agency may be underfunded, so that resource-consuming tasks, such as market analysis and market monitoring, cannot be adequately carried out.

In the courts, decisions made by the regulatory authorities are often overturned, suspended or not adequately enforced. This undermines regulatory action. Although judicial oversight is needed to ensure that fundamental rights are respected, this should not allow stakeholders to systematically block or delay regulatory decisions. Regulatory authorities should be able to enforce regulation, and to impose proportionate fines that discourage infringements. Some regulatory authorities in the LAC region do not have this power, or the level of fines that they are permitted to impose is too low.

The legal authority to collect and publish data from market players is essential. It is also important to allocate enough resources to the communications regulator to allow for statistical analysis. Market players and investors need an annual report and regular updates on the competitive situation and the performance of different communication services. In a few specific cases, communications authorities do not have the power to collect relevant information from stakeholders. The Inter-American Development Bank has detailed information about data collection in LAC countries (IDB, 2015).

With the exception of five countries in Central America and the Caribbean, most countries in the region have a competition authority dealing with general competition issues in all economic sectors, including telecommunications services. An effective competition authority is important for broadband and telecommunications services, because many anti-competitive practices are addressed by competition law on an *ex post* basis for all sectors of the economy (e.g. anti-trust law).

Co-ordination between competition authorities and communications authorities is vital to facilitate regulation and avoid contradictory decisions. Some countries have a

Memorandum of Understanding (MoU) between the competition and communications regulatory bodies, to ensure better co-ordination and determine ground rules for the intervention of each authority. However, room for improvement remains in formalising co-ordination between the two authorities when making decisions on market analysis, mergers and acquisitions and other issues where both agencies would benefit from co-ordination. In some LAC countries, as in the OECD area (such as for the Authority for Communications and Markets, or ACM, in the Netherlands, Spain's *Comisión Nacional de los Mercados y la Competencia* [CNMC], or the Office of Communications, or Ofcom, in the United Kingdom), the communications authority also has powers comparable to those of a competition authority but limited to the telecommunications sector, to allow for more co-ordinated regulatory action.

A number of LAC countries involve stakeholders in the design of national digital strategies, through public consultations, sectoral fora or digital platforms for collecting citizens' feedback. However, many do not have enough public consultations on key policy regulatory decisions, such as the preparation of new laws, market analysis or broadband plans. The time allotted for stakeholders to provide written comments is often too short. A number do not publish feedback from stakeholders or the rationale for adopting or rejecting comments by the institution carrying out public consultation.

Good practices for the LAC region

The design and implementation of digital strategies

Digital strategies are master plans involving not only the ICT ministry but government bodies in charge of finance, public administration, industry, education, culture and labour. Designing digital strategies requires **co-ordination among the public institutions** involved, to set realistic targets and make sure procedures are in place to monitor their progress. The design of digital agendas may be so complex that it is not appropriately harmonised. A co-ordinating body for a digital strategy is needed to establish a mechanism for decision making in areas where different government bodies' competences overlap. Clear responsibility for the overall strategy, and adequate power to make decisions is crucial to ensure success.

In countries that prioritise a rapid transition to a digital society, the office of the president or prime minister may take the lead in co-ordinating the digital agenda, as, for example, in Korea. One good practice applied in some countries is appointing chief information officers or adjusted ministerial portfolios, to improve co-ordination and ensure the productivity and other benefits expected from the use of broadband networks.

Formal co-ordination mechanisms, such as participation of the various ministries in a digital agenda programme steering group, may also be considered. These should include experts from the private sector and academia, who can provide feedback on the different issues addressed in the digital agenda. Regional and municipal governments, as well as consumer organisations, should be invited to participate in these steering groups. The group should meet regularly to assess implementation of the digital agenda, detect gaps and assess proposals for improvements. Accountability and monitoring indicators directly related to the digital strategy's goals are also key to ensuring success.

Public-private partnerships (PPPs) can be an efficient model for implementing actions under a national strategy for publicly funded broadband access extension plans or projects. Examples can be found in the OECD and IDB documents included in the references for Chapter 5, which discusses good practices on PPPs.

Legal instruments for broadband regulation

A general telecommunications law usually provides the legal and policy framework for the sector, distributing powers among different institutions and setting the main principles for authorisations, competition issues, consumer protection, etc. Separately, competition law sets the framework for *ex post* intervention (e.g. antitrust regulation) and is usually applicable for the telecommunication sector.

Telecommunications regulatory frameworks set specific rules for *ex ante* intervention for the sector and are more specific, and tend to be more dynamic, than competition law. However, it is good practice to ensure that the general principles of telecommunication regulatory frameworks are stable, technologically neutral, and based on a forward-looking approach, within a horizon of two or three years. Specific regulations are usually needed in due course to address issues related to new services, new technologies, addressing the need to share certain infrastructures, or to set specific procedures (as for example, number portability). In general, this can be achieved through decrees or regulations issued by the national regulatory authority.

Finally, regulatory bodies, such as the Communication Authority or the Competition Authority, need to adopt decisions imposing specific obligations on market actors when regulating broadband. For this, it is important to equip these bodies with effective legal tools to curb market power throughout the digital ecosystem, not only for telecommunications. This includes the ability to impose fines proportionate to infractions and aimed to encourage compliance with regulatory decisions.

Involvement of non-governmental stakeholders

Stakeholders' engagement in formulating strategy and policy is important to improve the quality of laws, policies and their implementation. Integrating stakeholder input into the policy making and regulatory processes strengthens public trust in government and allows for better policy decisions. This is especially relevant for key policy instruments such as regulatory frameworks, and the main pro-competition and pro-investment regulatory decisions.

The tools available for this purpose are the publication of draft legislative projects, public consultations, public hearings and digital participation. Many countries have set up a broadband forum to engage operators, business, consumer associations and other organisations of civil society in the design of policies promoting broadband deployment, access and use. In addition, institutional websites should be kept up to date, clearly organised and provide easy access to all public documents.

In carrying out **public consultation**, it is important to apply the following good practices:

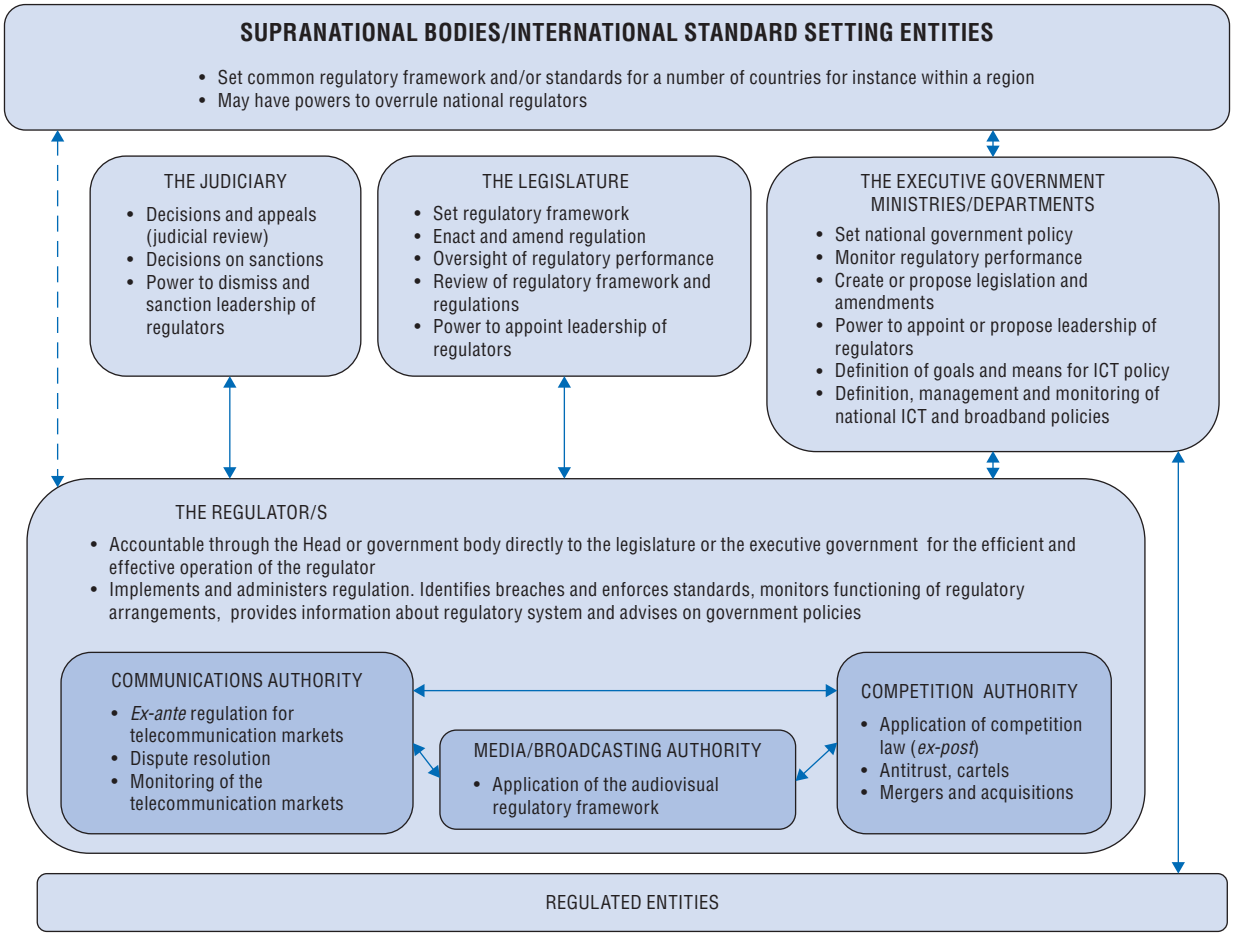
- The public consultation must be announced on the institutional website, providing links to relevant documents, deadlines for feedback and simple procedures for sending stakeholders feedback. In specific cases, it may be advisable to inform key stakeholders of the public consultation. Stakeholders should have enough time to prepare responses to the public consultation.
- Apart from the regulatory proposal, plan or document subject to public consultation, in certain cases it is also useful to include specific questions to stakeholders, to collect opinions or relevant information to facilitate informed policy decisions. Responses received should be published on the institutional website (respecting confidentiality on issues that the stakeholder does not wish to share), and it is also good practice to

provide the information, economic and legal arguments for decisions taken, explaining why alternative proposals have been rejected. Such transparency also serves to reduce future legal appeals.

Distribution of powers among policy/regulatory authorities

The **institutional setting** is one of the key issues to address in the regulatory framework. The responsibilities of different bodies must be clear, avoiding overlap, and giving each institution specific tools to enforce their decisions through sanctions on any infringement of regulations and decisions enacted by the regulatory body. Policy making and application of the regulatory framework usually involve different organisations (Figure 2.1).

Figure 2.1. **Organisations involved in policy making and regulation for broadband services**



Note: Regulatory agencies may be convergent, covering communications, media/broadcasting and/or competition powers.

Supranational bodies are in charge of co-ordinating specific aspects of broadband access and services, such as spectrum assignment co-ordination (the International Telecommunication Union [ITU]) and trade issues (the World Trade Organization [WTO]). Certain countries, such as the member states of the European Union, have also developed a common regulatory framework and policy co-ordination framework. In the case of the LAC region, the most relevant supranational bodies in the context of broadband access are the ITU, in the context of spectrum management and standardisation, as well as regional bodies

as CITEL (Inter-American Telecommunications Commission), COMTELCA (*Comisión Técnica Regional de Telecomunicaciones*) in Central America, CARICOM (Caribbean Community) in the Caribbean Area, UNASUR in South America, or the organisms co-ordinating international and regional trade agreements, like the WTO, Mercosur, NAFTA, ALADI or the Pacific Alliance. Chapter 8 in this toolkit addresses in detail issues of regional co-ordination. In general, participation in these supranational bodies is co-ordinated by the corresponding branches of the executive governments.

Telecommunications laws and the framework for regulation are enacted by the **legislative body**, based on proposals made by the executive government. The legislative body should have also as a mission a general oversight of the performance of the regulatory framework. The executive government and regulators should report regularly to this body, and hearings should also be organised to facilitate monitoring by the legislature, as well as making informed decisions on the evolution of the regulatory framework.

The **executive body** should be in charge of policy making, defining goals and means for implementing the ICT national strategy, as well as proposing new legislation. In general, design and execution of national broadband plans should also be within the scope of the executive body. These responsibilities should be organised around a specific ministry or department focused on ICT policy making and the design and implementation of national strategies.

The **judicial power** is responsible for ensuring that stakeholders' rights are protected, and that regulatory decisions are aligned with laws. The legal system must be designed to avoid the use of the judicial system by stakeholders to evade or delay the application of the law through excessive unjustified litigation. Good practice in this context is to allow regulatory decisions that are challenged in the courts to remain in force until the court reaches a decision. As noted earlier, transparency in the regulatory process and providing for stakeholders to address their concerns on draft regulations can help reduce legal challenges.

Typically, the functions of the regulatory bodies are distributed among several agencies addressing different issues: telecommunications (communications authorities), media/broadcasting services (audio-visual authorities) and antitrust and general aspects of competition (competition authorities). However, as shown in Chapter 7, in many countries, the convergence of telecommunication and broadcasting has prompted a merger of the communications and audio-visual authorities. The intent is to ensure a technologically neutral regulatory framework to address the complete value chain, including content and applications, in a holistic approach. Some countries have also given the communications authority the authority to make *ex post* as well as *ex ante* regulation.

Independence of regulatory agencies

In distributing powers between the executive branch (ministerial departments) and regulatory agencies, it is vitally important to establish a clear separation between policy formulation (preparing laws, national ICT strategies and broadband plans, etc.) and the application of the regulatory framework, which is the responsibility of regulatory authorities.

Regulatory agencies should be **independent** of governments in formulating and applying regulations. Government involvement in regulation can potentially undermine effective regulatory decisions with political considerations. These concerns are heightened by possible conflicts of interest, if the state maintains a stake in operators and decisions are viewed as benefitting those entities relative to other actors. An independent regulator is in general less subjected to short-term political pressure and can focus directly on creating competition.

In general, governments should focus on the main objectives and requirements for the development of broadband services, while regulatory bodies need to establish the regulation necessary to transform the communications market. This is usually dominated by one or more operators, whereas it should become a competitive market open to access by new entrants. In turn, this usually requires that dominant operators are required to provide access to their networks and services. Governments also become a *de facto* market player when subsidising network deployments. As shown in Chapter 5 in discussing the expansion of broadband access and services, public intervention may be necessary to ensure broadband availability in areas where private initiatives cannot fulfil all public objectives. However, any broadband expansion plan or project involving public funding must take into consideration the potential implications of distorting a market or inhibiting future competition and private investment in that location.

Good practices to ensure the independence of regulatory bodies applied in many OECD countries include:

- **Providing the regulator with a distinct legal mandate, free of ministerial control.** Decisions taken by the regulator should not be subject to ministerial approval. In general, the ability to overrule the regulator's decisions by other actors should be limited to a minimum.
- **Regulatory powers must include all aspects of regulatory oversight and must be clearly defined**, to allow for addressing competition issues for telecommunication players and to over-the-top providers (OTTs) when they offer similar services. This includes powers to enforce their decisions independently.
- **Regulators should have their own source of funding that is not controlled by the government.** If the budget of the regulatory body depends on an appropriation from the government's budget, a government may use this discretionary power to control a regulator. A good practice applied in many countries is to impose a levy on the regulated industry, based on a small percentage of its turnover, which is then used to finance the regulatory agency. This provides for a stable source of funding independent of the government, which is more predictable than other alternative sources, such as spectrum fees or fines.
- To enforce independence from governments, it is a good practice that the **legislative body be responsible for appointing heads and members of the board of regulators**, or at least, to be able to confirm/reject appointments governments propose. Appointments of members of the board and the head of the regulatory bodies should be conducted through open and transparent procedures. Mandates should not be too short, to avoid instability and increase independence. A usual practice is to mandate periods of around five or six years on a staggered basis, to ensure continuity of the board.
- **Issues such as rules for dismissal, conflicts of interest and provisions regarding joining the regulated sector after the termination of a mandate** should be addressed in the law, to ensure independence and increase the credibility of the regulatory body.

Relations among the different policy/regulatory authorities

Ensuring a clear separation of powers between regulatory bodies and policy makers does not mean that institutional actors should act as separate silos. On the contrary, the different institutions should co-operate closely, under clearly established procedures. These procedures must allow for input on key policy making and regulatory decisions, and allow the different actors an advisory role in the areas of their competence when requested by other institutions.

Procedures for articulating key issues on the relationship between different authorities should be defined by law, establishing which type of decisions, draft laws or measures are subject to a consultation process by other bodies, and the context for taking opinions into account. Further details on co-operation among institutions can be established through memoranda of understanding that should also include specific actions and clear procedures for co-operation.

Government institutions in charge of policy making should request an opinion from communications and competition authorities on draft laws, decrees and any other legal instrument where competition and investment in the telecommunication sector is involved. Digital agendas, national broadband plans and any project involving public funding should also be provided to regulatory authorities to obtain their feedback on the implications of the proposals on competition and investment. When key regulatory decisions are to be taken by communications authorities, it is also good practice to ensure that policy makers have an opportunity to provide feedback.

Communication authorities should also allow local administrations to provide input on issues related to telecommunications infrastructure deployment, in areas such as providing and administering rights of way and the funding of specific projects aimed at extending broadband access in municipalities. Local administrations' input can help incorporate their concerns in setting national regulatory frameworks for regulation of rights of way and providing guidance to local administrations on simplification and standardisation of procedures. This helps avoid multiple complex local regulations and encourage network deployment by operators (see Chapter 4 on competition and infrastructure bottlenecks).

Communication and competition authorities must have a fluid and continuous relationship, because competition issues are addressed both by *ex ante* regulation (the focus of communications authorities) and *ex post* regulation (the focus of competition authorities). Inconsistencies may lead to regulatory uncertainty. The key areas where communication and competition authorities should co-ordinate include:

- **Merger and acquisitions analysis and its implications for preserving competition.** Assessment of the potential effects of mergers in the telecommunications sector is complex and can benefit from input by experts in market analysis in the communications authorities.
- **Market analysis and imposition of specific *ex ante* regulation.** This is typically the task of the communications authority, and input from competition authorities is also valuable to co-ordinate *ex ante* and *ex post* regulation and avoid inconsistencies in regulatory decisions.
- **Antitrust regulation.** This usually has a general focus, however, there are certain issues on collusion practices in the communications sector where the competition authority may rely on expert advice from the communications authorities. The regulatory framework should allow for collaboration among institutions, upon request of the institution entrusted with the corresponding area of competence.

As described earlier, in some cases, a single regulatory body may have the competence for *ex ante* and *ex post* regulation. This is the case for communications authorities with authority over *ex post* competition issues in the telecommunications sector, such as CNMC in Spain, or Ofcom in the United Kingdom.

Concurrent *ex ante* and *ex post* powers allow for easier co-ordination, and in this case, co-ordination procedures can be kept internal to the regulatory body. Terms for co-ordination between units in the organisation must nevertheless be defined. Combining *ex ante* and

ex post powers for telecommunications services in a single organisation allows for close co-operation of experts, with the goal of reaching consistent regulatory approaches and measures. However, it is important to ensure that decisions on competition focused on *ex post* regulation are aligned with the application of *ex post* regulations by other regulatory bodies.

Judicial review of regulatory decisions

Regulatory decisions should be subject to judicial review and may on occasion require review on substance in a limited number of specific areas. However, appeals may lead to a suspension of regulatory action and freeze or delay regulatory decisions, undermining the legal certainty vitally important in a regulated market. Legal processes are usually lengthy and expensive, used by telecommunications operators, especially incumbents, as a way to delay, prevent or undermine regulatory decisions. Suspending regulatory decisions can result in significant financial losses to new entrants, hindering competition and facilitating the entrenchment of dominant positions.

If needed, reform of legal processes must be considered to allow a regulator's decision to stand until the court has ruled on the complaint if a market player goes to court. This reduces the number of frivolous complaints. Although countries still provide for injunctions, the burden of proof should be on the plaintiff to show that suspension is necessary to avoid damage, or is needed to avoid an irreversible situation.

It is also good practice to set up special judicial panels to hear court appeals on telecommunications issues where the judges are **familiar with the telecommunications sector**, or to create a **specialised court** that can deal with appeals in this sector, as Mexico has. This allows for better judicial decisions in an area that demands specialised knowledge. Regulatory bodies can also organise seminars, workshops and courses for the judicial power, to make sure that the judicial powers make well-informed decisions.

The functioning and structure of the regulator

Regulators should be structured taking into account their areas of competence, establishing well- defined processes for each of the issues to be addressed, such as regular market analysis, dispute resolution, etc. These processes should provide clearly defined deadlines for each process. These procedures should also ensure transparency and for stakeholders to provide their feedback on decisions under consideration. A right of appeal for stakeholders affected by decisions should also be considered.

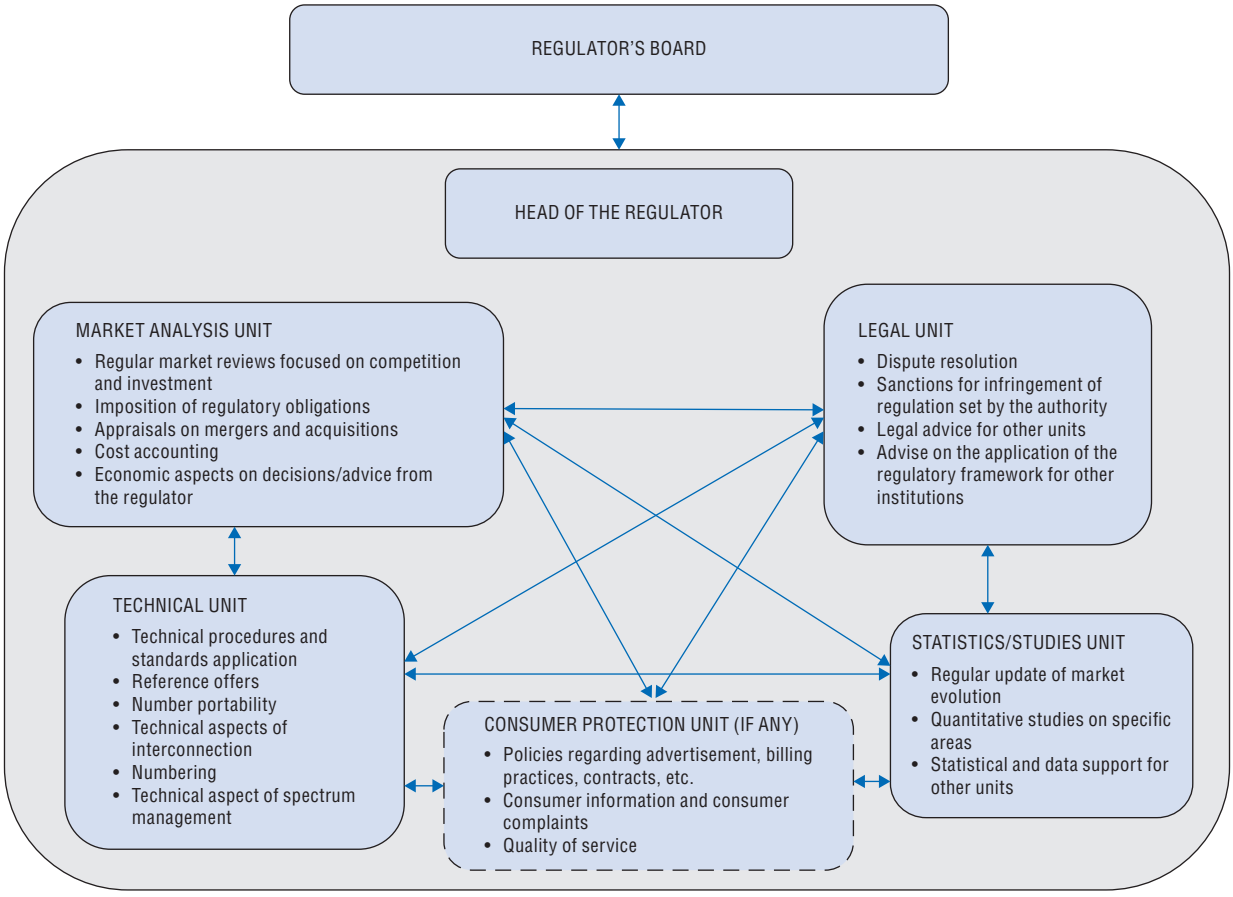
Regulators should define and measure **key performance indicators** on the main issues to be addressed, including inputs (e.g. number of disputes filed and claims received), processes (e.g. time to perform market analysis), outputs (e.g. number of decisions taken) and outcomes of the regulator (e.g. evolution of concentration for each market). A reference for the definition of these performance indicators can be found in the OECD Best Practice Principles for Regulatory Policy (OECD, 2014a). A specific practical case of its application in the case of communications regulators is the OECD review conducted for Colombia's Communications Regulation Commission (CRC) (OECD, 2014b).

Most issues examined by the regulator require the **collection of data from operators**. It is important that the regulator have the power to request necessary data from operators, set a time limit to receive the data requested and if necessary, fine operators if data are not forthcoming. The regulator must establish effective procedures to ensure confidentiality for data needed for regulatory decisions that is sensitive and should not be disclosed to third parties.

Staffing is often a challenge for national regulators in the LAC area. The lack of human resources can slow the reform process, reduce the quality of decision making and may create regulatory uncertainty. Experts in the regulatory authority must have relevant experience in the telecommunication sector and in their area of work. Adequate incentives must be established to attract and retain well-qualified staff, and if needed, exemption from civil service employment and salary rules may be considered to engage professionals at rates competitive with the private sector.

Communications regulators are usually organised around several units specialised in different areas of competence or fields of expertise. There is no single model for structuring the different areas of competence, but it is important to ensure that there is a fluid communication and collaboration between them. For illustrative purposes, a typical distribution of units that can be found in many of the regulators in the LAC and the OECD area is included (Figure 2.2). Depending on powers assigned to the regulator, there may be additional units, or they can be organised in a different way.

Figure 2.2. **Structure of the regulator**



A **market analysis** unit is usually in charge of evaluating telecommunications markets to identify competition problems, especially those associated with positions of dominance and interconnection issues. If any are identified, the unit determines which regulatory measures should be applied. Mergers and acquisitions appraisal (or collaboration with the competition authority) in the sector is also the responsibility of this unit. It also governs

cost accounting, given that some regulatory measures include price regulation. The unit collaborates with other units where economic analysis is needed, and experts in this area should have a strong background in economics and competition law.

A **technical unit** focuses on the engineering aspects of regulatory measures, such as the procedures and standards used by operators when interconnecting, technical details of reference offers and number portability. A technical unit is usually also responsible for management of scarce resources, including spectrum and numbering. Telecommunications engineers and other experts with relevant experience in the sector are needed. A legal unit usually co-ordinates dispute resolutions, infringement procedures and in general, legal advice for other units, in order to ensure that decisions are consistent with the regulatory framework, minimising judicial overturn of decisions by the regulator.

If the communications authority also has **consumer protection** responsibilities, it is advisable to configure a unit to address all consumer protection issues that involve specific aspects, tools and methodologies (see Chapter 13). Collaboration with other units is usually required to ensure consistency of consumer protection policies with other objectives, such as encouraging competition and investment.

Data collection, statistical analysis and production of reports, as discussed in the final section of this chapter, is an important area of work for the communications authority. Data collection and statistical analysis is complex and resource-consuming and requires experts on econometrics, and in general, statistical analysis. Apart from other tasks, such as production of regular reports on the evolution of the sector, this unit has a key role in supporting other units (IDB, 2015).

Apart from the types of units common in many organisations with similar responsibilities (e.g. external communications and human resources), the telecommunications industry requires close **international co-operation**. International activities are especially relevant, as most regulatory policies benefit from close collaboration and benchmarking with regulators in other countries, as well as international organisations in the area. The online ICT regulatory toolkit[1] prepared by the ITU provides more detailed information, practical material and advice for the organisation of regulators.

The head and the members of the Regulator's Board

There is widespread agreement among competition experts that the head and the members of the board of the competition and communication authorities should be independent of the government, to avoid political interference and ensure that decisions are not dependent on the prevailing political situation. No direct participation of government departments should be allowed on the regulator's board, which should be able to make decisions independently.

The head and commissioners of these regulatory bodies should not be subject to discretionary appointment and dismissal by the government, and appointments should be for a fixed term that is long enough to ensure their independence (five or six years is often the norm). These appointments should be involve open and transparent procedures, such as by establishing a shortlist of qualified candidates from which the appointing authority can select. The appointment process should observe high standards of transparency, through open procedures and clear qualification and evaluation criteria. An evaluation committee should be established and tasked with assembling a list of qualified candidates, according to established criteria.

The Regulator's Board is in charge of discussing and adopting regulatory decisions. It is advisable to have staggered appointments for commissioners, to ensure continuity and avoid

the replacement of multiple commissioners at the same time. The legal framework should provide legal protection for the head of the regulator and commissioners when acting on behalf of the regulator, limiting their personal liability, to avoid the filing of criminal charges and administrative complaints against them as a means of putting pressure on them and creating time-consuming disruptions.

Data collection and reporting

Successful implementation of policy and regulatory measures require an ability to respond to the complexity of the economy and assess their effects on public policy making. In the OECD this is called "evidence-based" policies, which depend on collecting the data needed to inform policies.

This section discusses a series of issues: why the collection of data by regulators is important for broadband policy-making; what mandate the regulatory framework should provide; which data should typically be collected; what reporting should be produced; and finally, which issues to take into account when collecting relevant data. A discussion on measurement and indicators on specific themes covered by this Toolkit (such as competition, e-education and e-health) is addressed in the section "Tools for measurement and analysis in the LAC region" of each chapter. Data collection issues discussed here refer to the assessment of broadband policy objectives and should not be confused with the tracking of internal management indicators.

There are many **reasons to collect data** on the market and to produce reports. First and foremost, the collection and analysis of data is crucial to make informed policy and regulatory decisions. That means collecting solid statistical data and indicators, which can guide regulatory action. Collecting and reporting on statistical evidence is also key for providing information on those policies or regulatory measures, to assess their effects and, if necessary, adjust them.

In OECD countries, many central government departments and independent regulators undertake assessments to provide cost-benefit analysis of policy proposals and evaluate the functioning of the market and the effectiveness and efficiency of regulation.[2] This approach has, to a large extent, been stimulated by treasuries and finance ministers concerned with the value for money of public expenditures. At the same time, a more informed public with increased access to news and data sources has put pressure on policy makers to provide clear and reliable evidence on which to base their decisions.

Data collection is useful not only to compare indicators over time within a country, but to benchmark domestic performance against peer countries. Regular benchmarking with similar or neighbouring countries is an additional tool for identifying gaps or good practices. Peer comparison has become an essential instrument for improving public sector performance in many countries of the OECD.

Another dimension of data collection and reporting is its value for the private sector. Regular publication of key performance indicators (e.g. level of investment, revenues, infrastructure availability and quality of service) can be useful for market players such as telecommunications operators or potential investors, as it helps reduce information asymmetries, increase transparency, level the playing field and increase predictability.

Finally, by routinely collecting information on internationally agreed indicators, policy makers and regulators provide data that can be used by international observatories and international organisations such as ITU, IDB and OECD. These observatories are important

for benchmarking and for informing policy analysis. In the LAC region, digiLAC, an IDB initiative, measures broadband policies and development in the LAC area by comparing countries according to the Broadband Development Index (Box 2.2).

The OECD's broadband portal is another example, which provides a range of comparative broadbaand data enabling performance benchmarking and other information (Box 2.3).

Box 2.2. **digiLAC Broadband Development Index**

The digiLAC

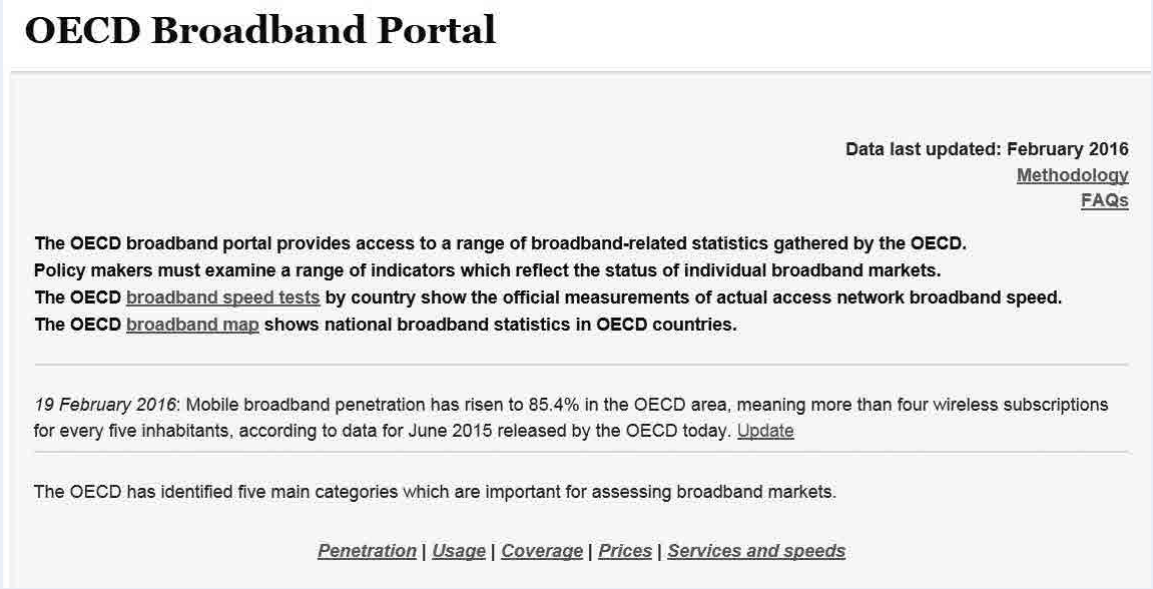
The Broadband Development Index brings together 37 indicators, each with a score ranging from one (least developed) to eight (most developed), to produce the overall index. The indicators are chosen on the basis of four pillars: public policy and strategic vision, strategic regulation, infrastructure, and applications and knowledge.



Source: http://dataset.iadb.org/es/digilac.

Box 2.3. **OECD Broadband Portal**

The OECD broadband portal provides access to a range of broadband-related statistics gathered by the OECD. The portal is frequently updated with data supplied by OECD member countries and key partners and provided for verification before its publication.



Source: www.oecd.org/sti/broadband/oecdbroadbandportal.htm.

Another relevant issue is to decide on the **type of information to be collected**. To inform broadband policies, regulatory authorities and ministries require a wide array of data to be collected, analysed and reported. Usually, telecommunications indicators cover the supply-side (or the infrastructure side), demand-side, prices and the quality-of-services aspects of telecommunications services. These indicators should be relevant, accurate, coherent, timely, based on a clear methodology, preferably using internationally comparable standards, and regularly reviewed in light of technological developments:

- **Supply side:** for both fixed and mobile technologies, as well as at the retail and wholesale levels, data should be collected on the number of lines, number of subscriptions, population and geographical coverage, number of customers (market shares), financial information (revenue and investment) and ownership structure of service providers. From this core data, other indicators can be calculated, such as ratios (broadband subscriptions per 100 inhabitants, per households, by speed tiers, etc.). Revenue is often presented per telecommunication access path or by broadband subscription, which provides an indicator of relative revenue levels.
- **Demand side:** Demand-side data are used to measure the effective usage and adoption of broadband by households, individuals and businesses and are usually collected using surveys. These cover issues ranging from duration and type of broadband usage to detailed aspects of the exact usage of broadband (such as platform used and location of use) and particular usage to access advanced services and applications, like e-health, education services, e-government, transport, energy and finance.
- **Prices:** Prices are one of the most reliable indicators for monitoring the effects of competition on consumers and market performance. Data on prices of wholesale and retail services, both stand-alone and bundled, are vital information for regulators. Regulators may use basket methodologies to analyse retail offers, where different user profiles are compared, in order to represent a larger variety of types of users in a market. Wholesale prices can be collected, as needed, from requests for data of the commercial agreements of operators.
- **Quality of service (QoS):** QoS data collection should feed performance indicators measuring advertised and effective broadband speeds, latency, consumers' complaints and incidents. On speeds and latency, for example, direct measurements on the network can be carried out by the regulator, or by using third parties that provide independent data, such as Akamai, Ookla or M-Lab. Regulators should also be aware that different services require distinct QoS statistics. Services provided to enterprises, for example, usually have QoS reporting requirements contained within contracts, and would initially not require monitoring of QoS, differently from services offered directly to consumers. In terms of consumer satisfaction, qualitative data can also be collected via targeted surveys.

The OECD Guide to Measuring the Information Society provides a standard reference for statisticians, analysts and policy makers in the field of ICT, to define and implement key performance indicators in this area (OECD, 2014c). It is crucial that all stakeholders are involved in the design and collection of these indicators.

Publication and dissemination of data is a key issue. The regular publication of reports and press releases facilitates the circulation of information, alerting stakeholders and experts to new trends arising from the data collected. Regulators should produce an annual report of KPIs and other relevant indicators to illustrate the evolution of the wholesale and retail markets, such as the ones highlighted above, as well as to provide regular updates through

press releases of monthly or quarterly available data. Moreover, ministries or regulators may wish to produce thematic reports showing the evolution of specific services, trends or regional differences.

To reduce the burden of data collection on operators, **co-ordination among institutions** to avoid duplication of data requests is crucial. Despite data collection's importance in evidence-based policy making, government institutions should take care to not overload operators, analysing which information is necessary and sending questionnaires on a regular basis to allow stakeholders to plan ahead. In addition to recurrent requests, specific data needed for decision-making processes should be tailored case by case.

Finally, it is crucial that operators and consumers **trust** regulators to keep the confidential data collected from being publicised or used in an inappropriate or unauthorised manner. Depending on the size and structure of the sample collected, raw data can sometimes be aggregated or masked in a way that protects confidentiality and yet produces useful information for analysis. But if operators are not convinced the information provided will be protected, the quality of the information provided will suffer. Regulators should be committed to safeguarding information that identifies the operations, or individual characteristics of respondents, either operators or consumers.[3]

Conclusion

This chapter sets out good practices for developing effective digital strategies and sound regulatory frameworks. First, designing digital strategies requires co-ordination of a range of public institutions to identify realistic targets and ensure that processes are in place to monitor their progress. This requires designating a co-ordinating body and establishing a mechanism for decision-making in areas where the competencies of different government bodies overlap. Clearly defining responsibilities, and providing public institutions the necessary authority is a key to ensuring success. Establishing an effective oversight mechanism for digital strategies is also important, to ensure successful implementation, assess fulfilment of goals, improve planning, and help policy makers in decisions. Steering groups that involve different types of stakeholders and benchmarking exercises can also smooth implementation.

This chapter also notes the importance of establishing telecommunications regulatory frameworks that are stable, predictable, technologically neutral and based on a forward-looking approach, with a horizon of two or three years. Moreover, the distribution of responsibilities and powers between the executive branch (ministerial departments) and regulatory agencies should establish a clear separation between policy formulation and application of the regulatory framework. It is crucial that regulatory agencies be independent of governments in formulating and applying regulations. This can avoid conflicts between effective regulatory decisions designed to encourage competition and investment, and short-term political pressures. It is also important that judicial review does not undermine the timeliness and legal certainty of regulatory decisions.

Regulators should thus be given a distinct legal mandate, with adequate authority, and have a stable and independent source of funding that is not controlled by the government. Members of the board should be nominated in an open, transparent and merit-based process. The head and the members of the regulatory board should be independent of the government and their mandates should have appropriate, stable timeframes.

Different policy/regulatory authorities should maintain close co-operation based on well-defined procedures that enable fluid communication. Converging *ex ante* and *ex post* powers within the same institution allow for easier co-ordination, as procedures are kept internal, but defining terms for co-ordination between the different units is advised.

Finally, it is crucial that the regulators have the power to request necessary data from all actors in regulated markets, set time limits for responses and, if necessary, fine actors if the request is not fulfilled. Collecting solid statistical data and consolidating indicators, while ensuring confidentiality of sensible data and producing reports, is key to making informed policy and regulatory decisions. It is also important for informing market agents, increasing transparency, reducing information asymmetries, levelling the playing field and increasing predictability of the regulated sectors. Indicators should be relevant, accurate, coherent, timely, based on a clear methodology, preferably using internationally comparable standards, and regularly reviewed in light of technological developments.

Notes

1. See *www.ictregulationtoolkit.org*.
2. The UK Treasury's "Green Book" provides consistent guidance to public bodies on the methodology for cost benefit analysis and impact assessments. Available at *www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-incentral-governent*.
3. The protection of confidentiality is one of the fundamental principles of a national statistical agency (see *http://unstats.un.org/unsd/methods/statorg/*).

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Further reading

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ANNEX 2.A1

Regulatory frameworks in the LAC region

	Telecommunications regulatory frameworks for the countries in the LAC region
Argentina	*Ley de Telecomunicaciones. Ley Argentina Digital* (2014), modified by decree 267/2015 (Creation of *Ente Nacional de Comunicaciones*, ENACOM) www.infoleg.gob.ar/infolegInternet/anexos/235000-239999/239771/norma.htm *www.boletinoficial.gob.ar/#!DetalleNorma/139608/20160105*
Bahamas	The Communications Act 2009 and Communications Amendment Act 2011 www.urcabahamas.bs/download/088554800.pdf and *www.urcabahamas.bs/download/034593300.pdf*
Barbados	The Telecommunications Act CAP282B (2011) *www.telecoms.gov.bb/website/index.php?option=com_content&view=article&id=35&Itemid=138*
Belize	Belize Telecommunications Act CAF229 N° 16, (2002) *www.belizelaw.org/web/lawadmin/PDF%20files/cap229s.pdf*
Bolivia	*Ley General de Telecomunicaciones, Tecnologías de la Información y Comunicación*, N° 164 (2011) *www.nci.tv/archivos/ley_164___ley_general_de_telecomunicaciones_tecnologias_de_informacin_y_comunicacion.pdf*
Brazil	*Lei Geral de Telecomunicações* N°9.472 (1997) *www.planalto.gov.br/CCIVIL_03/leis/L9472.htm*
Chile	*Ley General de Telecomunicaciones* N° 18.168 (1982) *www.leychile.cl/Navegar?idNorma=29591*
Colombia	*Ley para las Tecnologías de la información y las Comunicaciones* TIC N° 1341 (2009) *www.mintic.gov.co/portal/604/articles-3707_documento.pdf*
Costa Rica	*Ley General de Telecomunicaciones* N° 8642 (2008) *http://sutel.go.cr/sites/default/files/normativas/ley_general_de_telecomunicaciones.pdf*
Dominican Republic	*Ley General de Telecomunicaciones* N°153-98 (1998) *www.indotel.gob.do/index.php/uploads/123/Ley_153_98_Telecomunicaciones-pdf*
Ecuador	*Ley Especial de Telecomunicaciones* N°. 184 (1992) *www.palermo.edu/cele/pdf/Regulaciones/EcuadorLeyEspecialdeTelecomunicaciones%281992%29.pdf*
El Salvador	*Ley de Telecomunicaciones* (1997) *www.siget.gob.sv/attachments/1447_Ley%20de%20Telecomunicaciones%20%28actualizada%20nov.10%29.pdf*
Guatemala	*Ley General de Telecomunicaciones* (1996) *www.sit.gob.gt/attachments/article/75/Ley_General_de_Telecomunicaciones_SIT.pdf*
Guyana	Telecommunications Act (1990) *http://unpan1.un.org/intradoc/groups/public/documents/tasf/unpan024410.pdf*
Haiti	*Loi Telecom* (1977) *http://conatel.gouv.ht/pdf/loitelecom.pdf*
Honduras	*Ley Marco del Sector de Telecomunicaciones* (1995), updated in 2011 and 2013 *www.conatel.gob.hn/doc/Regulacion/leyes/LEY_MARCO_DEL_SECTORDETELEC.pdf* *www.conatel.gob.hn/doc/Regulacion/leyes/DECRETO_LEGISLATIVO_112-2011.pdf* *www.conatel.gob.hn/doc/Regulacion/leyes/Decreto%20325-2013%20Reforma%20a%20la%20Ley%20Marco%20del%20Sector%20de%20Telecomunicaciones.pdf*
Jamaica	The Telecommunications Act (2000) *www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/telecommunications_act2.pdf*

	Telecommunications regulatory frameworks for the countries in the LAC region
Mexico	*Reforma Constitucional en Materia de Telecomunicaciones* (2013) *www.dof.gob.mx/nota_detalle.php?codigo=5301941&fecha=11/06/2013* *Ley Federal de Telecomunicaciones y Radiodifusión* (2014) *www.dof.gob.mx/nota_detalle.php?codigo=5352323&fecha=14/07/2014* *www.sct.gob.mx/fileadmin/Comunicaciones/LFTR_english.pdf*
Nicaragua	*Ley General de Telecomunicaciones y Servicios Postales* N° 200 (1995) *www.telcor.gob.ni/MarcoLegal.asp?Accion=VerRecurso&REC_ID=178*
Panama	*Ley que regula las telecomunicaciones* N° 31 (1996) *www.asep.gob.pa/leyes_decretos/ley31.asp*
Paraguay	*Ley de telecomunicaciones* Nº 642/95 (1995) *http://www.conatel.gov.py/images/iprincipal/LEY%20642/Ley_N_642-95.pdf*
Peru	*Ley de telecomunicaciones* Nº 26096 (1993) *http://transparencia.mtc.gob.pe/idm_docs/normas_legales/1_0_892.pdf*
Suriname	Telecommunications Act, No.151 (2004) *www.tas.sr/images/pdf/eng/01.pdf*
Trinidad and Tobago	Telecommunications Act (2001) *www.sice.oas.org/investment/NatLeg/TTO/Telecom_e.pdf*
Uruguay	There is no general telecommunications law, relevant legislation includes the law Nº 17.296 and the decree 212/001, establishing URSEC and its functions (2001) *www.miem.gub.uy/documents/10180/0/Ley%20N%C2%BA%2017.296%20-%20Vinculaci%C3%B3n%20con%20la%20Unidad%20Reguladora%20de%20Servicios%20de%20Comunicaciones?version=1.2&t=1360343547000*

ANNEX 2.A2

National digital Strategies

Country	National digital strategies
Barbados	**National Information and Communication Technologies Strategic Plan** *(www.redgealc.net/new-document-barbados-ict-strategic-plan/content/4988/en/)* **(2010-15)** **Objective:** Provide the policy framework for the advancement and promotion of Barbados as an e-country. ICT skills for the society, use of ICTs to encourage and promote a culture of innovation and entrepreneurship, ICT access to all Barbadians, e-government, e-business; continuity of governance in national disasters. **Managed by:** MTIC.
Belize	**ICT National Strategy** (*http://redgealc.org/download.php?len=es&id=5006&nbre=belize11_16.pdf&ti=application/pdf&tc=Contenidosv*) **(2011-16)** **Objective:** open ICT, ICT in education, and ICT for e-commerce, e-inclusion, job creation and accelerating e-government. **Managed by:** MESTPU.
Chile	**Agenda Digital Imagina Chile** *(www.mtt.gob.cl/wp-content/uploads/2014/02/agenda_digital.pdf)* **(2013-20)** **Objective:** Creation of a knowledge economy, expansion of technologies among the population, and that by 2020, the 10% of the Chilean GDP is derived from ICT. **Managed by:** Sub-secretary for Telecommunications.
Colombia	**Plan Vive Digital** *(http://micrositios.mintic.gov.co/vivedigital/2014-2018/)* **(2014-18)** **Objective:** Promote the digital ecosystem and its axis: applications, users, infrastructure and services, including the relevant issues for their demand and supply. **Managed by:** MinTIC.
Costa Rica	**CRDigit@l** (*www.crdigital.go.cr/)* **(2015-21)** **Objective:** Framework for policies concerning public and private actors (PNDT) and set of comprehensive actions on connecting communities, homes, educational and health centres. **Managed by:** Ministry of Science, Technology and Telecommunications, Vice Ministry of Science and Technology (MICITT).
Dominican Republic	**Digital Agenda of Dominican Republic** (*www.cnsic.org.do/images/docs/Agenda/Versi%C3%B3n%20Preliminar%20Agenda%20Digital%20R%20D%20%202016-2020.pdf)* **(2016-20)** **Objective:** Strategic plan for Information and Communication Technologies to enable social development and economic development. **Managed by:** CNSIC, INDOTEL.
Ecuador	**Estrategía Ecuador Digital 2.0** (*www.telecomunicaciones.gob.ec/programas-y-servicios)* **(2012-17)** **Objective:** Reduce the digital divide, promoting access to the Internet. For 2017, the goal is to have 45 000 kilometres of optical fibre. Different plans and programmes. **Managed by:** MINTEL.
Honduras	**Agenda Digital Honduras** (*http://agendadigital.hn/ and http://agendadigital.hn/wp-content/uploads/2013/10/AgendadigitalCOR.pdf)* **(2014-18)** **Objective:** The national strategy has four axes: increasing Internet access and infrastructure; digital government strategies; promote ICT training; and the legislative and institutional frame for ICT. **Managed by:** SEPLAN.
Mexico	**Estrategia Digital Nacional** (*www.presidencia.gob.mx/edn/)* **(2013-18)** **Objective:** Build a digital Mexico in which technology and innovation to help achieve reach Mexico's development goals. **Managed by:** Digital National Strategy Co-ordination.
Panama	The National ICT plan is included in Broadband National Strategy (*www.innovacion.gob.pa/descargas/PlanEstrategicoBandaAncha.pdf*) **(2008-18)** **Objective:** The ICT includes five axes: The citizen, the government, education, health and enterprises. The ICT plan is a series of initiatives to develop through the strategic plan. **Managed by:** SENACYT, CAPATEC.
Peru	**Agenda Digital Peruana 2.0** (*www.codesi.gob.pe/agenda_digital/codesi_agenda_digital.php)* **(2011-15)** **Objective:** Inclusive access to ITC by the population, promote scientific research, increase productivity and competitiveness in ITC, develop the national ICT industry, and promote ICT usage in public administration. **Managed by:** CODESI.
Uruguay	**Agenda Digital Uruguay ADU** (*www.agesic.gub.uy/innovaportal/v/1443/1/agesic/mapa_de_ruta:_agenda_digital_uruguay_2011-2015.html?menuderecho=11)* **(2011-15)** **Objective:** The strategic lines contribute to the general objective of constructing an information society focused on development, in which everyone is able to use and share information and knowledge. The strategic lines include social inclusion, citizens' participation, state transformation and promotion of education. **Managed by:** AGESIC.

ANNEX 2.A3

Policy/regulatory bodies in the LAC region

Country	Ministry of telecommunications	Communications authority	Competition authority	Broadcasting authority	Consumer protection
Argentina	Ministerio de Comunicaciones (MinCom)	Ente Nacional de Comunicaciones (ENACOM)	Comisión Nacional para la Defensa de la Competencia (CNDC)	Ente Nacional de Comunicaciones (ENACOM)	Subsecretaría de defensa del consumidor (SDC)
Bahamas	Minister with responsibility for the Electronic Communications Sector (ECS), currently the Prime Minister (Office of the Prime Minister)	Utilities Regulation and Competition Authority (URCA)	Utilities Regulation and Competition Authority (URCA)	Utilities Regulation and Competition Authority (URCA)	Consumer Affairs Office Utilities Regulation and Competition Authority (URCA
Barbados	Telecommunications Unit (TU)	Telecommunications Unit (TU)	Fair Trading Commission (FTC)	Barbados Broadcasting Authority (BBA)	Fair Trading Commission (FTC)
Belize	Ministry of Energy, Science & Technology and Public Utilities (MESTPU)	Public Utilities Commission (PUC)	In the process of establishing such an authority	Belize Broadcasting Authority (BBA)	Public Utilities Commission (PUC)
Bolivia	Viceministerio de Telecomunicaciones (VT)	Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte (ATT)	Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte (ATT)	Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte (ATT)	Autoridad de Regulación y Fiscalización de Telecomunicaciones y Transporte (ATT)
Brazil	Ministério das Comunicações (MC)	Agência Nacional de Telecomunicações (ANATEL)	Conselho Administrativo de Defesa Econômica (CADE)	Agência Nacional do Cinema (ANCINE)	Secretaria Nacional do Consumidor (SENACON)
Chile	Ministerio de Transportes y Comunicaciones (MTC)	Subsecretaría de Telecomunicaciones (SUBTEL)	Tribunal de la Defensa de la Libre Competencia (TDLC) Fiscalía Nacional Económica (FNE)	Consejo Nacional de Televisión (CNTV)	Ministerio de Economía Fomento y Turismo (SERNAC)
Colombia	Ministerio de Tecnologías de la Información y las Comunicaciones (MinTIC)	Comisión de Regulación de Comunicaciones (CRC)	Superintendencia de Industria y Comercio (SIC)	Autoridad Nacional de Televisión (ANTV)	Comisión de Regulación de Comunicaciones (CRC) Superintendencia de Industria y Comercio (SIC)
Costa Rica	Ministerio de Ciencia, Tecnología y Telecomunicaciones (MICIT)	Super Intendencia de Telecomunicaciones (SUTEL)	Comisión para Promover la Competencia (COPROCOM) and Superintendencia de Telecomunicaciones (SUTEL)	Ministerio de Ciencia, Tecnología y Telecomunicaciones (MICIT)	Comisión Nacional del Consumidor (CNC)
Dominican Republic	Comisión Naciona para la Sociedad de la Información y el Conocimiento (CNSIC)	Instituto Dominicano de las Telecomunicaciones (INDOTEL)	Comisión Nacional de Defensa de la Competencia (Pro-Competencia)	Instituto Dominicano de las Telecomunicaciones (INDOTEL)	Instituto Nacional de Protección de los Derechos del Consumidor (PRO CONSUMIDOR)

Country	Ministry of telecommunications	Communications authority	Competition authority	Broadcasting authority	Consumer protection
Ecuador	Ministerio de Telecomunicaciones y Sociedad de la Información (MINTEL)	Agencia de Regulación y Control de las Telecomunicaciones (ARCOTEL)	Superintendencia de Telecomunicaciones del Ecuador (SUPERTEL)	Agencia de Regulación y Control de las Telecomunicaciones (ARCOTEL)	Ministerio de Industrias y Productividad (MIPRO)
El Salvador	Consejo Nacional de Ciencia y Tecnología Viceministerio de Ciencia y Tecnología (NCONACYT)	Superintendencia General de Electricidad y Telecomunicaciones (SIGET)	Superintendencia de Competencia (SC)	Ministerio de Gobernación	Defensoría del Consumidor (DC)
Guatemala	Ministerio de Comunicaciones, Infraestructura y Vivienda (CIV)	Superintendencia de Telecomunicaciones (SIT)	Ministerio de Economía (ME)	Dirección General de Radiodifusión y Televisión Nacional (TWG)	Dirección de Atención y Asistencia al Consumidor (DIACO)
Guyana	Ministry of the President. (MOTP)	Public Utilities Commission (PUC)	Competition and Consumer Affairs Commission of Guyana (CCAC)	Guyana National Broadcast Authority (GNBA)	Competition and Consumer Affairs Commission (CCAC)
Haiti	Ministère des Travaux Publics, Transports et Communications (MTPTC)	Conseil National des Télécommunications (CONATEL)	Conseil National des Télécommunications (CONATEL)	Ministère de la Culture – Ministère de la Communication (MCU-MCO)	Conseil National des Télécommunications (CONATEL)
Honduras	Comisión Nacional de Telecomunicaciones (CONATEL)	Comisión Nacional de Telecomunicaciones (CONATEL)	Comisión para la Defensa y la Promoción de la Competencia (CDPC)	Comisión Nacional de Telecomunicaciones (CONATEL)	Secretaría de Industria y Comercio(SIC)
Jamaica	Ministry of Science, Technology, Energy and Mining (MSTEM)	Office of Utilities Regulation (OUR)	Fair Trading Commission (FTC)	Broadcasting Commission (BC)	Consumer Affairs Commission (CAC)
Mexico	Secretaría de Comunicaciones y Transportes (SCT)	Instituto Federal de Telecomunicaciones (IFT)	Comisión Federal de Competencia Económica (COFECE) Instituto Federal de Telecomunicaciones (IFT)	Secretaría de Gobernación (SEGOB), Instituto Federal de Telecomunicaciones (IFT)	Procuraduría Federal del Consumidor (PROFECO), Instituto Federal de Telecomunicaciones (IFT)
Nicaragua	Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)	Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)	Instituto Nacional de Promoción de la Competencia (PROCOMPETENCIA)	Instituto Nicaragüense de Telecomunicaciones y Correos (TELCOR)	Instituto Nacional de Defensa del Consumidor (INDEC)
Panama	Autoridad Nacional para la Innovación Gubernamental (AIG)	Autoridad Nacional de los Servicios Publicos (ASEP)	Autoridad de Protección al Consumidor y defensa de la Competencia (ACODECO)	Autoridad Nacional de los Servicios Publicos (ASEP)	Autoridad de Protección al Consumidor y defensa de la Competencia (ACODECO)
Paraguay	Secretaría Nacional de Tecnologías de la Información y Comunicación (SENATIC)	Comisión Nacional de Telecomunicaciones (CONATEL)	Comisión Nacional de la Competencia (CONACOM)	Comisión Nacional de Telecomunicaciones (CONATEL)	Secretaría de Defensa del Consumidor y el Usuario (SEDECO)
Peru	Ministerio de Transportes y Comunicaciones (MTC)	Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSPITEL)	Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSPITEL)	Instituto Nacional de Radio y Televisión de Perú (IRTP)	Tribunal Administrativo de Solución de Reclamos de Usuarios (TRASU)
Suriname	Ministry of Transport Communication and Tourism (MINTCT)	Telecommunicatie Autoriteit Suriname (TAS)	x	Ministry of Education	Ministry of Trade and Industry (MTI)
Trinidad and Tobago	Ministry of Science and Technology (MST)	Telecommunications Authority of Trinidad and Tobago (TATT)	Telecommunications Authority of Trinidad and Tobago (TATT)	Telecommunications Authority of Trinidad and Tobago (TATT)	Consumer Affairs Division (CAD)

Country	Ministry of telecommunications	Communications authority	Competition authority	Broadcasting authority	Consumer protection
Uruguay	Dirección Nacional de Telecomunicaciones y Servicios de Comunicación Audiovisual (DINATEL)	Unidad Reguladora de Servicios de Comunicaciones (URSEC)	Comisión de Promoción y Defensa de la Competencia (CPDC)	Consejo de Comunicación audiovisual[1]	Unidad Reguladora de Servicios de Comunicaciones (URSEC) Agencia de Gobierno Electrónico y Sociedad de la Información y del Conocimiento (AGESIC) Comisión de Promoción y Defensa de la Competencia (CPDC)
Venezuela	Ministerio del poder popular para la comunicación y la información (MINCI)	Comisión Nacional de Telecomunicaciones de Venezuela (CONATEL)	Superintendencia antimonopolio (SAM)	Comisión Nacional de Telecomunicaciones de Venezuela (CONATEL)	Superintendencia de Defensa de los Derechos Socioeconomicos (INDEPABI)

Note: x = not applicable.

1. According to the Law no. 19.307 of 29 December 2014, an Audiovisual Communications Council is to be created in Uruguay to deal with Broadcasting issues and meanwhile traditional broadcasting issues will be treated by the *Ministério de Educación y Cultura* (MEC) and emerging issues by the *Institución Nacional de Derecho Humanos y Defensoría del Pueblo*.

ANNEX 2.A4

Distribution of powers among policy/regulatory bodies in the region

Table 2.A4.1. **Standardisation, spectrum management, numbering, IT**

	Standardisation/ certification	Spectrum planning	Spectrum allocation	Spectrum assignment	Enforcement/monitoring of law/regulation	Management of numbering resources
Argentina	SECOM-ENACOM	SECOM	SECOM	SECOM	ENACOM	SECOM-ENACOM
Bahamas	URCA	URCA, Minister	URCA, Minister	URCA	URCA	URCA
Barbados	TU	TU	TU	TU	FTC	TU
Belize	PUC	PUC	PUC	PUC	PUC	PUC
Bolivia	ATT	VT - ATT	ATT	ATT	ATT	ATT
Brazil	ANATEL	ANATEL	ANATEL	ANATEL	ANATEL	ANATEL
Chile	SUBTEL	SUBTEL	SUBTEL	SUBTEL	SUBTEL	SUBTEL
Colombia	CRC	ANE	ANE	MINTIC-ANTV	MINTIC-ANTV-SIC	CRC
Costa Rica	SUTEL/ECA	MICITT	MICITT	MICITT	SUTEL	SUTEL
Dominican Republic	INDOTEL	PROCONSUMIDOR-INDOTEL	INDOTEL	INDOTEL	INDOTEL	INDOTEL
Ecuador	ARCOTEL	ARCOTEL	ARCOTEL	ARCOTEL	SUPERTEL	ARCOTEL
El Salvador	SIGET	SIGET	SIGET	SIGET	SIGET SC	SIGET
Guatemala	SIT	SIT	SIT	SIT	SIT	SIT
Guyana	NFMU	NFMU-PM	NFMU	NFMU	OP-PUC	NFMU
Haiti	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL
Honduras	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL
Jamaica	OUR -SMA	SMA	SMA	SMA	OUR, SMA-BC	OUR
Mexico	IFT	IFT	IFT	IFT	IFT	IFT
Nicaragua	TELCOR	TELCOR	TELCOR	TELCOR	TELCOR	TELCOR
Panama	ASEP	ASEP	ASEP	ASEP	ASEP	ASEP
Paraguay	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL	CONATEL
Peru	MTC	MTC	MTC	MTC	OSIPTEL - MTC	MTC
Suriname	TAS	TAS	TAS	TAS	TAS	TAS
Trinidad and Tobago	TATT	TATT	TATT	TATT	TATT	TATT
Uruguay	URSEC	MIEM-URSEC	URSEC	URSEC	URSEC	URSEC

Table 2.A4.2. **Licenses, interconnection regime, market/competition analysis), price regulation, quality of service**

	Licensing (telecom)	Interconnection regime	Market/competition analysis (telecom)	Price regulation	Quality of service
Argentina	SECOM	SECOM-ENACOM	CNDC-ENACOM	SECOM	SECOM/ENACOMC
Bahamas	URCA	URCA	URCA	URCA	URCA
Barbados	TU	TU	TU-FTC	TU	FTC
Belize	PUC	PUC	CARICOM	PUC	PUC
Bolivia	ATT	ATT	ATT	ATT	ATT
Brazil	ANATEL	ANATEL	ANATEL-CADE	ANATEL	ANATEL
Chile	SUBTEL	SERNAC-MTC	FNE- SUBTEL-TDLC	SERNAC- MTC	SUBTEL
Colombia	MINTIC	CRC	CRC-SIC	CRC	CRC
Costa Rica	SUTEL	SUTEL	SUTEL-COPROCOM	SUTEL	SUTEL
Dominican Republic	INDOTEL	INDOTEL	PRO-COMPETENCIA	INDOTEL	INDOTEL
Ecuador	ARCOTEL	ARCOTEL	SUPERTEL	ARCOTEL-SUPERTEL	ARCOTEL
El Salvador	SIGET	SIGET	SC	SIGET	SIGET
Guatemala	SIT	SIT	ME	SIT	DIACO
Guyana	OP-NFMU	PUC	CCAC	OP	PUC
Haiti	MTPTC-CONATEL	CONATEL	CONATEL	CONATEL	CONATEL
Honduras	CONATEL	CONATEL	CDPC	CONATEL	CONATEL
Jamaica	OUR	OUR	OUR-SMA-FTC	OUR	OUR- SMA- BC
Mexico	IFT	IFT	IFT	IFT	IFT
Nicaragua	TELCOR	TELCOR	PROCOMPETENCIA	TELCOR	TELCOR
Panama	ASEP	ASEP	ASEP-ADECO	ASEP	ASEP
Paraguay	CONATEL	CONATEL	CONATEL-CONACOM	CONATEL	CONATEL
Peru	MTC	OSIPTEL	OSIPTEL-MTC	OSIPTEL	OSIPTEL
Suriname	TAS	TAS	TAS	TAS	TAS
Trinidad and Tobago	TATT	TATT	TATT	TATT	TATT
Uruguay	MIEM-URSEC	URSEC	URSEC-CPDC	URSEC	URSEC

Table 2.A4.3. **Design and implementation of National Broadband Plans, universal access/service funding, universal access/service obligations**

	Design and implementation of National Broadband Plan	Universal access/service	Funding universal access/service obligations
Argentina	SECOM	ENACOM	SECOM-ENACOM
Bahamas	URCA	URCA, Minister	URCA
Barbados	MTIC	TU	TU
Belize	MESTPU	PUC	PUC (not regulated)
Bolivia	MOPSV	MOPSV	MOPSV -PRONTIS
Brazil	MC-ANATEL	ANATEL	MC-ANATEL
Chile	SUBTEL	SUBTEL	SUBTEL
Colombia	MINTIC	MINTIC-FONTIC	MINTIC FONTIC -ANTV
Costa Rica	MICITT	MICITT-SUTEL	SUTEL
Dominican Republic	INDOTEL	INDOTEL	INDOTEL
Ecuador	MINTEL-ARCOTEL-SUPERTEL	MINTEL-ARCOTEL	MINTEL-ARCOTEL
El Salvador	NCONACYT	FINET	FINET
Guatemala	SIT	FONDETEL- MCIV	FONDETEL-MCIV
Haiti	CONATEL	CONATEL	CONATEL
Honduras	CONATEL	CONATEL	x
Jamaica	MSTEM	MSTEM-USF	OUR-MSTEM-USF
Mexico	SCT	CSIC-SECON	CSIC-SECON
Nicaragua	TELCOR	TELCOR	TELCOR
Panama	AIG	AIG-ASEP	AIG-ASEP
Paraguay	CONATEL	CONATEL-SENATICs	CONATEL-SENATICs
Peru	MTC-OSIPTEL-FITEL	MTC-FITEL	MTC-FITEL
Suriname	MINTCT-TAS	MINTCT-TAS	MINTCT-TAS
Trinidad and Tobago	TATT	TATT	TATT
Uruguay	AGESIC-MIEM-URSEC	MIEM-URSEC	x

Notes: The grey cells represent either Ministries or their directly subordinate entities, while the blue or white cells represent regulatory authorities. x = not applicable.

Chapter 3

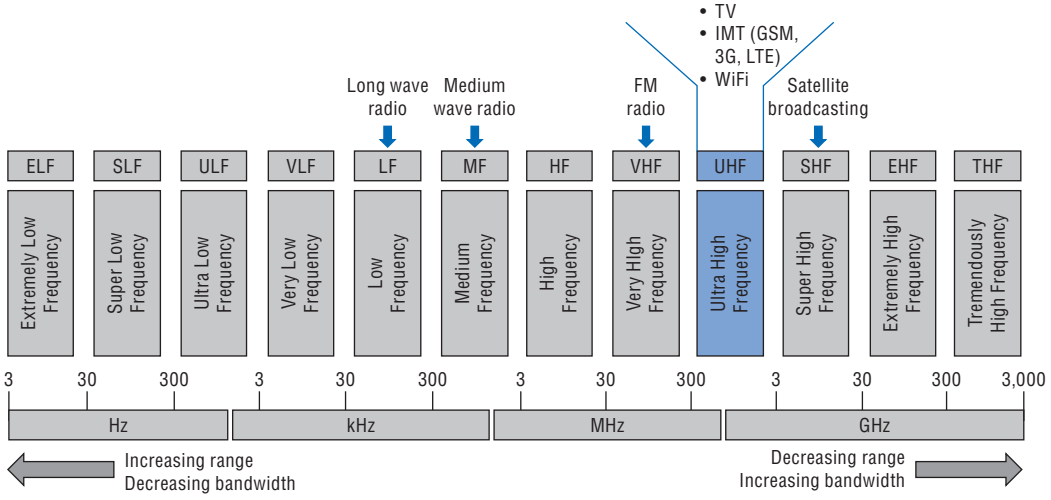
Spectrum policy

This chapter addresses the topics of spectrum planning, management, licensing, assignment and valuation, as well as policies to promote the efficient use of spectrum, such as spectrum trading, sharing and refarming. Spectrum is a key resource for expanding wireless access to broadband services and a crucial element for broadband policy making. Moreover, this chapter aims to shed light on the current challenges of spectrum management, such as those related to the switch-over to digital terrestrial television (DTT) and the increased need for spectrum resources for wireless broadband.

Spectrum is a scarce resource essential for providing wireless telecommunication and broadcasting services. Spectrum assignment and use is associated with important social and economic trade-offs that need to be carefully considered.

From a technical perspective, radio spectrum, commonly referred to in telecommunications as "spectrum", is the part of the electromagnetic spectrum whose frequencies span the 3 hertz (Hz) to 3 000 gigahertz (GHz) range. The International Telecommunication Union (ITU) has divided the radio spectrum into different bands (Figure 3.1). Ultrahigh frequency spectrum, from 300 megahertz (MHz) to 3 GHz, is the most suitable for telecommunications services. Bandwidth increases with higher frequencies, but their reach decreases. Thus, higher frequencies are more suitable for dense areas that require bandwidth, whereas lower frequencies are more appropriate for coverage purposes, as fewer base stations are required to provide service in any given area.

Figure 3.1. **Radio spectrum and its uses**



Source: Adapted from ITU (2011), *Telecommunications Regulation Handbook*, *www.itu.int/pub/D-PREF-TRH.1-2011*.

From an economic perspective, spectrum is a scarce resource in any given place or time, meaning that only a finite amount of spectrum can be used. It cannot be stored, as opposed to many other scarce resources such as minerals or oil, and it cannot be transported, although, at least in theory, it can be traded, given that the rights of use can be transferred.

As spectrum is used for the delivery of services that are considered essential, public authorities have an underlying obligation to guarantee that it is used in the most efficient way. Only careful management can reach a balance between licensing processes and conditions (including costs), as well as coverage, deployment and quality obligations associated with the spectrum, together with competition considerations. This management is essential for maximising the use of the spectrum, socially and economically.

Spectrum policy has undergone dramatic changes in many OECD countries. These are, or soon will be, affecting all Latin America and Caribbean (LAC) countries. The switch-over to digital terrestrial television (DTT), together with the increased need for spectrum resources for wireless broadband, is challenging spectrum regimes. More spectrum resources need to be released and made available for wireless broadband services, while maintaining a competitive level playing field. This chapter addresses spectrum management, licensing and valuation.

Except when explicitly stated, this chapter refers to spectrum used for the provision of telecommunications, and especially broadband services. Several references are made to changes in allocation, which have been crucial for the transition to DTT and the "first digital dividend" (the 700 MHz band in Latin America). A potential "second digital dividend" (the sub-700 MHz band, which encompasses the frequencies in the 470-698 MHz range) will require the evaluation of spectrum use for telecommunications in relation to broadcasting.

Key policy objectives for the LAC region

For the LAC region, spectrum policy and efficient spectrum management is especially important in the context of broadband development. In many geographical regions without fixed telecommunications, infrastructure broadband development will depend on wireless access. The main spectrum policy objective can be broadly defined as guaranteeing its "efficient use". This general objective has several more specific objectives:

- **Maximise the social and economic utility of spectrum use**. As spectrum is a scarce resource essential for the provision of services that have positive externalities, active management is required to maximise these externalities, both from an economic and social perspective.
- **Increase the availability, penetration and use of telecommunications services**. Inefficient management of spectrum usually translates into insufficient wireless telecommunications infrastructure and investment, inadequate coverage for the population of wireless telecommunication networks, low quality and high prices. These facts reduce availability (thus impacting the possibility of universal access), slow down penetration, and hinder demand for telecommunications services. Usage of services is the main cause of the economic spillover effects attributed to telecommunications services, and the lever that policy makers should aim to increase. Wireless networks are often the most cost-effective way of reaching rural and remote areas, especially with the advent of technologies that use lower frequencies with a wider reach.
- **Provide a level field for competition in allocating spectrum**. Spectrum plays a fundamental role in developing competition. First, as spectrum is limited, and there is a minimum amount of spectrum needed to operate, the number of licences that can be made available in any given place is very low; this leads, naturally, to concentrated markets. (Even six locally concurrent licenses, which is rare, implies a minimum Herfindahl-Hirschman Index of 1 667, which falls in the range of what is considered a "moderately concentrated market"). Secondly, not all spectrum bands are equal. Higher frequency bands, although they can accommodate more bandwidth, have lower reach, which translates into a larger number of radio base stations required for similar coverage than if lower frequencies are used; this, in turn, implies higher investment requirements, which influence costs and end-user prices. Thirdly, spectrum is valued very differently by different players. As a rule, incumbents value it more than new entrants, which means that unmanaged spectrum auctions may provide less scope for new entrants. Policy makers have to consider these three facts when managing spectrum, to encourage effective competition.

Tools for measurement and analysis in the LAC region

With the rapid evolution of telecommunication services that require spectrum, and with the difficulty of pulling regulatory levers expeditiously to respond to the ever-changing technological environment, spectrum management requires detailed long-term planning, backed by certain tools (some of which have been in use for a long time) and objective periodic measurements.

- **National frequency allocation tables (NFAT)**. Allocations are entries in a table that sets out the use of a given frequency band for use by one or more radio communication services. Frequency allocation tables, which have been in use for a long time, describe which radio communication services can be provided in each portion of the spectrum. These tables should comply with international agreements and technical characteristics, but can be adjusted depending on national priorities and policy objectives. The tables are updated frequently. A good practice is to have a well-defined process for changing allocations, with documented support behind the decision.
- **Spectrum inventories and licensee database**. An exhaustive mapping of all spectrum, whether licensed or not, is fundamental for its management. The database should include all relevant information (area, licensee, granting and expiration dates, conditions and obligations, etc.). A good practice is to make the database public and easy to access, updated on an ongoing basis.
- **Long-term planning**. A prospective long-term public document that outlines plans for spectrum use, including short-term actions (e.g. future auctions) as well as areas that will be studied and evaluated (e.g. possible allocation changes) is a good tool that can provide greater certainty to the market and allows regulators to focus their efforts. Though it covers several years, the document should be updated at shorter intervals. This will reflect potential changes mostly for accomplishing short-term objectives, technological advances, international agreements and user and market trends and developments. The document may also contain a plan to release spectrum based on the expected need, for all or some of the telecommunications services.
- **Measurement of efficient use**. Measuring how well spectrum is being used is crucial to measure "efficiency", a loosely used word. Occupancy and data rates are two of these measures, but they fail to account for certain critical aspects mostly associated with the value generated (e.g. public safety and emergencies). However, measuring periodically how spectrum is being used (e.g. number of users, intensity of use, data rates, data transported, investment) gives a reasonable picture of how well objectives are being met, especially when compared among players using similar bands attributed to similar or identical services. There are no standard ways to measure efficiency comprehensively; several indicators need to be measured and normalised, taking into consideration the specific characteristics of each market.
- **International benchmarking**. Evaluating spectrum efficiency relative to other countries provides insight into how well spectrum is being used to meet objectives. Standard definitions of indicators, including processes for measuring and collecting data, must thus be applied.

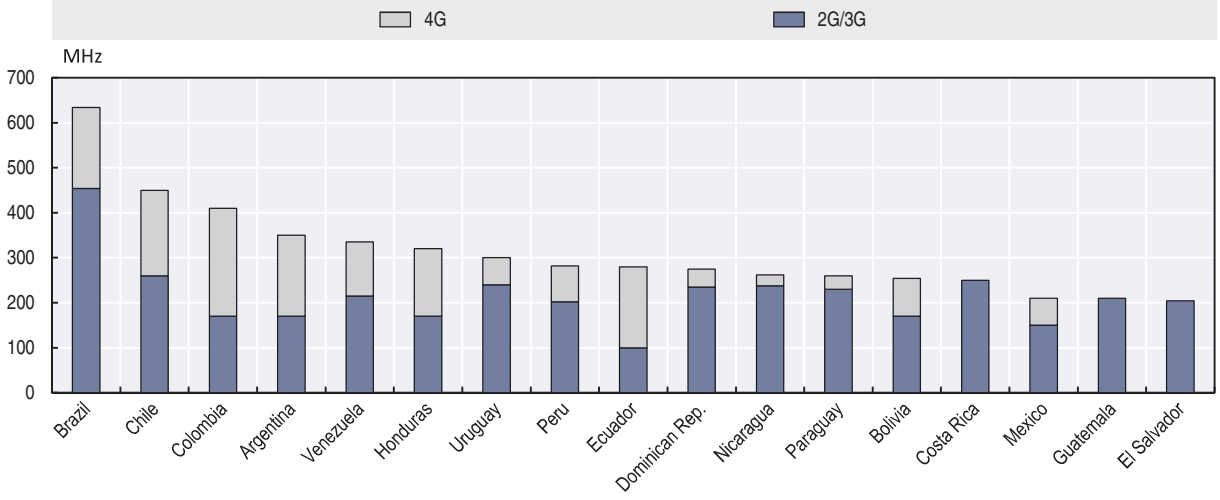
Overview of the situation in the LAC region

Mobile communications have become ubiquitous in the LAC region. Although penetration was low in the late 1990s, they have become the preferred way for voice communication and broadband access. The advent of prepaid mobile plans, which allow users to control

their telecommunications spending without recurrent financial commitment and to top up with very small amounts, has dramatically increased the number of users. The combination of decreasing prices for mobile access and the growing use of new devices (e.g. smartphones and tablets), as well as the burgeoning use of Internet applications, has substantially increased the demand for spectrum.

Historically, LAC countries have not been generous with the licensing of spectrum. In 2003, on average only 104 MHz had been assigned to mobile operators, equivalent to less than 38% of the amount licensed in OECD countries. By 2011, this number had increased to 195 MHz, but it still represented only 46%. As of September 2015, after several years of intense regulatory activity in the region, the average had grown to 311 MHz (Figure 3.2). Though the amount of licensed spectrum grew by 60% in only four years, it is still below the OECD (less than 60%) and well below the International Telecommunication Union (ITU) recommendation of spectrum required. For 2020, ITU recommends that 1 280-1 720 MHz be made available for wireless communications (ITU, 2006); LAC countries have only assigned around 20%.

Figure 3.2. **Spectrum assigned in the LAC region**



Source: GSMA (2016), *Spectrum in Latin America*, *www.gsma.com/latinamerica/es/espectro-en-america-latina*.

StatLink http://dx.doi.org/10.1787/888933354222

Spectrum management and its licensing to service providers have resulted in the adoption of different approaches in the LAC region: from a full "command and control" regime, where regulators are the central axis in the assignment and other relevant usage rules (service regulation, secondary markets, etc.), to a fully liberalised market, where regulators mostly just dictate rules to avoid interference. As in most of the world, the LAC region still exercises significant command and control over the spectrum, its assignment, and the rules and obligations that govern its use for the provision of mobile telecommunications services.

Before the liberalisation of markets in the early 1990s, most licenses were awarded through a comparative selection (sometimes called a "beauty contest"). Interested parties were evaluated in terms of their announced plans (investment, coverage, prices to end consumers, etc.) and licenses were awarded to the candidates that best suited the regulator's formula. In practice, though, this award system was extremely discretionary and not transparent, deterring the entry of players and not maximising efficiency and benefits of spectrum use. In fact, almost as a rule, all fixed-line telecommunications providers were awarded a mobile license, as they were deemed to be the natural candidates. Some, though

not all, of the LAC markets went on to create a duopoly structure, similar to the one defined in the United Kingdom and the United States when they first licensed additional players. The market was considered to be relatively small, primarily aimed at business users, and the licensing process and competition was not considered to be a priority for governments.

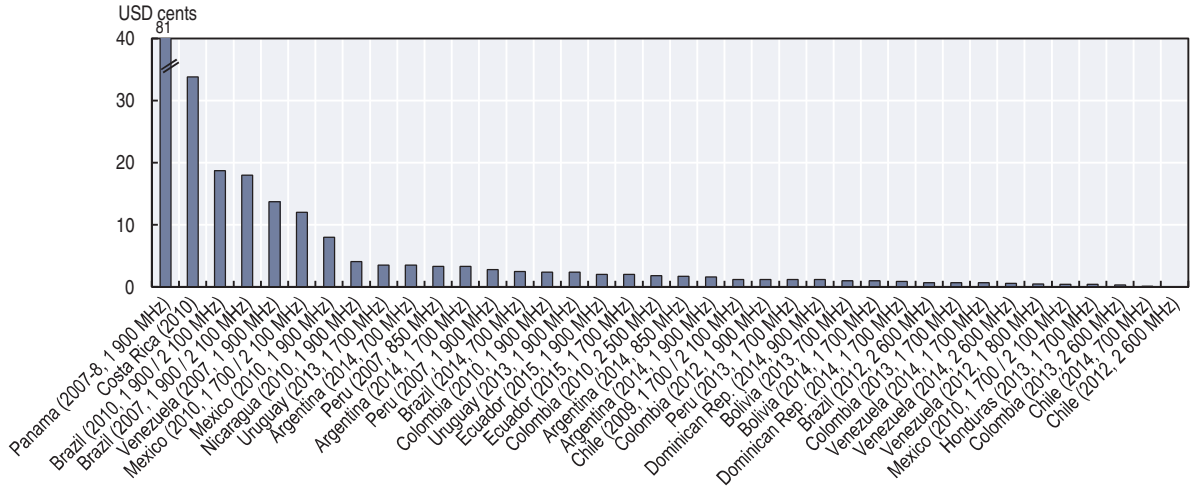
In the 1990s, beginning in the United States, a substantial change in the approach to licensing spectrum took place. Though alternatives had been tried to comparative selections (e.g. lottery), some of the advantages of auctions began to bear fruit. Observing these experiences, countries in the LAC region also embarked on assigning spectrum through auction processes. While their widespread introduction took some time, most countries now carry out one of several forms of auctions to assign spectrum to private users. Since 2007, more than 35 processes of spectrum assignment have been concluded, with proceeds exceeding USD 7.25 billion, and only a few are carried out through a comparative selection process (Table 3.1).

Table 3.1. **Spectrum licensing in the LAC region**

	Year	Frequency band	Frequency	Amount (USD million)	Amount paid per MHz per pop (USD cents)	Assignment procedure
Venezuela	2007	1.900 MHz	60 MHz	240	14.46	Auction
Peru	2007	850 MHz	25 MHz	22	3.11	Auction
Peru	2007	1.9 GHz	35 MHz	27	2.73	Auction
Panama	2007-8	1.900 GHz	80 MHz	229	83.25	Comparative selection
Brazil	2007	1.9 GHz/2.1 GHz	90 MHz	3 096	17.84	Auction
Chile	2009	1.7 GHz /2.1 GHz	90 MHz	18	1.19	Comparative selection
Mexico	2010	1.7 GHz /2.1 GHz	30 MHz	405	11.38	Auction
Mexico	2010	1.9 GHz	30 MHz	217	6.1	Auction
Mexico	2010	1.7 GHz /2.1 GHz	30 MHz	14	0.39	Auction
Brazil	2010	1.9 GHz/2.1 GHz	20 MHz	712	17.92	Auction
Colombia	2010	1.9 GHz	20 MHz	22	4.35	Direct
Colombia	2010	2.5 GHz	50 MHz	42	1.83	Auction
Costa Rica	2010	Several	130.6 MHz	170	28.64	Auction
Nicaragua	2010	1.9 GHz	50 MHz	12	4.18	Auction
Brazil	2012	2.6 GHz	120 MHz	1 396	5.75	Auction
Chile	2012	2.6 GHz	120 MHz	12	0.58	Comparative selection
Colombia	2012	1.9 GHz	25 MHz	51	4.35	Auction
Venezuela	2012	1.8 GHz	30 MHz	85	9.49	Mixed
Bolivia	2013	700 MHz	24 MHz	19	7.61	Auction
Colombia	2013	1.7 GHz	90 MHz	270	6.34	Auction
Colombia	2013	2.6 GHz	100 MHz	145	3.06	Auction
Honduras	2013	1.7 GHz	80 MHz	24	3.82	Auction
Peru	2013	1.7 GHz	80 MHz	257	10.51	Auction
Uruguay	2013	1.7 GHz	60 MHz	68	33.26	Mixed
Uruguay	2013	1.9 GHz	60 MHz	47	22.99	Mixed
Argentina	2014	700 MHz	90 MHz	1 044	26.99	Auction
Argentina	2014	850 MHz	8 MHz	45	13.09	Auction
Argentina	2014	1.7 GHz	90 MHz	1 000	25.85	Auction
Argentina	2014	1.9 GHz	30 MHz	163	12.64	Auction
Bolivia	2014	1.7 GHz	30 MHz	23	7.26	Auction
Brazil	2014	700 MHz	60 MHz	2 410	19.49	Auction
Chile	2014	700 MHz	70 MHz	22	1.77	Comparative selection
Dominican Republic	2014	900 MHz	20 MHz	28	13.45	Auction
Dominican Republic	2014	1,7 GHz	40 MHz	42	10.09	Auction
Venezuela	2014	2.6 GHz	80 MHz	240	9.77	Mixed
Venezuela	2014	1.7 GHz	40 MHz	148	12.05	Mixed
Ecuador	2015	1.7 GHz	40 MHz	120	18.49	Comparative selection
Ecuador	2015	1.9 GHz	70 MHz	210	18.49	Comparative selection
Mexico	2016	1.7/2.1 GHz	80 MHz	240	9.77	Auction

The sums paid per spectrum assignments have varied substantially in recent years (Figure 3.3). That being said, except for a few assignments, where the high price paid can be explained by specific characteristics of the market and the timing of the auction, normalised prices (that is, USD cents per megahertz per population) tend to be under USD 0.05. It is important to emphasise that these prices are not fully comparable, as several countries impose recurring spectrum fees, which affect the price of spectrum at the outset.

Figure 3.3. **Spectrum prices in the LAC region (USD cents)**



Note: Panama (2007-08) and Costa Rica (2010), with values of USD 81.3 cents and USD 28.6 cents respectively, were omitted from the figure. Year of auction and frequencies auctioned are indicated but type of offers may differ.

Sources: Regulators; Katz (2015), *Directrices de política y aspectos económicos de asignación y uso del espectro radioeléctrico www.itu.int/es/ITU-D/Regional-Presence/Americas/Pages/EVENTS/2015/0831-NI-cosydirc.aspx*.

StatLink http://dx.doi.org/10.1787/888933354236

Spectrum trading is an emerging practice in the region and to date there is still limited experience outside of Mexico, Guatemala and El Salvador. In 2004, for example, the Mexican subsidiary of América Móvil (Telcel) purchased 8.4-megahertz of spectrum in the 1.9 GHz frequency band from Unefón. Some other countries in the region are awaiting a regulatory framework specifying the terms and rules for trading to be put in place. The regulatory authority in Chile, for example, sent a bill to the National Congress in September 2014 to create a secondary RF spectrum market and approval is pending.

One of the main pillars of the evolution of spectrum use relies on a successful migration from analogue to digital terrestrial television. The aim is to free the 700 MHz band, as digital terrestrial television is much more efficient in using the spectrum. This band is especially useful for mobile communications, due to its propagation characteristics. This allows the 700 MHz signals to more easily penetrate buildings and walls, covering larger geographical areas with less infrastructure and therefore at a lower cost. Though most OECD countries have already completed the analogue switch-off, Latin America is lagging. Most countries plan to end analogue transmissions by the end of the decade, though a few are expected beyond 2020.

Good practices for the LAC region

Spectrum planning, management and control

For spectrum to be rationally and efficiently used across borders, **international co-ordination** is necessary. At the highest level, the governance of spectrum use on a global basis is one of the main responsibilities of the ITU, a specialised agency of the United Nations,

mostly carried out through its Radiocommunication Sector (ITU-R). The mission of the ITU-R is, among other things, "to ensure rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using satellite orbits, and to carry out studies and adopt recommendations on radiocommunication matters" (ITU, 2016). It helps meet the ITU's objective of "maintaining and extending international co-operation among all the Member States of the Union for the improvement and rational use of telecommunications of all kinds". Its activities focus on ensuring interference-free operations of radiocommunication systems by implementing the Radio Regulations and regional agreements. These include establishing recommendations to ensure performance and quality in operating radiocommunication systems, seeking ways to ensure good use of the radiofrequency spectrum and satellite-orbit resources and to promote flexibility for future expansion and new technological developments. The ITU-R holds periodic world (WRC) and regional (RRC) radiocommunications conferences. WRCs are held every three to four years, in order to review and, if necessary, to revise the international treaty governing the use of the radio-frequency spectrum and the geostationary and non-geostationary satellite orbits (jointly referred to as Radio Regulations). During these conferences, frequency assignments and allotment plans are revised. RRCs are conferences of either an ITU region or a group of countries with a mandate to develop an agreement on a particular radiocommunication service or frequency band; these conferences cannot modify the Radio Regulations.

At the regional level, the Inter-American Telecommunications Union (CITEL), an entity of the Organization of American States (OAS), is a key player in matters of the spectrum. Its main objectives are to co-ordinate the rules needed to facilitate infrastructure deployment and telecommunication service delivery, harmonising the radio frequency spectrum to reduce the cost of providing wireless services, training in information and communications technologies (ICTs), and helping countries devise telecommunications development strategies. The Caribbean Telecommunications Union (CTU), an intergovernmental organisation dedicated to facilitating the development of the sector in the region, also plays a role.

LAC countries are active in all these international fora. Common regional positions are important for the development of the sector and for more effective positions at meetings for international negotiations. LAC participation in international fora, and especially in regional ones, is addressed in Chapter 8 on regional integration.

Another key element of spectrum management involves considering the economic impact of spectrum resources. As an essential but scarce input for the provision of broadband, spectrum has immense value for the economy. As in many LAC countries, the fixed telecommunication infrastructure does not have nationwide coverage, wireless broadband has become the alternative way to access the Internet, a key input for the digital economy. It is therefore vital that decisions influencing the way spectrum is managed – whether in terms of attribution, allocations or assignments – are evaluated within a framework that considers value creation and externalities. An appreciation of externalities for the potential effects on GDP, job creation, investment, social welfare, and consumer and producer surpluses is essential.

It is vital to consider the potential **alternative use of spectrum**. This has been critical in assisting LAC countries to benefit from the digital dividend, since auctions allowed the market to help determine the value of the different uses of spectrum for the economy. The outcomes generally indicate that the market for mobile services places a higher value on spectrum than other potential forms of use and that there is still likely unmet demand of several hundred megahertz (AHCIET GSMA, 2012) if countries are to meet the ITU spectrum requirement recommendation. This means alternatives will have to be constantly evaluated

through authorities with the necessary tools and skills, but also with the acknowledgement that market forces can help reveal the knowledge held by the private sector. Spectrum needs differ among countries in the region, depending on issues like the intensity of the use of mobile broadband, coverage and penetration.

One challenging area in spectrum management can be the decision as to which bands are allocated for **use by public authorities**, such as emergency services. In any such decision, a good practice can be to conduct a cost-benefit analysis. Assessing information on alternative uses of the spectrum makes it possible to compare the costs and benefits and to make better decisions to suit national needs and government objectives. Part of such analysis requires evaluating how best to meet objectives including the most efficient delivery of public services, alongside the consideration of spectrum management. By way of example, see the Australian experience (Box 3.1).

Box 3.1. **Securing broadband capability of public safety agencies in Australia**

In 2015, the Australian Productivity Commission examined the best way to secure a mobile broadband capability to meet the long-term needs of Australia's public safety agencies (PSAs), the police, fire, ambulance and emergency services.[1] To do this, they were asked to:

- undertake a "first principles" analysis of the most efficient, effective and economical way of delivering mobile broadband capability to PSAs by 2020
- consider the most cost-effective combination of private and public input, services and expertise to deliver the capability
- consider aspects of this capability such as national interoperability across jurisdictions and agencies, coverage, integration of voice services, security, capacity, resilience, sustainability of arrangements into the future and compatibility with end-user devices
- consider domestic and international developments that might be applicable to Australia.

The **economic valuation of the radio spectrum** is a challenging, if not daunting, task. Firstly, it necessarily requires a multiyear evaluation – ten or more years – in a sector characterised by technological breakthroughs and discontinuities. Few envisaged, for example, the high rate of smartphone uptake around the world. Secondly, country-specific and market conditions influence any valuation. Thirdly, even among similar players and uses, the value for each player could be significantly different depending on specific circumstances. Assigning the spectrum to a player that values it the most does not necessarily maximise the value to the economy. This is part of the rationale behind spectrum caps, which try to protect competition by pre-empting possible spectrum hoarding, which increases barriers to entry. Fourthly, the valuation might require a comparison of distinctly different things, as was the case for broadcasting and broadband. In such scenarios, certain aspects are very hard – if not impossible – to measure. In countries where most households predominantly access free-to-air (FTA) television broadcasting, either because of income restrictions or because pay television infrastructure is not ubiquitous, the social value of the service is high and challenging to quantify.

There are three broad approaches to measuring the value of the spectrum to an economy (OECD, 2014):

- **Economic welfare**. This approach is based on estimating consumer and producer surpluses. Consumer surplus is defined as the difference between the amount each consumer is willing to pay and the actual price of the service. Producer surplus is usually defined as the difference in price and the marginal cost of production. This methodology is meaningful given that it includes both the effect of lower prices and the increase of the subscriber

base, as well as the production function, which considers the cost of providing the services. Though simple enough in theory, the actual estimation requires evaluating demand and supply curves, and thus, will require a significant simplification of assumptions. Even more, when the analysis is a multiyear, forward- looking exercise, the evolution of demand and supply curves will need to be incorporated. Special attention needs to be paid to the fact that, on the demand side, many services are bought in bundles, and on the supply side, services are provided through a multiservice platform.

- **Economic contribution**. Another way of valuing spectrum use is to measure the total value added created in the economy. This looks at the different stages of the value chain to produce the service and estimates how much value added is created in each of the steps. For example, it considers how much investment and labour are required to build and run a network, how much effort is necessary to distribute, market and sell the services, and how much is required for customer care. In broadcasting, a crucial link in the value of a chain is the development of content. This approach is simple, as it is based on input-output tables, which are usually available, but it does not fully account for all indirect externalities and fails to estimate consumer surplus and broader productivity increases.
- **Productivity increase**. This third approach tries to estimate the impact on the economy attributed to the use of services provided through the spectrum. For example, a given workforce could be able to produce more output if it were aided by mobile communications (for example, better routes for the delivery of goods could be chosen, reducing time spent and increasing deliveries at any given period). Higher productivity translates into higher GDP. Several studies have recently been conducted to assess the effects of broadband, but significant work needs to be carried out.

It is important to note that spectrum in the LAC region carries more relative weight and relevance for broadband access and use than in OECD countries, because fixed networks are much less developed. At the end of 2014, fixed broadband penetration in Western Europe was 32.8%, whereas in the LAC region it had reached 7.9%. Wireless broadband in the area is more a substitute for fixed broadband than a mere complement. Millions of people will mostly only have access to broadband networks through infrastructure that relies on the use of spectrum. Spectrum thus plays a fundamental role in reducing the digital divide, not only between developed and emerging economies but within countries. It has become an important tool for tackling inequality and bridging income gaps. In a geographical region where between 15% and 20% of the population live in rural areas, spectrum can often provide broadband services more efficiently from a cost and deployment perspective.

As technology evolves, consumer preferences change, and as the relative value of spectrum changes, policy makers have the obligation to facilitate a shift from less to more valuable uses of spectrum. Spectrum is a public good, and policy makers should ensure that it maximises public benefit.

Managed market-based approaches have proven effective in maximising public value. These require a market-based approach to licensing spectrum (usually through auctions, see below). They also require few barriers for sharing and transferring spectrum holdings, few or no technological requirements, greater license flexibility, and rules that guarantee that the market for services is competitive.

Moreover, **institutional issues** arise with spectrum management, since the use of spectrum affects not only the telecommunications and broadcasting industries, with their overall impact on the economy and social welfare, but also other users, such as certain

government tasks (e.g. transport), the military, public safety agencies and the research community. The different needs and objectives are not necessarily fully aligned, or can even be divergent, demanding a whole-of-government approach. Both international co-ordination and high-level national co-ordination are needed.

From a broad perspective, two potential institutional arrangements are possible:

- **Single institution**. A single entity is responsible for all aspects of spectrum management at the national level, in charge of planning, licensing and monitoring spectrum. This model centralises decision making, and, if the entity is fully autonomous, it has all the attributes necessary to take a long-term perspective based on welfare creation. IFT, Mexico's recently established regulator, Ofcom in the United Kingdom and the Australian Communications and Media Authority (ACMA) follow this model.
- **Shared responsibilities**. This is the most common model, with responsibilities assigned to different government entities based on various criteria.
  - In the United States, the Federal Communications Commission (FCC) administers spectrum for nonfederal use (business, state and local, government, entertainment, commercial, private), whereas the National Telecommunications and Information Administration (NTIA), a unit of the United States Department of Commerce, administers spectrum for federal use (national defence, law enforcement and security, transport, resource management and control, emergencies). The Interdepartment Radio Advisory Committee, chaired by the NTIA, ensures co-ordination between the two agencies.
  - Some countries divide spectrum management by service (e.g. broadcasting and telecommunication services). In Colombia, the *Autoridad Nacional de Televisión* (ANTV) oversees TV broadcasting and grants spectrum licenses. The ICT Ministry oversees TV radio broadcasting and grants spectrum licenses. Meanwhile, the *Agencia Nacional del Espectro* (ANE), is in charge of planning, managing, allocating all services (including broadcasting), and gives technical support to the *Ministerio de Tecnologías de la Información y las Comunicaciones* (MinTIC), which is responsible mainly for the licensing phase in the spectrum management process for the remaining services.
  - Other models incorporate the federal and state dimensions. In Germany, the *Bundesnetzagentur* (BNetzA), reporting to the Ministry of Economics and Technology, regulates several public utilities (telecommunications, electricity, gas, post office and railways). The German Federal Council (*Bundesrat*), the legislative body that represents the 16 federal states at the national level, is a member of the advisory council of BNetzA.

No model is without pitfalls, but even in those without shared responsibilities and significant autonomy, co-ordination among the different institutions is vital to guarantee that all objectives are met.

Spectrum resources have important implications for competition dynamics. For example, the decisions taken on setting spectrum caps on operators during spectrum auctions are likely to shape a market in the subsequent years. While the use of caps in spectrum auctions can facilitate new entrants, in markets that lack adequate competition, it could also have a potential for spectrum fragmentation and market inefficiencies if not undertaken with due consideration to the costs and benefits. Likewise, spectrum planning and management tasks are key decisions for the future of communications, both from an operational (e.g. assigning spectrum to mobile stations) and a strategic point of view (e.g. band segmentation plans, migration schedule). Given the highly technical nature of these issues and their implications for competition in communication markets, regulatory authorities should have the authority

to conduct spectrum auctions or, at a minimum, be able to establish competition-related conditions for spectrum auctions. The government should in any case retain control of the bands used for government-related purposes (e.g. military, police) under the designated framework.

In all cases, especially those where the communications authority is not in charge of assigning spectrum, it is essential that all parties work closely with the competition authority to guarantee that spectrum use promotes effective competition. The relationship in Chile between the *Subsecretaría de Comunicaciones* (SUBTEL) and the *Fiscalía Nacional Económica* (FNE), which is responsible for defending and promoting competition, demonstrates good practice.

Spectrum harmonisation, defined as the uniform allocation of radio frequency bands across entire regions, is an important government responsibility. Harmonisation aims to minimise radio interference along borders, facilitating international roaming, and sharing the economies of scale that arise from international standards and the creation of large markets. The ITU, as the United Nations agency responsible for radio communications, is responsible for harmonisation at the global or regional level.

The benefits of harmonisation are clear, although the process for reaching consensus is not. Certain parties will argue for total, compulsory harmonisation, and others for a more liberal approach that allows more autonomous management and new policies (e.g. spectrum trading) and that allocates spectrum to those who value it the most. Nevertheless, it can be argued that the current preference for harmonisation has served the industry well and is one of the chief factors facilitating the advent of wireless digital telecommunication services, leading to lower costs and benefiting consumers.

Apart from each country's approach to spectrum management, it is imperative that all LAC countries actively participate in the global harmonising forums (ITU-R and the preparatory conferences). It is also important to strengthen regional organisations, the Caribbean Telecommunications Union (CTU) and the *Comisión Técnica Regional de Telecomunicaciones* (COMTELCA), and to increase their participation in the Inter-American Telecommunications Commission (CITEL), while enhancing CITEL's role.

Moreover, **spectrum licensing frameworks** are key to managing spectrum consistently. From a high-level perspective, there are three possible licensing agreements:

- **Exclusive assignment**. Licensing of a given band to a party that has exclusive rights over its use has been a common model in the assignment of spectrum. The original rationale behind this was that, because of technological limitations, interference could become a problem, which could be minimised by giving the rights of use to a single party. How spectrum is assigned, though, can vary widely from the type of band and country (e.g. direct assignment, "beauty contest", auction, lottery, etc.). These licenses come with restrictions on how spectrum is used, to avoid interference with other users in other bands.
- **Unlicensed spectrum**. Sometimes also referred to as open or free spectrum, unlicensed spectrum (or license-exempt spectrum) can be used by any entity for any private or public purpose. In practice, to minimise interference, equipment using unlicensed spectrum must comply with certification rules, and adhere to certain standardised protocols. Most importantly, there is no regulatory protection against interference. Unlicensed spectrum is adequate for services and devices based on low-power radiation, where potential interference can be managed in a reasonable way. Wi-Fi spectrum, which is unlicensed, has become one of the most common means to access broadband networks. Other technologies and devices that use unlicensed spectrum are Bluetooth (which allows communications

over very short distances), ZigBee (low-power wireless communications mesh network, also for short distances), WirelessHART (used for monitoring industrial processes and power consumption), WirelessHD (used for high-definition television sets), WiGig (for multi-gigabit transmissions at very short distances), and RFID (automatic identification of tagged objects or living entities).

- **Licensed Shared Access (LSA) and Authorised Shared Access (ASA)**. Only recently introduced, LSA/ASA allows spectrum that has been licensed to be used by more than one entity. It introduces additional licensed users on a given band, further increasing spectrum efficiency and unlocking additional spectrum capacity. Though they could potentially lower overall industry costs and accelerate spectrum harmonisation, these licensing frameworks have not fully taken off and are not yet mainstream in any country, because by definition, the use of the spectrum is binary (either one or the other can use it at the same time, location and frequency) and thus requires clear sharing rules that guarantee predictable quality of service.

The exclusive licensing agreement has been the traditional approach to granting private entities the use of spectrum. It has successfully allowed wireless telecommunication services to grow rapidly and become ever more diverse within a framework of legal and operating certainty. Unlicensed spectrum has become a widespread complement for the last 100 feet (or less) of communications networks, either wireless or wireline. With the advent of machine-to-machine communications and Internet of Things (further addressed in Chapter 8), it will become much more widely used.

The LSA/ASA approach has only recently been developed. Though its theoretical benefits – better use of a scarce resource, especially when it is underutilised – are clear, it poses certain technical issues (interference), most of which are currently being resolved. It is also facing opposition from incumbent exclusive license holders that acquired spectrum through an award procedure. Other types of agreements use underutilised spectrum, such as white spaces. White spaces are part of the spectrum that is left unused, mostly because it is required for historical technical reasons, such as the use of guard bands or between adjacent analogue broadcasting channels, to avoid interference. Advances in modulation techniques and technical characteristics of equipment allow for using and sharing these white spaces. This can potentially increase the amount of spectrum available for international mobile telecommunications (IMT), but their widespread adoption is not imminent in the very short term. Experience on the use of white spaces to make more spectrum available includes research and projects on dynamic spectrum and television white spaces carried out by Microsoft.[2]

As a general practice, following historically successful worldwide trends, authorities should continue to grant exclusive spectrum licenses for IMT. More spectrum should be identified for such purposes; IMT spectrum that is not being used should be offered following a well-thought out medium- to long-term strategy based on maximising spectrum efficiency and competition. Additionally, unlicensed spectrum should be promoted, as its complementary value to licensed spectrum is well proven, and because it has become a hotbed of technological development. Given the worldwide success of Wi-Fi technology, and the important role it plays in mobile traffic offloading, policy makers in the region should conduct needs assessment for unlicensed spectrum, to avoid congestion (promoting, for example, the use of the 5 Ghz band). LSA/ASA regimes and other approaches such as white spaces should be used experimentally with caution. LAC countries could use international experience to guide use of these regimes, as significant advantages are to be gained from the successes and failures of first movers.

As a rule, all regimes should be as flexible as possible, imposing minimal requirements, except when interference is an issue that compromises services and spectrum efficiency. Many unforeseen issues could potentially be handled with *ex post* regulation. To increase legal certainty, regulatory regimes should explicitly allow for such intervention if certain conditions, expressed *ex ante*, are met. Where certain conditions have been imposed during the licensing process, such as coverage and utilisation, these should be well-defined and measurable.

It is well-known that legal certainty and strong institutions favour an environment for long-term investment and innovation, reducing the cost of capital and increasing risk taking. Significant economic and social benefits emerge when rules are clear and when adjusting them to a changing marketplace, technological advancements and shifts in social and economic needs is based on careful evidence assessment involving public discussion.

All licensing regimes require legal certainty. Specifically, exclusive licensing arrangements require strict rules of temporary property rights and protection from interference. Deployments of telecommunications infrastructure typically need significant up-front investments, which then have a long useful lifespan. Licensing terms should reflect this: long terms with high renewal expectations are accompanied by constant investments in network upgrades. Uncertainty in the renewal of licenses usually translates into insufficient investment towards the end of the license term, which results in poor service and lack of supply. This situation is exacerbated with short licensing terms, as insufficient investment periods become more frequent. In general, spectrum licenses should be awarded for periods of more than ten years. Conditions for renewal should be known well in advance and the proceedings should be conducted through open and transparent procedures.

Long licensing regimes and transparent, high-probability renewal processes do not mean that authorities cannot revoke licenses. Governments should always retain the authority for this purpose under predefined circumstances, such as infringement of the law (especially with recurrent breaches) and inefficient use. Another situation to consider is long-term spectrum planning and the possibility of attribution changes. The advent of digital terrestrial television and the possibility of using the 2.6 GHz band for IMT has proven that revocation can be needed for better spectrum use. Governments should be able to appeal to this evidence.

Some countries, such as the United Kingdom, removed predefined license terms to increase certainty surrounding spectrum licenses. Nevertheless, the regulator can revoke any license for spectrum planning purposes, with a five-year notice. This guarantees that it can recover any spectrum if it is required to do so, but ensures that services using such spectrum are not degraded and that deployment investors can use the spectrum for a time that is financially sustainable.

Certain situations should be avoided if possible. The need for greenfield renewal after expiry creates uncertainty on several fronts (likelihood of renewal and price). Some of the recent renewal processes in the LAC area lacked clarity on the price; in another case in the region, this, and a long and uncertain injunction process, has left the 2.6 GHz band idle. Pricing of licenses, and, more importantly, renewals of licenses, should be transparent, known in advance as far as possible, and nondiscretionary. In addition, policy makers should monitor the evolution of the market and define in advance any update on conditions for renewal of licences, if needed.

Policies to promote efficient use of spectrum

It is important to outline some general principles for promoting the efficient use of spectrum. The term "efficient use" can refer to several broad objectives, which makes it hard to establish uniform metrics. This is particularly true in comparing different services. For example, discussions for changing the allocation of the digital dividend spectrum, which meant comparing broadcasting to mobile broadband, entailed not only evaluating the economic value of each sector, but also their social value. In other instances, spectrum used for military or national security is compared with traditional telecommunications services. It is crucial to define the objective intended in conjunction with the measurement of efficiency.

Apart from the particular definition and objective, certain policies promote good use of the spectrum. In general terms, **transparency** (in terms of assignment procedures, conditions of use and renewal, and statistics on actual use) **and assignments that promote competition** are good practices. In terms of use, flexibility should be paramount, lest it hamper competition and innovation. This should involve not only technology (to which the coinage "technological neutrality" refers, essentially meaning not defining technologies as long as they are interoperable with the system), but also service ("service neutrality" refers to allowing all services, as long as they are compatible with the allocation of the spectrum band).

An almost unsurmountable challenge arises from the fact that significant parts of the spectrum are not subject to market incentives. This is the case for almost all spectrum held by the state or governments. It can also be argued that this is true of spectrum that, though allocated, has not been assigned. As spectrum cannot be stored, unused spectrum has a significant opportunity cost.

As an almost universal rule, government agencies (military, national security, transport, etc.) receive spectrum assigned directly for free and are restricted from using it for other applications. Many of the considerations for such policies are subjective and follow a public policy (if not political) agenda. One way of promoting more efficient use of such spectrum is to create **incentives that mimic market-based incentives**. A good example is an "administered (or administrative) incentive pricing" regime. In such regimes, fees are replaced by prices set by a regulatory authority attempting to reflect the opportunity cost of the spectrum. Meanwhile, they also incorporate potential incentives, which then promote efficient use. Ofcom in the United Kingdom has used this methodology successfully since 1998. As a consequence, Ofcom cites the release of 384.5 MHz used by radio astronomy, the return of some UHF spectrum used by the police in Scotland, and the removal of legacy fixed links in the 4 GHz point-to-point band. In any case, acknowledging that spectrum used by public agencies or other nonprofit organisations has an economic value, for which the economy as a whole is paying, ought to create incentives for more efficient use.

A further policy that can increase efficient use of the spectrum that has recently been discussed or used in several countries is **spectrum trading and the development of secondary markets**. Spectrum trading brings more flexibility to the formation of better market structures. It allows spectrum to be transferred to those that value it the most, provided that conditions for spectrum trading are well designed and set clear conditions and timely procedures. Subdivisions and regroupings of licenses based on market prices will most likely produce a more efficient solution (OECD, 2005). For example, the Australian Communications and Media Authority allows combining or subdividing existing licenses to form new licenses, but the subdivisions cannot be smaller than the "standard trading unit" (STU – defined as an area of 5 minutes by 5 minutes of arc, approximately 9 square

kilometres, with 1 Hz frequency band).[3] New Zealand defines radio spectrum in terms of property rights (MRR – Management Rights Regime). Management rights spectrum can be sold to service providers ("right-holders") and subsequently traded between them (New Zealand, 2005). In the United States, spectrum trading is an incipient reality. Licenses are tradable and can be converted to other uses (though regulatory sanctioning is required). The United States also allows leasing and subleasing of spectrum. Several agreements have been reached since 2003, when it first published leasing rules.

All these policies imply transferring the rights of use (and the obligations that the licenses carry), either temporarily or permanently (until the expiration of the license) and are fraught with economic and regulatory barriers. Administrative processes are lengthy and complicated, regulatory approval is usually required, and incentives for current holders are low due to scarcity (either because spectrum might be worth more in the future or because they might need it for future expansion).

Nevertheless, it is too early to assess their impact, and good practice in this area is to gear resources towards understanding these figures and closely following international trends. At least in theory, they provide a market-based approach to a better use of spectrum and as such, are worth considering. Although legal, competition restrictions must be taken into account, and technical issues (most importantly, interference) need to be incorporated into any trading framework. This creates a mechanism not only to correct any deficiencies that might have arisen during the original licensing process but also to adjust to the evolution of the market.

In addition to unlicensed and LSA/ASA agreements, **spectrum sharing** is another policy that would increase spectrum efficiency use. In principle, this refers to multiple wireless systems operating in the same frequency band, without causing interference to other users, through at least one of several dimensions (time, space or geography) and could be administrative, technical or market-based. According to a European study (Werbach and Mehta, 2014), the average occupancy rate for a dedicated band was below 10% of the band's capacity, so there is significant room to increase its use. As concerns over spectrum scarcity increase, sharing may well become the norm, as it increases supply and provides greater access to a scarce resource. Sharing involves a process of continual reallocation, including even reallocation to different services, such as data and broadcasting. Needless to say, if well implemented, sharing reduces waste and increases efficiency.

One of the main criticisms of spectrum sharing is the limitations of managing interference between different users. This is the main reason why spectrum has traditionally been licensed for exclusive use. It is often mentioned that, absent usage rules, sharing can lead to the "tragedy of the commons", whereby increasing the number of users results in a lower quality of service for everyone. Nevertheless, technological advances (e.g. cognitive radios, which are designed to be able to use several spectrum channels), regulation (e.g. rules of "etiquette" and co-operative approaches that govern common usage), and economic incentives (pricing and penalties) are helping to alleviate most of the existing concerns. A long road lies ahead, but sharing promises to address the demand for increased spectrum for broadband services. LAC regulators should follow international developments in this respect, as other countries are bound to face spectrum scarcity problems earlier than in the region and thus are impelled to work out the details and hurdles in its implementation. As with the implementation of secondary markets, important competition considerations need to be taken into account.

Spectrum refarming has proven to be a frequently sought-out tool that significantly increases spectrum use efficiency. Refarming – defined as changing the use of frequency bands – has been quite common for some time, but it attracted little attention, due to limited demand for spectrum and the sparsity of usage and ownership. Due to technological advancements, spectrum scarcity and ever-changing social demands, refarming is now not only common but in many cases contentious. Some types of refarming (e.g. from broadcasting to broadband) are fiercely defended and opposed by several parties, and thus take a long time to be approved and implemented. Other types of refarming (e.g. reallocating spectrum from fixed to mobile networks) can also be quite contentious, but are much easier to justify. Finally, the most common kinds (e.g. the evolution of wireless telecommunication technologies, from analogue to Long Term Evolution (LTE) tend to occur in a seamless manner.

Most spectrum refarming requires regulatory intervention through a lengthy and expensive process (e.g. allocation of the digital dividend, incentive auctions in the United States to free up additional low-frequency spectrum for broadband beyond 700 MHz). It usually entails the displacement of providers and end users and requires new equipment (CPEs/handsets and network), which can be costly. It should, though, be promoted once the alternative uses of the spectrum have been evaluated (as described before in this chapter).

Refarming can also bring more competition for existing providers, and should be carried out in a competitively neutral fashion, without creating artificial advantages or disadvantages for any of the players. Spectrum used for fixed networks has usually been awarded at much lower prices than spectrum used for mobile networks. From the perspective of economic benefit, it is hard to argue against fixed spectrum being used for mobile telecommunications. Nevertheless, allowing this to happen without an economic compensation mechanism to level the playing field creates unfair distortions. This could significantly damage the market and create unjustified advantages to certain players attributable to a regulatory anomaly. Implementing rules for technological neutrality, as well as flexibility on the use of the spectrum, is a way of facilitating refarming agreements among market players for optimal use of spectrum.

Spectrum refarming that is more akin to technological upgrades is much easier to implement. The original refarming of mobile technologies (from analogue or 1G to 2G, and from 2G to 3G, or even from 2G CDMA to 2G GSM) met significant restrictions from regulators, but further upgrades have gone smoothly. Refarmings are now understood for what they are: spectrum being utilised for IMT that operators choose to use more efficiently to provide better and cheaper services. Some countries still require regulatory approvals for operator-centric refarmings, which, in essence, complicate and slow upgrading a network, and make it more expensive. As long as interference restrictions are met and band re-segmentations are not required (as the spectrum used for Motorola's integrated digital enhanced networks, or iDEN, requires if it is used for traditional mobile networks) or do not affect interoperability in the market, these refarmings should not only be allowed but promoted. Regulatory intervention against this practice could hold back the evolution of wireless telecommunication services. It could also slow the deployment of last-generation networks, the increase in competition, the creation of social and economic welfare, and better use of the spectrum.

Spectrum assignment procedures

Historically, spectrum has been assigned by several distinct methods. Licenses can be awarded by **non-market-based procedures**, such as through a direct administrative procedure. This assignment procedure is widely used to grant government agencies the use of spectrum, but was also prevalent in monopolistic markets when spectrum was awarded to incumbents. Some recent examples of direct spectrum assignments include the *Instituto Costarricense de Electricidad* (ICE) in Costa Rica and Arsat in Argentina in 2012.

Spectrum has also been awarded through other **procedures that lack market incentives**. The FCC in the United States in 1992 awarded licences through a lottery process. Since consolidation was later allowed, significant value was transferred from public to private hands by a process with a random component. The FCC abandoned this process and moved to an auction-based system. LAC countries have not used lottery assignments. Except in certain specific situations, such assignments should be avoided, as they are not efficient from an economic perspective. The OECD supports market-based mechanisms to assign spectrum.

All other assignment mechanisms fall into the **contest category**, but it is important to point out that not all contests are market driven. The most widespread mechanism is one of **comparative selection**, where the license is awarded to candidates that submit the best plan based on a series of promises usually linked to some aspect of "social" or "public welfare" (e.g. coverage, technology, investment, prices, financial strength, etc.). Even if this mechanism is recommended by the mobile industry, it could potentially have nontransparent results as it can easily be designed to favour a certain operator. In practice, a significant arbitrary and discretionary component remains in such procedures, given that some criteria might not be fully relevant to judge appropriateness, and the weight given to the different variables is often subjective.

The price paid for the spectrum under the contest model tends to be low (or nonexistent), which suggests that the state may be handing a subsidy to a private stakeholder. Contests do not allow for a real valuation of the economic value of spectrum resources, as information between the regulatory authorities and the operators is asymmetrical. Comparative selection procedures have been common in the region, but **auctions** are increasingly being used.

Auction theory is a complex area in which significant progress has been made in recent years. Well-designed auctions provide the right incentives for players to use spectrum efficiently and to price it accordingly. Needless to say, one of the main reasons auctions have become common in the industry, including in the LAC region, is that they tend to generate important revenues for governments.

Auctions are an efficient assignment mechanism. They make it possible to answer two questions simultaneously: whom to assign the spectrum to and how much to charge. Well-conducted auctions have detailed rules published in advance. Prices paid by winners are defined by all players in terms of their strategy and skills. Auctions allow efficient assignment of spectrum to the players that value it most. They also help answer the pre-eminent question of value. Auctions, if well designed, can be an invaluable price discovery mechanism, leaving to the regulator the more basic question of setting a minimum reference price. It is a process that avoids the pitfalls of other alternatives, becoming significantly less discretionary and increasing certainty to markets. Several types of auctions exist:

- In **sealed price auctions**, all pre-qualified participants submit one bid. In a sealed first-price auction, the license is awarded to the highest bidder, who then pays the proposed price. In "Vickrey auctions", or sealed second-price auctions, the license is awarded to the highest bidder, who in turn pays the second-highest price.
- In **ascending price auctions** (English auctions), participants progressively increase their bid. The auction is over when there are no more bids; the winner is the entity that offers the highest bid. In descending price auctions (Dutch auctions), the auctioneer sets a price and progressively lowers it until one of the bidders accepts it. English and Dutch auctions can be done in successive rounds, where all participants submit a bid; the bidding information is then made available to participants, who then proceed to the next round.
- **Multiple round auctions** are advantageous in that they are easy to understand for participants. Giving information to participants after each round increases confidence in all the players involved. Nevertheless, it is a mechanism that can be distorted by players, for example, by signalling during the process or even colluding.
- **Combinatorial auctions** have become common in many countries to address such issues. These are auctions for the simultaneous sale of more than one item, such as blocks of spectrum bands with geographical delimitations. Participants place bids on combinations of the items on offer and the winning bids are those that maximise overall value to the auctioneer. The larger the number of items on offer, the more complex determining the winners becomes, and the more uncertainty for operators to ensure that the final distribution of spectrum matches their preferences, which can discourage participation. The maximising solution could potentially mean leaving some items unassigned. These auctions have been used in Canada and the United Kingdom.

In principle, any auction can incorporate **restrictions and obligations**. Some of the most common ones are spectrum caps (where bidders cannot exceed maximum spectrum holdings) and coverage obligations. Given the investments required to deploy a nationwide network, it makes sense to implement clearly defined and reasonable coverage obligations for operators being awarded spectrum. This can provide some certainty about the future coverage of networks.

Ambitious coverage obligations are difficult to enforce and may increase regulatory risk. Any obligation imposed should be carefully designed to balance benefits from larger coverage against lower auction receipts for the state and slowing market entry and competition. However, coverage for rural areas where network rollout is less or even not profitable can be included among the obligations stipulated. Extending mobile broadband and telephony access and/or introducing competition in rural areas may be advisable, and a case-by-case analysis is needed to provide adequate coverage to maximise benefits for citizens.

Some elements in assignment procedures to promote competition should be noted. Auctions can be designed to promote competition in the marketplace. A common restriction is the setting of spectrum caps, which, even though they can potentially reduce the number of participants in the auction, avoid spectrum hoarding, eliminate pre-emptive strategies, create some equilibrium in spectrum holdings, and increase efficiency of spectrum use. Spectrum caps are common in OECD countries, where they are widely used for encouraging entry and addressing situations of dominance. To promote competition, special care should be taken to continue to ensure that smaller players have access to sufficient spectrum resources, by setting spectrum caps or set-asides in auction design (i.e. reserved blocks for entrants where incumbents or dominant operators cannot bid), bearing in mind the

balance between higher and lower spectrum bands. Caps have been used in Argentina, Brazil, Chile, Colombia, Ecuador, Mexico and Peru; they vary widely, as they respond to the specific characteristics of each market at the time they were set. For example, Mexico has set a cap of 80 MHz in its latest AWS (Advanced Wireless Service) auction. Colombia applies different caps for lower-frequency (30 MHz below 1 GHz) and higher-frequency bands (85 MHz). Caps are usually updated whenever more spectrum is auctioned or when consolidation activity results in spectrum accumulation that is deemed to affect competition in the marketplace.

In addition, consideration should be given to introducing a spectrum floor. This novel approach, recently introduced by Ofcom in the United Kingdom, will not accept the outcome of a combinatorial bidding process if it does not offer a specified amount of spectrum to at least one newcomer. In effect, this gives preference to a lower bid from an entrant, over a higher bid from an incumbent.

Other commonly used elements are the incorporation of obligations to offer wholesale services for the hosting of mobile virtual network operators (MVNOs). As addressed in Chapter 4, on competition and infrastructure bottlenecks, entry of MVNOs, can be further facilitated by obligations imposed in the license. For example, the regulator can also introduce mechanisms to make the competitive environment more favourable to MVNOs, by making national roaming obligatory among operators, so that MVNOs can offer the same coverage as MNOs. Although non-facilities-based competition exerts a limited discipline on facilities-based carriers, non facilities-based entry may be a legitimate entry strategy for new players. In addition, facilitating resale may enhance the value and therefore incentives to invest in new infrastructure.

Other issues that have arisen in dealing with spectrum are related to the clearing of the bands. Some countries (Colombia and Brazil) have opted to impose this obligation as a condition to be awarded the spectrum license. This is bound to become more common as more spectrum is allocated to IMT, but is occupied by other tenants (e.g. the 600 MHz band in the United States). Well-designed migration processes and clearing of band obligations during an auction could be an efficient way of dealing with the issue and could accelerate the expansion of wireless broadband networks.

Governments should avoid restricting assignment to existing players. This thwarts competition and allows the government to decide administratively what the market structure ought to be, rather than leaving this to market forces. Generally speaking, "beauty contests" are not recommended, as they tend to be subjective, operators tend to underpay for the real value of the spectrum, and economic rents are transferred to private companies.

Finally, some countries in the LAC region include conditions for spectrum auction procedures, such as the distribution of tablets or contributions for universal service funds, that can create distortions and risk reducing the cost-effectiveness of public funds. These programmes should be run independently of spectrum auctions, and in general, cross-subsidies from spectrum fees to fund public interest programmes should be avoided.

Spectrum valuation

One of the most challenging tasks authorities face when licensing the spectrum is setting a fair price. There is no doubt that the market is best positioned to determine the value of the spectrum, but this alternative is not always available. Auctions are the best price-discovery mechanism, but it is still necessary to set a minimum reference price, which can be different from one auction to another. Excessive prices can leave spectrum unsold and hamper the sector in meeting policy goals. A balance should, therefore, be found to maximise the value generated by spectrum bands.

There are basically five different ways to estimate the value of the spectrum. In practice, regulators need to analyse all of them and then adjust the value, depending on the objectives sought and other specific conditions of the problem at hand. For example, if few bidders are expected at a given auction, the reference price plays a fundamental role in an auction. The main reference for the minimum price is given by the avoided-cost methodology (described below), as it reflects the indifference point, which considers that an operator would not pay less than what it would cost to find an alternative solution to accommodate future demand. An auction would then throw up a price between the avoided-cost price and the net present value of cash flows obtained by using the spectrum.

Any estimation of the value of spectrum should be approached with caution, especially when valuing the future use of spectrum, as this is essentially a forward-looking exercise where many factors may vary substantially in the medium and long term. This can be done through:

- **Benchmarking** compares prices paid at other similar auctions (national, regional or international) in a normalised fashion (usually price per megahertz per population). It is probably the most common spectrum valuation methodology, simple and easy to explain, but its main pitfalls arise because real value depends on several factors, such as market potential, spectrum already allocated, competition level, license periods and additional fees, which a simple price comparison does not consider, but that can be addressed by econometric analyses. The comparison, to be fair, should consider total price paid (that is, not only the amount paid at the auction but also any recurring fees linked to the spectrum tenancy) as well as the assignment methodology (that is, it is not advisable or sensible to compare an auction price with a the price paid at a "beauty contest", as this last assignment probably does not reflect a market price). Chile awarded the 700 MHz band for USD 0.1 cent per megahertz per population in 2014, whereas Brazil, almost at the same time, licensed it for 25 times as much.
- **Econometric analysis** assess the value of the spectrum as dependent on a large number of variables. By accounting for them, it makes the benchmarking of different prices more reliable. Some variables that need to be considered reflect the general conditions of the market (GDP per capita, population, urbanisation, etc.), while others are intrinsic to the spectrum and the auction (band, amount of megahertz on offer, timing, duration of the license, market structure, etc.). An econometric analysis where price is the dependent variable can be performed using some of these variables as controlling factors. The main disadvantage of this methodology arises from the lack of enough data points to be able to incorporate several independent variables. Attention needs to be paid to the definition of the controlling variables, as they could be measured differently in different countries, and the analysis could thus yield misleading results.
- The **estimation of avoided costs** is based on calculating the cost reduction for a given operator of being able to use additional spectrum. The model assumes that operators have to satisfy increasing demand, which entails a different cost structure if more spectrum is made available. Network capacity can be increased by technological improvements, frequency reuse, increase in the number of radio base stations, simultaneous use of different networks (for example, Wi-Fi local networks or buying capacity from other operators), or, ultimately, using additional or a different band of the spectrum. Due to its propagation characteristics, higher frequencies allow for more capacity, reducing coverage per base station, while lower frequencies allow for higher coverage per base station, but less bandwidth capacity. Avoided cost is defined as the investment required to deploy the

first four options without being able to use additional spectrum. The estimation is intrinsic to each market, can be done for each operator, and does not depend on any benchmarking analysis. Its main disadvantage arises from the limited information regulators have on the cost structure of operators, as well as the need to build a hypothetical network as complement to existing networks. It also requires estimating future demand, which recent history has shown to be extremely difficult in the LAC and elsewhere. This methodology is widely used by operators, as they can easily estimate their own avoided costs.

- The estimation by **business case** is based on the cash flow of the business using the spectrum. The main assumption behind this methodology is that an operator would never be willing to pay more than the net present value of the cash generated by the business. It is usually the most realistic way to estimate the price of the spectrum for new entrants. It is important to note that the avoided-cost methodology is a comparison of the discounted cash flow of two distinct business cases: with and without spectrum. Both require the estimation of the cost of capital, which can, from a regulator's perspective, become a contentious issue.
- **Opportunity cost** is defined as the value created when something is put to an alternative use. In the case of spectrum, it is the value not generated when it is used for one alternative instead of another. This methodology is used to compare the value of the spectrum used for different telecommunications services (e.g. mobile versus fixed, mobile versus satellite, broadcasting versus IMT). In practice, calculating the opportunity cost of the spectrum relies on estimating avoided costs and discounted cash flows, as well as estimating the economic externalities generated by each of the alternative uses. For example, many of the economic and social benefit estimations of the value of the digital dividend include a detailed analysis of the opportunity costs of the spectrum.

Digital television, digital dividend and analogue switch-over

The **digital dividend** – the 700 MHz band in LAC countries – is, without any doubt, at the heart of all digital inclusion initiatives in the region, as it promises to bring broadband access to areas not reached by existing networks and to lower the price of service. Compared to other IMT bands, the 700 MHz band has significant propagation advantages; more coverage is attained with every cell site.

This band was allocated to broadcasting services in most LAC countries, with intensity of occupation varying significantly. With the advent of digital television, which allows more channels with higher quality to be transmitted through the same bandwidth, less spectrum can be assigned to broadcasting without compromising either the number of signals transmitted or their quality, making possible a greater choice of television channels and licenced broadcasters. This could increase competition in broadcasting and the development of more local content. This transition constitutes a unique opportunity to release spectrum resources, as a result of greater spectrum efficiency, and make them available for advanced mobile services, such as mobile broadband.

With the possibility of using this spectrum for mobile broadband in the LAC region, the case for changing the allocation of the band seemed reasonably straightforward. Nevertheless, the debate was intense and lasted several years. By 2010, two years after this band had already been auctioned for IMT and one year after the analogue switch-off of full power television had been completed in the United States, LAC countries had just started the debate to change its allocation. Most countries have already proceeded with the change and some have even auctioned this spectrum (the Plurinational State of Bolivia [hereafter "Bolivia"] in 2013; Brazil,

Chile, and Argentina in 2014). This is a good example of transferring spectrum to more beneficial uses, responding to technological evolution and the demands of society. Nevertheless, the migration to digital television has not been a smooth, as it involves significant investment on both sides of this two-sided market (broadcasters and households). Even though digital signals are already being transmitted almost everywhere, the switch-off is still many years away in most countries (Table 3.2). Broadcasters have been reticent about ceasing analogue transmission, as the installed base of digital TV sets in the region is still low. Insufficient incentives and lack of information, as well as limited purchasing power, have made the transition very slow. As free over-the-air television is deemed to be extremely important from the civic, cultural and social perspective, forcing the switch-off unilaterally is not considered to be an option; Free to Air (FTA) television is the only affordable television service for many households. As broadcasters have prominent positions in this area of public policy and have influential lobbying skills, the debate is still open in most countries. Nevertheless, all countries are moving in the same direction, and the spectrum being freed from the switch-off will be used more efficiently from an economic and social perspective, based on a broader consideration of all potential costs and benefits.

Another important part of the debate has been the choice of **standard for digital TV**. Most countries in South America opted for the Brazilian standard (ISDB-Tb, based on the Japanese standard); in turn, the debate to choose the standard in Brazil, concluded in 2006, was heated and lasted several years. Brazil opted to modify the Japanese standard and then proposed that neighbouring countries to adopt it. Peru, Chile, Argentina and Venezuela announced their decision in 2009, followed by Ecuador, Bolivia, Uruguay, Nicaragua, Costa Rica (Box 3.2) and Paraguay in 2010. The widespread adoption of this standard will give it reasonable economies of scale (more than 450 million people), which can help bring down equipment costs and ensure innovation and research and development (R&D)-related investment. Countries that opted for other standards will achieve similar or higher economies of scale, as they can "piggyback" on larger and more developed markets, such as in Europe and the United States.

Table 3.2. **Digital switch-over in the LAC region**

	Expected date	Digital TV standard
Argentina	2019	ISDB-Tb
Bolivia	2020	DVB/T
Brazil	2018	ISDB-Tb
Chile	2020	ISDB-Tb
Colombia	2019	DVB/T
Costa Rica	2017	ISDB-Tb
Dominican Republic	2015	ATSC
Ecuador	2017	ISDB-Tb
El Salvador	2018	Not defined (decision to implement ATSC was suspended in 2012)
Guatemala	2021	ISDB-Tb
Honduras	2020	ISDB-Tb
Mexico	2015	ATSC
Nicaragua	2020	ISDB-Tb
Panama	2017	DVB/T
Paraguay	2024	ISDB-Tb
Peru	2020	ISDB-Tb
Uruguay	2019	ISDB-Tb
Venezuela	2020	1.9 GHz

Box 3.2. **Selection of the standard for digital broadcasting in Costa Rica**

In the interests of greater transparency and technical objectivity, Costa Rica appointed a Joint Commission to recommend to its executive branch, through a nonbinding technical report, the standard for digital television broadcasting in the country. The committee included government personnel, representatives of broadcasters, the telecommunications regulatory body and officials from the state channel and representatives from academia.

After several field tests in different parts of the country analysing the various standards available for digital television, the recommendation of the ISDB-Tb standard was issued. The results were documented and recorded, ensuring the portability of the recommendations issued to the executive.

Sources: Costa Rica (2010a), *Decreto Ejecutivo sobre la Definición de Estándar de Televisión Digital y reforma Crea Comisión Especial Mixta Analizar e Informar Rector del Sector Telecomunicaciones posible Estándar Aplicable País e Implicaciones Tecnológicas, Industriales, Comerciales y Sociales de Transición, www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=67968&nValor3=80763&strTipM=TC*; Costa Rica (2010b) *Informe Final de la Comisión Mixta de TV Digital sobre el Estándar de Televisón Digital Recomendable a Costa Rica, http://new.infocom.cr/wp-content/uploads/2014/02/INFORME-FINAL-TVD-Comision-Mixta-25-11-10.pdf*; Costa Rica (2011), *Decreto Ejecutivo sobre la Creación de la Comisión Mixta para la Implementación de la Televisión Digital Terrestre en Costa Rica, https://cgrfiles.cgr.go.cr/publico/jaguar/USI/normativa/2011/DECRETOS/DE-36775.pdf*.

Another important issue that arose after the digital dividend was allocated to IMT concerned the **segmentation of the band**. The United States, which adopted its own band plan in 2007, assigns a total of 60 MHz to mobile broadband and 24 MHz to a public safety broadband network. The Asia-Pacific Telecommunity (APT) published its recommendation for harmonised frequency arrangements in 2010: the arrangement allows for full use of the 90 MHz, that is, 30 MHz more than the US plan. Though discussions were intense, with some urging the adoption of the American band plan, most LAC countries opted for the APT standard. Argentina was the first country to announce its intentions in 2011, but Colombia was the first to officially adopt it in 2012; it was followed almost immediately by Mexico, Panama, Ecuador, Chile and Costa Rica. Only two countries, Bolivia and Paraguay, opted for the United States' band plan. The adoption of a harmonised plan in the region is important, as it will ensure interoperability, allow economies of scale and minimise interference problems.

As the LAC region switches off the analogue broadcasting networks, many aspects need to be considered for a smooth **transition**. Public funding will most likely be required. The first is that the population needs to be well informed about the transition and what it means to them. Some countries have not sufficiently raised public awareness of the issue. Such campaigns take a long time to take hold, but once they have been understood, an important part of the burden shifts to the population, and the transition speeds up, reducing the need for aggressive campaigns to subsidise decoders and television sets. Broadcasters also face significant costs as their networks migrate to the digital standard; commercial broadcasters, except for small networks, usually have no trouble meeting these costs, though public networks can potentially need public funding. Better quality and the possibility of multiplexing, in principle, make reasonable financial sense for action in this respect. Concluding the analogue switch-off is important, as it allows countries to enjoy the benefits of the 700 MHz band sooner. According to some estimates (Flores-Roux, 2013), each year that its use is delayed has an impact of around 1% of GDP six years later. This suggests that subsidising the transition to digital television is the correct strategy, but that a well-planned and orderly transition, as well as targeted subsidies, will minimise the cost.

Conclusion

This chapter addressed policy considerations regarding spectrum management. First, it noted that spectrum management frameworks should be transparent and stable. Their main goal should be encouraging investment and competition to increase availability and penetration of telecommunication services. Meanwhile, such frameworks should take into account the effect of value creation and externalities on GDP, job creation, investment, social welfare, and consumer and producer surpluses. National spectrum licensing frameworks (for the different types of agreements, whether exclusive, unlicensed or LSA/ASA) are key for managing spectrum consistently and establishing legal certainty, so that deployments and upgrades of infrastructure can be carried out with a long-term perspective and with a high expectation of renewal.

The main tools for spectrum management are national frequency allocation tables (NFAT), spectrum inventories, licence databases, long-term planning and measurements of efficient use. Moreover, as they undertake the challenging task of economic valuation of radio spectrum, policy makers can choose between tools of econometric analysis, benchmarking, avoided costs, and financial and opportunity costs.

This chapter raises important implications of spectrum management for competition dynamics. Close collaboration with the competition authority is advised, as is flexibility in assignment, not only in terms of technological neutrality, but also in terms of service ("service neutrality"). Setting spectrum caps, spectrum trading, development of secondary markets, spectrum sharing and spectrum refarming are other tools policy makers can use to increase competition and the efficient use of spectrum.

While spectrum may be assigned via non-market-based procedures (whether by lotteries or direct administrative channels) and different contest procedures (such as comparative selection), this chapter demonstrates that the most efficient mechanism of spectrum assignment is through auctions. Well-designed auctions are less discretionary, increase market certainty and can be an invaluable price-discovery mechanism, leaving the regulator the role of setting minimum reference prices, setting aside blocks for entrants and/or establishing restrictions (such as caps) and obligations (such as coverage or offering wholesale service to MVNOs) as necessary for attaining policy goals.

Finally, this chapter addresses the current challenges associated with the digital dividend (the 700 MHz band in LAC countries) and the switch-over to digital terrestrial television. To ensure a smooth transition and greater spectrum efficiency, well-planned, orderly transitions, public awareness campaigns and targeted subsidies (for decoders or migration costs of broadcasters), will help to minimise public and private costs involved in the transition.

Notes

1. See *www.pc.gov.au/inquiries/completed/public-safety-mobile-broadband#report*.
2. See *http://research.microsoft.com/en-us/projects/spectrum/default.aspx*.
3. See *www.acma.gov.au/Industry/Spectrum/Radiocomms-licensing/Spectrum-licences/spectrum_21*. In addition, in February 2016, ACMA outlined its strategy for addressing the growth in mobile broadband capacity in its work plan, based on its experience. See *www.acma.gov.au/Industry/Spectrum/Spectrum-planning/About-spectrum-planning/mobile-broadband-strategy-caps-off-decade-of-work*.

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Chapter 4

Competition and infrastructure bottlenecks

This chapter focuses on two fundamental issues concerning the availability of innovative and competitive broadband access services and applications. The first is policy making and regulation to encourage competition. The second is good practices in this area intended to address such bottlenecks as access to essential facilities for deploying broadband services. Special attention is paid to dominance issues and regulation at the wholesale level, the key issues for regulators in the LAC area.

Experience in OECD countries demonstrates that competition is the key to promoting rapid broadband development. Broadband competition stimulates network rollout and higher speeds and helps to lower prices, which in turn, attracts users. Another relevant key issue, affecting both competition and investment in broadband access, is to remove infrastructure bottlenecks, because access to the existing passive infrastructure acts as a high barrier for existing operators and new entrants alike.

Broadband will only develop when the markets for fixed and mobile communication networks and services are competitive. The majority of Latin America and Caribbean (LAC) countries lag in the development of fixed networks. Many still have powerful dominant operators with large market shares and weak institutional frameworks that slow competition and block the expansion of services. Such weaknesses make it challenging to meet broadband policy objectives through market forces. Encouraging competition and network deployment of mobile broadband access is especially important, because this may be the most efficient and economical way to deliver services and competitive choice for consumers in areas where high-speed fixed networks are not well developed.

This chapter presents a set of policy and regulatory instruments to advance competition in communication networks and services in LAC countries. In addition to interconnection issues, which have already received a great deal of attention in the region, a full set of tools is proposed to advance competition in fixed and mobile markets. Removing potential bottlenecks, such as restrictive rights of way, limitations of access to poles, ducts and so forth, is of extreme importance to facilitate network deployment and encourage investment by new entrants.

Facilitating and encouraging passive infrastructure sharing is also critical, to encourage the deployment of both mobile and fixed networks. This can assist in addressing outstanding challenges to increase deployment of fibre access and backhaul infrastructure for mobile networks.

Key policy objectives for the LAC region

The main high-level policy objective for opening broadband markets in the LAC region is to promote competition along the entire value chain for all actors (including new entrants and alternative providers). This general goal can be enhanced by some specific policy objectives, such as:

- **establishing an investment-friendly environment** that facilitates both national and international investment, as well as reasonable regulatory certainty
- **lowering, and where appropriate, eliminating administrative entry barriers;** simplifying procedures, time and costs for obtaining licenses to deploy networks; as well as easy, quick and efficient access to scarce resources such as numbering and spectrum
- **facilitating efficient access to rights of way and passive infrastructure** deployed by other actors, in particular market players with a dominant position

- **ensuring effective and efficient interconnection** among the different actors
- **facilitating demand-side competition** by reducing switching time and costs; promoting effective and rapid number portability in fixed and mobile markets; and monitoring and controlling retention clauses and penalties for switching operators
- **monitoring and assessing dominance** in the different markets for both mobile and fixed broadband access; taking corrective measures against any dominant position in the geographical areas that lack competition
- **ensuring access to infrastructure controlled by dominant operators** that is difficult to replicate (usually qualified as essential facilities), as well as encouraging network sharing among all market players, ideally through their own commercial negotiations, to reduce investment and accelerate the rollout of broadband.

Fulfilment of these policy objectives facilitates competition and investment by operators, maximises coverage of broadband services, reduces prices for the final consumer and encourages innovation in broadband services.

Tools for measurement and analysis in the LAC region

The collection and analysis of data are crucial in setting and monitoring the implementation of policy objectives, as well as for adapting specific policy or regulatory measures as necessary, and benchmarking with other countries, as addressed in Chapter 2 on regulatory frameworks and digital strategies. To inform policies aimed to promote competition, the following assessments are advised:

- **Collecting data on investment by market players.** Such data, provided regularly by operators, should, when possible, show the type of investment undertaken by each competitor related to revenues and customers. Time series and comparisons with similar countries of the volume of investments can help detect trends and potential problems.
- **Monitoring competition**, the typical indicators that should be produced and updated regularly are: number of operators active in each market, revenues for each operator, market shares and their evolution over time (revenues/subscriptions), concentration indexes (such as the Herfindahl-Hirschman Index [HHI]), evolution of prices, evolution of number portability, evolution of broadband speeds (both those announced and measures of real speeds), as well as coverage, quality of service and level of investments. As discussed later in this chapter, these indicators are needed to perform market analysis, which is the basis for taking regulatory reform measures aimed at encouraging competition.
- **Infrastructure bottlenecks** and issues with difficulty in accessing the relevant inputs needed to provide services should also be assessed regularly. Key performance indicators (KPIs) should be identified based on data about the availability of infrastructure and other resources. For each of the potential bottlenecks, one or several KPIs should be defined. The following box lists some key performance indicators that could be used to monitor fulfilment of policy objectives, as well as references to existing reports from regulatory authorities that can be used to identify KPIs and data collected on infrastructure bottlenecks and access to relevant inputs (Box 4.1).
- With respect to **rights of way**, it is difficult to define meaningful KPIs, as time frames and procedures may vary for each different right of way (i.e. ducts, poles, base station sites and so on). In addition, access to rights of way may be dependent in some cases on municipalities rather than a dominant operator. Nevertheless, it is important that the national regulatory authority have the power to facilitate access to rights of way and to

monitor developments in this area, particularly since administrative authority over rights of way may be distributed among many different levels of administration in a given country. Development and publication of infrastructure maps, covered later in this chapter, is one way of informing operators about the availability of passive infrastructure that can be used in new network deployments. The aim of the regulatory authority is to lower barriers for market players to acquire new rights of way, access existing rights of way and minimise the time required to obtain approvals (e.g. access ducts, install poles, construct towers, place antennas and so on), applying simple and quick procedures in the whole country.

Box 4.1. **Key performance indicators for competition and infrastructure bottlenecks**

Examples of KPIs for competition:

- number of operators in each market
- revenues and subscribers for the fixed and mobile markets by operator
- market shares in terms of revenues/subscribers, concentration indexes
- evolution of prices (typically baskets of services)
- numbers ported among operators (fixed and mobile), portability times (average and deviation) and number failed portability requests
- broadband speed (fixed and mobile) contracted and measures on real speeds
- broadband subscribers by technology
- data on volumes and growth in broadband traffic
- data informing fixed-mobile broadband substitution.

Some examples of KPIs for infrastructure bottlenecks:

- access supported by different technologies deployed by different providers (e.g. number and percentage of copper lines, fibre access, number of mobile base stations and coverage relative to geographic area and population density)
- prices for termination rates (for both fixed and mobile)
- number of unbundled and bitstream-based accesses, as well as, when possible, number/length of ducts available and used by alternative operators
- availability of backbone infrastructure and Internet exchange points (IXPs) (relative to traffic and country dimensions)
- number of circuits and leased lines provided to alternative operators by the incumbent (per technology and speed).

Overview of the situation in the LAC region

In the LAC region, a large variation obtains regarding competition and infrastructure bottlenecks. Different geographical areas within each country also show a wide variation, as is the case in any other region of the world.

In general, recent years have seen an increase in competition, especially in mobile markets where new entrants are competing with incumbents. However, by comparison with most OECD countries, the LAC region has room for competition both in fixed and mobile broadband markets. In many of countries, market shares are highly concentrated. Most new entrants in these markets also face infrastructure bottlenecks, such as access to rights of way, passive infrastructure and international gateways.

The reasons for this lack of competition, especially in large urban areas where there is room for several operators to compete on prices and services, are chiefly based on the following issues:

- In a number of countries, the process for **granting licences is cumbersome**, protracted and costly, even when there is no associated spectrum involved. In general, except in some countries with short-term plans to adapt the licensing regime, notification-based market entry models have not been adopted.
- Although most countries in the region do not restrict foreign investment in the telecommunications sector, a few exceptions remain, with **limitations on the share of foreign ownership**. This reduces the incentives for external investments. In a few countries, new entrants are still at a disadvantage by comparison with dominant publicly owned operators, which are not subject to regulatory obligations to provide access to essential facilities. Although most countries in the LAC region have liberalised telecommunication markets and, in general, operators are privately owned, some state-owned operators exist. In some countries, state-owned operators are said by some to have preferential treatment, with those players benefiting from priority on government contracts, spectrum granting or regulatory fee exemptions. As a result, in such instances, new entrants have difficulty expanding their networks and obtaining customers.
- **Termination rates** for both fixed and mobile voice, although they have been reduced over the last few years, are still very high in many LAC countries compared to OECD non-LAC countries. Termination rates are still not regulated in many countries, and the drivers used to set termination rates are in many cases unclear and render prices much higher than costs. This results in higher prices for customers and a barrier for competition for new entrants that must face high costs for delivering calls to dominant operators. It also raises the issue of on-net/off-net retail price differentiation, which is a barrier to the entry of new players.
- A minority of LAC countries still focus on **retail price regulation** (typically, price caps for fixed and even mobile voice), with the aim of protecting consumers. Meanwhile, not enough focus is placed on wholesale regulation facilitating access to essential facilities for new entrants. As addressed in the section on good practices, if competition is ensured by applying wholesale regulation, retail regulation may be reduced to a minimum or may even not be applicable, as prices will be disciplined by market forces and retail regulation may interfere with innovation and competition.
- Except for a few exceptions, in the LAC region, the **concept of "dominance"** is considered in the regulatory framework, as well as the application of regulatory measures to solve competition issues that arise out of dominant market positions. However, in a number of cases, dominance is not analysed regularly, dominant operators are not regulated, or the regulation imposed is ineffective, due to judicial litigation by the dominant operator, lack of enforcement or the lack/inadequacy of reference offers.
- An important regulatory tool that has been used in many OECD countries to ensure effective market access by new entrants and reduce the dominant position of incumbent fixed telecommunication network operators is **local loop unbundling (LLU)**. Unbundling and bitstream access have helped provide a foothold to new entrants and, in particular, to Internet Service Providers (ISPs) in the broadband market. In the majority of the LAC countries, LLU and bitstream access is not imposed on dominant operators, or when it is imposed, has not been effectively used by alternative operators, due to high prices, lack

of enforcement and/or inadequate reference offers. This has not allowed for competition for fixed broadband from new entrants in areas such as large cities, where LLU can help encourage competition. As discussed further in the section on good practices, LLU is one of the regulatory options that can encourage competition for fixed broadband, particularly if there are too few alternative infrastructure competitors (e.g. cable television broadband operators) to exert enough competitive pressure. However, LLU should not be viewed as an isolated regulatory tool and evaluating its applicability, together with monitoring its effects on meeting goals (e.g. encouraging infrastructure investments, innovation, competition to improve service), is critical. Promoting mobile broadband extension and competition is also important, and further regulatory measures in this area should be implemented when necessary.

- In the mobile sector, some countries have imposed **national roaming obligations** to allow for the phased deployment of infrastructure by new entrants and to help overcome the market advantage of the incumbent mobile operators. This has been helpful in creating mobile competition, but often needs to be supplemented by wholesale pricing agreements that allow fair access to the incumbent's network by new entrants. Allowing market entry by mobile virtual network operators (MVNOs) is also important for creating competitive conditions in the mobile market. Again, a key requirement for the success of MVNOs is the wholesale price for access to the networks of mobile network operators. A few LAC countries have initiated regulation permitting MVNO market access. There are, however, novel initiatives such as the *Red Compartida* (shared network) proposal under discussion in Mexico, where a new network infrastructure will use a public-private partnership model to provide network access to MVNOs as well as to MNOs, and even fixed network operators, in rural areas (further detail on this project appears in Box 4.2).
- **Ensuring access to rights of way** for ducts, poles and base stations is a key regulatory requirement in the LAC region, and an essential part of this Toolkit. In many cases, there are no national rules or regulation to grant right-of-way access, and municipalities have wide discretion to impose very high fees to access rights of way; to delay, or even prohibit, deployments; and to impose unreasonable conditions. This is an issue of concern for operators and discourages investment. As discussed in the next section, the LAC region and OECD countries can furnish examples of good practices aimed at reducing barriers to rights of way that can be used to improve market access and facilitate passive infrastructure deployment.
- **Infrastructure sharing of fixed networks**, apart from wholesale supply obligations for dominant operators, is not developed sufficiently in the LAC, while infrastructure sharing in the mobile market is relatively more developed. In some cases, sharing of mobile infrastructure has resulted from regulation, as it has in Chile. In some LAC countries, public passive infrastructure has been made available to new entrants, for example in Peru and Brazil, where the passive infrastructure from the public electricity utility is shared by law with telecommunication operators.[1]
- **IXPs** are widely available in the region but unevenly distributed, with the highest number of well-functioning exchanges in the South American sub-region, followed by the Central American and Caribbean sub-regions. Brazil has been a leader in increasing the number of IXPs in its territory, from a single IXP in 2004 to 23 in 2013. However, a number of countries are still without such infrastructure. This results in higher costs and lower quality of service for managing Internet traffic, which in many cases, could be exchanged at

a national level, especially for alternative operators. Additionally, lack of effective IXPs is a disincentive for the development of local data centres, which should also be encouraged in the region, and will be the subject of a forthcoming Inter-American Development Bank (IDB) study of the LAC region.

- **International bandwidth high costs and the deployment of content distribution networks** (CDNs) are other issues that need to be addressed to lower retail prices and increase competition and quality of service. These issues are addressed in Chapter 8 on regional integration.

Good practices for the LAC region

Authorisation/licensing models

In general, the authorisation system for operators should be as simple, prompt and inexpensive as possible. For those services not using scarce resources, such as spectrum, which cannot be allocated to a large number of players, a **notification-based** system can be used. Smooth access to market entry, as the experience in most OECD countries shows, facilitates competition.

Colombia offers an example of an efficient market-entry regime. After the approval of the Information and Communication Technology (ICT) Law in 2009, market-entry requirements for telecommunications operators, other than those using spectrum, have been limited to a **registration process**. The process is fairly rapid and not burdensome. The provision of a communication service that uses radiofrequency spectrum requires a prior authorisation or license from the Ministry of ICT (MinTIC). The ICT Registry, under the responsibility of MinTIC, can be modified and updated. Moreover, when an operator provides or stops providing a new communications service, it must inform the ICT Registry of such changes. New entrants are required to provide information on the legal and natural persons undertaking the registration, a description of the network and services to be provided and the use of scarce resources, such as spectrum.

Registration-based authorisation processes are usually not linked or specific to any service (uniform registration requirements for all services), facilitating entry for convergent operators. In general, registration should not entail high fees (registration can either be accomplished without charging a fee or involve a low payment to cover the expenses of registration). The registration process can be very simple, for example notification using a predefined format. As in many OECD countries, authorisation is granted if there is no feedback from the regulator within a short period (e.g. two weeks or a month). The registration process is also used to collect fees, send notifications to operators and for other regulatory purposes, such as data collection.

State-owned operators

Publicly owned operators have traditionally taken strategic decisions on investment, prices, coverage and innovation, based on very different drivers than private operators. In some cases, this has led to budgetary issues and potential conflicts among commercial and public policy objectives. At the same time, these state-owned operators, when operating in competition with the private sector, should also compete on an equal footing. This can be challenging for both the policy maker and the state-owned operators, since many of these state-owned operators are subject to specific regulatory frameworks.

Good practice in this area should be based on several key aspects:

- Both private and state-owned operators must be subject to the **same regulatory framework** and when possible, special exemptions should not be given to state-owned operators (for example, exemptions on fees to be paid or automatic granting of licenses or contracts). However, it may be necessary to impose asymmetric regulation on a state-owned operator (usually the incumbent operator) because it is found to be dominant in one or more markets, and equally, on privately owned operators when they are in a dominant position. Universal service obligations are usually imposed only on a dominant operator (sometimes state-owned) because it has the most extensive infrastructure.
- State-owned operators should have the **flexibility to compete with the private sector**. For practical purposes, they should be subject to similar conditions, whether for contracting services, budgeting and financing network deployments, or launching new services.[2] A careful review may be needed to shift the setting of specific social objectives from the state-owned regulator to the scope of the governmental action, to avoid conflicts and promote healthy competition. For example, network deployments in rural areas, where there are not enough returns to cover investment but where action is needed, to ensure access, should be funded by different sources than the public operator revenues. Tenders and conditions for deployment and access should not favour or penalise public-owned operators. Chapter 5 addresses in more detail the role of publicly owned operators in the implementation of broadband extension plans.
- It is critical to ensure the **independence of the communications authority**, as well as separation of functions between the ministerial agencies in charge of policy making and the ministerial agencies in charge of controlling state participation in any state-owned operator.

Putting these recommendations into practice is challenging and politically complex, which is one reason why, in OECD countries, state-owned operators have been privatised.

Foreign ownership restrictions

In general, foreign ownership restrictions in the telecommunications sector have been lifted in most of the LAC region, although some countries limit the share of foreign participation. However, in the broadcasting sector, foreign ownership restrictions are widely used.

Telecommunications markets have large associated infrastructure costs, requiring a long recovery period. This means that market players with large funds to invest and with easy access to financial markets are better placed to invest the necessary sums. Most of these actors are transnational, rather than based in the country invested in. This is especially challenging for small countries, but it also applies to large countries, and for example, in most of OECD countries, where many operators are not national, but transnational.

Administration of scarce resources

The availability of **spectrum** is a key issue for encouraging competition in mobile markets. As noted in Chapter 3 on spectrum policy, development of broadband in the LAC region will depend on more spectrum being made available for mobile broadband services. This is also relevant in terms of accelerating the digital switch-over for television services, so that the digital dividend can help expand the use of mobile broadband services. Authorities should ensure that this spectrum is fully available, to speed this process.

Well-defined policies and procedures for **number allocation and management** are also important. Numbering plans for different services must be periodically reviewed, to anticipate future needs and allow for the provision of emerging services needing public numbering (for example for machine-to-machine, or M2M, services, as discussed in Chapter 8). It is important to set up well-defined procedures allowing market players to request numbers and to ensure that they are assigned rapidly by the relevant authority, verifying that numbers have been efficiently used (Box 4.2). One-off fees for number assignment should in general be oriented to cover the cost of numbering management, and any recurrent fee should be aimed to encourage efficient management by the operator. High fees should be avoided, since they may deter or disincentivise growth of services and/or entry by new players.

Box 4.2. **Promoting efficient use of numbering resources**

Spain

In Spain numbers assigned to operators must be used within 12 months, counting from the moment where the assignment took place. In order to ensure an efficient use of numbering resources, operators are required to report regularly (each year) the use of numbers previously assigned, as well as a forecast on number resources that will be needed in the next three years. Once requested, number blocks must be provided within three weeks.

Source: Minetur (2009), *Reglamento sobre mercados de comunicaciones electrónicas, acceso a las redes y numeración, www.minetur.gob.es/telecomunicaciones/es-ES/Servicios/Numeracion/Normativa/Normativa%20aplicable/Marco/BOE-A-2004-21841-consolidado_MAN.pdf*.

United Kingdom

In the United Kingdom, Ofcom has carried out several reassessments of the numbering plan. In the latest *National Telephone Numbering Plan 2015*, which is made public in Ofcom's website, it is defined that withdrawal of a number allocation can take place when the communications provider has not adopted these numbers within six months from the date it was allocated.

Source: Ofcom (2015), *The National Telephone Numbering Plan, Office of Communications, http://stakeholders.ofcom.org.uk/binaries/telecoms/numbering/Numbering_Plan_July2015.pdf*.

Interconnection

Providing telecommunication services requires interconnection among operators, since each operator's customers need to connect to customers of other operators. Ensuring that operators interconnect effectively is a key requirement of regulatory policy. All the countries in the LAC region have established obligations to interconnect. However, as there are no incentives for operators with large market shares to facilitate interconnection, regulatory authorities must ensure that interconnection is prompt and effective. The following good practices help to ensure that **interconnection for fixed and mobile voice services** is not a barrier for competition:

- Requiring the **publication of a reference offer** by dominant operators. This should specify: all the technical issues; prices for interconnection and other ancillary services; procedures for requesting interconnection; time for provision; procedures for incident management; standards for quality of services; penalties for not meeting published offers, and any other relevant issues. The regulator must review the reference offer and consider input from all operators (both dominant operators and new entrants), to ensure it is adequate. Reference offers should be issued and reviewed regularly to address any problems, and should be adapted to changing costs and technological developments.

- Ensuring that **prices for interconnection are cost-oriented**. In many cases, and especially when there is an asymmetric situation in terms of market share, dominant carriers have a clear incentive to increase costs for rivals by setting high termination rates. This can result in significant costs for new entrants, in particular as interconnection is crucial in the early stages as they build up their customer base. Although in certain cases, negotiation among operators may lead to low prices for termination, prices for interconnection should not only be monitored but, in most cases, directly regulated. Regulated prices for termination rates can be based on costs, in order to facilitate low rates, while ensuring that the cost for providing the termination service is covered.[3]

Interconnection will also remain important for all-IP networks that replace the public switched telecommunication network (PSTN) for fixed services, including voice services. 4G Mobile Networks are also moving to use **IP for voice**. In this context, reference offers for interconnection should facilitate a smooth transition to managed VoIP interconnection among operators. When technically feasible, the implementation of IP interconnection protocols and procedures should be ensured to improve the efficiency and effectiveness of interconnection among operators that are using IP networks for managing voice services.

The provision of **Internet services** also relies on interconnection with other operators. Many, if not most, of the content and applications accessed by consumers are hosted by an operator different from their service provider. However, there are important differences between voice and Internet services, justifying a different regulatory treatment:

- A much larger proportion of Internet traffic consists of connection to resources provided by content and application providers in foreign countries. Although more and more of this traffic is being managed by CDNs hosting content at a national level, a significant part of the traffic is **international**, and the interconnection model is different and more complex than in voice services.
- Internet interconnection has largely been based on **peering** (direct traffic exchange between two operators) using bill and keep models (no payments passing between operators, provided that traffic is in general symmetrical). The Internet interconnection model is, however, evolving, due to the rapid growth of Internet traffic for access to audiovisual content. New actors, such as CDNs, have appeared, and access operators would like to charge large content providers to send content to end consumers.

Prices for Internet interconnection have not typically been regulated, and the market has provided excellent results for Internet interconnection in most countries with high penetration and use of Internet services. There is therefore no need to apply in the LAC region models similar to those applied for voice (regulation of termination prices and publication of reference offers). That does not mean that regulators should not pay attention to Internet interconnection. In fact, prices for Internet interconnection are higher in the LAC region than elsewhere in the world, and active intervention is needed in some areas to ensure sufficient competition. Recommended good practices include:

- Monitoring by regulators of **prices for interconnection** and **evolution of interconnection models**. Data from the relevant players should be collected and processed to make informed decisions and take action when needed. The evolution of the interconnection models, driven by the increased use of Internet for accessing content, may present challenges in the future, and it is important to detect trends and potential bottlenecks as they emerge.

- Promotion of the deployment of **IXPs**. IXPs are platforms that enable new market entrants to compete in the Internet service market in an efficient and cost-effective way. By using IXPs to interconnect with other networks, service providers can reduce their operational costs, becoming more competitive. A better quality of service is achieved, as networks can generally interconnect directly with more efficiency without a third-party network connection. In some contexts and depending on the concrete infrastructure bottlenecks, IXPs can increase the available bandwidth to the service providers, which, in turn, can offer better connectivity packages to their customers. A more detailed discussion on the role and benefits of Internet exchange points and local data centres, as well as best practice, is discussed in Chapter 8 on regional and international integration.
- Fostering **Internet openness**. This issue, addressed in Chapter 7 on convergence, may have implications for interconnection among players. Regulatory initiatives in this area are focused on retail service provided to customers, and in general, there is no need to set any specific regulation for Internet interconnection. However, disputes may occur among operators that require intervention from the regulatory authority to ensure that interconnection agreements are consistent with regulation of Internet openness.
- Development of **backbone infrastructure and gateways**. Lack of backbone infrastructure and alternatives for connecting to foreign networks is an issue in a number of LAC countries, leading to higher costs for Internet interconnection. Chapter 8, on regional integration, addresses the situation of the LAC region and good practices in this area.

Increasing mobile broadband competition with the entry of MVNOs

Mobile providers play a key role in the provision of mobile broadband access, and in particular in most of the LAC countries, where fixed networks have limited geographical coverage. Taking into account trends in the reduction of prices for mobile terminals, technological evolution and the new spectrum made available for mobile broadband, mobile providers' role is likely to increase in the next few years. Encouraging competition in this market and facilitating entry of new mobile operators is thus essential.

Spectrum is a scarce resource, and deploying mobile networks demands high sunk costs. In practical terms, the market for mobile network operators with a national footprint is limited to a small set of operators, typically from three to five. Given this limit on the number of Mobile Network Operators (MNOs) able to compete for mobile services, it is important to facilitate competition from other mobile providers using mobile wholesale access from MNOs. These Mobile Virtual Network Operators (MVNOs) do not have their own mobile access infrastructure, and use the mobile access network deployed by MNOs. Depending on the availability of their own core network infrastructure and numbering, MVNOs can be classified in several different categories, ranging from full MVNOs to resellers whose business model is based on marketing services completely supported by MNOs.

MVNOs account for a small market share in many OECD countries, including Chile and Mexico, and also operate in some other LAC area countries, such as Argentina and Colombia. Although the role they play in competition is not as important as that of new MNOs entering a market, MVNOs may increase competitive pressure on MNOs, and provide customised products for specific niche markets, for retail segments MNOs do not cover.

A first set of good practices should ensure that there are no regulatory barriers impeding MVNO entry, specifically:

- Ensuring that the regulatory framework allows for **simple and prompt authorisations for MVNOs**, addressing specifically the issue of number allocation for these players, and that the rights and obligations for mobile providers, such as portability requirements and consumer protection, also apply to them.
- Monitoring the **wholesale market for the use of MNOs' mobile access infrastructure** by MVNOs, and maintaining regular contacts with both MVNOs and MNOs to identify any refusal to provide wholesale access, or any other barrier MNOs may impose.
- Ensuring that MNOs do not set **unreasonable technical or pricing conditions** or establish **unfair limitations** that disrupt the business model for the MVNOs. In principle, there is no need for *ex ante* regulation if MNOs are willing to provide wholesale services to MVNOs, but if potential problems are detected, at least in a first phase of MVNO introduction, regular meetings with both MNOs and MVNOs are recommended, and, if necessary, specific regulations may be set out to avoid obstacles to market entry by MVNOs.

MVNOs use wholesale access from MNOs to provide their services. This means that they must have an agreement and interconnection with at least one MNO to use their network. Experience shows that in many countries, these agreements take place without the need for imposing regulatory obligations on MNOs. However, often where there are few MNOs with similar market shares and incentives to tacitly collude on deterring the entry of MVNOs, MVNOs may not be able to reach an agreement, or wholesale prices may be too high to allow for a sustainable business model that allows them to compete with MNOs. In such situations, national regulatory authorities may use the following expedients:

- Undertaking an **official enquiry into the reasons for lack of agreement**, by obtaining data from MNOs and MVNOs and if necessary, due to refusal from MNOs, for example, imposing regulation of wholesale access for MNOs, setting obligations to define a reference offer for MNOs, or even regulating prices. The obligation to provide wholesale access could be imposed on all MNOs or those in a dominant position. In certain cases, the credible threat of regulation is enough to ensure that MVNOs can obtain wholesale access at reasonable terms.
- Including clauses aimed at ensuring provision of wholesale access for MVNOs **in licenses** for new MNOs, as part of the requirement to authorise mergers/acquisitions, after careful analysis of the expected effects on competition, or in **new bands of the spectrum** aimed to ensure provision of wholesale access for MVNOs.

An interesting new initiative in the LAC area is Mexico's *Red Compartida* ("shared network"), promoted by the Secretary of Communications and Transportation (SCT) (Box 4.3). This mobile network is intended to support any MVNO as well as MNOs and fixed operators, particularly to improve coverage in rural areas, by acting as a neutral wholesale platform. As the *Red Compartida* had not been rolled out at the time of writing, it was too early to assess the effect on competition with respect to MVNOs.

Box 4.3. **Some examples encouraging competition from MVNOs**

Chile: regulation of wholesale access offers for MVNOs

The Chilean market for mobile services is concentrated in three operators that accounted for just over 95% of the market in December 2014. Several MVNOs (full and mainly resellers) offer retail services accounting for less than 5% of the market. The Chilean regulator, *Subsecretaría de Telecomunicaciones*, or SUBTEL, is preparing regulation to encourage competition by MVNOs, aimed to set reasonable, transparent and non-discriminatory conditions for wholesale access supply to MVNOs.

Additionally, SUBTEL has also included the obligation to publish reference offers for wholesale access use by MVNOs in the tender process for spectrum in the 2 600 megahertz (MHz) and 700 MHz bands.

Source: SUBTEL (2014a), *Licitación 700 MHz: SUBTEL define frecuencias para Entel, Movistar y Claro*, *www.subtel.gob.cl/noticias/5246-licitacion-700-mhz-subtel-define-frecuencias-para-entel-movistar-y-claro*.

Germany: MVNOs' wholesale agreements as remedies for clearing an acquisition

Telefónica acquired E-plus in 2014. The European Commission had concerns that the merger would result in a reduction of competition between MNOs and also weaken the position of MVNOs, at the expense of consumers. The merging parties had been close competitors, in particular for prepaid customers, by offering a lesser network quality for less expensive rates than Deutsche Telekom and Vodafone. The merger was thus considered likely to constitute a significant impediment to effective competition in the market. As part of the remedies imposed to clear the acquisition, Telefónica agreed to enter into capacity-based wholesale agreements with up to three "Upfront Mobile Bitstream Access MVNOs". These agreements allow MVNO(s) to purchase, in return for a payment up front, up to 30% of the total capacity of the merged company's network, for up to ten years after the completion of the merger.

Spain: Obligations to provide wholesale access to MVNOs based on market dominance

In 2006, the Spanish regulator *Comisión Mercado del Telecomunicaciones* (CMT, now CNMC) declared joint dominance among the three main mobile operators at that time, noting that wholesale network access to third parties had been blocked as the focal point for tacit collusion. As CMT noted, despite the evidence of pent-up demand from service providers seeking wholesale access, none of the established MNOs voluntarily granted access on a commercial basis. In other European markets, meanwhile, MVNOs were able to obtain wholesale access from MNOs. By denying such access, the MNOs managed to maintain a high level of profitability in the retail market, deterring the entry of MVNOs. The three jointly dominant MNOs were required to meet the following obligations: i) the obligation to grant access to their networks on reasonable requests; ii) the obligation to charge reasonable prices. Once the regulatory obligations took effect, MVNOs started to obtain wholesale agreements and compete in the retail market. At the end of 2013, around 30 MVNOs were operating in the country, accounting for 10% of the total market share in terms of revenues.

Mexico: Wholesale shared nationwide 4G network with access for MVNOs and MNOs

The government of Mexico, through the Secretary of Communications and Transport (SCT) is promoting the Shared Network (*Red Compartida*) to accelerate availability and access to broadband services. This will be a mobile network using at least 90 MHz in the 700 MHz band. It aims to provide wholesale capacity, infrastructure and telecommunication services to other companies and not to end users. It will be designed, deployed and operated using private investment. Service is scheduled to begin in early 2018. The tendering process opened at the end of 2015 with the publication of the bid specifications, and the concession is expected to be awarded in the second semester of 2016.

Source: SCT (2016), *Red compartida*, *www.gob.mx/sct* (accessed on 23 February 2016).

National roaming agreements

National roaming agreements allow for full coverage at the national level for operators with a limited footprint. It takes a substantial period for any new entrant to establish national coverage. In the interim, it makes sense to utilise a network from another operator in areas where the new entrant has not yet deployed its network. Ensuring national roaming agreements under specific regulations can help new entrants deploy their networks faster and compete against established players. As the costs of deploying mobile infrastructure are in general substantially lower than those for fixed access networks, it is advisable to establish sunset clauses to ensure that such national roaming obligations only remain in force for a reasonable period (typically four to six years) to encourage investment from new entrants to deploy their own infrastructure.

National roaming can also be useful when licences for mobile services are provided on a regional basis. In this case, national roaming agreements allow services to be provided at a national level for regional operators once they have entered into a national agreement with other MNOs. National roaming agreements may also help provide service in rural areas where an MNO believes the financial basis for deployment is lacking.

National roaming agreements are in many cases a natural outcome of the market, and policy makers should ensure that no legal barriers prevent such agreements (Box 4.4). In specific cases, especially in large countries, where nation-wide network deployment can take a long time for new entrants, obligations must be imposed on the dominant operator to provide national roaming for new entrants at a reasonable price in specific areas. Such obligations can be limited in duration, providing an incentive for new entrants to extend their infrastructure. National roaming can also be set as a condition for spectrum licenses, as analysed in the next chapter.

Emerging services

The ICT sector has been one of the most innovative areas in recent years, with many new services and technologies emerging, increasing consumer welfare and reducing the cost of providing better services. It is very important to ensure that an adequate framework exists for innovation and experimentation with new services. ICT policies in general and broadband services in particular must ensure that there are no regulatory barriers for new emerging services, establishing an innovation-friendly market open to new technological advances and service experimentation.

Regulatory authorities should also as a general rule refrain from regulating emerging services too early except where justified, for example, in the case of consumer protection, national security or other specific issues. When new products or services are launched, it is often unclear what the barriers to competition will be. It is thus advisable to let the market stabilise before imposing obligations aimed at increasing competition. This will also help to avoid picking winners or restricting technological developments. That being said, authorities should monitor emerging markets to take action when and if required.

Number portability

Number portability is one of the key tools for competition for fixed and mobile services. It is also a crucial component related to the switching of providers phase within consumer protection frameworks (further addressed in Chapter 13 on consumer protection). A prompt, effective and simple number portability process allows consumers to switch from one operator to another, encouraging competition. When no number portability process is available or the process is slow, cumbersome or fails in a relevant number of cases, customers refrain from switching operators, rendering other pro-competitive measures ineffective.

Box 4.4. **Selected national roaming cases**

Brazil

The general competition plan (*Plano Geral de Metas de Competição* [PGMC]), is a comprehensive regulatory package aimed at encouraging competition in relevant telecommunication markets, enacted in November 2012.

Among other issues, Article 43 of the PGMC stipulates that mobile operators in a dominant position publish a reference offer for national roaming, including voice, data and SMS services. These reference offers must include all the technical and commercial information relevant for obtaining national roaming access, including prices and geographical coverage.

Sources: ANATEL (2012), *Plano Geral de Metas de Competição (PMGC) – Resolução No. 600 de 8 de novembro de 2012*, *www.anatel.gov.br/legislacao/resolucoes/2012/425-resolucao-600*; Vivo (2013), "Oferta Pública de Referencia de Roaming Nacional", *www.vivo.com.br/portalweb/ShowPropertyServlet?nodeId=/UCMRepository/CONTRIB_093690*.

Chile

The Chilean communications authority, SUBTEL, launched a spectrum tender for the provision of LTE services in October 2013. Obligations in the tender included connecting a number of isolated regions and schools, and the tender set specific obligations for providing national roaming to other MNOs that did not have coverage in specific areas, as well as to provide wholesale access for any MVNO.

Source: SUBTEL (2014b), *Bases del concurso público para otorgar concesiones de servicio público de transmission de datos en las bandas de frecuencias 713-748 y768-803MHz*, *www.subtel.gob.cl/images/stories/apoyo_articulos/concurso_700/bases_700.pdf*.

Mexico

According to Articles 119-120 of the Federal Law on Telecommunications and Broadcasting (*Ley Federal de Telecomunicaciones y Radiodifusión*), enacted in July 2014, the preponderant operator or the one with relevant market power has the obligation to provide national roaming on a temporary basis in the geographical areas where the other operator has no available infrastructure. Prices for national roaming services are to be determined by the communications regulator (*Instituto Federal de Telecomunicaciones* [IFT]), based on a cost model aimed to encourage effective competition and the best international practices.

Source: Mexico (2014), *Ley Federal de Telecomunicaciones*, *www.dof.gob.mx/nota_detalle.php?codigo=5352323&fecha=14/07/2014*.

Colombia

In February 2013, the CRC issued Resolution 4112, which forced operators to provide national roaming as part of their license conditions. National roaming obligations, as laid down by the resolution, include:

- Availability of a national roaming public offering that includes essential technical requirements, deadlines and service fees, coverage areas and so on.
- Clear obligations for home and visited network providers.
- Regulated prices. For voice and SMS services, actual prices must remain below certain cap values.[1]

1. Actual prices must remain below the caps, which are fixed at the same level as the termination rates (for voice and SMS), and national data roaming prices were set at around USD 0.014 (COP 25.63) per megabyte (MB) in 2013, USD 0.01 (COP 19.36) per MB in in 2014, and USD 0.007 (COP 13.09) per MB from 2015 on (with USD-COP exchange rates of February 2013).

Source: CRC (2013), *Resolución 4112 de 2013*, *http://colombiatic.mintic.gov.co/602/articles-3863_doc_norma.pdf*.

Although the use of broadband services does not entail the use of fixed or mobile numbering, broadband services are often contracted bundled with fixed and/or mobile voice services, meaning that number portability is also relevant in the context of creating competition for broadband services.

The experience and tools in implementing number portability have advanced during the last ten years. As an example, in many OECD countries, porting numbers can take less than a day. In many of these countries, number portability does not incur costs for customers. The main success factors for number portability are shown in Box 4.5.

Box 4.5. **Success factors for number portability**

To enhance competition and empower consumers, many regulators have introduced number portability, which allows consumers to keep their number when they switch to another network provider. This is widely regarded as a fundamental prerequisite of open competition and choice in telecommunication markets. For this to be successfully implemented and for transition costs to be brought to a minimum, however, regulators should take into consideration some key success factors:

- **Application of international experience**. Regulators should make the most of the extensive existing international experiences on the implementation of number portability, and use, when possible, well-established processes and technical solutions.
- **Involvement of operators**. Although regulators define the requirements and key issues to be considered in implementing number portability, the operation of number portability falls on service providers. It is thus crucial that regulators make sure service providers work with them to define and implement number portability processes.
- **Porting time**. Long porting times translate into lower numbers of ports. In the initial stages, to ensure a smooth introduction, longer periods of maximum portability time may be acceptable, but regulators should require that in the medium term, the shortest possible time is taken to complete number portability. The shorter the porting process, the better it is for competition and consumers.
- **Porting fees**. In many of the LAC countries and other emerging countries currently implementing number porting, a vast majority of subscribers are prepaid users extremely sensitive to prices. High porting fees hinder porting opportunities. If they exist, fees should be minimal for consumers or fall on the operator that receives the numeration. Ideally, no onus should fall on consumers once they have expressed a preference to change provider.
- **Simplified processes for consumers**. Number porting should be done in a simple and rapid manner for consumers. The creation of one-stop-shop to request the new operators of choice to implement portability is a good practice.
- **Consumer awareness**. Awareness that alternative suppliers and mechanisms for number portability are available is critically important. In some countries, regulators have gone to significant lengths to make consumers aware of number portability, such as through publications in their websites, social media and marketing campaigns. Additionally, accurate information on portability should be given to consumers, before and during portability processes by service providers, and especially immediately after the switching is concluded, and information should be presented in an easily accessible format.
- **Clear guidance**. Regulators should ensure that service providers are aware of, understand and comply with all obligations relating to national legislation on number portability and to the best practices that apply to each service.

Customer retention and SIM locks

Some commercial strategies, from mobile and fixed operators, are based on less expensive up-front offers for a service or a bundle of services and/or handheld subsidies, locking in customers by preventing them from switching provider for a fixed duration. In these cases, users can sometimes face high penalties if they switch providers before the end of this period. Although bundling of services and handheld subsidies are not *per se* poor outcomes for some customers, the practice of imposing lengthy customer retention periods, which often range from 24 to 36 months, can be harmful for competition in the short term.

Good regulatory practice in this area can include:

- **Reducing the time that customers are locked into a contract** for services and ensuring that once the initial contract is over, no further lock-in period is enforced, and that customers are allowed to switch provider whenever they wish to do so. Any penalties imposed on customers who change providers during the lock-in period should reflect the time left in the contract period.
- Where handheld subsidies are provided, the **price for the terminal should be transparent** on the bill and customers should have the choice, during the contract period, to purchase the terminal outright.

Locking of SIM cards is another practice used by mobile operators subsidising terminals. When SIM lock is in use, the terminal can only be used for the operator providing the subsidy, and consumers cannot use it to access service from another operator. To encourage competition, it is important that regulations require an obligation to provide SIM unlock codes when requested by the customer, once the contract is finished, or after a reasonable period allowing for cost recovery for the operator. Unlocked handsets are another means by which users can select another operator when roaming in another country, such as through purchasing a local SIM card. In the section about consumer protection (Chapter 13), issues related to these issues are also addressed.

In-building wiring

Deployment of broadband services in multi-dwelling buildings is usually undertaken by providing ducts inside the building to access each home or directly deploying cable on the façade of the building. This is usually done by the operator deploying the access infrastructure, although there can be regulations in force to include the corresponding passive infrastructure in new dwellings. The inability of new entrants to access in-building wiring can be a barrier to competition in the broadband market. Where buildings are already wired, it is often difficult for a new entrant to install a competing wire, either because of opposition by the homeowners' association or because of engineering difficulties.

To encourage infrastructure-based competition and reduce high market entry costs for new entrants, facilitating broadband availability and minimising civil works in buildings, regulatory authorities may:

- **Require building developers to deploy vertical wiring passive infrastructure** in new buildings, setting rules on the size of ducts to allow for the deployment of networks from several operators and using different technologies (e.g. fibre, copper), as well as providing chambers for operators' connection to the in-building wiring (Box 4.6).

Box 4.6. **Passive telecommunications infrastructure in buildings**

Korea

Korea is one of the leaders in the deployment and take-up of fibre-optic networks in the OECD area. The percentage of fibre connections in total broadband subscriptions reached 66% in June 2014, close to Japan, with 71%. This successful penetration of fibre networks is, however, underpinned by a decade-long effort to enhance the in-building wiring framework for multi-dwelling buildings in Korea, which was seen as one of the main ways to facilitate greater competition in fibre infrastructure deployment. The Building Certification Programme (BCP) certifies that an apartment building complex is equipped with suitable communication infrastructure for fibre-based broadband services. For instance, when every apartment building is connected to at least four optical cables (i.e. in-building facilities such as main telecommunication rooms, ducts and wiring for fibre-to-the-home, or FTTH, services for residents), it qualifies for BCP's "supreme grade". BCP has two other grades, first and second, both of which should ensure FTTB connectivity. Unshielded twisted pair (UTP) cables are used for in-building wiring for first- and second-grade buildings and apartments.

The programme can be applied to most of the apartments and major buildings in the country. If a building is compliant, the applicant is awarded a certificate and given permission to publish and advertise the award. Korea's Building Certification Programme's certificates, introduced in July 1999, is now the *de facto* standard for in-building wiring, especially in multi-dwelling residential units, with 28.8% of Korean households complying with BCP (13.2% ranked as "supreme grade", 60.9% as "first grade", and 25.9% as "second grade"). The most striking feature of BCP is that it is not based on the regulation of in-house wiring but on competition in the housing market. Current regulations for in-building wiring in Korea do not require facilities for FTTH or fibre-to-the-building (FTTB). The Korean government, assisted by a growing housing market, succeeded in upgrading in-building wiring in most new apartments to the "superior" fibre-based system. Bearing in mind that 58.6% of Koreans live in apartment buildings, it may be noted that this programme has significantly increased competitive access to in-house facilities and prevented apartments from being locked into a single provider, without imposing high costs on residents to change operators.

Chile

The Ministry of Transportation and Telecommunications published Decree 18/2004 in 2014, establishing a new regulation for telecommunications infrastructure in new buildings, and setting out technical norms to be followed. Among these norms, telecommunications passive infrastructures in buildings must allow for use from multiple telecommunications operators, enabling co-owners to freely choose their telecommunications provider.

Spain

In 2011, the Spanish government updated the regulation defining technical norms for Common Telecommunications Infrastructure (CTI) to be deployed in new buildings. This was intended to support access for telecommunications services, to ensure that all types of access infrastructures were supported (including fibre). The regulation aims to ensure that the passive infrastructure deployed in each new building can accommodate in-house building from several operators.

Source: Minetur (2011), *Real Decreto 346/2011*, *www.minetur.gob.es/telecomunicaciones/Infraestructuras/Normativa/1.-%20Normativa%20de%20aplicaci%C3%B3n/REAL%20DECRETO%20346_2011.pdf*.

- Regulators should consider **promoting in-building infrastructure sharing for fibre cabling** for individual apartments, and avoid exclusivity agreements. In this context, some European Union countries have imposed symmetrical obligations for the party deploying in-house wiring based on national law, namely Spain, Portugal and France (BEREC, 2011). In Finland, all in-house wiring belongs to the house owners and is therefore not included in the wholesale market definition. Such arrangements are also in force in Sweden and Korea, which also has an effective framework for labelling new buildings depending on their fibre connectivity. This framework, in Korea, has played a major role in transitioning to "fibre-ready" multi-dwelling buildings. In the LAC region, promoting and regulating in-building infrastructure should focus mainly in urban areas with high-rise buildings. In smaller villages and suburban areas, the emphasis of regulatory action should be on simplifying management of rights of way by municipalities. A summary of some applications of these practices in selected countries are provided below (Box 4.7).

Passive infrastructure

Passive infrastructure accounts for a large part of the cost of building telecommunication networks and represents a very high part of the sunk costs for network installation. For example, civil works (ducts, poles and so on) account for a 68% of the total of the first-year costs of deploying a new fibre network (OECD, 2008). Passive infrastructure is not only expensive, but time-consuming to deploy, constituting a clear entry barrier for infrastructure-based competition. This issue is especially relevant for new entrants, which, unlike incumbent operators, do not own a pre-existing access network inherited from the monopoly era. For this reason, passive infrastructure deployment and sharing should in general be facilitated and encouraged by policy makers and regulators, provided that lowering costs via infrastructure sharing do not raise concerns about a reduction of competition.

The critical policy area in facilitating passive infrastructure is the regulation of **rights of way**. Costa Rica and Canada are two examples of good practices in rights of way regulation (Box 4.8). Absent any national or regional regulation on rights of way, local administrations (municipalities) are the relevant administrative bodies in charge of authorisation/denial or imposing conditions (such as fees or dates for obtaining permission) for carrying out civil works in a public space.

The lack of harmonised procedures, rights and duties at a national level may negatively affect plans for deployment not only of fixed, but also of mobile networks. Operators in these cases face a complex situation in which conditions, time and costs for deployment differ in each municipality, unpredictably raising costs and adding uncertainty over the amount of time required to before a network can be deployed. National, regional and local regulations of right of ways overlap, leading to disputes among administrations and adding a judicial burden for operators, and involving additional costs and delays.

For these reasons, it is important for national authorities to:

- Institute **co-ordinated national administrative procedures** for access to rights of way, ensuring consistency and predictability in the application of these procedures. It is also important to ensure clarification of jurisdiction both for granting rights of way and for settling disputes and arranging co-ordination among the public authorities involved.

Box 4.7. **Examples of application of in-building wiring sharing practices**

France

The Law on Modernising the Economy (LME, dated 4 August 2008) introduced a system of rights and obligations for operators deploying very high-speed broadband solutions. It sets out specific rules for very high-speed broadband in order to: i) facilitate the deployment of fibre in private premises (inclusion in the agenda of meetings of buildings' co-owners, recommendations for the agreements between buildings' co-owners and operators, individuals' "right to fibre", and so on); ii) reduce the risk of a local monopoly in the building, through the sharing of terminals, the implementation of which is ensured by ARCEP; and iii) equip new buildings with optical fibres. In particular, the process of installing fibre in buildings is facilitated for operators and imposed on property developers in greenfield housing. The party that installs the fibre in the building (i.e. the building operator) is responsible to the property owner for all operations performed on the network on the private property, and must fulfil the obligation to share its infrastructure, allowing other operators to provide ultrafast broadband services to the residents of the building under fair and non-discriminatory conditions. Furthermore, Article L. 34-8-3 created by the LME stipulates that the concentration point must be located outside of private property, "except in instances defined by [ARCEP]".

Portugal

New rules were laid down not only to promote the installation of fibre-optic cable in new buildings but also to avoid monopolisation by the first operator of vertical communications infrastructures in existing buildings by the time the new regime went into force. In this case, the first-building operator to reach an existing building is required to install at least two fibres per home (apartment) and the associated infrastructure is to be shared by other operators (e.g. vertical infrastructure and ODF). For new buildings, the same rule applies, but the responsibility for the installation of the infrastructure and cabling remains with the owner/builder.

Spain

The regulation establishes that operators that install in-building fibre cabling shall meet all reasonable access requests, and are obliged to conform with third-party procedures, technical constraints, prices and timing with respect to the provision of access to the fibre facilities installed. Such wholesale agreements must provide for the establishment of technical implementations, so that other operators can share fibre resources under reasonable conditions in terms of costs and prices. To avoid situations in which operators encounter entry barriers, such as being refused access to property or lack of space for additional fibre deployments, the first operator, in installing fibre in buildings, must play the role of manager of the network resources installed. Thus, the first operator is obliged to carry out the tasks required to effectively complete the facilities sharing, such as cabling and installation of the referred facilities for other operators.

Facilitating access to the facilities installed in buildings at a reasonable cost is required, thereby guaranteeing that costs do not constitute a barrier to entry for third parties. Finally, because transparency is essential to allow operators to efficiently arrange and generate access requirements, the regulator requested that a number of information fields in an information system be included for that purpose, such as passed buildings, details on the variety of installation performed and technical data on distribution boxes and fibre.

Box 4.8. **Good practices in rights of way regulation**

Costa Rica

Costa Rica sets a delimitation of powers among the different public bodies for co-ordinated and expedited approval required for installation or expansion of telecommunication networks in Decree No. 36159-MINAET-S-MEIC-MOPT. Among other issues, it includes directives for municipalities, periods and due dates for responding to requests of rights of way.

Source: Costa Rica (2010), "Normas Estándares y Competencias de las Entidades Públicas para la aprobación coordinada y expedita requerida para la Instalación o Ampliación de Redes de Telecomunicaciones", *www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=68605&nValor3=82005&strTipM=TC*.

Canada

In Canada, the Canadian Radio-television and Telecommunications (CRTC) has wide-ranging authority to settle disputes between operators, and between operators and municipalities or other public authorities on rights of way, and can make recommendations on expropriating property to ensure rights of way through private land. Although operators need to obtain the consent of municipalities to obtain rights of way, the CRTC can intervene. Where an operator cannot reach agreement with a municipality, the CRTC can grant permission and set the conditions to access the rights of way.

Source: OECD (2008), "Public Rights of Way for Fibre Deployment to the Home", *http://dx.doi.org/10.1787/230502835656*.

- Develop a **reasonable system of compensation** for access to and use of municipal public rights of way. Municipal costs incurred in the associated civil works must be covered, but fees for civil works licenses should be limited, to avoid discouraging investment. Benchmarking with similar successful countries can provide a guide on maximum fees. It is also advisable to ensure that operators investing in ducts are required to conform to obligations for remediation and maintenance of ducts, masts and any other passive infrastructure deployed.
- Set **maximum times for obtaining licences** (depending on the type of civil work involved), to reduce uncertainty and help operators to schedule their network deployments.
- Set **one-stop shops** for rights of way and related administrative procedures. These can significantly reduce the administrative burden on operators during the planning phase of network deployment, and ultimately lead to greater coverage. Time saved in the planning phase can also help operators to bring in revenues faster and begin to compete as soon as possible.
- Provide **advice and guidelines to municipalities** on right of way management. Even when there is an existing national law harmonising procedures, local administrations play a key role in applying the regulation. In many cases, municipalities lack the resources and/or knowledge to apply the corresponding procedures. To address this, clear and concise guides may be prepared by the national authorities, including models for forms and other key aspects.

As in any other policy area, regular contacts and seminars with local administrations and operators can help identify aspects for improvements in the regulation of rights of way, as well as to anticipate future needs and bottlenecks.

Encouraging passive infrastructure sharing is also good policy practice that can significantly reduce initial costs for network deployments, facilitating competition and investment in active network deployments. Additional benefits can also be obtained from the reduction in damage to existing infrastructure during excavation work. Some examples are provided below on encouraging passive infrastructure deployment and sharing (Box 4.9).

Box 4.9. **Some examples of encouraging passive infrastructure sharing and deployment**

Peru: Law on access to infrastructure owned by incumbent telecommunication operators

In 2008, the Legislative Decree No. 1019 or *Ley de Acceso a la Infraestructura de los Proveedores Importantes de Servicios Públicos de Telecomunicaciones* was published in Peru. Its goal was to make mandatory shared access and use of telecommunications infrastructure from incumbent telecommunication services providers, so that telecommunication licensees could be guaranteed reasonable, non-discriminatory access to telecommunication infrastructure.

The Decree defines telecommunications infrastructure as poles, ducts, conducts, chambers, towers and other elements of the network, as well as rights of way related directly to the provision of public telecommunications service. It also guarantees that the conditions required by the incumbent for the shared access and use of its infrastructure should not be less advantageous than those required of their own subsidiaries or third parties. Two modalities are possible for infrastructure sharing: either agreement of parties (within 60 days of the request for access) or by decision of OSIPTEL (when the 60 days have expired without negotiation).

Source: OSIPTEL (2008), *Decreto Legislativo 1019 Ley de acceso a la infraestructura de los proveedores importantes de servicios públicos de telecomunicaciones*, *https://www.osiptel.gob.pe/repositorioaps/data/1/1/1/par/solucion-de-controversias/files/DL_1019_NormasInterconexion-ST.pdf*.

Bahamas: Infrastructure-sharing regulations

The Utilities Regulation and Competition Authority (URCA) in Bahamas passed a set of infrastructure-sharing regulations in September 2015, setting obligations, procedures and directives on price setting for infrastructure sharing among operators. These regulations also include special provisions for construction, use and sharing of communication towers. According to URCA's regulations, infrastructure providers (operators owning passive infrastructure facilities) must set commercially negotiated access rates based on actual costs and in accordance with the following principles:

1. Charging should serve to promote the efficient use of assets and sustainable competition and maximise benefits for customers.
2. Access charges must reflect a reasonable rate of return on capital employed and take into account the investment made by the Infrastructure Provider.
3. Access charges must only reflect the unbundled components that the Infrastructure Seeker wishes to use. An Infrastructure Provider must unbundle distinct facilities and corresponding charges sufficiently so that the Infrastructure Seeker need only pay for the specific elements required.
4. Access charges must be transparent; and
5. Access charges must be impartial, non-discriminatory and must be no less favourable than those the Infrastructure Provider offers its subsidiaries, affiliates partners or any other licensee.

Source: URCA (2015), *Infrastructure Sharing Regulations – ECS 04/2015*, *www.urcabahamas.bs/download/035843400.pdf*.

Costa Rica: Public consultation on regulation of infrastructure sharing for telecommunication services

The *Superintendencia de Telecomunicaciones* (SUTEL), the telecommunications regulatory authority in Costa Rica, has performed a public consultation on specific detailed regulation regarding infrastructure sharing (Resolution RJD-181-2015). This regulation is aimed to promote the efficient use of passive infrastructure, encouraging infrastructure sharing under a clear and orderly model, reducing costs for all actors, and increasing competition for services.

Among other issues, this regulation set specific guidelines on space to be left on ducts when installing them, to leave room for future growth, as well as duct sharing among operators.

Box 4.9. **Some examples of encouraging passive infrastructure sharing and deployment** *(Cont.)*

Specific provisions on access by operators to passive infrastructure deployed in public infrastructure (for example roads, bridges or railways) are also included, to help address the need for inclusion on passive infrastructure deployments in public infrastructure projects. Detailed guidelines on setting charges for infrastructure charging are also included.

Source: SUTEL (2015), *Consulta pública al reglamento sobre el uso compartido de infraestructura para redes públicas de telecomunicaciones*, *https://sutel.go.cr/sites/default/files/audiencias/reg-01904-2015.pdf*.

United States: Broadband Conduit Deployment Act of 2015

Members of Congress are discussing the Broadband Conduit Deployment Act, with the goal of mandating that federally funded highway construction projects include the installation of pipes to carry fibre-optic cables, assuming that the area in question has a need for broadband in the next 15 years. The Federal Highway Administration estimates that it is ten times more expensive to dig up and then repair an existing road to lay fibre than to dig a channel for it when the road is being fixed or built. According to a study by the US Government Accountability Office, "dig once" policies can save from 25% to 33% in construction costs in urban areas and approximately 16% in rural areas.

Source: United States (2015), *Broadband Conduit Deployment Act of 2015*, *http://eshoo.house.gov/wp-content/uploads/2015/10/10.22.15-Dig-Once-Bill-Text.pdf*.

Some specific good practices aimed to encourage passive infrastructure sharing are:

- **Setting obligations** for dominant operators owning ducts, masts and any other passive infrastructure, to share them at regulated prices with alternative operators, even when the passive infrastructure belongs to a parent company (e.g. an electricity utility).
- **"Dig-once" policies** may also be applied, encouraging diverse utilities (gas, electricity, telecommunications and water) to adhere to a common shared planning to dig. This can reduce investments for all parties involved, minimise troubles and inconvenience in the public space and better organise deployment and future maintenance.
- When **planning new public infrastructure**, such as highways, it is usually worth investing in ducts that could be used by any operator under open-access cost-based conditions to deploy their own networks. This is especially useful when there is a lack of backbone or backhaul infrastructure.
- A relevant part of the passive infrastructure deployed by **other utilities**, such as gas, water or electricity companies, can also be used for telecommunication services. Utility companies performing civil works that are fully or partly financed by public means could be required to meet reasonable requests from telecommunication companies for civil works co-ordination, in order to deploy high-speed broadband networks. This is for example the case in the European Union, where Directive 2014/61/EU, of 15 May 2014, on reducing the costs of deploying high-speed broadband networks, addressed such obligations.

To ensure efficient use and sharing of passive infrastructure, it is critical to ensure that operators have access to accurate information about its availability. This requires development of IT systems showing georeferenced information on this infrastructure, as well as supporting processes for requesting its use, provision and maintenance. When the passive infrastructure to be shared belongs to the dominant operator, the implementation of these systems can be part of the obligations imposed on its access. When passive infrastructure to be shared also includes elements provided by other utilities and/or other infrastructure, the administration should manage the corresponding project to implement and collect data

from different organisations. An example of an infrastructure atlas managed and launched in 2012 by the German Regulatory Agency can serve as one example (Box 4.10).

Box 4.10. **Infrastructure mapping**

In December 2012, a nationwide infrastructure atlas was put into operation by the German Regulatory Agency, the *Bundesnetzagentur*. The atlas contains spatial data information on existing infrastructure in Germany that can be shared in principle for the construction of broadband networks and to increase the transmission capacity of existing networks. Data on existing passive infrastructure are provided by infrastructure owners from different industries. These include companies in the energy and telecommunications sector, as well as relevant infrastructure in the public sector.

The purpose of the infrastructure atlas is to bring together stakeholders to arrange broadband expansion projects with infrastructure owners. It helps operators access information on the location of relevant infrastructure and obtain contact details for infrastructure owners. On this basis, the user can contact the infrastructure owner and negotiate joint use of the existing infrastructure. The Federal Network Agency has a legal basis for the acquisition of data for the infrastructure atlas, which has hitherto operated on a purely voluntary basis. However, most infrastructure owners have opted to participate voluntarily.

Source: Bundesnetzagentur (2013), "Infrastructure Mapping – The German Infrastructure Atlas", *www.cept.org/files/1051/Workshops/PT%20TRIS%20FTTH%20Workshop/7.%20Steffen%20Schmitt.pdf*.

Building a complete infrastructure atlas, including georeferenced information and procedural support, is challenging and takes substantial time and resources, not only for the administration, but also for operators and utilities involved in providing data. Some challenging issues in this area include: defining formats for the information to be sent by the different actors who own passive infrastructure, to ensure that the information can be aggregated in a meaningful way; ensuring that the information to be provided by different actors is up-to-date and verified; providing functionalities to allow for co-ordination among actors; restricting access to authorised agents,[4] and ensuring the provisions of geographical and technical data that can be useful for operators intending to use the passive infrastructure. A step-by-step process can be followed, starting with simple information and functionalities useful for encouraging infrastructure sharing, incrementally refining the functionality and data that is provided.

Network sharing and co-investment

Network sharing and co-investment strategies are increasingly used by operators to reduce investments and risks associated with network deployment. In the context of mobile services, these strategies have been applied for sharing sites for base stations, including ancillary services such as electricity, masts, antennas or even network elements (Box 4.11). In the context of fixed services, ducts and in-building wiring have also been shared among operators.

Network sharing and co-investment are especially relevant for alternative operators that cannot realistically undertake large-scale deployments in the access network on their own, or when the deployment of new networks or technologies requires substantial investments, which can be shared by several actors. Such agreements can be seen as an opportunity rather than a threat to competition. As noted in Chapter 5, network sharing can be a useful tool to enable governments to achieve the availability of network infrastructure in rural areas or elsewhere given particular circumstances (Box 4.12), and/or to promote an efficient use of infrastructure or investments.

Box 4.11. **Mobile network sharing**

Mobile network sharing is the generic term used to describe situations where mobile network operators (MNOs) share part of their networks. The term is generally used when larger parts of the network, such as antenna sites and backhaul, are shared, but it can also mean different things. Networks can share many different elements with different competitors, or purchase it from third parties as a service (outsourcing), which can have the same effect as sharing. Other than a spectrum license, which is assigned to a single party by governments, and an operator's brand identity, there is little in mobile network operations that cannot be shared. In general terms, four forms of network sharing may be noted:

Passive sharing, e.g. sharing of sites, masts and antennas

Site sharing. Finding good locations for antennas can be challenging, particularly in cities where there are few places to erect a high mast or where neighbouring buildings can create shadows on the signal. Planning procedures and site permits can create even more pressure to use the same locations. It is therefore common for antenna sites to be shared between multiple operators, because it may be easier to obtain a permit for an existing site. At the site, the antenna's base transceiver station (BTS),[1] which is at the bottom of the mast and controls the functioning of the antenna, backhaul equipment and other equipment, is still owned by the respective networks. Sites must often be rented from third parties, such as building owners or farmers.

Mast sharing. In the case of mast sharing, the mast, in addition to the site, is shared between the operators. Each network brings its own BTS, backhaul equipment and other equipment. This may require some co-ordination between the MNOs, for example to guarantee the structural integrity of the mast and the location on the mast. As the MNOs use different antennas, and each determines the direction of the antenna, their coverage can also be different. The same companies that offer site sharing as a service to MNOs also offer mast sharing to them.

Active sharing, e.g. radio access network (RAN) sharing

The radio access network consists of the site, mast, antenna, BTS and backhaul. The company managing the site will lease the whole package to an MNO and carry the data to the core network of the MNO. It can use the same radio equipment to broadcast and receive traffic from multiple spectrum license holders. The MNO, however, has less influence over the orientation of the antennas and therefore the coverage of the network. Where and how traffic is broken out to the core networks of the various spectrum license holders is dependent upon the local situation.

Core network sharing

Core mobile network systems are generally not shared between mobile operators. Examples of such systems are the network and switching subsystem (NSS), which carries out switching and mobility management; the High Speed Serial/Home Location Register (HSS/HLR) and systems for data communication (EPC) and for cost optimisation of traffic (UTRAN and GERAN). They are, however often managed or provided as services by third-party service providers, such as Ericsson, NSN, Alcatel-Lucent and Huawei. The ownership and management has therefore been outsourced.[2] Cloud- based solutions for core mobile network equipment, where multiple operators can share the same infrastructure, are currently being discussed and developed, but it is not clear how far these systems have made significant inroads into the market.[3]

Network roaming

Roaming is the term applied when a mobile customer of a network other than that of the owner of the spectrum license makes use of the mobile network. This can be a network from the same country or from another country. In practice, from a technical perspective, there is no fundamental difference between a terminal from the host network or from a visiting network.

1. BTS is also referred to as the radio base station (RBS), node B (in 3G Networks) or, simply, the base station (BS). For discussion of the LTE standard the abbreviation eNB for evolved node B is widely used.
2. The exact construction of the arrangements can resemble business process outsourcing, financial leases, ownership and sub-contracting.
3. SK Telecom, NSN successfully complete Evolved Packet Core virtualisation proof-of-concept, 25 November 2013, *http://fr.nsn.com/news-events/press-room/press-releases/sk-telecom-nsn-successfully-complete-evolved-packet-core-virtualization-proof-of-concept*.

Source: OECD (2014), "Wireless Market Structures and Network Sharing", *http://dx.doi.org/10.1787/5jxt46dzl9r2-en*.

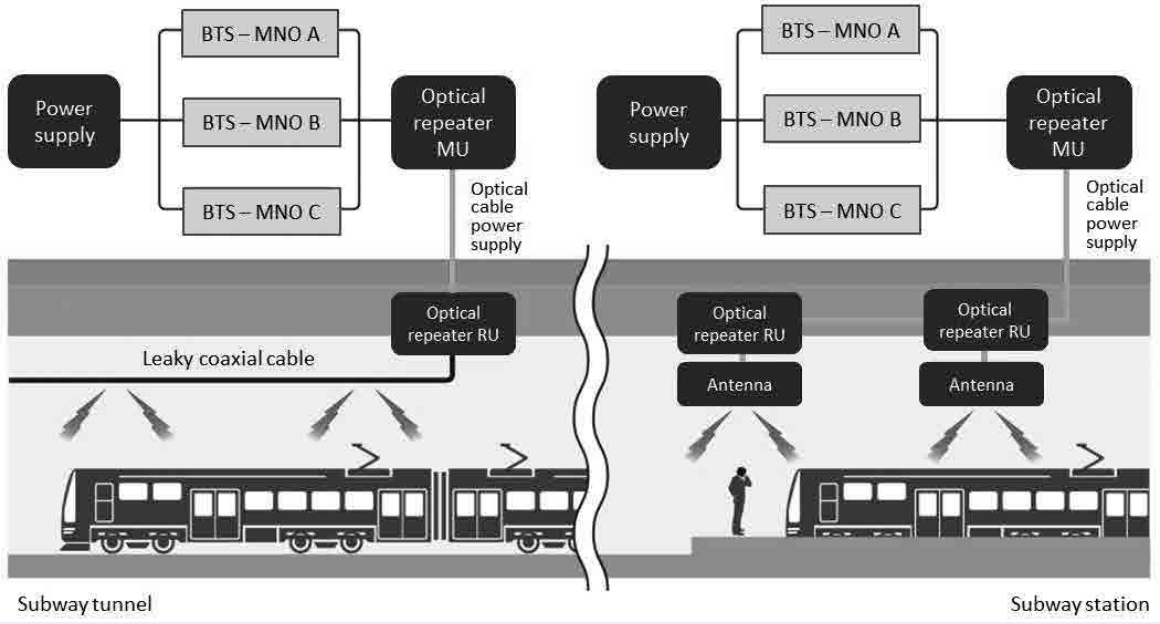
Box 4.12. **Network sharing examples**

Japan: Tunnel association

In a densely populated country, where infrastructure costs are lower relative to the expected returns, certain types of locations can still benefit from network sharing, including active components. In Japan, for example, tunnels are used to overcome obstacles such as mountainous terrain or terrain associated with urban areas and conurbations. Using tunnels can nevertheless present challenges for MNOs. They may, for example, have limited space for laying cables, and the cost of deploying infrastructure in a tunnel is of course not negligible.

In 1994, the Japan Mobile Communications Infrastructure Association (JMCIA), a public entity, was established to provide a solution for active network sharing in tunnels. Its membership includes all MNOs, major facility vendors and developers. It builds mobile infrastructure shared by those operators in railway, roads and subway tunnels, as well as underground shopping malls. The association provides transmission facilities from base transceiver stations (BTS) to antennas, including the power supply, whereas BTS are separately operated by the MNOs. In the fiscal year ending in March 2014, the association had completed deployments and made mobile broadband services available at 473 points in subway tunnels, covering all underground lines in Tokyo, including 211 points in road tunnels, 82 points in railway tunnels and 765 points in subway stations.

Figure 4.1. **Shared facility operated by JMCIA in the subway**



Notes: MU = master unit; RU = remote unit. BTS is operated by each MNO.

Source: JMCIA (2016), *Japan Mobile Communications Infrastructure Association Website*, *www.jmcia.or.jp/* (accessed on 23 February 2016).

From a policy perspective, it may be noted that the efforts of the association are similar to other successful examples of network sharing, as practised in Sweden. It aims to develop new infrastructure by co-ordination through a joint entity, mainly financed by the operators. Government policy also supports this process. In some cases, the government subsidises the development of shared facilities in less populated areas, although this is proportionally a very small part of the association's revenue (2.7% in FY2012). The association has also benefited from lower taxation requirements, as it is an authorised public interest entity.

Network sharing in the United Kingdom

The experience of the United Kingdom illustrates how network sharing can evolve and how different forms of sharing can coexist. Site sharing, for example, has been practised in the United Kingdom since the first mobile networks were launched in the 1980s. Coverage was seen as a competitive differentiator, so MNOs

Box 4.12. **Network sharing examples** *(Cont.)*

were reluctant to make their sites, seen as strategic assets, available to competitors. However, in some cases, sites were shared on a reciprocal basis: that is, each operator provided access to sharing a small number of its sites, in return for access to the same number of their competitors' sites.

As the third and fourth MNOs rolled out their networks in the United Kingdom, few sites were made available to them for sharing: the incumbents considered their coverage advantage to have too great a strategic value. However, as all of the networks matured, reciprocal arrangements became common across all MNOs. Prior to the award of 3G licenses in the United Kingdom, the regulator secured a voluntary undertaking to provide national roaming to support the entry of a fifth MNO, and in 2003, Hutchison 3G UK ("Three") launched its 3G service, with its own network in urban areas underpinned by national roaming on Orange's 2G network. This national roaming arrangement has subsequently been renegotiated, but remains in place today.

In 2007, Three and T-Mobile announced plans for "3G RAN" through a joint venture, Mobile Broadband Network Limited (MBNL). In the same year, Vodafone and Orange announced plans to RAN share both 2G and 3G. Although Vodafone and Orange did not complete their agreement, together with the MBNL RAN sharing, it did mark heightened interest among the MNOs for greater network sharing.

There are now two mobile network sharing arrangements in the UK: Cornerstone, covering arrangements between Vodafone and Telefonica-O2 ("O2"), and MBNL, covering arrangements between Everything Everywhere ("EE") and Hutchison 3G-UK ("Three").

The Cornerstone arrangement is comprised of two main elements:

- radio access network (RAN) sharing: sharing of active network components to establish a single RAN
- passive sharing: consolidation of the two operators' existing sites and passive infrastructure into a joint venture company.

The active sharing element of Cornerstone was announced in July 2012, and represents an evolution of the two parties' previous passive sharing arrangements. Under Cornerstone, the United Kingdom is divided into two geographic zones outside London (east and west) and separate treatment of north and south London. Within each territory, one operator is the "host", owning and operating the single RAN that is used by both companies. The parties co-operate in each territory under the terms of a managed network services agreement. London is treated as a special case to be split only for 4G. The arrangements also establish a joint transmission network, consolidating traffic over a reduced number of sites to achieve economies of scale in backhaul capacity.

Passive assets (existing sites and passive infrastructure) are consolidated into a joint venture company that owns and manages all of the sites of both operators, nationally and in accordance with the single grid of base stations across the United Kingdom, to serve the combined needs of both operators as efficiently as possible. This was essentially the extension of the existing Cornerstone agreement.

MBNL (EE/Three) was initially set up as a joint venture between T-Mobile and Three in October 2007. MBNL was responsible for consolidating two separate 3G RANs of T-Mobile and Three to deliver, and consequently manage, a combined 3G network for both operators. After the merger to form EE, the merged company replaced T-Mobile in the MBNL joint venture and MBNL's role extended to consolidating Orange's 3G cells in the combined 3G RAN.

In contrast to the sharing agreement between O2 and Vodafone, Three and EE share nationally passive infrastructure, active 3G base station equipment ("NodeBs"), backhaul transmission and Radio Network Controllers (RNCs). Similarly, however, to Project Beacon, Three and EE maintain separate backbone and Core Network infrastructures, while each operator uses its own spectrum allocation. EE and Three have subsequently updated their arrangements for 4G to share sites, masts and backhaul transmission, but the two companies will not share active 4G equipment. The two operators will maintain their separate Core Networks.

Source: OECD (2014), "Wireless Market Structures and Network Sharing", *http://dx.doi.org/10.1787/5jxt46dzl9r2-en*.

Box 4.12. **Network sharing examples** *(Cont.)*

Network sharing 4G network in Colombia

In 2013, the ICT Ministry issued Resolution 449, which established the conditions and requirements for the allocations of the 4G spectrum (AWS and 2.5 GHz) for mobile broadband services. This resolution set some network-sharing obligations for incumbents (i.e. national roaming and passive sharing according to the general regulatory framework) and also encourages network sharing, by allowing the passive and active sharing of network to fulfil coverage obligations, understanding it as a way to promote the efficient use of resources and infrastructure.

In that context, after the spectrum was finally allocated, Tigo and Movistar set a network active sharing agreement for the deployment of the 4G network to provide broadband services in Colombia. The agreement was reviewed by the national competition authority, the *Superintendencia de Industria y Comercio* (SIC). In its ruling, SIC understood this operation as a collaboration agreement between competitors that have more precompetitive effects than risks for the competitive conditions of the national market or for collusion among the parties.

Because of the network sharing agreement, both Tigo and Movistar launched 4G services in December 2013, only four months after the spectrum allocation, and announced a reduction of at least six months of estimated time for regular network deployment.

Source: MinTIC (2013), Resolution 449 2013, www.mintic.gov.co/portal/604/w3-article-3799.html.

Although co-investment agreements and network sharing can in general be encouraged, especially when no financial case can be made for the deployment of several competing infrastructures, such agreements should be monitored. In certain cases, the conclusion of these agreements may facilitate behaviour that might lower the level of competition with respect to fully independent partners (e.g. with parallel networks). In general, agreements for sharing passive infrastructure are less prone to raise concerns about competition and leave room for differentiation among operators sharing ducts or base station sites. One issue worth monitoring is the risk of foreclosure by some operators to others, if they are not allowed to enter into sharing/co-investment agreements. Competition authorities and communications authorities should monitor and take action if any sharing/co-investment agreement risks abuse of market power positions or reduces competition.

Market analysis and dominance

Regulatory decisions to require access to essential facilities, price regulation and other associated measures are usually based on a market analysis carried out periodically under a pre-defined methodology set in the regulatory framework and publicly available to facilitate regulatory certainty (Box 4.13). The aim of this market analysis is to identify situations of "dominance" or "significant market power". Several varying definitions of "dominance" are applied in competition law and *ex ante* regulation in different countries. All in some way apply the concept of market power enough to act like a monopoly in terms of the ability to raise prices and/or reduce quality, in order to increase profit independent of other firms in the market or consumer pressure. As addressed below, dominance is not simply an issue in relation to market shares, although high market shares usually point to dominance. Other relevant factors focusing on barriers to entry, market performance or economies of scale should also be considered when assessing dominance.

When no dominance is demonstrated, and the market is deemed to be competitive, there is no need to regulate access to essential facilities for alternative operators. If dominance is

found, regulatory measures must usually be taken to ensure competition. A careful analysis should be conducted before setting regulatory measures aimed to solve dominance issues. Regulatory obligations should be proportionate, oriented to solve the key aspects leading to dominance, and imposed only on the operators in a dominant position (also known as "asymmetric" regulation, in contrast to "symmetric" regulation, which is applied to all operators in the sector).

Box 4.13. **References for market analysis procedures**

OECD Competition Toolkit

OECD's Competition Assessment Toolkit helps governments to eliminate barriers to competition by providing a method for identifying unnecessary restraints on market activities and developing alternative, less restrictive measures that still achieve government policy objectives. One of the main elements of the Toolkit is a Competition Checklist, which asks a series of simple questions to screen for laws and regulations that have the potential to unnecessarily restrain competition.

Source: OECD (2011a), *Competition Assessment Toolkit*, *www.oecd.org/competition/assessment-toolkit.htm*.

European Union

Market-analysis methodology aimed to identify dominance situations (known as "significant market power", or SMP in the European regulation) is enshrined in the European regulatory framework and has been extensively applied in all member countries in the European Union. Communications regulatory authorities in the area are required to observe the "Guidelines on market analysis and assessment of significant market power" (European Commission, 2002). The European Commission also defines the set of relevant markets that are required to be analysed every three years by all regulatory authorities in the European Union. It list of relevant markets has been reduced over time, and the recommendation in force, enacted on October 2014 just five relevant markets, all at the wholesale level, emphasising regulation for wholesale access to solve competition problems at the retail level (European Commission, 2014).

Additionally, the Body of European Regulators for Electronic Communications (BEREC, 2014a) has also published a significant number of reports focused on the application of the market analysis procedures. One of them is focused on practical implementation of geographical segmentation in market analysis. This can be very useful in countries where conditions of dominance in different geographical areas (for example, rural and urban areas) vary widely.

Sources: European Commission (2002), *Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services – 2002/C 165/03*, *http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52002XC0711(02)*; European Commission (2014), *Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation – 2014/710/EU*, *http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014H0710*; BEREC (2014a), *BEREC Common Position on Geographic Aspects of Market Analysis (Definition and Remedies)*, *http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/common_approaches_positions/4439-berec-common-position-on-geographic-aspects-of-market-analysis-definition-and-remedies;* ERG (2006), *Revised ERG Common Position on the Approach to Appropriate Remedies in the ECNS Regulatory Framework*, *http://pfs.is/upload/files/erg_06_33_remedies_common_position_june_06.pdf*.

Market analysis in LAC area

The OECD published a report in 2015 on competition and market studies in Latin America (OECD, 2015) detailing practices on market analysis applied by communications regulators in Chile, Colombia, Costa Rica, Mexico, Panama and Peru.

Source: OECD (2015), *Competition and market studies in Latin America 2015: The case of Chile, Colombia, Costa Rica, Mexico, Panama and Peru*, *www.oecd.org/competition/competition-and-market-studies-in-latin-america-2015.htm*.

As defined by the ITU, essential facilities in telecommunication network markets may include public rights of way, support structures such as poles and conduits, local loops, telephone numbers and frequency spectrum (infoDev, 2000). New entrants typically require access to these facilities for competition to be feasible. Duplication of these facilities may be either technically difficult, or more often, economically inefficient. Control of essential facilities can give an incumbent numerous advantages over new entrants. For example, an incumbent can use its control over essential facilities to increase competitors' costs or to discriminate them by providing inferior quality to these essential facilities, making the competitors' services less attractive to end-customers. As a response to this competition issue, the essential facilities doctrine (EFD) predicts that the owner of an essential or bottleneck facility should be mandated to provide access to that facility at a reasonable price.

The market analysis process is typically divided as follows:

- **Market definition**. Definition of the set of products to be included in the market, as well as the geographical scope. It is based on substitutability among different products (for example cable and fibre broadband services are typically included in the same market) as well as on homogenous conditions for competition in a geographical area (for example, very different competitive situations may be found in rural and urban areas).
- **Dominance analysis**. Based on different aspects such as market shares, control of essential facilities that are difficult to replicate, financial resources, economies of scale and scope, barriers to entry, potential entry, ability to influence prices and so on.
- **Analysis of potential competition problems**. These are derived mainly from two situations – vertical leveraging (this applies where a dominant firm seeks to extend its market power from a wholesale market to a vertically related wholesale or retail market, applying tactics such as bundling or cross-subsidies) and horizontal leveraging (this applies where a dominant operator seeks to extend its market power to another market that is not vertically related). Competition problems associated with vertical leveraging are usually related mainly to a refusal to make deals or deny access, discriminatory use or withholding of information, delaying tactics, bundling/tying, quality and price discrimination, and application of excessive or predatory prices for certain services.
- **Imposition of obligations**. When dominance is found, one or more obligations are imposed on the dominant operator/s focusing on areas, which create dominance in the market.

Specific good practices in this area should include:

- Making the market analysis methodology to be applied **transparent**, as well as the rules for imposing obligations and including them specifically in the regulatory framework. This will allow for regulatory certainty (to encourage investment), as well as to support regulatory obligations if challenged in courts by operators.
- As technology and competition trends evolve, market analysis for each market should be **reviewed periodically** (ideally, the period between market reviews should be specified in the regulatory framework) and obligations for operators must be lifted if no dominance is found in the new analysis, or maintained or adapted if needed. In general, market reviews should be carried out about every three years, depending on the pace of evolution in the corresponding markets and the resources available in the communications authority. It is also important to take into consideration that market analysis must be prospective, in the sense that the most relevant concern is the future, and what is likely to evolve while the regulatory measures will be in place.

- **Experts** with knowledge of competition law, economics and telecommunication markets are needed to carry out market analysis. Additionally, **data collection** is crucial (the authority to request nonpublic information from operators is necessary, and procedures must be implemented to keep confidentiality) and data processing and analysis if needed. This implies that, as indicated in Chapter 2, the communications authority must ensure that experts and resources are available to carry out periodic market analysis.
- Declarations of dominant positions should be based on a set of **parameters** that take into account the structure of the market. In some countries in the LAC region, a reliance on data from market shares may result in an oversimplified analysis. This can lead to false positives when relatively high market shares are not based on advantages derived from a dominant position, or false negatives that inhibit the regulatory measures needed to encourage competition.
- **Emerging services** should not, in general, be subjected to regulatory obligations, and any dominance analysis should be undertaken once the market becomes sufficiently stable.
- **Geographical segmentation** of markets can also be used to analyse whether competition exists in a market, if it is deemed that the competitive situation differs significantly in different geographical areas. In some cases, urban areas enjoy a competitive situation, where several operators use their own infrastructure, and none exhibit a dominant position. Rural areas, by contrast, may have a single operator with a clearly dominant position, which may require regulatory remedies. If this is the case, market analysis can be segmented geographically, adapting obligations according to each situation. When such differences exist, relevant geographical data is needed to make the best decisions. As for other regulatory measures, a cost-benefit analysis should be conducted to ensure that the outcomes adequately address the problem identified.
- Preliminary market analysis must be subject to **public consultations**, providing an adequate period and procedures for stakeholders' feedback. This will allow for the correction of errors, resolution of misunderstandings and in general, increasing the robustness of the market analysis. Additionally, many of the issues that may be challenged in the courts can be anticipated and addressed in advance. Once the public consultation is finalised, it is also good practice to include responses to comments in the final market analysis.

With one or several operators in a dominant position, competition problems may arise, hindering or even deterring competition from alternative operators. One potential problem is vertical leveraging, where the dominant operator uses its market power at the wholesale level to leverage its position at the retail level. This is the case of dominant operators with exclusive access to a network where no other infrastructures are available. Horizontal leveraging may also occur. For example, a dominant position in one service (telephony) can be used to extend dominance to other services (broadband access), via bundling or cross-subsidies. Direct entry deterrence may also take place when access to essential facilities for alternative operators is simply refused. Moreover, in general, other problems typical of monopolistic situations such as exploitative behaviour or allocative inefficiencies may also result.

When **facing dominance situations**, Communication Authorities must impose regulatory obligations aimed to solve the specific competition problem that are consistent with the

objectives set out in the regulatory framework. Good practices for regulatory obligations include the following:

- The set of potential obligations for dominant operators should be listed in the **regulatory framework**, to provide stakeholders (and dominant and alternative operators in particular) regulatory certainty.
- When selecting the most appropriate and effective remedies, the communications authority must select the **least burdensome and simplest to apply**, to avoid imposing high costs that could reduce consumer satisfaction, reduce incentives for investments, and make regulatory monitoring and enforcement more complex and uncertain.
- A careful analysis should be undertaken of the implications of the obligations for **static efficiency** (in general related to short-term reduction of prices for final services) and **dynamic efficiency** (related in general with incentives for investment, innovation and long-term sustainability). Static efficiency in the short term must not compromise medium- and long-term efficiency.
- Any regulatory measure must be imposed with the aim of **developing sustainable, long-term competition** with minimal regulation in future. One of the objectives of regulatory authorities is to avoid the need to regulate in the long term, by developing sustainable competition (usually infrastructure-based competition, but not necessarily always if there are enough incentives for infrastructure sharing among actors). This does not mean that complete infrastructure-based competition must be the only focus in the short term. Service-based competition based on use of incumbents' essential facilities by alternative operators (for example, local loop unbundling) may be a way to facilitate infrastructure-based competition in the long term. Alternative operators may then invest using revenues from service-based competition, to reduce their reliance on competitors' infrastructure.
- Encouraging competition at the retail level usually means that regulatory action should be taken at the **wholesale level**, avoiding retail price regulation that may protect consumers, but in general does not encourage competition. This means that communication authorities must look for competition problems at the retail level and impose regulation, if needed, at the wholesale level. If competition problems are found at the retail level, regulatory measures should be in general aimed to ensure access for alternative operators to wholesale inputs, in order to allow them to replicate incumbent's retail offers and compete in price and quality at the retail level, using not only wholesale inputs from the incumbents, but also their own infrastructure.
- The imposition of burdensome obligations on dominant operators or any real pro-competitive regulatory asymmetric measure may be challenged in courts, implying that the regulatory framework must clearly provide **adequate powers** for the imposition of regulatory obligations.

Regulation at the retail level

Regulatory measures at the retail level are aimed at imposing specific obligations on maximum prices (cap prices), approval of tariffs or restricting any behaviour from the dominant operator to encourage competition. As noted, the main regulatory tools to solve dominance problems are in the scope of wholesale services, but it is worth analysing some of the regulatory tools used in the region, as well as in OECD countries in other regions.

Price-cap regulation is in general applied to avoid high charges for customers when the market is not disciplined by competition. It has been applied (and it is still applied in

some countries in the LAC region) for fixed and mobile services. Price-cap regulation is also applied in certain cases in the context of extending broadband services (see Chapter 5) to encourage broadband use by communities with low incomes (see Chapter 6, on affordability, government charges and digital inclusion).

Price approval requirements by the Communications Authority are also applied in a small number of countries in the LAC region. In general, this model is cumbersome for both the operators (who have to wait for regulators' approval before launching a new service) and for the regulator, which must ensure a prompt response and devote resources to this offers analysis.

One context remains in which price approval requirements are a useful tool, and where they are applied in many OECD countries, is for **margin squeeze tests**. In national markets where competition from alternative operators is based on the use of wholesale inputs provided by the dominant operator, there is a risk of anti-competitive practices based on margin squeeze for alternative operators. The dominant operator may make offers that cannot be reproduced by alternative operators, using wholesale inputs at regulated prices to reduce the number of competitors in the long term. When there is a risk of margin squeeze for alternative operators, dominant operators are requested to send their planned offers for approval before making them public (typically one or two months before, to allow for analysis by the communications authority). The communications authority performs a "margin squeeze test" to check replicability by alternative operators using regulated wholesale inputs and applying a publicly available methodology. If the offer is not replicable, the dominant operator is allowed to launch the new retail offer only if it reduces the price of the wholesale inputs. Otherwise, the offer cannot be launched.

The application of margin squeeze tests is a good practice to be considered in dynamic markets with alternative operators intensively using wholesale inputs. However, its effective application demands considerable resources, and sometimes it is complex to forbid the application of low price offers by the dominant operator, which, although they may harm competition in the long term, are viewed as attractive by some consumers in the short term.

Margin squeeze tests are particularly helpful in addressing competition problems arising from the bundling of telecommunication services if a dominant position exists, since they can provide a given element for the services of others. Here, alternative operators need to be able to compete by offering their own bundles, using their own infrastructure combined with regulated inputs from the dominant provider. This is different from predatory pricing (selling below cost), which is forbidden by competition law in most countries. In applying margin squeeze tests, it is especially important to adequately select suitable cost-accounting models, as well as to get relevant and updated data on operators' actual costs.

For example, in 2013, the European Commission adopted Recommendation 2013/466/EU on consistent non-discrimination obligations and costing methodologies, to promote competition and enhance the broadband investment environment. This requires that European Communication Authorities impose obligations to ensure the economic replicability of retail offers of operators with significant market power (SMP), thus preventing them from engaging in margin squeeze practices. Based on the experience of communications authorities, the Board of European Regulators for Electronic Communications Services (BEREC) has developed a guidance document to provide information on how to conduct the economic replicability test and more generally *ex ante* margin squeeze tests in practice (BEREC, 2014b).

Retail price regulation in the context of mobile services is seldom used. Ensuring that there are enough competitors using their own infrastructure (e.g. typically three to five MNOs in countries with thriving competition) and MVNOs adding competitive pressure is usually enough to allow the market to compete in prices and quality of service. Still, in some countries, **on-net/off-net retail price differentiation** applied by operators with a high market share may present challenges. This differentiation is applied with the aim of retaining market share, discouraging consumers from switching to a new entrant with low market share, when new entrants face high costs for termination in the network from operators with high market share. As a consequence, on-net/off-net differentiation may harm competition.

On-net/off-net differentiation competition problems may be addressed at the wholesale level by setting cost-oriented low termination prices, making differentiation less profitable and allowing new entrants to set low prices for both on-net and off-net calls. Where the differences between retail prices for on-net and off-net calls by operators with high market share is high and restricts competition from new entrants, regulatory action to forbid this practice can be considered.

Regulation at the wholesale level

In the OECD area, wholesale regulation for essential facilities has been extensively used, and many countries are still applying regulatory measures, following the model of the ladder of investment (Box 4.14). Tools include using local loop unbundling and bitstream access, and even extending it to fibre unbundling. Other countries have lifted wholesale regulation, relying more on infrastructure competition. For those applying such regulations, a wide range of wholesale access products can be provided by dominant operators.

Many LAC countries show a clear need to encourage competition in the broadband market, so that consumers can benefit from lower prices and more investment. Wholesale regulation has been applied in some countries, but it has not always been effective, due to high wholesale prices, lack of technical detail on products offered, or active intervention by dominant operators to render it ineffective.

According to the ladder of investment model, **wholesale access products** that are usually regulated include the following steps:

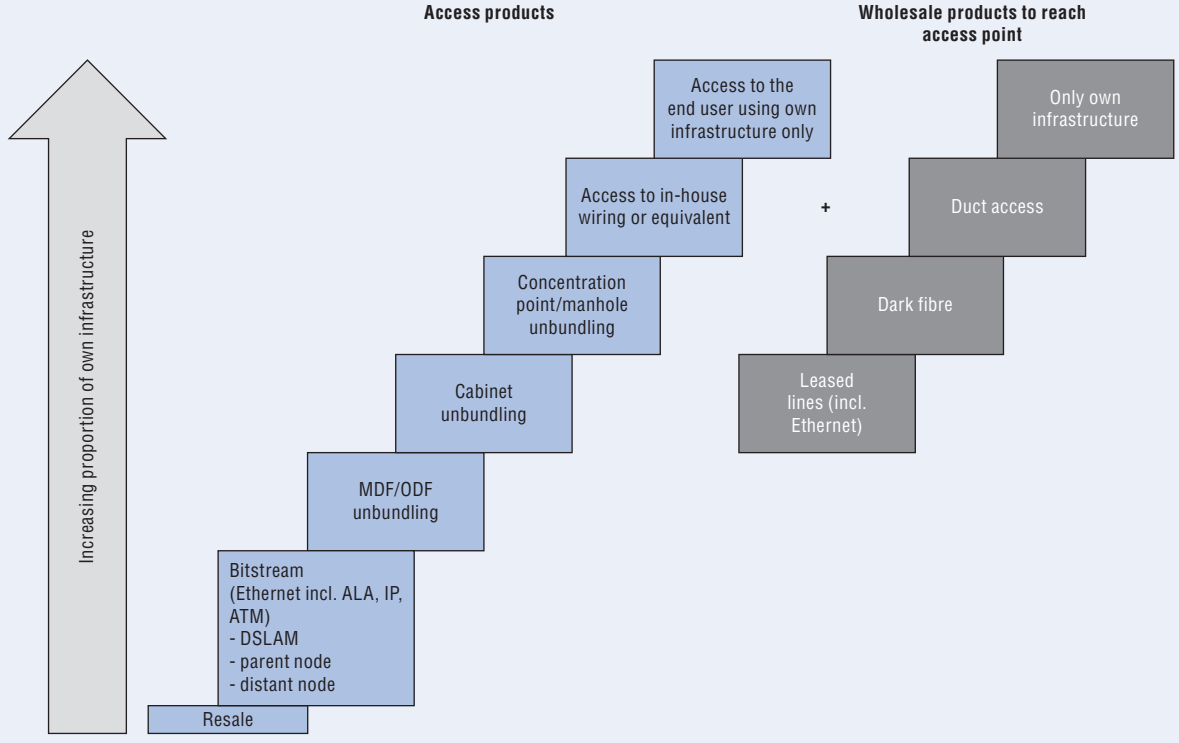
- **Resale** is the simplest way to start competition. Reselling is based on commercialisation of complete services provided and operated by the dominant operators. This does not involve any network investment, or any differentiation by new entrants, except in prices dependent on commercial agreements (if prices are not regulated) or prices defined by the regulator. As resale has a limited effect on competition and leaves no room for differentiation, wholesale regulation is not usually applied, except in certain cases forbidding non-reselling clauses set by operators.
- **Bitstream** consists of providing broadband access for alternative operators using the access infrastructure of the dominant operator, as well as part of the IP network, delivering the bitstream signal for the alternative operators at central and/or regional points. Depending on the characteristics of the bitstream services considered in the regulation, the alternative operator may have more or less room to differentiate, but any retail service offered must be based on what the dominant operator provides. The use of bitstream wholesale access implies some network deployment by the alternative operators, since they must reach the IP connection points of the dominant operators, as well as connect with the Internet. In general, it is not as effective for competition as other wholesale inputs, such as copper

loop and fibre access unbundling in urban areas where access unbundling is economically feasible for new entrants. However, bitstream can be important for competition in countries where it is applied in rural and suburban areas. These areas have low economies of density (the investment for reaching a switch is too high for a small number of customers). In such cases, which typically have only one copper access network and often no cable operators, this is the only way to enable competition. Using bitstream access in these areas does also allow alternative operators to complete their coverage and provide services in a wide area or the whole country.

Box 4.14. **The ladder of investment model**

The ladder of infrastructure investment model assumes that investments are made in a step-by-step manner by new entrants. The model's premise is that in order to allow new entrants to gradually (incrementally) invest in their own infrastructure, they need a chain of (complementary) access products to acquire a customer base, by offering their own services to end users based on (mandated) wholesale access. In those instances where duplication of access is not considered feasible, promoting service competition is an important goal for the regulator, because service and infrastructure competition are not in opposition. They are linked through the ladder of investment, allowing competitors, through a sequence of regulated access products, to invest incrementally in their own infrastructure. Once they have reached a critical mass, they will deploy their own infrastructure, making them less dependent on the incumbent's infrastructure. This involves migration from one access product to another (moving to the next rung), as the entrant progresses through several stages of competition in ascending a "ladder" of infrastructure investment (Figure 4.2).

Figure 4.2. **The ladder of investment**



Source: ERG (2009), *Report on Next Generation Access – Economic Analysis and Regulatory Principles*, *http://berec.europa.eu/doc/publications/erg_09_17_nga_economic_analysis_regulatory_principles_report_090603_v1.pdf*.

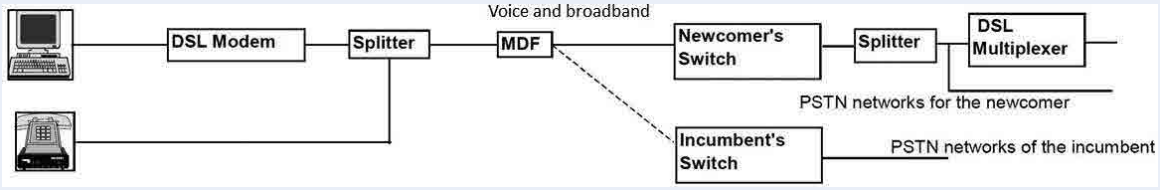
- **Local loop unbundling (LLU)** allows an alternative operator to rent the copper access loop connecting the access switch and the customer's premises. Local loop unbundling may be full (comprising all services) or shared (where the alternative operator uses part of the frequencies for a set of services and the dominant operator uses the access loop for other services). Contrary to bitstream access, alternative operators must deploy their own network infrastructure for each access switch where local loops are rented, implying more infrastructure deployment and investment, but also more room for differentiated services. Competition based on LLU has been extensively applied in many OECD countries, such as all those in Europe and to a greater or lesser extent in the Asia-Pacific and North American regions. It has been less used or superseded in countries where there is judged to be sufficient infrastructure competition (e.g. Korea where high population densities and apartment living enable multiple players to provide fibre to the basement of these buildings). On the other hand, it has proven very successful in countries such as France and the United Kingdom enabling these countries to lift their penetration rates through the additional competition it enables. LLU use is economically feasible in areas where there are a large number of local loops connected to a switch, as investment is required to reach the switch and equipment to collect traffic must be co-located in the dominant operator's premises. In the context of broadband services, LLU can be effective in increasing competition in the range of speeds provided by xDSL. This does, however, depend on the length of copper loops, as speed and QoS degrades with distance covered. Further details are shown in Box 4.15.
- **Fibre unbundling** is the evolution of LLU applied in the context of next-generation networks based on fibre access. In this case, the dominant operator must provide wholesale access to the fibre access that connects the customer with the access switch. Fibre unbundling is not technically feasible under some specific network architectures, and an alternative wholesale product, Virtual Unbundled Local Access (VULA) is considered by regulators in this case to facilitate access for alternative operators. Although fibre unbundling is regulated in many European countries, it is still in its early stages of implementation.
- **Leased lines, Ethernet services and high speed bitstream services**. These wholesale products are designed to increase competition in the business market segment. These customers require high speeds, a high quality of service (including guaranteed speed), as well as connections in several different premises, not all located in urban areas, but also in foreign countries. In some cases, the market for business services is highly concentrated and a single operator accounts for a large market share. This usually entails high prices for business services, which in turn significantly increases costs for business operations, especially those involved in the digital economy, discouraging growth. When dominance is detected and barriers to competition are high, establishing obligations to provide wholesale access for leased lines and high-speed IP services (for example, Ethernet services that are increasingly used as a substitute for leased lines) may be advisable. This can allow alternative operators to complement their own infrastructure (typically based on fibre access intended to provide high speed/high quality IP services for the business segment) in areas where the only available infrastructure is deployed by the dominant operator.
- **Dark fibre wholesale access** is typically provided not only by dominant operators, but by other actors. These may include utilities (electricity, water or gas providers), as well as transport providers, for example railway operators using their own passive infrastructure to deploy fibre for their own use. For this reason, dark fibre access is not generally regulated, as many different actors may compete to provide these services.

Box 4.15. **Local loop unbundling models**

Full unbundling

Full unbundling (sometimes referred to as access to raw copper) occurs when the copper pairs connecting a subscriber to the main distribution frame (MDF) are leased by a new entrant from the incumbent (Figure 4.3). The new entrant takes total control of the copper pairs and can provide subscribers with all services, including voice. The new entrant can also enhance the copper pairs by adding asymmetric digital subscriber line (ADSL) technology. The incumbent still maintains ownership of the unbundled loop and is responsible for maintaining it.

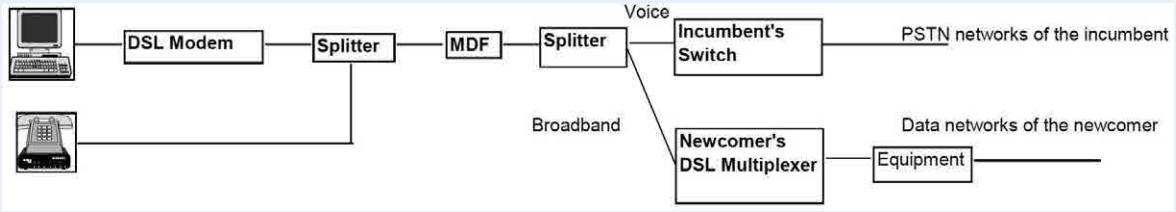
Figure 4.3. **Full unbundling scheme**



Line sharing (shared access)

Line sharing allows the incumbent to maintain control of the copper pair and continue providing some services to a subscriber, while allowing an access seeker to lease part of the copper pair spectrum and provide services to the same subscriber (Figure 4.4). Line sharing allows the incumbent to continue to provide telephone service while the competitor provides broadband (xDSL) services on the same copper pair. With line sharing, the competing supplier uses the non-voice frequency of the loop. Consumers can obtain broadband service from the most competitive provider without installing a second line.

Figure 4.4. **Line sharing scheme**



Sub-loop unbundling

Sub-loop unbundling is a much more far-reaching and complicated regulatory measure than LLU. It makes it possible to gain access to the incumbent's network on an unbundled basis closer to the customer than at the MDF, that is, at a point between the customer's location and the incumbent's site. For example, this arrangement can be used to supply very high bandwidth services that can only be transmitted at a short distance on copper pairs.

Source: OECD (2003), "Developments in Local Loop Unbundling", *http://dx.doi.org/10.1787/233065827862*.

- **Passive infrastructure access**. As noted in the section on rights of way, passive infrastructure, and especially ducts, is the least replicable infrastructure asset owned by dominant operators. Even when rights of way are well managed by public administrations, deploying ducts is expensive and slow. Any operator that has to deploy its own ducts would necessarily take a long time to start competing with dominant operators, and deploying access networks with a national footprint would take decades, as was the case for the PSTN. As a result, facilitating access to the dominant operator's passive infrastructure is fundamental to enable competition

with a lower level of investment and less time for deployment. Passive infrastructure sharing allows also for complete differentiation in terms of services provided, as each operator deploys its own network, increasing room for competition. Passive infrastructure wholesale access obligations are usually structured around a reference offer to be prepared by the dominant operator, under the monitoring of the regulatory authority. This should include prices for the different assets to be shared, procedures for service, maintenance, incident management, as well as address compromises on times and the penalties to be paid if conditions for providing the service are not met. Key factors for success involve guaranteeing that alternative operators know the georeferenced location and capacity of passive infrastructure assets, and ensuring non-discrimination compared to self-supply by the dominant operators and capacity management for existing ducts. This usually implies the implementation of a passive infrastructure database accessible online by alternative operators.

- **Access to submarine cables**. The market for submarine trunk connection is in general limited to a few operators. Entry barriers are high for new entrants, and in many cases, infrastructure competition based on competing submarine cables covering similar routes is not sustainable. In cases where no alternative infrastructure exists (as in the case for islands with a single submarine cable, or continental areas with no fixed backbone alternative infrastructure), cable operators are not only in a dominant position, but also act as a monopoly. This can lead to high wholesale prices or even refusal to provide wholesale services, also raising retail prices for broadband. In such cases, regulation is needed to enforce access to alternative operators at regulated prices (usually cost-based), and a reference offer must be prepared by the dominant operator.

Each of the wholesale products described in the previous subsection cover different needs and have different impacts on competition. In general, they can be combined, provided that prices are set according to product's characteristics (for example, local loop unbundling should be less expensive than bitstream access, as it involves fewer resources from the dominant operator and more investment by the alternative operator). In many OECD countries and some of those in the LAC region, most or all of them are laid out in national regulation:

- **Bitstream access** is used to rapidly spark competition with a low level of investment by alternative operators. Typically, many alternative operators begin by using bitstream access, and evolve toward local loop unbundling, which offers more room for differentiation in areas where local loop unbundling is economically sustainable. Bitstream access is helpful for encouraging competition in rural areas where local loop unbundling may not be profitable for alternative operators.
- **LLU** is one of the most useful regulatory tools for encouraging competition in urban areas. Where there are dominant operators, it can offer fixed broadband access from alternative operators without their own access infrastructure. Although LLU is difficult to implement, it can help cultivate competition and allow alternative operators to develop networks. This can increase competitive pressure in markets where the dominant operator enjoys a large market share and prices are high, as in Mexico. The *Instituto Federal de Telecomunicaciones* (IFT), the Mexican regulator, introduced this obligation, together with resale and bitstream access, in 2015 (Box 4.16).
- **Passive infrastructure access** and especially duct access encourages infrastructure-based competition so that the competing operators can deploy their own active network infrastructure. This encourages complete differentiation and innovative services based on different network technologies. Duct access is useful not only to boost competition for fixed broadband access, but also to encourage competition in mobile broadband. The

increased penetration and use of mobile broadband has increased the traffic handled by base stations. When mobile operators can access existing ducts, they rent them out to connect base stations to their core networks deploying their own fibres. Additionally, mandating duct sharing for the dominant operator may reduce the need for civil works and digging, reducing any inconvenience to the public at large. In general, imposing obligations for duct access encourages infrastructure-based competition, reducing the need for investment while preserving incentives for innovation.

Box 4.16. **Local loop unbundling in Mexico**

In December 2015, Mexico's national regulatory authority for telecommunications, *Instituto Federal de Telecomunicaciones* (IFT) approved a reference offer on local loop unbundling for the access network of Telmex. The dominant telecommunication operator in Mexico, Telmex has a market share of more than 50%. This regulatory measure was one of the obligations imposed on Telmex as a result of its preponderant position in the services sector, as determined by the IFT in 2014.

The primary purpose of this regulation is to allow competitors to access Telmex's network on a non-discriminatory basis, in order to replicate the retail services it provides. By lowering entry costs for competitors, this measure is expected to promote innovation, new services and to lower prices for consumers. The local loop unbundling reference offer includes wholesale line rental (voice and Internet) and bitstream access services (at a local, regional and national level) as well as full and shared local loop unbundling.

The IFT also determined the rates that allow competitors to supply competitive services, while allowing Telmex to cover its incurred costs. Rates are based on cost models using the "retail-minus" methodology for resale and bitstream access, and the long-run incremental cost (LRIC) methodology for local loop unbundling and co-location. IFT authorised discounts on the retail prices of Telmex as follows: 28.9% for voice line resale, 24.5% for internet resale and 54.9% for bitstream access. Fees authorised by IFT for the local loop unbundling services are 89.1% lower than the services retail prices of Telmex for the full unbundling services, and 98% lower in the case of shared-access services. Local loop unbundling in Mexico enforces Telmex to make available information about its infrastructure to competitors, especially related to the local loop. Resale and bitstream services are available at a national level, while local loop unbundling services are feasible at Telmex exchanges with at least 5 000 lines in the 24 largest cities of Mexico.

Local loop unbundling in Mexico is technically feasible only for the legacy network of Telmex. Given that the operator's fibre-optic network is based on Gigabit-capable passive optical network (GPON) technology, physical unbundling is not feasible. Thus, its access is available only through bitstream access and is limited to Telmex profiles offered to its end users. The reference offer for local loop unbundling (OREDA) is applicable until 31 December 2016, and Telmex is required to submit a new reference offer to IFT by 30 June 2016 at the latest.

Source: IFT (2015), *OREDA: Oferta de Referencia para-la Desagregación del Bucle Local*, *www.ift.org.mx/sites/default/files/oreda_telmex.pdf*.

- Wholesale access obligations for **submarine cables** are generally needed if no other alternatives exist for operators to cover the route. This can help avoid high prices and/or refusal of access that would reduce competition and increase prices at the retail level. However, while wholesale access obligations are important when no alternatives exist, encouraging (and in some cases funding) alternative infrastructure (other submarine cables, or when possible, fixed backbones) can let competition develop in the long term.

- **Leased lines and high-quality IP wholesale** products are intended to help encourage competition for business services. They should be considered when a dominant position for these services has been established. Products, configuration and competition dynamics for the business services markets are usually very different from those for mass markets, and demand specific analysis. In any case, high prices and/or low quality for business products influence productivity and competitiveness.
- **Price regulation for reselling** is seldom used, as its influence on competition is very limited. Dark fibre is usually provided by entities such as utilities, which are not subject to telecommunications regulation.

In general, bitstream, local loop and fibre unbundling are usually used to encourage competition for fixed broadband access when there is not enough infrastructure-based competition (for example, the competitive pressure exerted by cable operators) and when competition is not expected to develop given the absence of these obligations in the medium term. In certain cases, mobile broadband can act as a complete substitute for fixed broadband. Competition from mobile providers should also be taken into account in designing regulatory measures to impose wholesale access for essential facilities for competition in the broadband market. At present, in most situations, especially in urban areas with short loops, the speed and quality of service for fixed networks cannot in any case be wholly replicated by mobile infrastructure.

Wholesale regulation is key in encouraging competition in markets where one operator accounts for most of the market share. It is also critical where there is insufficient infrastructure competition and new entrants need access to essential facilities that are not replicable in the short term, as is true of most LAC countries. However, wholesale access is not regulated in many cases, and in others, while at least some of the wholesale products are regulated, the obligations are not effective. This is especially relevant in the context of fixed networks, where access network deployment demands time and resources. The key wholesale access obligations are focused on facilitating access to bitstream services, local loop unbundling, leased lines and other high-quality wholesale products aimed at the business segment, passive infrastructure access and trunk segments based on submarine cables. Regulating wholesale access implies setting prices as well as technical conditions and procedures for access.

Wholesale prices for dominant operators should be set under a cost-based assumption. This means that the regulatory authority must perform a careful analysis of the costs involved, so that the wholesale inputs can be regulated. Regulatory cost-accounting is a complex discipline involving specialised knowledge and extensive data. Additionally, setting wholesale prices too low discourages investments by the dominant operator subject to the obligation, while setting regulated prices too high renders the obligation ineffective, and discourages alternative operators from using these wholesale inputs. The key good practices for setting prices include the following:

- **Experts** on regulatory accounting must be involved in price setting for wholesale access. Knowledge and experience in applying different cost models is needed.
- **Extensive information** on the accounting for the services involved is needed and must be provided by the dominant operator on a regular basis. This information must be audited by a third party, and the regulator must also review the key aspects of the information provided by the dominant operator.
- Depending on the information available and the context and purpose for the wholesale regulation, **different cost models can be applied** when performing cost-accounting exercises (Box 4.17). Top-down modelling attempts to measure costs starting from the firm's actual costs, as set out in its accounts. This method does not involve detailed

network modelling. Instead, a top-down model separates the firm's assets and costs into service groups, and then adds the extra costs associated with interconnection, to arrive at an estimate of LRIC. The bottom-up approach develops the cost model on the basis of the expected demand in terms of subscribers and traffic and sets the network design and estimates the related costs on the basis of a network engineering model. There are advantages and disadvantages of both models (Table 4.1). Selection on the cost model to be applied should take into consideration data available, resources available, as well as the impact on competition and investment for both access seekers and access providers.

Box 4.17. **Key concepts applied when regulating cost-oriented prices**

Broadly, the key concepts in the regulator's access pricing toolkit are:

- **Cost-oriented prices**. As required by the World Trade Organization (WTO) Reference Paper, these can be developed from bottom-up or top-down cost models or from benchmarking rates in similar countries that have used cost models.
- **Cost models**. Bottom-up costing for long-run incremental costs (LRIC) where a firm sets prices to cover only the incremental costs of the product (i.e. the product's LRIC), and sales of that product make no contribution to the firm's common costs. These cover many variations, but it is sufficient to consider LRIC to understand the issues and principles.
- **Regulatory accounting** is top-down costing associated with fully distributed costs (FDC) where all costs, including joint and common costs, are fully allocated to all the operator's services/products according to a specified distribution/allocation key. The costs of a given service/product are composed of direct volume-sensitive costs, direct fixed costs and a share of joint and common costs.
- **Benchmarking**. This compares access prices across a peer group of countries to determine what price would be reasonable.
- **ECPR**, the efficient component pricing rule, is closely related to "retail minus avoided retail costs". ECPR is cost-based because it includes opportunity cost.
- **BAK**. Bill and Keep has been used for mobile termination in countries with "receiving party pays" (as in the United States) and seems related to "peering" in Internet traffic exchange.
- **GB** is volume-based charging. This is a possible alternative access pricing to address changes in the industry that BAK cannot address.

Related technical concepts:

- **DAC** (depreciated actual cost) – based on historic cost accounting (**HCA**). Some regulators also require current cost accounting (**CCA**), in which assets are revalued at replacement cost; which may then require further adjustment to "mean equivalent assets".
- **DORC** (depreciated optimised replacement cost) – takes accumulated depreciation from **ORC** (optimised replacement cost) calculated for **TSLRIC** (total service long run incremental cost).
- **SAC** (stand-alone-cost) – the sum of the incremental cost of the product, plus all the costs which are common between that product and other products. The stand-alone cost is therefore higher than long-run incremental cost (**LRIC**).
- **WACC** (weighted average cost of capital) – derived from the capital asset pricing model and used to set the return to capital to be applied when setting capital costs.

Detailed information on the different cost models and additional references can be found in other toolkits, as the ITU/InfoDev ICT Regulation Toolkit or the World Bank toolkit "Broadband Strategies".

Source: ITU (2016), *ICT Regulation Toolkit*, *www.ictregulationtoolkit.org*.

Table 4.1. **Comparison of bottom-up and top-down cost models**

	Bottom-up	Top-down
Advantages	Can model the costs that an efficient entrant would face. Flexible: can change assumptions readily. Transparent: much of the information used is publicly available.	Incorporates actual costs. Useful for testing results from bottom-up model. May be faster and less costly to implement, but this depends on how well categories in the final accounts match the data required.
Disadvantages	May optimise too much or omit costs. If this happens, the operator will be undercompensated and will reduce investment in the network. Modelling of operating expenditure is usually based on simple margins instead of real-world costs. Data needed for the model may not exist. The modelling process can be time-consuming and expensive.	Includes actual costs, which are likely to incorporate inefficiencies. Less transparent: confidentiality issues mean that other stakeholders may not have access to the information used. The parties may dispute the cost allocation rules used to allocate shared and common costs among specific services. Data may not exist in the required form.

Source: ITU (2016), *ICT Regulation Toolkit*, *www.ictregulationtoolkit.org*.

- **Regulated prices must be reviewed periodically** to adapt to the evolution of costs, as well as effects of the wholesale regulation in the evolution of the market. When there is a significant difference between wholesale prices applied at the moment of enacting the regulation and costs obtained from the cost accounting exercise, it can make sense to define a glide path to facilitate a smooth non-disruptive adaptation of wholesale prices from the existing situation to the objective situation. Glide paths prices are defined setting descending prices along time. This is, for example, the model applied for reduction of termination rates by a number of member states in the European Union.
- The information on how regulated prices are set must be **published** (with the exception of confidential data from the dominant operator) and be **subject to public consultation**. This helps improve the methodology, correct errors and anticipate potential conflicts among operators or judicial challenges by any of the stakeholders involved.
- Well-defined **technical specifications and procedures** covering all the areas are as relevant as prices and very important to ensure prompt and effective access. When technical specifications are not well defined, there is room for the dominant operator to restrict access and make it ineffective. Related good practices in this area are:
  - Impose an obligation on the dominant operator to publish a **reference offer** where all technical, procedural and price issues are covered. This reference offer should be aligned with the obligations required, address all the issues defined by the regulator and be approved by the regulator before its publication. A deadline must be set for the publication of the reference offer.
  - Given the complexity of the contents of a reference offer, it is good practice to have **regular meetings** with both the dominant and the alternative operators while drafting the reference offer. This can help ensure that all aspects are well covered and that the reference offer can be used effectively by alternative operators.
  - The **definition of processes and deadlines** for each step is key in ensuring that issues are solved in time, do not delay provision of essential facilities and ensure effective operation (including incident management and maintenance). Such processes should also include providing information regularly to the regulator and alternative operators about key performance indicators, as well as penalties for not meeting objectives. To make these processes effective, specific IT systems may be needed, so that key processes, such as provisioning or incidence management, can be automated as far as possible.

- **Non-discrimination** is an important issue that needs to be addressed and monitored by the regulator. In principle, alternative operators must face the same conditions when accessing the dominant operator's wholesale products as the dominant operator's retail business faces. Terms for access, prices and times for provisioning and incidence management should be as similar as possible.
- Ensuring that reference offers are **effective for competition** is a process that usually takes many years. Experience from OECD countries shows that reference offers are incrementally improved based on experience of their application, as well as on conflict resolution between the dominant operator and alternative operators using the reference offer. Fortunately, extensive experience of preparing and tuning reference offers in OECD countries is available. That being said, context conditions differ from country to country, and adaptation to the local context is always needed.
- **Benchmarking with other countries**, and maintaining a network of contacts among regulators in different countries, is a valuable tool for refining reference offers, as well as for gaining useful experience. The Board of European Regulators for Electronic Communications Services (BEREC) is a forum for sharing experiences of regulatory action, and allows for an exchange of views and experiences. The LAC area could also benefit by building network of regulatory experts to exchange information.

Functional and structural separation of operators

Functional separation, sometimes referred to as operational separation, aims to achieve non-discriminatory conduct of an operator with significant market power in providing access products and in downstream competition. It requires a dominant operator to separate, but not sell, its network infrastructure (or wholesale services) from its retail services division. The key feature of functional separation models is that the network provider is required to operate at arm's length from downstream service operators, providing competitors and the incumbent's own retail operations with non-discriminatory, equivalent services.

Structural separation goes further than functional separation. It requires the separation of a vertically integrated firm, not only operationally but also in terms of ownership, into a company owning the local access network, providing wholesale access (the network operator); and the rest of the company that provides retail services. The separation of ownership is intended to eliminate the incumbent's incentives to discriminate.

Functional and structural separation are complex to implement and can substantially affect the structure of the dominant operator. For this reason, both should be considered as a last-resort regulatory measure used only when other regulatory measures cannot solve the problem of competition problem in a given market. A careful impact analysis should be conducted to demonstrate that the benefits to be obtained are greater than costs and that wholesale access regulation is considered insufficient. Although functional and structural separation in the telecommunications sector have not been applied in the majority of OECD countries, some experiences in the OECD area, such as Australia, Italy, New Zealand, Sweden, the United Kingdom and the United States (OECD, 2011b), can be used as a reference. The recommendation of the OECD council concerning structural separation in regulated industries can also be used as a general reference for issues to consider (OECD, 2001).

Conclusion

Significant advances have been made in competition in the LAC region in the last few years, but in general, regulatory measures are needed to encourage entry and investment by new operators, as well as to encourage price competition and innovation.

Good practices to encourage competition in both fixed and mobile broadband markets include:

- Improved authorisation and licensing processes for new entrants, which are still burdensome in many countries. Licensing processes should be faster and simpler, and fees for registration should be as low as possible, aimed to cover associated costs, following when possible a registration-based authorisation process not linked or specific to any service.
- Foreign investment restrictions in the broadband access market, where they exist, should be lifted to maximise funding of networks and service deployment needed in the area, as well as to encourage competition. With a few exceptions, most of the LAC countries do not apply restrictions to foreign investment.
- To ensure a level playing field, state-owned operators should be regulated and operate under rules and regulations as close as possible to those that apply to private operators. The administrative body responsible for overseeing the ownership of state-owned operators should be separated from policy-making administrative bodies.
- Interconnection prices for fixed and mobile voice are still high in a number of LAC countries, leading to on-net/off-net differentiation, raising prices for voice services and limiting competition by small operators and new entrants. As broadband services are usually marketed with voice services, this also effects broadband competition. Ensuring that interconnection prices are public and cost-oriented and in line with prices in other regions where competition is thriving is good practice. At the same time, ensuring rapid and efficient number portability procedures in both fixed and mobile services is critical to facilitate switching by consumers and to develop competition. Countries that have still not implemented number portability should prioritise this issue.
- The prices for Internet access are in general very high in the region, resulting in high retail prices for broadband access. Regulators should encourage IXP deployment, development of local data centres, encourage backbone deployment (see Chapter 8 on regional integration), ensure Internet openness (see Chapter 7) and monitor prices for Internet interconnection.
- Regulatory authorities should as a general rule refrain from regulating emerging services too early, except where justified, such as for consumer protection.
- Customer retention practices must be monitored. If periods for customer retention are too long, regulatory measures can limit the lock-in period and set conditions for customer retention. This can help improve competition.
- Network sharing and co-investment should in general be encouraged by regulators. Administrative barriers for co-investment should be lifted, as this can significantly reduce investment needed to provide services. Regulators should monitor network sharing and co-investment agreements, setting conditions when needed to prevent undesirable negative impacts on competition.
- Rights of way are an important area where national administrations and regulatory authorities can take measures to reduce barriers to entry. National harmonising administrative procedures, setting rules for quick and reasonable fees, one-stop-shopping procedures, as well as guidelines for municipalities are all important to ensure that operators do not face high administrative barriers in deploying networks.

In the context of mobile broadband, which can play an increasingly key role in the region for network expansion and competition for broadband services, competition can also be encouraged by:

- auctioning more spectrum for broadband mobile access, encouraging new entry in the market (see Chapter 3 on spectrum management)
- reviewing the regulatory framework to ensure that MVNOs have no regulatory barriers to entering the market, and if needed, imposing regulatory obligations on MNOs to facilitate wholesale access for MVNOs
- imposing obligations for national roaming access when needed, to facilitate competition from new entrants, while they are deploying their network and for a time limited period
- SIM lock-in practices should be monitored, and regulation may be applied to ensure SIM unlocking for customers under reasonable circumstances, e.g. when the terminal has been completely paid for.

In the context of fixed broadband, competition can also be encouraged by ensuring that in-house building wiring is not a barrier for competition. Another expedient is regulating existing in-house building wiring sharing, as is regulation to ensure adequate passive infrastructure in new buildings configured to accommodate several competing in-building wires.

Dominance is a key factor preventing competition, since dominant operators are in a position to set high prices and stall or prevent entry by new actors. Analysis of dominance in relevant markets must be performed regularly, since it provides the evidence base for subjecting dominant operators to regulatory measures aimed to facilitate entry of new market actors. Good practices in this area include:

- Performing dominance market analysis on a regular basis (every two to four years) using recent data collected from operators, and applying sound methodologies that address not only market share, but other structural parameters in the market. A preliminary market analysis must be subject to public consultation.
- Operators must have clear powers, set out in the regulatory framework, to impose regulatory measures derived from market analysis. These regulatory measures should be justified, be adequate to address the competition problems, and should be the least burdensome possible.

In general, the regulatory measures applied should be focused on the wholesale market and aimed at facilitating access of alternative operators to essential facilities. Bitstream, local loop unbundling, fibre unbundling, duct access, trunk services supported by submarine cables and wholesale access to leased lines are the typical wholesale access measures to consider.

Setting cost-based maximum prices for wholesale access and ensuring that an adequate and effective reference offer is prepared by the dominant operators are key issues for ensuring success and cultivating competition. The extensive experience in OECD countries can be used to address these issues.

Notes

1. In 2012, the Peruvian government published Law No. 29904, (*Ley de Promoción de Banda Ancha y Construcción de la Red Dorsal Nacional de Fibra Óptica*). This states that telecommunications companies have the right to access and use the infrastructure of electricity and hydrocarbon companies. Access cannot be denied unless it threatens the continuity of these services. For details, see: *www.osiptel.gob.pe/repositorioaps/data/1/1/1/PAR/ley-29904-promocion-banda-ancha-rdnfo/ds014-2013-mtc.pdf*.

2. See, for example, *Ley 8660 de Fortalecimiento y Modernización de las Entidades Públicas del Sector Telecomunicaciones*, enacted by the Costa Rica regulator, SUTEL, aimed to set a more flexible framework for the *Instituto Costariccense de Electricidad* (ICE), the public telecommunications operator (*https://sutel.go.cr/sites/default/files/normativas/fortalecimiento_y_modernizacion_de_las_entidades_publicas.pdf*).
3. It may not always be necessary to regulate interconnection prices in an asymmetrical situation if compensation charges are reciprocal. If that is the case, and one party tries to charge more than its cost, it faces the problem that traffic flows may reverse and it will end up being the net payer. This happened in the United States in the 1990s. Some incumbents set their reciprocal compensation rates too high, and instead of receiving money, found themselves forced to pay it out as new entrants promptly set up modem banks to receive dial-up Internet access calls from incumbent customers. That being said, cost may differ among the incumbent and new entrants, and a reciprocal-rate model may not be fair. Moreover, high reciprocal rates may harm competition from alternative providers in the context of fixed and mobile telephony.
4. Unrestricted public access to all information about passive infrastructure may not be advisable, as it may be considered sensitive information for security reasons. As a result, controlling and granting limited access to specific persons or companies should they need to use the information may be advisable.

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ANNEX 4.A1

Number portability implementation in the region

	Number portability in the LAC region			
Country	Portability for mobile operators	Maximum time to port the number (working days)	Portability fixed operators	Maximum time to port the number (working days)
Argentina	Yes	5	No	x
Bahamas	No[1]	Currently, there is only one mobile service provider, thus no effective portability	Yes	5 (Only on the same island)[2]
Barbados	..	x	..	x
Belize	No, implementation by 2016	x	No, implementation by 2016	x
Bolivia	No	x	No	x
Brazil	Yes	3 to 5	Yes	3 to 5
Chile	Yes	1	Yes	Depending on technical feasibility
Colombia	Yes	3	No	x
Costa Rica	Yes	1	No	x
Dominican Republic	Yes	3	Yes	10
Ecuador	Yes	4	Yes	4
El Salvador	Yes	1	Yes	3
Guatemala	No	..	Yes	
Guyana	..	..	..	..
Haiti	..	..	No	..
Honduras	..	..	..	..
Jamaica	Yes	1 to 2	Yes	10
Mexico	Yes	1	Yes	1
Nicaragua	No	x	No	x
Panama	Yes	1	Yes	..
Paraguay	Yes	5	No	x
Peru	Yes	1	Yes	Varies
Suriname	No	..	No	x
Trinidad and Tobago	..	..	..	..
Uruguay	No, but there is a law project	x	No, but there is a law project	x
Venezuela	..	..	..	..

Note: x = not applicable; .. = data not available.

1. According to information provided by the regulator, mobile number portability will take effect when the new mobile operator enters the market in 2016.

2. While the rules only require porting within the same island, CBL (one of the fixed providers) ports between islands within this timeframe (on its network and if a number is ported from the BTC network to the CBL network).

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Chapter 5

Extending broadband access and services

This chapter focuses on good practices aimed at ensuring that broadband infrastructure and services are as widespread as possible. It describes leading mechanisms and tools to extend broadband access that policy makers have at their disposal, for example through national broadband plans, universal service funds and public-private partnerships.

A clear precondition for increasing broadband use by people and businesses is the availability of broadband infrastructures and final services in the geographical area where potential users are located. Any demand-side policy assumes that potential users have at their disposal broadband access and services designed to overcome barriers that are lacking because the infrastructure is not available (e.g. skills).

Ensuring that broadband networks and services attain the greatest national coverage and use is a priority for most governments. Policies to promote competition, private investment and independent regulation have been tremendously effective in extending coverage. In doing so, they reduce the size of that segment of the market that requires alternative approaches to meet policy goals. In areas where markets cannot fulfil all policy objectives, a range of further approaches is possible. Policies to increase access, in such instances, can be addressed in national broadband plans using tools such as "universal service funds" (USF) or by imposing legal obligations on operators, such as using spectrum licences that have coverage objectives, or through public funding intended to facilitate network deployments and broadband service provision in specific areas. Even here, the market may play a role through the use of tools such as public tenders for competitive bidding, to find a provider best able to deliver the infrastructure and services required, an approach that Colombia has used successfully.

Together with increasing competition, extending broadband access is one of the key challenges in the Latin American and Caribbean (LAC) area. Its diverse and sometimes inaccessible geography (e.g. the Amazon basin rainforest or small Caribbean islands), combined with low incomes, a lack of basic infrastructure (e.g. electricity grids) have meant that broadband access infrastructure is lacking in large geographical areas. In many remote rural areas, population density is low and fewer incentives for private-sector investment exist. This limits access to the abundant content and applications available on the Internet. In turn, it restricts the opportunities for people to participate in the economy, increase their civic engagement and for the country as a whole to benefit from the potential productivity gains broadband access makes possible.

Policy objectives for extending broadband access have often been articulated around concepts similar to those for telephony. These can be "universal service" (availability of the service in a residence or carried with the individual through wireless devices) and "universal access" (availability of services in public spaces, for instance at telecentres). Although the economic and social objectives that served as the basis for universal service for fixed telephony remain valid, goals for universal access acquire a new dimension with the expansion of high-capacity networks and the evolution of social needs. To extend broadband access and services, data is needed to identify coverage gaps and bottlenecks in the LAC region. In addition, government policies and funding are needed where objectives are not met by the market, to monitor their effective use. Ongoing collaboration between the public and private sectors is crucial, as it allows for synergies and mobilising resources and expertise (Broadband Commission, 2014a).

The challenges of extending coverage for broadband access are not new, or exclusive to LAC countries. Successful instances have been demonstrated in the area, as elsewhere in the world, that can serve as examples of good practice. The evolution of wireless technology has made possible new ways to extend broadband access, including mobile broadband, which extends access at lower prices and at a more rapid pace than traditional fixed technologies. Nonetheless, fixed networks play a key role, including for backhaul, and must be an integral part of any plan.

This chapter examines current policies to expand access in LAC countries, focusing on demonstrated good practices and experiences.

Key policy objectives for the LAC region

Facilitating wide availability of broadband access at affordable prices for all segments of society, including for people with low incomes and living in rural areas, is the main policy objective. Achieving this goal involves two related policy objectives:

- **Encouraging private investment extending broadband access.** Most of the good practices intended to increase competition by lowering barriers for investment can and should be used to encourage private investment. These include simplifying licensing requirements, lifting foreign investment restrictions, simplifying and harmonising rights-of-way acquisition and encouraging network sharing and co-investment. These issues are addressed in detail in Chapters 2 and 4.
- **Solving critical bottlenecks for infrastructure deployment and use.** In certain situations, these critical bottlenecks, such as addressing the availability of high-speed backbones or backhaul infrastructure, cannot be addressed adequately by private initiatives. Active public policies are needed to encourage sustainable infrastructure deployment from the private sector in the access portion. Bottlenecks for national and regional infrastructure deployment are also discussed in Chapters 4 and 8.

These policy objectives are usually set down comprehensively in national broadband plans (NBPs). These enable policy makers to set clear objectives, taking into account the level of development in the country, existing coverage gaps by fixed and mobile broadband networks and the level of competition (Chapter 4). Such policy objectives should also take into account the broadband demand side, since encouraging demand promotes the rollout of broadband networks by the private sector (Chapters 6, 9, 10, 11, 12, 13, 14 and 15).

Tools for measurement and analysis in the LAC region

Setting broadband objectives and preparing plans may not be sufficient to expand broadband access if attention is not paid to metrics that allow policy makers to assess progress. **Establishing an effective and powerful oversight mechanism** can promote better performance from managers and stakeholders, evaluate how a broadband plan affects targeted beneficiaries, determine resource allocations, improve planning, and provide input for decisions about the strategic direction of the broadband plan. It is also important that national authorities be granted legal powers to collect the necessary data from market players. Using broadband metrics to compare performance relative to other countries in a region can also provide an indication of how national policies are working.

Key metrics and data required to determine objectives and monitor advances in broadband access include **data on geographical/household coverage and speed of broadband access**. This information can be collected from operators (both fixed and mobile) and processed and analysed by the authorities or regulator monitoring broadband access extension. The nature

of the Internet means that they can also engage in their own independent assessment of network availability and performance, including through new tools such as applications that enable users to provide information. In the United States, the Federal Communications Commission (FCC) uses this tool,[1] and ANATEL in Brazil has also an initiative along these lines (Box 5.1). Regular updates of data are needed to check progress and identify bottlenecks.

Measurements of **broadband availability and access** should address geographical coverage, as well as the share of population (households) where broadband coverage is available. In addition to the geographical coverage in a given area, data on the availability of household broadband access is vital. As discussed in the section on good practices, broadband maps are a key tool for this purpose.

Speed and quality of service is also important for broadband access, since low speeds or poor quality may make it difficult or impossible to use certain Internet applications and services. Data should regularly be collected on real speeds and quality of service (QoS) parameters. This data can be requested from operators, but real speeds and QoS parameters, such as on delay, can also be collected directly from the network (Box 5.1).

Box 5.1. **Measuring speeds and QoS**

OECD: Report on Access Network Speed Tests

The report examines developments in OECD countries in measuring broadband performance on fixed-access networks, particularly in actual Internet speeds for end users. It conducts a brief survey of access network speed measurement projects, existing practices for international comparisons, and future possibilities for measuring mobile broadband performance. The Annexes of this report list tables outlining official measurement projects collected from OECD countries.

Source: OECD, (2014a), *Access Network Speed Tests*, *http://dx.doi.org/10.1787/5jz2m5mr66f5-en*.

Brazil: Fixed and mobile broadband speed measurement

In Brazil, the communications regulator (ANATEL), the National Institute of Measurement, Quality and Technology (InMetero) and the Brazilian Network Information Center (NIC.br) have reached an agreement on defining a set of transparent criteria and the methodology to be used in measuring QoS for broadband access.

The Measurement Entity of Quality (*Entidade Aferidora da Qualidade*, or EAQ) was created by the Brazilian ANATEL as a part of the programme for measuring quality indicators for telecommunications networks supporting fixed and mobile broadband access in Brazil. The EAQ website offers consumers measurement software tools that can randomly test the quality and speed of their broadband access connection, giving a direct instantaneous measurement, as well as a log of previous measurements the consumer has taken.

In assessing QoS for broadband services, the following good practices were identified by the Brazilian Network Information Center (NIC.br):

- **Objectives for QoS measurement.** The publication of QoS measures encourages providers both to improve quality and lower prices. If consumers can access independent and transparent QoS measures, there is a clear incentive for broadband providers to improve QoS. Objectives for measurement should be focused on informing consumers of the quality of services, involving them as a part of the QoS improvement process, and encouraging competition in the broadband access market.

Box 5.1. **Measuring speeds and QoS** *(Cont.)*

- **Where to measure QoS parameters.** Establishing where the QoS measurement will be performed is crucial for ensuring the reliability of the process. When QoS data is obtained within the access provider network, results may be biased, showing better QoS depending on where the measurement probes are located. For this reason, the measurements should be taken between the consumer location and a point external to the service provider, usually the first traffic-exchange point. On the consumer side, the measurement is done using a Customer Premises Equipment (CPE) located between the router and the computer, or using specific measurement software.
- **When to take measurements.** Measurements can be taken on a random or regular basis. Ideally, the consumer uses a CPE with embedded measurement software that automatically takes regular measurements at least every six hours.
- **QoS parameters to be measured.** The most useful parameters are: availability, download/upload bandwidth (speed), latency (delay), jitter (variation of latency), packet loss, time and number of trials to establish Internet Protocol (IP) connections, and Domain Name Search (DNS) availability.
- **What to do with QoS data obtained.** Publication of QoS data and allowing consumers access to this data encourages improvement by service providers. The information allows consumers to compare the contracted and real values, encouraging competition among service providers.

Source: ANATEL and EAQ (2016), *Medir a qualidade da conexao banda larga*, *www.brasilbandalarga.com.br/index.php/* (accessed on 14 February 2016).

When **evaluating national broadband plans**, it is useful for any LAC country to **compare its performance** with that of others in the region, as well as other reference regions. OECD countries provide comparative data that allow members to view their performance relative to others, and the Inter-American Development Bank's (IDB) DigiLAC initiative aims, among other uses, to compare the situation for broadband access in the LAC region (Box 5.2). Comparisons with broadly analogous countries are also often made (e.g. Chile compares its performance with other Latin American countries, while South Africa compares itself with the other BRICS countries). In the United States, the FCC is required by law to include comparisons with at least 25 countries in its annual report on advanced services.

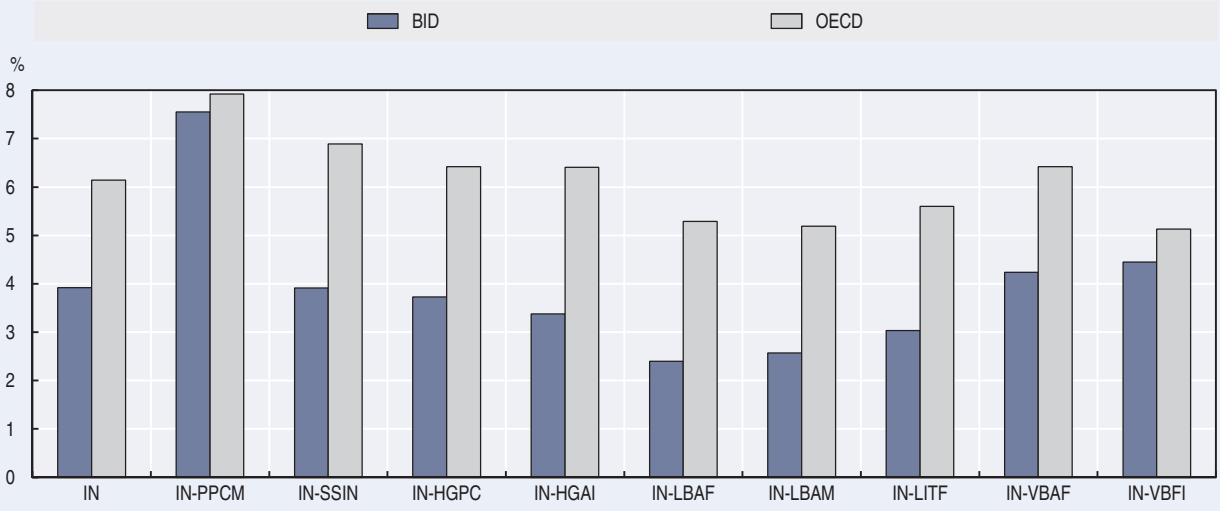
Peer reviews are also useful in assessing broadband access extension plans. They involve systematic examination and assessment of a country's performance by other countries, to help the reviewed country improve its policy making, adopt good practices and comply with established standards and principles. Peer review is a useful tool for assessing policies aimed at extending broadband access. The methodology developed by the OECD (2003) has been extensively applied, including by other international organisations, and could be also applied in the LAC area to assess National Broadband Plans. The examination is conducted on a nonadversarial basis, and relies heavily on mutual trust among the countries involved in the review, as well as their shared confidence in the process. When a peer review is conducted under the aegis of an international organisation, the secretariat of the organisation also plays an important role in supporting the process. With these elements in place, peer reviews tend to create, through a reciprocal evaluation process, a system of mutual accountability.

Box 5.2. **Comparison of broadband metrics across countries**

digiLAC initiative (Inter-American Development Bank)

The IDB has created a comprehensive Broadband Development Index (IDBA) that measures the different elements of the ecosystem around four pillars: i) infrastructure; ii) public policies; iii) strategic regulation; and iv) applications and capacity (IDBA, 2014a). Although the index may appear to be a ranking system, its objective is not to compile a classification but rather to spot the countries' strengths and weaknesses. The goal is to help LAC countries improve their strategies to boost broadband and information and communication technologies (ICTs). Indicators on broadband infrastructure considered in the IDB Index include households with Internet access, broadband fixed lines and mobile broadband subscriptions. The digiLAC portal (digiLAC, 2012) makes it possible to compare countries and regions, with an specific focus on the LAC region, for a broad range of indicators (Figure 5.1).

Figure 5.1. **IDB-OECD comparison on key parameters related to broadband penetration (2014)**



Note: IN-PPCM is the percentage of the population covered by a mobile cellular; IN-SSIN measures secure Internet servers; IN-HGPC is the percentage of households with a computer; IN-HGAI is the percentage of households with Internet access; IN-LBA measures the fixed broadband subscriptions per 100 inhabitants; IN-LBAM measures active mobile broadband subscriptions per 100 inhabitants; IN-LITF measures fixed telephony lines per 100 inhabitants; IN-VBAF measures fixed broadband speed, in megabits per second; and IN-VBFI is International Internet bandwidth (bits per second) per internet user.

Source: digiLAC (2016), digiLAC website, *http://kp.iadb.org/digilac/es/Paginas/Iniciativa.aspx* (accessed on 14 February 2016).

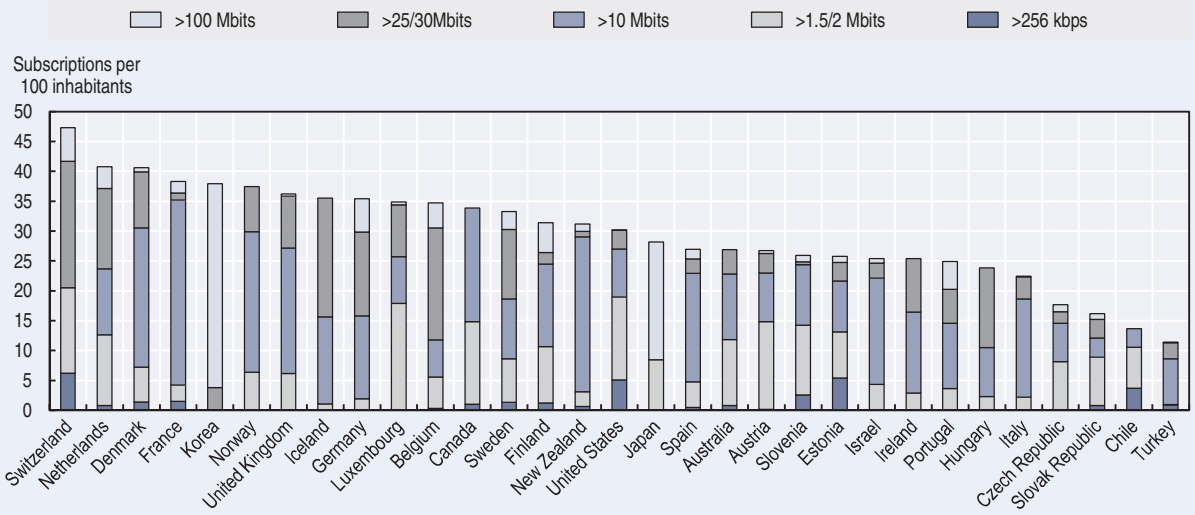
StatLink *http://dx.doi.org/10.1787/888933354249*

The OECD Broadband Portal

The OECD Broadband Portal (*http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm*) provides access to a range of broadband-related statistics gathered by the OECD. It compares a range of indicators that reflect the status of individual broadband markets. The OECD has identified five main categories that are important for assessing broadband: penetration, usage, coverage, prices, as well as services and speeds. An example of data provided in the OECD Broadband Portal is provided in Figure 5.2.

Box 5.2. **Comparison of broadband metrics across countries** *(Cont.)*

Figure 5.2. **Fixed (wired) broadband penetration by speed tiers June 2014**



Notes: For Japan, data are OECD estimates, with the tiers lower than 100 megabits (Mbit) unseparated. These may also include auxiliary portion of the top tier. For Korea, 10% is for below 50 Mbit, 90% is above 50 Mbit.

Source: OECD (2016), *OECD Broadband Portal*, *http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 25 February 2016).

StatLink *http://dx.doi.org/10.1787/888933354254*

Overview of the situation in the LAC region

According to the information provided by countries in the LAC region for this report, as well as publicly available information, policy makers are keenly aware of the challenges for extending broadband. Many have taken steps on a number of fronts, with a special focus on rural areas, underserved periurban areas or for citizens with particular challenges.

Although LAC countries have yet to catch up with the most advanced countries in broadband access and use (Figure 5.1), significant advances have been achieved in recent years in several LAC countries in terms of broadband access availability, use and skills. The ICT Development Index (IDI) published regularly by the International Telecommunications Union (ITU)[2] adds to the information provided by the IDB's Broadband Development Index (digiLAC) (IDB, 2014c). Countries such as Costa Rica, Suriname, Brazil and Colombia significantly advanced their placement in the ICT Development Index between 2010 and 2015, reflecting a wider availability, use of broadband access as well as an increase in skills on ICTs. However, the average increase in IDI level was substantially higher for countries in mainland Latin America (1.09 points) than for the Caribbean and Caribbean-facing countries (0.73 points) (ITU, 2015).

Despite this progress, many challenges remain in providing adequate broadband in the LAC region:

- The **geography** of many areas is especially complex for broadband networks. This is the case in the Amazon basin, which encompasses the Plurinational State of Bolivia (hereafter "Bolivia"), Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, but also for other densely forested areas in Central America. In other mountainous areas or small Caribbean islands with sparse populations and little backbone infrastructure, network deployments are costly, and revenues are likely to be limited for one, let alone multiple, operators. If these areas do have service, it may not be offered at competitive prices, due to monopoly power.

- **Affordability** issues are still a major challenge in the LAC. A relatively large proportion of the population has relatively low income, and the reduced demand for broadband services and lowers the incentives for private investment. However, competition in mobile markets demonstrates that operators will develop tools such as prepaid services to adapt to particular circumstances if the initial challenge of deploying infrastructures can be overcome. These issues are further analysed in Chapter 6. Some countries and regions lack the basic infrastructure necessary for network operation (e.g. electricity). The availability of roads for access to install infrastructure and maintain network infrastructure is also an issue in remote areas. Even when electricity is available, most rural areas lack backbone and backhaul infrastructure, which makes deployment of both fixed and mobile networks challenging and expensive, discouraging private investment.

Many of these obstacles, including the lack of basic infrastructure, cannot be solved by policy measures specific to broadband. This means that concurrent public policies in other areas must be taken to promote broadband access. This requires close co-ordination among the government sectors in charge of infrastructure planning.

With a few exceptions, most LAC countries have developed national broadband plans or digital agendas that include specific actions to extend broadband access or objectives or projects intended to increase coverage. Most countries define broadband access in a technologically neutral way. Nonetheless, a number of broadband plans, and the associated funding for network deployment, are aimed at specific technologies, even when a range of technologies could be used.

National broadband plans and projects in the LAC region that focus on extending broadband access differ in scope, level of detail, specific objectives, and the funding and collaboration models used by the public and private actors. Many of the plans are ambitious, well-designed and address the key issues involved. Some of the weaknesses of these plans, to be addressed in the section on good practices, are:

- Key indicators aimed at measuring progress in attaining policy objectives are not defined or are defined in a very general way and, in many cases, not directly related to the actions defined in the broadband plan. This makes it difficult or even impossible to **assess fulfilment of policy objectives**.
- In a number of cases, regular updates on the achievement of the broadband plan objective are not made public. **Transparency and accountability** in this area are needed so that stakeholders can provide input to improve plans, as well as to ensure that citizens can monitor advances. Increased transparency also provides an incentive for public authorities to implement broadband plans efficiently.
- **Inventories** of available fixed broadband infrastructure and maps are not in general publicly available at the national level in LAC countries. In a number of cases, this also applies to the available coverage of mobile broadband. As shown in the next section, collecting and aggregating this information is complex and resource-consuming. However, clear, detailed information on where coverage is lacking is crucial to focus policy measures on priority issues, and experience shows that operators themselves become the largest users of this information.
- Although the most ambitious and well-designed broadband plans in the LAC region benefit from **stakeholder involvement** in the design and implementation phases, there is little evidence to show that some plans have benefited from public consultations. As noted in Chapter 2 in discussing digital agendas, lack of stakeholder involvement raises the risk

of defining policy objectives that are not aligned with real needs, and of setting measures that are unrealistic or difficult, if not impossible, to meet.

- Broadband national plans aimed at deploying broadband access infrastructure must be co-ordinated with other projects to **encourage demand** and build the skills needed for individuals, businesses and governments to benefit from the digital economy. Policy makers should note that demand-side policies can represent an equal or even greater challenge and should be taken into account even in earlier phases of digital economy development. Coordination issues are addressed in Chapter 2 and demand-side policies in Chapters 6, 9, 11, 12, 13, 14 and 15.
- When the regulatory framework does not clearly **separate responsibilities**, it also results in an overlapping of powers among different institutions that can undermine effective management of broadband plans, as described in Chapter 2, on regulatory frameworks and digital agendas. This is true of plans where the responsibilities of the ministry in charge of telecommunication policy, the regulatory authority and/or federal or municipal institutions are not clearly delineated.

The most frequent source used for **funding broadband extension** is a Universal Service Fund (USF). Contributions to any USF may be obtained from several sources, such as contributions from operators, revenues from spectrum licences, specific taxes for broadband extension and government budgets. Annex 5.A2 shows detailed information on the universal service funds in the LAC region. The IDB (IDB, 2014b) has also developed a comparative study of different USF in the LAC region and in other parts of the world. It has been noted that in some countries, USF contributions are not always disbursed on extending the network, and that the funds remain unspent, often resulting in large surpluses. This suggests the capacity to develop projects to extend broadband access is insufficient.

In a number of cases, fees from spectrum auctions are used to fund universal service. Although such fees can be an important source of funding, they only become available when new licences are issued and serve as a one-time source of funds. Spectrum licence fees provide a continuous source of funds and allow for better planning of broadband extension projects. Caution should be taken to ensure that the level of annual spectrum licence fees is not determined by the financial needs of universal service projects, since this may raise costs for mobile operators that are reflected in end-user prices. Spectrum management and policy making in the LAC are discussed further in Chapter 3.

In the LAC region, as elsewhere, contributions from operators for the USF are usually based on total revenues for each operator (i.e. a percentage of revenues is set as a contribution for the USF, typically around 1%-2%). In general, no exceptions are made for small operators, nor a minimum threshold set for revenue contributions.[3]

Authorities can sometimes meet part of their broadband coverage policy objectives by **exemptions from specific fees**. This might be by lowering or not applying spectrum licence fees in rural areas, or by lowering fees paid for the USF when specific objectives for broadband access are implemented by an operator. This can be the case for publicly or privately owned operators.

An important means to extend mobile broadband coverage is to include **coverage obligations** in spectrum licences, to make sure mobile broadband access is also available in rural areas and that a certain percentage of the population will have broadband and mobile telephony access. Coverage obligations will also affect the valuation of spectrum licences by operators. In some cases, spectrum licences include conditions to provide connectivity

to specific premises, such as schools, and to apply special rates, provide free services for low-income citizens or to provide terminals for schools. Peru included such conditions when renewing the license for *Telefónica de Perú*.[4]

USFs were first used in the LAC region to invest in rural telephony and install payphones in remote areas. As USF objectives evolve, they can be used to extend broadband access and coverage to households, and when needed, to provide broadband connections to telecentres in underserved areas, schools and other public institutions, or satellite broadband in remote areas. These funds can also used to invest specifically in backbone and backhaul networks in areas lacking trunk connectivity, to encourage access network investment by network operators. Furthermore, some objectives can relate to demand-side issues and funds used to encourage demand by low-income consumers and promote digital literacy plans.

The **method for selecting an operator to obtain a subsidy** to develop projects for broadband extension varies across the region and according to the type of project. A tendering process is used for many projects, encouraging operators to bid and compete to obtain the subsidy. In other cases, the project is directly awarded to the incumbent operator or to publicly owned operators in charge of providing rural broadband or wholesale access networks used by other operators.

Good practices for the LAC region

Mechanisms to extend broadband access

The best mechanism for developing nationwide broadband is to encourage investment by the private sector through measures such as lowering administrative barriers to deployment, providing regulatory certainty for investors and encouraging network sharing. However, the market will not provide broadband access in certain situations. If this is the case, several mechanisms are available to public authorities.

These mechanisms can be classified as **obligations** (e.g. obligations to provide coverage in a certain area), **incentives** for operators to cover broadband access gaps (e.g. subsidies or reduction of fees for rural deployment) or **direct funding** of broadband infrastructure (e.g. public-private partnerships and deployment of publicly funded backbones).[5]

It should be noted that policies on extending broadband access availability, as noted in Chapter 2, should always be co-ordinated and complemented with policies aimed to encourage demand, for example adequate taxation regimes and programmes addressing affordability (Chapter 6), digital skills programmes (Chapter 9), encouraging ICT use for business (Chapter 10), e-health and e-government programmes (Chapters 11 and 12) and building consumer trust (Chapters 13 and 14).

Obligations aimed at extending broadband access. Any obligation imposed on operators regarding coverage should be carefully assessed against the costs and benefits. This includes comparing the expected positive effects (e.g. the number of households to be covered) against other potential implications (e.g. the cost of extending the network in less profitable areas, or the effects on competition resulting from higher costs to an operator or cross-subsidies). Obligations can be applied through:

- **Universal service obligations (USO)** for telephony services are usually in force in most OECD countries. However, the compulsory provision of fixed broadband access, with a minimum speed at affordable prices for all citizens in all geographical areas, is seldom imposed as part of universal service obligations. Countries such as Finland, Korea, Spain and Switzerland are an exception, in including broadband access as part of USOs. Even in these countries, much effort and investment was devoted to national and regional broadband

plans to increase coverage in rural areas, before considering universal broadband access as the right of all citizens (Box 5.3). In addition, a key difference in countries that introduce such policies is the definition they apply to broadband in terms of guaranteed baseline performance levels (i.e. the threshold speeds to be delivered).

Box 5.3. **Spain's Rural Broadband Plan (PEBA)**

One of the projects included in the National Broadband Strategy in Spain (*Plan Avanza*) programme was specifically tailored to rural areas: the PEBA project (the National Programme for Broadband Deployment in Rural and Isolated Areas), put into effect between 2005 and 2008. Two calls for proposals were launched (in 2005 and 2007), resulting in 29 smaller projects implemented by 2 operators (27 from Telefónica and 2 from Telecable). The aim was to ensure broadband affordability and the availability of certain key service requirements, without distorting competition (MITC, 2005):

- minimum bandwidth: 256/128 kilobits per second (kbps)
- price caps: EUR 39 (one-off sign-up fee) plus EUR 39 (monthly fee) for the first 36 months
- technical characteristics comparable to commercial broadband services
- technological neutrality (any technology could in principle be deployed, subject to assessment of the Evaluation Committee)
- infrastructure deployed was open to third parties for at least three years (e.g. direct subscriber line, or DSL, wholesale obligations, on conditions fixed by the telecom regulator)
- deployment objectives were outlined and a list of eligible population centres included in the calls for tender.

The total budget for the programme was EUR 90 million, of which the Ministerio de Industria, Turismo y Comercio (MITC) provided EUR 18 million in zero-interest loans and EUR 8.4 million in grants to the European Regional Development Fund (ERDF) Objective 1 regions. Asymmetric digital subscriber lines (ADSL) (86.3%), WIMAX (5.1%), satellite (8.4%) and hybrid-fibre coaxial (HFC) (0.2%) technologies were used, depending on the most appropriate technology solution for the region in question. Only three autonomous communities did not participate in the plan.

The main outcome of the plan was that 99% of the population has broadband coverage, using all available technologies. More than 8 million people obtained broadband coverage under the programme. Operators are now offering download speeds in line with commercial services, well above the initial 256 kbps requirement. In Spain, the majority of fixed broadband subscriptions (47.2% of the 9.8 million subscribers) have a speed of between 4 and 10 megabits per second (Mbps). The PEBA was continued under *Plan Avanza 2* (Infrastructure Sub-programme), focused on providing the remaining population with broadband.

Source: OECD (2010), *Good Governance for Digital Policies: How to Get the Most Out of ICT: The Case of Spain's* Plan Avanza, *http://dx.doi.org/10.1787/9789264031104-en.*

- **Licenses for fixed telephony** have also traditionally entailed obligations to cover rural areas where the cost of providing the service is high relative to the expected revenues. Historically, this has usually included the deployment of fixed pay telephones in small villages. With network convergence, a shift is taking place from service-specific licences to a general authorisation framework. This type of universal service obligations, like the models applied in many OECD countries, have evolved, and a competitive bid process is put in place to provide universal service, and the cost assessed by regulatory authorities and shared by operators or funded by the state. Obligations for installing pay telephones can also be reassessed in areas where penetration and coverage for mobile voice are high.

- In the context of mobile broadband, obligations imposed on operators are defined in terms of specific network rollout obligations, typically set out in the **licence conditions or spectrum auctions**. Setting coverage obligations demands careful analysis. Lax coverage obligations may waste the opportunities to ensure mobile broadband access in areas where there are not enough economic incentives to deploy network infrastructure. On the other hand, obligations that provide for extensive geographical coverage in too short a time may impose an excessive burden on an operator. It is important that all MNOs in a country, with a similar license, have the same obligations. For new entrants, however, the time allotted to fulfil obligations may differ from MNOs already operating in the market, given that they actors have a first-mover advantage.
- One additional issue to consider when setting obligations associated with spectrum licences is the inclusion of obligations to finance **objectives not directly related to coverage** and the provision of mobile services, such as providing computers to certain communities (e.g. schools), or funding ICT skills programmes. While these are laudable goals in theory, including such obligations in the conditions for licences may result in market distortions. Any initiative to increase demand or any policy objective not directly associated with coverage, quality and services should be separated from auction proceedings and be funded through other sources, such as universal service funds.

Incentives for operators to extend broadband access are aimed at bridging the investment gap in areas where the expected returns do not justify network deployments. These incentives can be take different forms: partial or total tax exemptions, lower or no fees for spectrum licences in certain areas associated with the obligation to provide coverage, direct partial/total subsidisation of rural or backbone/ backhaul deployments, or loans at reduced interest rates. In many cases, such incentives are sufficient to stimulate the private sector to extend broadband access.

Direct funding, policy measures and incentives to extend broadband access are usually laid out in National Broadband Plans (NBPs) and Digital Agendas, which are closely interrelated. Both aim to provide a comprehensive set of co-ordinated actions involving the public and the private sector, and to address issues both on the supply side (e.g. funding of network rollout or specific measures to encourage private investment) and on the demand side (e.g. policies on education, e-health, or e-government, aimed at increasing use of broadband access by citizens, the public sector and business). Digital Agendas, as noted in Chapter 2, however, have a wider scope (covering issues related to access and application of ICTs in general across the economy and society) than NBPs, which are usually focused on extending broadband access and coverage. In many cases, NBPs are a part of national Digital Agendas.

National Broadband Plans

Defining goals for broadband expansion consists of framing national social, political and economic goals and is usually done by a government ministry. However, communication authorities have a crucial role in providing input, especially on issues involving the implications for investment and competition. In many cases, they are in a good position to manage their implementation and collect and manage universal service funds. Other stakeholders, including operators, civil society, academia and the technical community, should also be consulted and play a role in developing such plans (OECD, 2004, 2012).

Any NBP should include a reference to the gaps identified, clear objectives to cover these gaps, setting measurable targets, milestones and checkpoints to identify and correct deviations, as well as the financing mechanisms and funding to be applied. The literature on

the design of NBPs and examples of existing plans is rich and can be found in the research of the OECD (2011), IDB (2014b), the ITU (2012; 2015) and other authors, such as Calvo (2012). This section will address good practices in the design, funding, execution and assessment of NBPs, with an emphasis on issues related to the extension of broadband access.

The first step before defining and implementing public interventions is to **ensure that existing bottlenecks for infrastructure deployment by the private sector are addressed**. It is especially important to ensure that rights of way are simple, inexpensive and rapidly obtained and that existing passive infrastructures owned by the government or utilities can also be used for broadband access deployment. Chapter 4, on competition and infrastructure bottlenecks, discusses these issues in detail.

The next key step in designing a National Broadband Plan is to **identify areas needing public intervention**, to fill the gaps in the availability of broadband. This requires collecting and aggregating data on the availability of broadband infrastructure. Promoting broadband access differs from promoting broadband penetration; the former relates to coverage (geographical footprint where service can be accessed) and the latter to the take-up by users.

When considering programmes to expand coverage, policy makers need to have reliable geographical data on current service availability. A useful way to understand the landscape of current coverage is to visualise it on a **map**. Additionally, maps can be used to aid in the communication of a new policy, including information on outcomes (e.g. "This new programme will have this effect on these geographical areas", "Rollout is scheduled for this area, following a given timetable" and so on). Broadband availability maps can also be a useful tool, as policy makers survey the status of competition among communication service providers or across different access technologies. Mapping broadband penetration rates, in addition to availability and demographic indicators, may also provide an overview of the achievement of policy goals in different locations, and this may be useful for work that informs broader questions (e.g. economic or social developments in areas with and without broadband).

Broadband maps are also useful to users. Maps can assist them to better understand the services available to them and to compare their performance with those of other geographical locations. To meet such requirements, a map may have to provide information at a detailed geographical level and for each location, viewers should be able to access at least some references to service providers, such as their names or contact points, to obtain further information on prices and other service conditions. The social and economic benefits of such maps are great, if they are well-designed.

Broadband maps are also commercially useful for a range of stakeholders. They can be used to inform entities that provide services (e.g. e-commerce), and help existing and new players plan to meet the level of demand and the rollout of network facilities in a location. They can also contribute to more effective infrastructure investment. In the United States, national broadband maps help companies identify the proper funding and targeted areas for universal service fund allocations (Box 5.4).

Preparing and publishing a broadband map is a good practice that, although resource-consuming, will render excellent results, not only in terms of policy decisions on the focus of broadband national plans, but also in terms of competition analysis, as well as in providing information to stakeholders. Good examples of broadband maps in LAC countries, showing key information for countries, regions and municipalities, are the infrastructure maps developed by the IDB under the DigiLAC Initiative (Box 5.4).

Box 5.4. **Some examples of broadband maps**

The United States' National Broadband Map

The National Broadband Map (NBM) is a searchable and interactive website that allows users to view broadband availability in every neighbourhood in the United States. It was set up by the National Telecommunications and Information Administration (NTIA), in collaboration with the Federal Communications Commission (FCC), and in partnership with 50 states, five territories and the District of Columbia. The NBM is part of NTIA's State Broadband Initiative. The NBM is updated approximately every six months and was first published on 17 February 2011.

The State Broadband Initiative was created by the NTIA to encourage economic growth by facilitating the integration of broadband and information technology into state and local economies. In addition to the NBM, the State Broadband Initiative accomplishes this goal by providing grants. NTIA has awarded a total of USD 293 million to 56 grantees, one each from the 50 states, 5 territories and the District of Columbia, or their designees. Grantees are using this funding to support the efficient and creative use of broadband technology to better compete in the digital economy. These state-created efforts vary depending on local needs. They include programmes to help small businesses and community institutions use technology more effectively; research to investigate barriers to broadband adoption; innovative applications that increase access to government services and information; and state and local task forces to expand broadband access and adoption.

States are also using more than 50% of these grant funds to gather data twice a year on the availability, speed and location of broadband services, as well as the broadband services used by community institutions, such as schools, libraries and hospitals. This broadband data is used to populate the National Broadband Map. Detailed descriptions of how this data was collected and processed can be found in the technical overview.

The data download page also contains several documents that provide context for this round of data, including a "Changes and Corrections" summary provided by each grantee, a data package per grantee that includes the list of providers contacted or included by each grantee. The zipped state file will also include each state's methodology.

digiLAC's maps on broadband penetration and other key parameters

On May 2014, the Inter-American Development Bank (IDB) launched the digital platform digiLAC, to measure the "Index of Broadband Development" in 26 countries in the LAC region, based on 37 different indicators. digiLAC also explores the region through infrastructure maps showing 13 variables, including broadband penetration, existing infrastructure, as well as other socio-economic data at a municipal, departmental and national level. It also provides access to research materials, information on projects and publications.

digiLAC is part of the IDB's Broadband Programme, whose challenge is to promote an institutional and regulatory environment that facilitates competition and investment to accelerate access, adoption and use of broadband services in the region.

In setting goals for broadband national plans, preference can be given to **projects with high social returns** that benefit residents of rural and low-income urban areas. Experience has shown that the market is likely to serve other areas. These projects can be prioritised under a comprehensive assessment of the social and economic situation of these areas, including household income and poverty levels, demographics, existing infrastructure and the cost-effectiveness of any project.

Affordability is an important factor in analysing broadband gaps and the need for intervention. This is a particular challenge for the LAC region. In most rural areas lacking broadband access, affordability of broadband services (as shown in Chapter 6) can determine the take-up of broadband. Policy actions should not be restricted to availability of broadband access, but be reinforced with targeted subsidies to low-income people combined with ICT training (affordability issues are further addressed in Chapter 6, while Chapter 9 explores skills for the digital economy). It is also important to understand commercial and technological trends, and how the market can evolve without public support. Subsidies may appear to be necessary in the short term, but this may not be true of the medium term in some areas.

Another important factor in designing and implementing NBPs is making sure that NBPs are **co-ordinated with other initiatives in digital agendas and ICT plans**. The availability of broadband is linked with many other issues that NBPs must account for. These include a broad range of government responsibilities, such as law enforcement, finance, education and training, environment, health, industry, transport, regional and rural development, science, technology and innovation.

Digital government plans (or e-government plans) and e-health plans should also be co-ordinated with NBPs. From a geographical perspective, it is important to ensure that communications infrastructure is in place in some regions before promoting programmes to promote ICT skills. Closer co-ordination serves to ensure that all parties have realistic goals and assessments of the factors that promote success.

Furthermore, it is crucial to **involve stakeholders** in designing NBPs. In defining goals for broadband expansion, stakeholder input is needed to identify residents' needs and potential bottlenecks, as well as to ensure that the goals set and the initiatives taken are targeted and feasible. A good practice is to create a council, "platform" or forum to involve institutions, vendors, operators, business users and consumers. Another tool used in some OECD countries is "town hall" meetings, where stakeholders debate issues and address areas of public interest.

Even when key stakeholders have been involved in setting goals, national broadband plans should be subjected to public consultation to obtain feedback from all stakeholders and ensure that the parties concerned can provide input. Publishing the responses received and the rationale for rejecting or accepting suggestions received is a good practice that helps increase transparency. Local authorities can also provide key input in defining needs and objectives, as well as formulating and implementing broadband plans in municipalities.

Setting measurable targets and periodic assessment of fulfilment of objectives plays a central role in the success of NBPs. Goals defined in NBPs must be measurable, and procedures and tools should be defined to assess how they are met in a regular way. Government should typically set targets for geographic and household coverage, as well as minimum and/or average transmission speeds. Other QoS measures can also be defined, to support services that are sensitive to specific requirements (e.g. for VoIP or some e-health applications). The period over which targets should be met needs to be well-defined, and the progress in meeting targets should be monitored on a regular basis, so corrective measures can be taken if necessary.

When setting measurable targets, governments and regulators may use references based on best practices in the LAC region, or when it makes sense, in other regions, such as the OECD area. Broadband plans should cover a period of between five to seven years, given

that markets and technology change too rapidly to plan for longer periods. Establishing long-term and short-term targets is also advisable, to allow for quick gains and assessment.

Increasingly, targets for national broadband plans and digital agendas are being set for the adoption rather than the availability of broadband. This means that governments need to specify a different set of indicators and policies, addressing socioeconomic groups that have been slower to adopt ICTs. Promoting broadband adoption can also help provide an incentive to invest in broadband infrastructure, for example by creating demand by policies to promote the take-up of broadband by government entities (such as municipalities, schools, hospitals and police). Another good practice is to publish periodic reports, subjected to audits, and related to assessing progress in coverage, access (e.g. population penetration) and usage.

Traditionally, broadband availability has been understood as fixed broadband access. However, wireless technologies have evolved rapidly in recent years, and mobile broadband can in many cases be a good alternative for fixed technologies, especially in rural areas with scattered population where deploying fixed access infrastructure to households is especially challenging and costly.

When possible, **technological neutrality** should be a guiding principle in setting targets for broadband. Broadband access can be provided with many different technologies, such as copper, fibre, Wi-Fi, cellular networks or satellite. Each has different implications for costs, speed supported, quality of service, and so on, and can be sufficient for some applications. Allowing for a range of different technological proposals to cover broadband access goals expands potential options, increases competition and at the end of the day, improves the cost/benefit relationship. It also allows for a more transparent process, providing a level playing field for all actors and avoiding selecting "winners".

One reason for the lack of broadband access is the absence of transport infrastructure at the core network (backbone) or the infrastructure connecting these backbone networks with the access switches or base stations (backhaul networks). This is the case for rural areas, including in the LAC region, where there are fewer incentives for investment to extend nationwide backbone. In such cases, **funding backbone/backhaul infrastructure** with contributions from operators, direct funding by the administration or a combination of both through public-private partnerships, may help to bridge this gap and give operators access to infrastructure deployment.

Insufficient backbone and backhaul networks, especially in rural areas, is a problem in many countries in the LAC region. A number of governments have launched ambitious projects to roll out backbone/backhaul networks (Box 5.5). These facilities are intended to provide transit connectivity for operators, which in turn are expected to invest in rolling out the "last mile" to households in the area covered by funded backbone/backhaul networks.

Some good practices when designing projects to deploy backbone/backhaul networks are:

- **All market participants** with technical and managerial ability to roll out the network should be given the chance to bid for projects.
- Before launching a project, broadband access providers should commit to **using the financed backbone/backhaul network** and extend coverage for broadband access networks.
- **Open access clauses** for the future use of backbone/backhaul networks should be included, ensuring that all market participants, and not just the one deploying the network, are able to use it to connect their own access networks. Provisions on conditions for access, including guides for pricing and nondiscrimination, should be set and be made public from the outset.

- Backbone and backhaul networks should be designed to take into account **the estimated future growth of Internet traffic**. To avoid congestion, fibre is probably the best technology, although in cases where fibre cannot be deployed or is too costly for geographical reasons, microwave links can also be considered. In this case, special attention should be paid to future capacity upgrading.
- Backhaul capacity should be designed to **facilitate fixed and mobile broadband**. Base stations supporting mobile broadband access need high-speed fibre-based connections to cope with the growing need for bandwidth, and backhaul/backbone network availability is essential to permit mobile broadband access at reasonable speeds.
- **Structural or functional separation** may be considered as a means to ensure nondiscriminatory access to backbone networks. Under this model, the operator deploying and operating the backbone network is limited to providing wholesale services to other operators, ensuring that all retail operators are treated without discrimination. This model is used in Brazil with Telebrás and in Mexico's Telecomm (Box 5.5). Structural or functional separation is often considered a measure of last resort used when other measures do not succeed in ensuring open access.

Box 5.5. **Case studies on backbone deployment (Brazil and Mexico)**

Brazil

Telebrás' core activity is to act as a public "wholesale" broadband operator, providing infrastructure and network capacity for broadband providers, as well as the administrations of the federal government, the states and Federal District, municipalities and nonprofit organisations such as universities, schools, hospitals, community telecentres and other points of public interest.

The service is expected to be particularly useful to small broadband providers operating in the smaller towns and more remote areas that have not been reached by large operators.

Sources: World Bank Group (2016), "Broadband in Brazil: National Broadband Plan PNBL", i*http://broadbandtoolkit.org/Case/br/3* (accessed on 25 February 2016); Telebrás (2016), Telebrás Corporate Website, *www.telebras.com/* (accessed on 26 February 2016).

Mexico

Mexico's constitutional reform, among other issues concerning telecommunications services, included the rollout of a robust backbone network to be used as a core transmission infrastructure by telecommunications operators, including the provider of the shared network (*Red Compartida*) for broadband mobile services.

This backbone network will be deployed by *Telecomunicaciones de México* (Telecomm), a publicly owned operator using as a starting point the fibre network owned by the *Comisión Federal de la Electricidád* (Federal Commission on Electricity). Under Article 140 of the Federal Law on Telecommunications and Broadcasting, *Telecomunicaciones de México* can only sell wholesale services to other operators, and retail services only where no commercial player offers them. The planned backbone network is expected to allow for increasing fibre coverage, increasing competition in locations with only one provider, and to lower barriers to new entrants.

Source: SCT (2016), *Puntos México conectado*, *www.pmc.gob.mx/* (accessed on 26 February 2016).

Mobile networks usually cover a large proportion of a country or a region for which a license is issued. Where service levels are not sufficient, there may be justification to use public funds to assist in **extending and upgrading mobile broadband access networks**. Some good practices are:

- **All market participants** should have the opportunity to opt for the network upgrade subsidy, and open access conditions should be set to allow for infrastructure sharing among operators, to encourage competition at the retail level. Infrastructure sharing and open access conditions can be part of national roaming access conditions. Specific provisions on speed and capacity should be included under the conditions for obtaining the funds.
- New spectrum auctions can include specific **provisions for coverage in rural areas**. The regular fees for spectrum may be lowered (or even waived), so as not to impose a high burden on a new operator expected to compete with existing players who have no obligations to cover the corresponding rural area. Such exemptions have already been used in the LAC region.
- **Technological neutrality** should be considered. Goals for extending broadband access should not be limited to wireless broadband, and when possible, funding for extension of broadband access should be open to any type of technology and operator, including fixed operators, provided that requirements on speeds, quality of service parameters and costs are satisfied.

Extending fixed broadband access networks are usually part of NBP initiatives. Fixed broadband access, however, has not been traditionally subjected to coverage obligations, and areas exist in the LAC region where no broadband access service is available and no copper access exists for digital subscriber line (DSL) service. In certain cases, this is because network operators do not consider these areas a profitable investment for telecommunications infrastructure, and public support may be warranted.

When requiring open access in publicly funded network expansion, it is possible to specify that the operator receiving public funds provide bitstream or unbundled wholesale services for other operators. Generally, for rural areas, bitstream is much more effective in facilitating access, since unbundling is too costly in rural areas with a low population density and with insufficient economies of scale to justify unbundling by other operators. However, if new fixed-access deployments are fibre-based, there may be room for fibre unbundling, since fibre covers much larger distances and other fibre cables can be aggregated in a single point. Networks originally built for cable television and upgraded for broadband have fewer distance constraints than those built for telephony.

Policy makers should also incorporate **minimum speeds and quality of service parameters** into their plans. Any publicly funded project aimed at extending broadband access should delineate the geographic area to be covered and the minimum download/upload speeds provided. These speeds are usually set in terms of averages for each connection. Definitions of the precise threshold of transmission rates that determines whether Internet access is considered broadband vary substantially by country and over time as demand and technology evolves. At the low end, broadband is often defined as download speeds of at least 256 kilobits per second (kbit/s) for the purpose of data collection. This is the definition used by the OECD, the International Telecommunication Union, the United Nations Conference on Trade and Development, and the Partnership for Measuring ICT for Development, a consortium of international organisations and agencies.

The key consideration is to set minimum speeds and quality of service parameters that enable continuous and uninterrupted information flows, with sufficient capacity to provide access to data, voice and video applications that are common or socially relevant to users. When connecting education centres or hospitals, for example, sufficient speeds are needed to cover all potential uses, such as telemedicine. When connecting

individual households, more modest speeds could be considered if this allows larger areas to be broadband-enabled, given the available resources.

Policy makers need to evaluate the costs and benefits of investment in NBPs by conducting an **estimate of costs and impact assessment**. The objective is to select initiatives that deliver both strong immediate aggregate demand effects, such as the employment created by rolling out networks, and strong longer-term aggregate supply-side effects, to increase the productive capacity of the economy, as an improved foundation for commerce and communication. It is important to ensure that broadband plans are targeted, cover short-term objectives, and that government contributions directly relate to public service goals.

Provision of broadband in public premises at adequate speeds and quality of service is key to ensuring that communities and individuals can enjoy the benefits of the digital economy:

- In **universities and schools**, it is important to ensure that students can benefit from the wealth of content and applications available on the Internet, as well as to cultivate the acquisition of digital skills. This is further analysed in Chapter 9.
- In **hospitals and health** centres, as discussed in Chapter 11, the availability of broadband access can make possible the use of e-health applications that increase the quality and efficiency of public health provision. In government offices, it is also essential to promote digital government initiatives and increase the efficiency and quality of public services delivery, as discussed in Chapter 12.
- Moreover, in geographical areas where broadband access is not available or penetration is low, **other public buildings or spaces** (such as public squares) may act as an anchor for broadband connection by, for example, providing broadband services for citizens, somewhat like services provided by public libraries.

Provision of broadband access in public premises is thus generally prioritised in broadband plans. It is good practice to first assess the need, feasibility and potential impact of broadband access deployments aimed at connecting public premises, and especially educational centres and telecentres, where citizens can take advantage of spaces already equipped with computers to obtain broadband access (Box 5.6).

Universal Service Funds

Projects to extend broadband can be funded in several ways, ranging from direct full subsidisation by the public sector, mixed public-private funding, to setting incentives for network deployment by private operators (for example, through tax reduction/exemption or loans at reduced rates). Comprehensive plans for broadband extension may combine several of these mechanisms for funding, depending on the level of the access gap, the funding needed to bridge gaps not covered by market forces, taxes imposed on operators that do not adversely affect investment and competition, and the availability of public funding.

The constitution of Universal Service Funds (USFs) makes it possible to aggregate and manage different sources of funding simply and comprehensively, to increase the transparency of funds management and facilitate use of broadband plans.

A variety of models for providing funds and rules for using the USF are applied in the LAC region, as well as in OECD countries. Some OECD countries collect USF contributions from operators, and the funds may only be used to finance universal service obligations and are not available to invest in broadband projects. Other OECD countries, as well as most of the countries in the LAC region, use USFs to pay for a wide range of different broadband projects. These are not necessarily limited to infrastructure deployment but also demand

side programmes, such as improving digital literacy, improving affordability and development of e-government and e-health applications.

Box 5.6. **Examples of initiatives deploying broadband access in public premises**

Brazil (broadband in public urban schools)

The *Banda Larga nas Escolas Públicas Urbanas* (Broadband in Public Urban Schools) project aims to bring Internet access, through broadband, to more than 64 000 public urban schools in Brazil. According to estimates from the Ministry of Education, 86% of Brazilian students should benefit from it. The project is a partnership between the Presidency of the Republic, the Chief of Staff Office, Ministry of Education, Ministry of Communications and Ministry of Planning and Budget. It is managed by the Ministry of Education and ANATEL, the communications regulator, in partnership with the national and municipal secretaries of education. Fixed-network operators involved include *Telecomunicações de São Paulo S.A, Telemar Norte Leste S.A, Brasil Telecom S.A, Companhia de Telecomunicações do Brasil Central* and *Sercomtel S.A.*

ANATEL's role is to inspect and monitor the execution of the project. In 2008, when the concessionaries and the Agency signed the Additional Terms of Reference to provide Multimedia Communication Services. This agreement fixed dates and quality standards for connecting public schools to the Internet. All public urban schools were to be connected to the Internet by 2010 and the service maintained, free of charge, until 2025. The programme includes all public urban middle and high schools, as well as public urban schools for teacher training.

In fact, 40% of the schools were connected by the end of 2008, an additional 40% in 2009 and the remaining 20% in 2010. As well as installing high-speed Internet connection (1Mb/s download speed) in the schools, operators must offer periodical upgrades of speed, with the aim of maintaining the quality of service for as long as the validity of the Additional Terms of Reference. All public schools created between 2011 and 2025 are also to be granted Internet access through this project.

Source: ANATEL (2016), *"Projeto Banda Larga nas Escolas Públicas Urbanas"*, *www.anatel.gov.br/Portal/exibirPortalNivelDois.do?codItemCanal=1519&nomeVisao=Cidad%E3o&nomeCanal=Intera%E7%E3*) (accessed on 25 February 2016).

Costa Rica (broadband in public centres)

The projects to extend broadband access and services in Costa Rica are contained in the National Strategy for Solidarity Universal Access and Service, called crdigit@l. This strategy is part of the digital inclusion pillar of the 2015-21 National Telecommunications Development Plan: Costa Rica, "A Networked Society". This national strategy aims to address problems of access to telecommunications services by groups in vulnerable situations and the need to develop abilities, knowledge and skills for productive and meaningful use of information and communications tools. crdigit@l is the result of an inter-agency effort co-ordinated by the Deputy Ministry of Telecommunications, under the leadership of the Social Presidential Council. This strategy is financed by the National Telecommunications Fund (FONATEL) and counterparts of the institutions involved, aiming to reduce the digital divide, and increase employment and social inclusion.

crdigit@l Strategy is divided into five programmes:

- **Connected Communities.** With a budget of USD 168 million, this will provide fixed voice and Internet services to public education and health centres (such as schools, high schools, Centers for Education and Nutrition and Child Integrated Care Centers (CEN-CINAI), Comprehensive Health Care Basic Teams (EBAIS) and, to telecentres designated Intelligent Community Centers (CECIS). It will reach 184 districts in Costa Rica.

Box 5.6. **Examples of initiatives deploying broadband access in public premises** *(Cont.)*

- **Connected Homes.** This will provide access to Internet and devices through a subsidy that will benefit 140 000 households living in poverty and extreme poverty. The programme has a budget of USD 100 million.
- **Equipped public access centres.** This will provide equipment to public housing centres for people with disabilities, childhood, youth, the elderly, indigenous people, women heads of households and micro-entrepreneurs. This programme has a budget allocation of USD 20 million.
- **Connected Public Areas.** This will connect 240 public access spots with free Internet, using a budget allocation of USD 10 million.
- **Solidarity Broadband Network.** This is oriented to improve the quality of service of Public Service Provision Centres with superior connectivity needs.

To ensure transparency and accountability, an interagency commission was formed to follow up on the implementation of crdigit@l projects.

Source: Deputy Ministry of Telecommunications, *Ministerio de Ciencia, Tecnología y Telecomunicaciones* (MICITT). *www.micit.go.cr/images/Telecomunicaciones/pndt/PNDT-2015-2021.pdf* and MICITT (2016), Costa Rica Digital, *www.crdigital.go.cr/* (accessed on 24 February 2016).

Mexico (*México Conectado* and *Puntos México Conectado*)

México Conectado is a Mexican government initiative to provide open and free broadband access in schools, hospitals, clinics, library, community centres and other public spaces. At the end of 2014, around 65 000 public spaces were providing free Internet access to Mexican citizens.

The *Puntos México Conectado* programme (Connected Mexico Points, or PMCs) aims to encourage innovation and the use of new technologies for the development of digital skills and entrepreneurship. The educational services include courses on digital literacy, English, robotics, mechanics, software programming, as well as innovation and entrepreneurship programmes.

The network was launched in March 2015 and includes 32 PMCs, one in each federal state. Locations were determined by prioritising municipalities with more than 40 000 inhabitants included in national development programmes, like the *Cruzada Nacional Sin Hambre* and *Nos Mueve la Paz*. By January 2016, 141 700 people were registered as members of PMCs (54% of them women) and 70 000 citizens are registered in the courses offered.

Source: SCT (2016), *Puntos México conectado*, *www.pmc.gob.mx/* (accessed on 26 February 2016); *www.mexicoconectado.gob.mx/*.

It is important to note that the original purpose of USFs – such as extending of the public switched telephone network (PSTN) to rural areas – is still relevant in most LAC countries. Nonetheless, given the ability of mobile networks to provide telephony and the growing relevance of broadband networks to provide a range of services, as well as acting as backhaul networks, policy makers should consider adapting such USF programmes. A case-by-case analysis is needed, considering a series of factors that will be analysed in the following sections. Annex 5.A2 provides information on USFs in the LAC region.

First, policies can be put in place to provide **direct funding by the public sector** to fulfil universal service goals. Providing broadband access to people in both urban and rural areas, as well as to those in the LAC region with lower incomes, is fundamental to achieve digital

inclusion. The level of financial support for broadband extension projects depends on many factors, such as gaps in broadband coverage, priorities for other investments in infrastructure (e.g. water or electricity) and the availability of public funds.

Secondly, **contributions from operators to the USF** are another, potentially important, mechanism for financing broadband expansion. Setting an adequate level of contributions to USFs from operators is complex:

- **Policy makers should analyse data** on the financial returns for operators, existing incentives for investments, the availability of public funding, and should compare the burden imposed and its implications on investment and competition relative to the expected benefits. Benchmarking with similar and reference countries is also a useful tool for determining the optimal level of USF contributions from operators.
- **Regular contributions** from operators based on their revenues allows for a steady stream of funds to address requirements for broadband expansion. This can be considered an option, provided that the burden imposed on operators is reasonable. Demanding high contributions to the USF from operators can also discourage other critical investment in the region. In addition, when there is a lack of competition, as is the case in many LAC countries, the additional burden for operators would be automatically transferred to consumers through increases in prices for telecommunications services. Conversely, setting contributions to the USF too low may not be optimal, since covering all broadband deployment projects with public funding may not be feasible in the region.
- A **balance** should be found between the burden imposed on operators and funding requirements needed to complement public funding for broadband plans. The potential effect on investments by operators and final prices should be considered, as well as the real needs for funding universal services based on the operators' contributions. When possible, and if government budgets allow it, contributions should gradually shift to being funded by general government revenues, bearing in mind that imposing high burdens on operators may hold back broadband development and its positive economic and social spillovers (OECD, 2014b).
- **Accumulating contributions** to the USF without disbursement on broadband access projects, or disbursing substantially less than contributions collected, would exact rents on operators, affecting the incentives for investment without benefiting consumers. If this occurs, as is the case in certain LAC countries, management capabilities should be reinforced to invest in projects with the funds obtained or to adapt the level of operators' contributions to fit the existing ability to implement USF projects.
- It is important to note that the level of USF contributions should be **reviewed regularly**. When broadband access is successfully extended and broadband penetration increases, improvements in quality and speeds may rely more and more on market competition. This means that contributions from operators can be reduced, providing more room for competition and private investment.
- Finally, in a **pro-competitive regime** favouring market entry, it can make sense to set a minimum revenue threshold for contributions to the Universal Service Fund. This lowers barriers for new entry and simplifies the management of the Universal Service Fund.
- A third mechanism used to finance broadband access is through **revenues from spectrum licenses and cross-subsidies between services**. Some countries in the LAC region use, for example, spectrum license revenues as a source for universal service funding. Although spectrum revenues can be an important source of potential funds, the availability of

such funds is unpredictable. This is because spectrum auctions only take place periodically and the outcome of auctions is not known in advance. As a result, auction earnings can be used to supplement USF but should not be relied on for planning purposes. Similarly, income from fines imposed on operators for infringing regulations do not provide for a predictable source of revenue for USF funds.

- **Cross-subsidies** between services to extend broadband access, using revenues from one service to subsidise another, is not advisable, and any contribution from revenue obtained from a specific telecommunications service should be avoided. Tariff rebalancing can be an essential requirement for the creation of effective conditions for competition, and distorting prices through cross-subsidisation is likely to have a negative effect on affordability and demand for other services.

Selection of providers for broadband access extension in the LAC region

When possible, publicly funded infrastructure deployment projects should be awarded using a **transparent, open and competitive process**, in which a variety of operators tender and offer the use of different technologies, speeds, quality of service, operational support, future upgrading of a network, and so on. This may also result in higher levels of co-funding and reveal the players' knowledge of the actual costs of meeting policy objectives, or alternatively, result in more beneficial offers (e.g. wider coverage). This allows for better outcomes and for competition among operators.

Attention should be paid to the **scope of the project**, since, for example, breaking up projects to cover smaller geographic areas can provide an opportunity for small operators to take part in the bid, increasing competition and allowing for diversification and experimentation with different models for deployment of broadband networks. In other projects, such as nationwide backbone networks, management and implementation may be more complex, making it necessary to use larger players with the experience and adequate financial and management capacity.

The interrelation between public and private sectors when extending broadband access

Several issues in the relationships between the public and the private sector should be considered when extending broadband access. They include the implications of public funding for competition among private providers; the opportunities offered by public-private partnerships, and the role publicly owned operators can play in closing the access gap.

As discussed in Chapter 4, ensuring fair competition among telecommunication providers is vital in improving the quality of service and lower prices for broadband access. Any broadband expansion plan or project involving public funding must consider the **potential implications for competition**, to avoid distortions in the market or inhibiting future competition. To address this potential concern, the following good practices can be applied:

- In geographical areas that already have competition for broadband and an adequate quality of service, or where there is room for more competition (for example by lowering administrative barriers), policy makers should, in principle, abstain from funding access infrastructure projects. Experience shows that **well-functioning competitive markets** lead to higher speeds, and better prices and quality of service; public intervention may distort a competitive market. Meanwhile, the use of public funds in such areas diverts these resources from areas under-served by the market. In the European Union, the legal framework does not allow for public funding of NGA deployments in areas considered as competitive (Box 5.7).

- In general, any partially or totally public funded network deployment should promote **open access** by allowing all operators use of the access infrastructure. Open access clauses should be included in tender documents stating price conditions, and the technical and other requirements for ensuring access from other operators.

Box 5.7. **Government-aid rules for NGA network funding in the European Union, a case study**

The objective of the Commission's government-aid control provisions is to ensure that government intervention does not distort competition and intra-European Community trade. The provisions specify formal guidelines for differentiating, by market structure/market contestability conditions, between white (unserved) areas, grey (private monopoly served) areas and black (multiple private infrastructures) areas for NGA networks.

- **Basic broadband networks (white areas).** In white areas, no provider of broadband access services is currently operating, and no provider is expected to emerge in the next three years. Public intervention is thus likely to be in line with the common interest, and government aid is likely to be compatible. In grey areas, one (infrastructure-based) provider is already active, but another network is not likely to be developed in the next three years. Such cases require more detailed analysis and a thorough compatibility assessment. Black areas already have, or will have in the next three years, at least two basic broadband networks of different operators. Broadband services are thus provided under competitive conditions (infrastructure-based competition) and it can be assumed there is no market failure. In such cases, little scope remains for government intervention to generate more social benefits by subsidising another basic broadband network. However, it may well be possible to support an NGA network in black basic broadband areas.
- **NGA networks (grey areas).** In a "white NGA" area, no NGA network currently exists and none is likely to be built within the next three years by private investors. In this case, the area is in principle eligible for government aid to NGA. The area is considered a "grey NGA" area if only one NGA network is in place or is being deployed in the coming three years, and no operator plans to deploy another NGA network in the coming three years. Under such circumstances, the European Commission will carry out a more detailed analysis to verify whether government intervention is needed. It is understood that deploying a second broadband infrastructure to compete with the existing one is not a sufficient argument for accepting government aid. Instead, the second network needs to provide substantially improved prices and higher speeds.
- **Black areas.** In a "black NGA" area, at least two NGA networks of different operators already exist or will be deployed in the coming three years. In such cases, there is a risk that the Commission will conclude that support for an additional publicly funded, equivalent NGA network is incompatible with the internal market targets. In practice, this means that the project is either modified or withdrawn. Prohibition decisions for broadband government aid are extremely rare. However, some exceptions may be granted if the NGA network amounts to a step change and is able to provide ultrafast speeds well above 100 Mbps.

Source: EC (2014), "Handbook for decision makers: The broadband State aid rules explained", *https://ec.europa.eu/digital-agenda/en/news/handbook-decision-makers-broadband-state-aid-rules-explained* (accessed on 26 February 2016).

Secondly, the public and private sectors can complement each other through **public-private partnerships** (PPPs). These can be an efficient model for structuring public funded broadband access extension plans or projects that take advantage of synergies that benefit both private and public interests, and that ultimately increase the benefits for consumers.

Public authorities' role in PPPs should in general be focused on defining objectives and specific targets; setting conditions and clauses for the deployment and operation of a network; contributing funding; selecting private partners to execute the project; and monitoring and assessing projects. The role of the private sector, and specifically operators and technology suppliers, is to contribute their expertise of efficient network technologies and deployment, and to help with project management and execution. PPPs should be structured to optimise the comparative advantages and natural roles of each partner. Many different experiences and models of PPP can be used, examples of which can be found in the OECD and IDB documents included in the references. The OECD has established principles for public governance of public-private partnerships to assist with good practices in this area (Box 5.8).

Box 5.8. **OECD Recommendation on Principles for Public Governance of Public-Private Partnerships**

A. Establish a clear, predictable and legitimate institutional framework supported by competent and well-resourced authorities

1. The political leadership should ensure public awareness of the relative costs, benefits and risks of Public-Private Partnerships and conventional procurement. Popular understanding of Public-Private Partnerships requires active consultation and engagement with stakeholders as well as involving end-users in defining the project and subsequently in monitoring service quality.
2. Key institutional roles and responsibilities should be maintained. This requires that procuring authorities, Public-Private Partnerships Units, the Central Budget Authority, the Supreme Audit Institution and sector regulators are entrusted with clear mandates and sufficient resources to ensure a prudent procurement process and clear lines of accountability.
3. Ensure that all significant regulation affecting the operation of Public-Private Partnerships is clear, transparent and enforced. Red tape should be minimised and new and existing regulations should be carefully evaluated.

B. Ground the selection of Public-Private Partnerships in value for money

4. All investment projects should be prioritised at the senior political level. As there are many competing investment priorities, it is the responsibility of government to define and pursue strategic goals. The decision to invest should be based on a whole-of-government perspective and be separate from how to procure and finance the project. There should be no institutional, procedural or accounting bias either in favour of or against Public-Private Partnerships.
5. Carefully investigate which investment method is likely to yield most value for money. Key risk factors and characteristics of specific projects should be evaluated by conducting a procurement option pre-test. A procurement option pre-test should enable the government to decide on whether it is prudent to investigate a Public-Private Partnerships option further.
6. Transfer the risks to those that manage them best. Risk should be defined, identified and measured and carried by the party for whom it costs the least to prevent the risk from realising or for whom realised risk costs the least.
7. The procuring authorities should be prepared for the operational phase of the Public-Private Partnerships. Securing value for money requires vigilance and effort, of the same intensity as that necessary during the pre-operational phase. Particular care should be taken when switching to the operational phase of the Public-Private Partnerships, as the actors on the public side are liable to change.

Box 5.8. **OECD Recommendation on Principles for Public Governance of Public-Private Partnerships** *(Cont.)*

8. Value for money should be maintained when renegotiating. Only if conditions change due to discretionary public policy actions should the government consider compensating the private sector. Any renegotiation should be made transparently and subject to the ordinary procedures of Public-Private Partnership approval. Clear, predictable and transparent rules for dispute resolution should be in place.
9. Government should ensure there is sufficient competition in the market by a competitive tender process and by possibly structuring the Public-Private Partnerships programme so that there is an ongoing functional market. Where market operators are few, governments should ensure a level playing field in the tendering process, so that non-incumbent operators can enter the market.

C. Use the budgetary process transparently to minimise fiscal risks and ensure the integrity of the procurement process

10. In line with the government's fiscal policy, the Central Budget Authority should ensure that the project is affordable and the overall investment envelope is sustainable.
11. The project should be treated transparently in the budget process. The budget documentation should disclose all costs and contingent liabilities. Special care should be taken to ensure that budget transparency of Public-Private Partnerships covers the whole public sector.
12. Government should guard against waste and corruption by ensuring the integrity of the procurement process. The necessary procurement skills and powers should be made available to the relevant authorities.

Source: OECD (2012), *Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships*, *www.oecd.org/governance/budgeting/PPP-Recommendation.pdf*.

Finally, fully or partially **public-owned operators** may play a role in extending broadband access. In a number of LAC countries, such public-owned operators are chiefly working on broadband expansion projects, deploying rural and backbone/backhaul networks. Some good practices to be considered are:

- In the LAC region, publicly owned operators are often in a position to take a **leading role** in the execution of national and rural broadband plans. In many countries in the region, they control a national-wide copper access network deployed for fixed telephony services, as well as much of the backbone and backhaul networks. These can be upgraded and extended rather than rolling out new networks.
- It is important to make sure that public-owned operators are **not treated more favourably** than other operators, based on the fact that they are publicly owned. Taxation of publicly owned operators, licenses, obligations and conditions for providing broadband services should in principle be the same as for any other operator, and any differential treatment (e.g. obligations to provide access to essential facilities) must be based on regulatory decisions (e.g. because they have a dominant market position, rather than by virtue of their ownership structure).
- Any broadband subsidy for public operators should be granted under the same **transparent and open access conditions**, and any obligations imposed be similar to those imposed on any other operator. If possible, subsidies for broadband access expansion must be awarded based on competitive bidding, open not only to publicly owned operators, but to any other operator fulfilling the prerequisites for participating in the bidding process.

It is important to ensure that publicly owned operators have no more obligations than other operators, such as providing universal service for specific communities at lower prices or in rural areas, without compensation for the operator's additional costs.

- **Exempting** public operators from contributing to universal service funds, paying for spectrum licenses or any other financial burdens applied to private operators, or more favourable conditions for using public infrastructure in exchange for universal access projects should in general be avoided. Such exemptions are not always transparent and may distort competition between public and private operators, and make it more difficult to apply competitive processes for universal access projects.
- **Publicly owned operators** can also be used in certain situations as a wholesale provider, deploying backbone or access infrastructures used by other operators at the retail level. For example, Telebrás, a publicly owned operator in Brazil, has a mission to implement a broadband plan aiming to provide coverage in rural areas, schools and other locations where the market has not provided coverage provided. Telebrás operates mainly as a wholesale infrastructure provider for other operators. Other LAC and OECD countries have also applied this model. Although separating the wholesale level and the retail level is attractive in terms of nondiscrimination, and is applied in specific OECD countries, there is no consensus on its merits. If all retail operators rely on a single wholesale access network, there is some risk of infrastructure remonopolisation and a loss of potential efficiencies in retail-wholesale integration. However, for broadband expansion plans to provide coverage in areas where there would otherwise be insufficient infrastructure, such a model may be necessary and considered good practice. The merits and risks of this practice must be analysed on a case-by-case basis.

Conclusion

This chapter focused on good practices for extending broadband access. While the private sector is expected to play a central role in expanding infrastructure and services, sound regulatory frameworks that lower administrative barriers to deployment, provide legal certainty for investors and promote competition and investment are also essential. Once existing bottlenecks for private-sector infrastructure deployment are addressed, policy makers should identify areas or locations needing public intervention.

National Broadband Plans (NBPs) usually set out the guiding policy objectives for broadband expansion. They should be done in a comprehensive manner, in co-ordination with stakeholders, Digital strategies (when present) and demand-side policies provide clear objectives and both short and long-term measurable targets; take into account regions' levels of development; map coverage gaps by fixed and mobile broadband networks; assess the existing level of competition; and implement a routine evaluation of progress towards goals. NBPs should be guided by the principle of technological neutrality, allowing market actors with different technologies to bid for coverage projects, giving preference to those with high social returns (e.g. connecting public premises and benefiting disadvantaged groups).

After assessing the policy objectives, the next step is selecting mechanisms to meet these goals. Policy makers can choose to impose obligations, set incentives or provide funding for closing access and usage gaps. Obligations, when revised for the new requirements and use of high-capacity networks and directly related to coverage and quality, could be aimed at extending broadband access in certain areas and tied to licensing frameworks and spectrum assignment. Demand-related objectives should be met through other procedures. Incentives could include partial or total tax exemptions, lower or waived fees for spectrum licenses in

certain areas, or loans at reduced interest rates. Direct funding of broadband infrastructure, usually articulated in NBPs and Universal Service Funds (USFs), should be within the reach of all market participants equally and awarded in a transparent and competitive manner, with the inclusion of infrastructure sharing and open access conditions. USFs are used to aggregate and manage different sources of funding, such as contributions from operators based on revenues and general government revenues, complemented in some cases by spectrum auction earnings. Well-run USFs rely on transparent and effective management processes and a steadier stream of funds. Operators' financial returns should be considered so as to not overburden them and impact investment, and cross-subsidies should be avoided so as not to distort prices. Meanwhile, USF contributions should be reviewed regularly through benchmarking exercises and economic analysis.

The public and private sectors can also complement each other through PPPs. These offer an efficient model for structuring public funded broadband access extension plans or projects that take advantage of synergies that benefit both private and public interests, and ultimately contribute to increasing the benefits for consumers.

Finally, public-owned operators may also have a role to play, but licenses, obligations and conditions for providing broadband services should in principle be the same as for any other operator. Any differential treatment should be based on regulatory decisions (due to a dominant market position, for example, and not to ownership structure). Broadband subsidies for public operators should be granted under a competitive process open to any operator that can satisfy the prerequisites.

Notes

1. See *www.fcc.gov/guides/mobile-speed-test-tip-sheet*.
2. See *www.itu.int/net4/ITU-D/idi/2015/*.
3. There is one specific case where incomes for a specific service (termination for international calls) is used to set the contribution for the Universal Service Fund.
4. See *www.mtc.gob.pe/comunicaciones/concesiones/renovacion_telefonica.html*.
5. These mechanisms are further described and addressed in a report by the Broadband Commission (2014b).

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ANNEX 5.A1

National Broadband Plans in the LAC region

Country	National broadband plans for infrastructure deployment
Argentina	**Plan Nacional de Telecomunicaciones Argentina Conectada (2010-15)** Managed by: Ministry of Federal Planning, Public investment and Services and the Ministry of Communications Objective: Build infrastructure and provide equipment for network connectivity.
Bahamas	**Included within the Electronic Communications Sector Policy (2014)** Managed by: The Utilities Regulation and Competition Authority (URCA), Minister with responsibility for the Electronics Communication Sector Objective: Ubiquitous access to affordable, reliable and high-quality electronic communications services (including broadband access) to promote the government's broader development goals.
Barbados	**Included within the National Information and Communication Technologies Strategic Plan (2010-15)** Managed by: Ministry of Economic Affairs and Empowerment, Innovation, Trade, Industry and Commerce and its Technical Unit Objective: Development and deployment of an ICT backbone infrastructure and security enterprise infrastructure, adopting a common IT infrastructure for the government.
Belize	**Included in the ICT national strategy (2011-16)** Managed by: Ministry of Public Service, governance improvement, elections, and boundaries and sports, and the Ministry of Energy, Science and Technology and Public Utilities (MESTPU) Objective: Provide citizens the opportunity to access telecommunications infrastructure, promote and facilitate investment in additional Internet backbone.
Bolivia	**Programa Nacional de Telecomunicaciones de Inclusión Social (2015)** Managed by: *Ministerio de Obras Públicas Servicios y Vivienda* (MOPSV) Objective: Telecommunications network expansion and reduction of the digital divide through the diffusion of ICT.
Brazil	**Programa Nacional de Banda Larga (PNBL) (2010-15)** Managed by: Federal Government Initiative, MiniCom within the Ministerio das Comunicações (MC) Objective: Expand broadband Internet access. Other programmes regarding the deployment of electronic communication infrastructure include: Regime Especial de Tributação de Banda Larga (REPNBL), *Banda Larga Popular*, *Cidades digitais*, *Telecentros*, *cabo submarine*, *Governo Eletrônico – Serviço de Atendimento ao Cidadão* (Gesac).
Chile	**Within the Agenda Digital Imagina Chile (2013-20)** Managed by: *Subsecretaría de Telecomunicaciones de Chile* (SUBTEL), MTC Objective: Infrastructure deployment includes three initiatives: i) the development of high-speed Internet networks; ii) the deployment of broadband in sectors with insufficient connectivity; and iii) increase efficiency in the use of the radio electric spectrum.
Colombia	**Plan Vive Digital (2014-08)** Managed by: *Ministerio de Tecnologías de la Información y las Comunicaciones* (MinTIC) Objective: Triple the number of Internet connections.
Costa Rica	**Plan Nacional de Desarrollo de las Telecomunicaciones 2015-21: Costa Rica "Una Sociedad Conectada"** Managed by: Deputy Ministry of Telecommunications, *Ministerio de Ciencia, Tecnología y Telecomunicaciones* (MICITT) Objective: Promote broadband, social inclusion, empowerment of the people and an open, accessible and transparent e-government.
Dominican Republic	**Biannual Projects. Resolution No. 001-14 (2014-15)** Managed by: INDOTEL-CNSIC Objective: Infrastructure development and broadband access based on optical fibre.
Ecuador	**The national Broadband Plan is included in the Digital Strategy for Ecuador (2012-17)** Managed by: *Ministerio de Telecomunicaciones y de la Sociedad de la Información* (MINTEL) Objective: Improve quality of life by the introduction, usage and appropriation of new ICT technologies, decreasing the prices of broadband access and promoting the deployment of the network and services.
El Salvador	**Does not have national plan, part of the regional project Autopista Mesoamericana de la información (AMI) (2008-15)** Managed by: Regulatory authorities from participating countries Objective: Provide connectivity in Latin America through fibre-optic expansion and submarine cables. It includes three subprojects: the rural connectivity network, the fibre-optic network and the regional network access point (NAP).

Country	National broadband plans for infrastructure deployment
Guatemala	**Does not have national plan, part of the regional project Autopista Mesoamericana de la información (AMI) (2008-15)** Managed by: Regulatory authorities from participating countries Objective: Provide connectivity in Latin America through fibre-optic expansion and through submarine cables. It includes three subprojects: the rural connectivity network, the fibre-optic network, and the regional network access point (NAP).
Guyana	**Within e-Gov Guyana Unit (2013-15)** Managed by: e-Gov Guyana Unit Objective: Facilitate the implementation of two ICT ventures integral to development in Guyana and loyal to the decree in the team's mission statement. The project has two subprojects: the transmission network and the data network.
Honduras	**National Plan for the Development of the Broadband included in the Digital Agenda, Section 1.4.2 (2014-18)** Managed by: Technical Secretary for Planning and External Co-operation, *Secretaría de Planificación y Cooperación Externa* (SEPLAN) and *Comisión Nacional de Telecomunicaciones* (CONATEL) Objective: Increase broadband connection in the different sectors of society through the availability of infrastructure and offering appropriate services.
Jamaica	**Within the Master Implementation Plan for E-powering Jamaica 2012, National Strategic Plan (2007-12)** Managed by: Central Information Technology office and the Ministry of Science, Technology, Energy and Mining (MSTEM) Objective: Establishing a widely dispersed ICT infrastructure and broadband penetration in rural Jamaica.
Mexico	**México Conectado (2013-18)** National project that contributes to warrant the constitutional right to access broadband internet service Managed by: Federal Government and the *Secretaría de Comunicaciones y Transportes* (SCT) Objective: Promote the deployment of telecommunication networks in public spaces such as libraries, schools and health centres.
Nicaragua	**A consultancy is being developed in collaboration with COMTELCA and the IDB for the deployment of a Central American broadband Regional** Managed by: *Gobierno Electronico de Nicaragua* (GOBeNIC), *Consejo Nicaragüense de Ciencia y Tecnología* (CONICYT), *Ente Nacional de los servicios de Telecomunicaciones* (TELCOR) Objective: Deployment of broadband at the regional level.
Panama	**Broadband strategic plan for the Panama Republic (2013-22)** Managed by: *Autoridad Nacional para la Innovación Gobiernmental* (AIG) Objective: Includes the analysis of the broadband ecosystem, the diagnostics of broadband and the strategic plan for broadband.
Paraguay	**A national plan for broadband is being developed. Broadband deployment is already included in the Telecommunications National Plan (2011-15)** Managed by: *Comisión Nacional de Telecomunicaciones* (CONATEL) Objective: Increase the coverage and density of fixed and mobile broadband, increasing penetration rates, as well as the number of localities with broadband.
Peru	**National Plan for the Development of Broadband in Peru (2011-15)** Managed by: *Ministerio de Telecomunicaciones y Transportes* Objective: Broadband deployment.
Suriname	**There is no national plan, but two regional projects exist: 1. Broadband Infrastructure inventory and Public Awareness in the Caribbean; 2. Regional Digital Development Strategy (2011)** Managed by: Caribbean Community (CARICOM) (regional) and TAT Objective: Broadband deployment at regional level.
Trinidad and Tobago	**smarTT (2014-18)** Managed by: Ministry of Sciences, Technology and Tertiary education and the Telecommunications Authority of Trinidad and Tobago (TATT) Objective: Address the provision of an adequate telecommunications and broadcasting network, to guide infrastructure deployment. Broadband vision aims at delivering access speeds of 100 Mbps to the majority of the population by 2016. The high-level broadband objective promotes widespread access to high-speed broadband. In the smarTT plan under thematic area 4: Infrastructure Development.
Uruguay	**Broadband deployment objectives are included in the digital agenda (2011-15)** Managed by: *Agencia de Gobierno electrónico y Sociedad de la Información y del Conocimiento* (AGESIC). Objective: One of the objectives of Uruguay's digital agenda is to reach Internet coverage for everyone. The goal is to reach Internet broadband connection for 60% of the population in 2012 and 80% in 2014.

ANNEX 5.A2

Universal service funds in the LAC region

Universal Service Funds in countries from the LAC region

	Name of the fund and website	Acronym	Financed through (% of operators income)	Budget estimation		Date	Legal framework	Responsible entity
				Country currency	USD million			
Argentina	Fondo Fiduciario del Servicio Universal *www.enacom.gob.ar/acerca-del-servicio-universal_p731*	FFSU	1%	ARG 2. 068 billion	220	2000	Reglamento General del Servicio Universal 558/2008	ENACOM
Bahamas	Universal Service Fund *http://www.urcabahamas.bs/consultations.php?cmd=search&cat=20*	USF	Proportionate	-		2013	Communications Act 2009	URCA
Barbados	Universal Service Fund *www.telecoms.gov.bb/website/index.php?option=com_content&view=article&id=35&Itemid=138*	USF	Proportionate	-		-	Telecommunications Act 2001	Prime Minister
Belize	Universal Service Fund *www.puc.bz/index.php/publications/telecom-sector/telecom-laws-of-belize/acts-1/60-belize-telecom-act/file*	USF	Levy to be determined	-		2002	Telecommunications Act 2002	PUC
Bolivia	Programa Nacional de Telecomunicaciones de Inclusión Social *http://www.comunicacion.gob.bo/?q=20151209/20103*	PRONTIS	Fees, licences, contributions	-		2011	General telecommunications law	MOPSV
Brazil	Fundo de Universalização dos Serviços de Telecomunicações *www.planalto.gov.br/ccivil_03/leis/l9998.htm*	FUST	Variable, determined by presidential decree	BRL 16.5 billion	4	2000	Law N. 9.998/2000	ANATEL
Chile	Fondo de Desarrollo de las Telecomunicaciones *www.subtel.gob.cl*	FDT	National Budget	CLP 87 759 billion	125	1994	Law Decree 1762	SUBTEL
Colombia	Fondo de Tecnologías de la Información y las Telecomunicaciones *www.mintic.gov.co/portal/604/w3-propertyvalue-6171.html*	FONTIC	Fees, licences, contributions 5%	COP 12 000 billion	3.9	2009	Article 58, law 1450	MINTIC-FONTIC
Costa Rica	Fondo Nacional de Telecomunicaciones *http://www.sutel.go.cr/pagina/que-es-fonatel*	FONATEL	1.5%	CRC 128 billion	239	2008	Law No.8642	SUTEL
Dominican Republic	Fondo de Desarrollo de las Telecomunicaciones *http://indotel.gob.do/indotel/fondo-para-el-desarrollo-de-las-telecomunicaciones/*	FDT	2%	DOP 397 million	8.8	1998	General Telecommunications Law resolution No. 24-10	INDOTEL

Universal Service Funds in countries from the LAC region								
	Name of the fund and website	Acronym	Financed through (% of operators income)	Budget estimation		Date	Legal framework	Responsible entity
				Country currency	USD million			
Ecuador	Fondo de Desarrollo de las Telecomunicaciones *www.telecomunicaciones.gob.ec/plan-de-acceso-universal-y-alistamiento-digital/*	FODETEL	1%		7.6	2000	Special Telecommunications Law No. 2000-4	MINTEL
El Salvador	Fondo de Inversión en Electricidad y Telefonía *www.fisdl.gob.sv/institucion/marco-institucional/informes/normativa/1921-ley-de-finet*	FINET	Fees, licences, contributions	-	-	1998	Ley del Fondo de Inversión Nacional en Electricidad y Telefonía	FINET
Guatemala	Fondo para el Desarrollo de la Telefonía	FONDETEL	Spectrum auctions	GTQ 114 million	14.6	1996	Telecommunications General Law. Decree No. 94-96	FONDETEL-MCIV
Jamaica	Universal Service Fund *http://www.usf.gov.jm*	USF	Levy to be calculated	JMD 11.97 billion	10.1	2005	Telecommunications Act	MSTEM-USF
Mexico	Fondo de Cobertura Social de Telecomunicaciones *www.sct.gob.mx/fileadmin/_migrated/content_uploads/LB_COBERTURA_SOCIAL_FONCOS_01.pdf*	FONCOS	Federal Resources	MXN 13 753 million	0.814	2002	Fideicomisos 2058 and 2059	CSIC-SECON
Nicaragua	Fondo especial de Inversión de Telecomunicaciones y servicios postales *www.telcor.gob.ni*	FITEL	2%	-		2003	Executive Decree 5-2006	TELCOR
Panama	Fondo para el Desarrollo de Proyectos de Servicio y Acceso *www.innovacion.gob.pa/descargas/acceso_universal_Resolucion_No_6.pdf*	FDPSA	1%	PAB 10 million	10	2010	Law 59 from 2008	AIG-ASEP- Junta Asesora de Servicio y Acceso Universal
Paraguay	Fondo de Servicios Universales *http://www.conatel.gov.py/*	FSU	1%	Amount is not fixed		1999	Telecommunications Law	CONATEL
Peru	Fondo de Inversión en Telecomunicaciones *www.fitel.gob.pe*	FITEL	1%		70	1993	Telecommunications Law	MTC-FITEL
Suriname	x	x	x	x		x	Telecommunications Act 2000	MinTCT-TAS
Trinidad and Tobago	Universal Service Fund *https://tatt.org.tt/*	USF	-	-		Universal Service Framework	x	TATT
Uruguay	x	x	x	x		x	x	x
Venezuela	Fondo de Servicio Universal *www.conatel.gob.ve/servicio-universal/*	FSU	1%			2011	Ley Orgánica de Telecomunicaciones	CONATEL

Note: x = not applicable; - = absolute zero.

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A Digital Economy Toolkit
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Chapter 6

Affordability, government charges and digital inclusion

This chapter focuses on good practices aimed at increasing the affordability of broadband services and digital inclusion. It outlines mechanisms that help reduce the costs of services and devices, taking into consideration taxation and government charges. It also examines how to promote further digital and financial inclusion, by using ICTs to overcome barriers resulting from such factors as affordability or for people with special needs.

Information and communication technologies (ICTs) and specifically broadband are general-purpose technologies that can be applied to a wide range of economic and social activities. Their positive effects on development have been well documented. More widespread use of ICTs translates into more social development and general economic growth. Given the large economic and social positive externalities of ICTs, governments should promote their use. This role requires, among other things, making the adoption and use of ICT affordable. Policies should aim to reduce the "affordability gap", defined as the number of people or households who do not access ICT services because they are not able to cover such expenses.

As competition generally results in more investment, better quality, increased supply and lower prices, the creation of a competitive framework is the single most important initiative that authorities can take to increase affordability. The difference in consumer demand that theoretically exists between any given market structure and a fully competitive market is usually described as the "market gap". It can be efficiently addressed with comprehensive policies that promote competition and lower barriers to entry. Yet, even in a perfectly competitive market, certain market failures may prevent areas or groups from being reached commercially without some form of intervention, commonly referred to as the "access gap" (Navas-Sabater, Dymond and Juntunen, 2002).

The recognition that some areas or groups, because they are located in isolated zones or because they cannot afford certain services, are not able automatically to benefit from competitive markets has prompted government intervention, including policies for universal service and community access (as discussed in Chapter 5). This chapter focuses on the particular market failure caused by the affordability dimension of the "access gap", a major challenge to the urban poor in Latin America and the Caribbean (LAC) in particular.

Apart from community access, universal policies and retailing innovations, affordability is also influenced by taxation and other charges imposed by governments, as this chapter will show. Such factors can refer to charges imposed by different levels of government at different stages of the value chain (among them direct sales tax, spectrum usage, rights of way and other fees levied on the deployment of communications networks, import duties, labour taxes, universal service funds, regulatory levies and fees). The taxes different government agencies impose throughout the production chain in order to provide telecommunication services are an important cost factor in the sector, and directly influence affordability. For mobile communications, the GSMA (for GSM Association) estimates that total tax and fee payments as a proportion of mobile revenues were on average 31.9% for a sample of 26 countries, of which seven countries are in the LAC region (GSMA and Deloitte, 2015).[1] The price of smartphones with greater functionality may also bar certain disadvantaged groups from enjoying the benefits of digital inclusion, although this is being rapidly addressed by market forces, as was the case with feature phones.

Closing the access gap and promoting digital inclusion requires more than simply ensuring that services are available and affordable. It also requires that these services be relevant and accessible for disadvantaged groups. While the Chapter 1 addresses Sustainable Development Goals (such as targets for the digital inclusion of women) and Chapter 5 delves into the issue

of connecting rural populations, this chapter will analyse issues related to digital inclusion, for example, financial inclusion and accessibility to people with special needs. This discussion should include the efforts to resolve other important "demand-side" issues, such as skills (Chapter 9), digital local content (Chapter 10) and consumer trust (Chapters 13, 14 and 15).

Key policy objectives for the LAC region

The main policy objective should be to encourage more people, businesses and governments to increase their use of ICTs. This is easier said than done: penetration still lags behind in LAC countries, businesses have not fully incorporated ICTs into their processes, and usage is still low by international standards. This general objective can be broken down into more specific goals:

- **Expand connectivity.** Policy makers should promote the widespread adoption of ICTs by tackling the obstacles to growth. Such actions could include the promotion of competition, skills for effectively participating in the digital economy, a neutral taxation system, the development of local content, and incentives to promote ICT usage in the private and public sectors (addressed in Chapter 10 on business uptake and in Chapter 12 on digital government, as well as in Chapter 11 on e-health and Chapter 9 on education and skills for the digital economy).
- **Increase affordability.** Governments should aim to increase affordability, not only through expansion of services but also through more specific policies and regulation that have a positive influence on lowering pricing of services and devices, and through targeted redistribution mechanisms aimed at tackling market failures.
- **Encourage financial inclusion.** The use of mobile telephony and broadband for mobile banking can bring poor people into the formal financial system at a relatively low cost, even though challenges related to privacy and security still need to be addressed (Chapters 14 and 15).
- **Promote the inclusion of those with special needs through the use of ICTs.** The use of ICTs helps reduce many of the obstacles faced by people with special needs, helping to fully include them in economies and societies. ICTs have a major contribution to make in integrating those with special needs.

Tools for measurement and analysis in the LAC region

ICTs are a rapidly changing industry involving constant innovation, and today's cutting-edge technologies quickly become outdated. Governments need to constantly track and benchmark progress towards a set of measurable indicators. This, in turn, will aid the timely development and modification of national policies to better meet connectivity goals.

Affordability is a relative concept that does not lend itself to precise indicators. **Market prices** should be evaluated periodically to evaluate trends. Specifically, average and minimum available prices should be collected and compared with the distribution of income. This allows for precise measurement of how many people and households need to spend more than an acceptable share of their income to acquire broadband services. International price comparisons are also a useful measurement tool.

Taxation, at least partially, can be measured through estimated total taxes levied on total cost of ownership (TCO) and total cost of use (TCU), the difference between both indicators being the inclusion in TCO of upfront payments (activation and terminal equipment). Other fees along the value chain (as explained below) can be benchmarked with international data. As a reference, the GSMA has been publishing annual statistics on taxation of mobile services for over a decade.[2]

Progress in gaining access to information and communications technologies (ICTs) among **people with special needs** can be measured by general indicators that track what percentage of members of such groups have adequate access, and that track the infrastructure that supports such access. The ICT Consultation in support of the High-Level Meeting on Disability and Development at the 68th session of the United Nations General Assembly (ITU, 2013) proposes a full set of indicators for monitoring and promoting the needs of people with disabilities/special needs, but effective implementation of this measurement agenda is not yet complete.

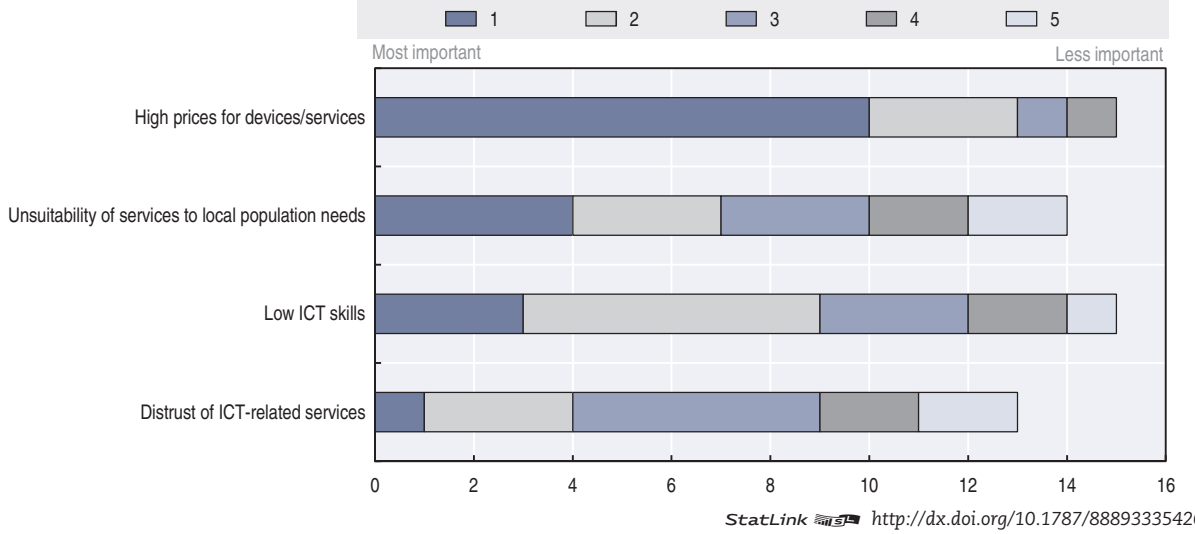
On the one hand, access to ICTs for people with special needs is based on the technology available for each type of impairment the availability of accessible ICT products and services across markets, and affordability. However, progress towards broader enabling conditions also has to be measured. This might include reference to ICTs in disability legislation; the rate of awareness of people with special needs of the use of ICTs; the share of GDP spent on research and development on ICT-enabled solutions for those with special needs; and total patents filed or awarded for ICT-enabled solutions for people with special needs. Other more specific indicators relate to health care, education, professional and lifelong learning, employment, independent living, government services and participation in political and public life. Finally, financial exclusion can be measured based on data showing the percentage of the population who use traditional as well as mobile and online banking.

Overview of the situation in the LAC region

Affordability

A crucial aspect of broadband uptake in the LAC region is affordability. Affordability is a relative concept that should be measured against income. It reflects the financial resources that households and businesses need to access services. In the OECD-IDB questionnaire, when asked about the main barriers to online and ICT services in middle- and low-income groups, LAC countries ranked "high prices for devices/services" as the greatest obstacle (Figure 6.1).

Figure 6.1. **Barriers to broadband and ICT services in general (2015)**



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As a rule of thumb, prices that exceed 5% of disposable income substantially reduce demand (Galperin, 2012). Wide income inequalities exacerbate the situation, given that low-income households tend to have income that is disproportionately lower than the average.

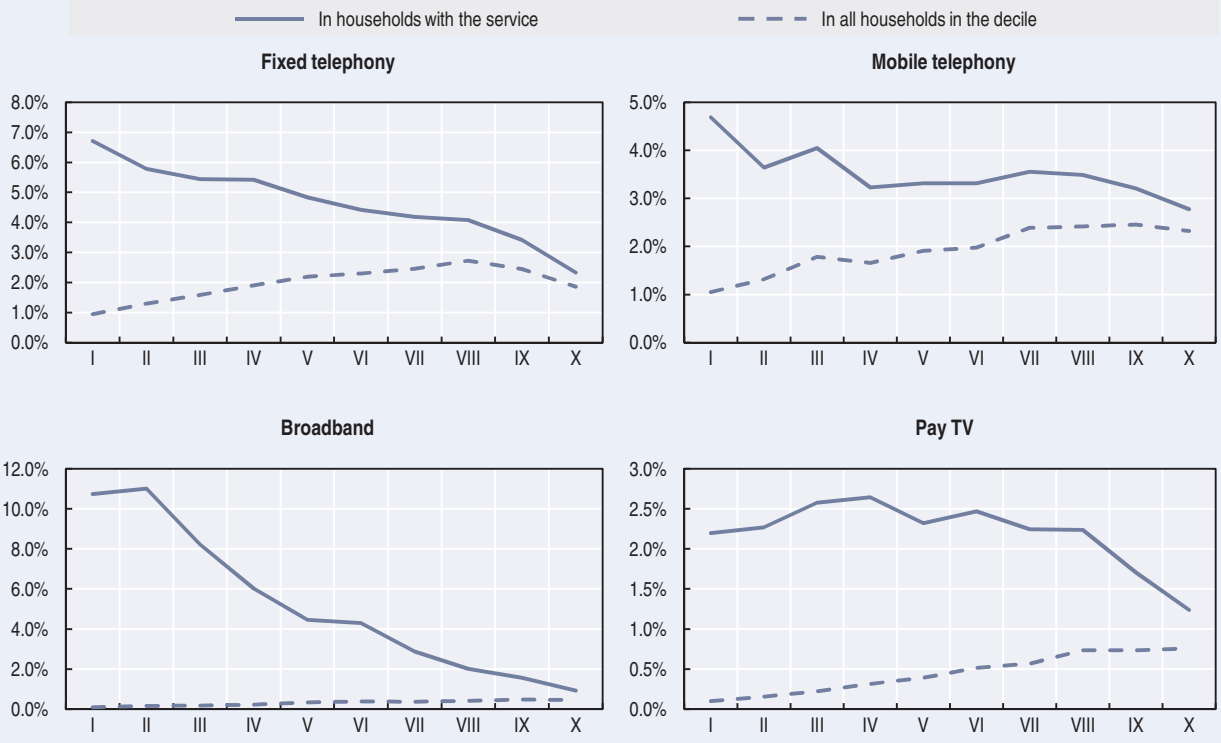
In Brazil and Mexico, the bottom of the pyramid (defined as those households located in the bottom three income deciles) has an average household income of around 30% of the national average. As both national averages stand at around USD 1 400 PPP per month, a 5% maximum expenditure in telecommunications services would translate to around USD 20 PPP. This would severely limit access.

High-income households (in the two top deciles) whose use of telecommunications services is generally above 90%, tend to account for around 50% to 60% of total household spending on telecommunications. As a percentage of disposable income, the amount spent in these groups is usually well below the 5% threshold. The bottom of the pyramid accounts for only 5% to 10% of total telecommunications revenues. On average, household spending is well below the 5% threshold, due to the fact that ICT penetration is spotty. Of those households that actually spend on ICTs, the average spending significantly exceeds the threshold (Box 6.1).

Box 6.1. **Distribution of use of ICT services in Mexico**

Use of ICT services in Mexico is extremely uneven. On average, the wealthiest 20% of households (2008) accounted for 47.1% of total household telecommunications spending, which represented 5.75% of total household expenditure. At the other extreme, the lowest three deciles accounted for only 7.6% of total telecom spending, which represented 2.55% of their expenditures. Nevertheless, for those households that reported having paid for the service, 6% of expenditures was spent paying for fixed telephony services, 4% for mobile services, 10.5% for broadband and 2.5% for pay television. Paying for ICTs thus consumes a significant proportion of disposable income (see Figure 6.2).

Figure 6.2. **Telecom expenditure in Mexico (2008)**



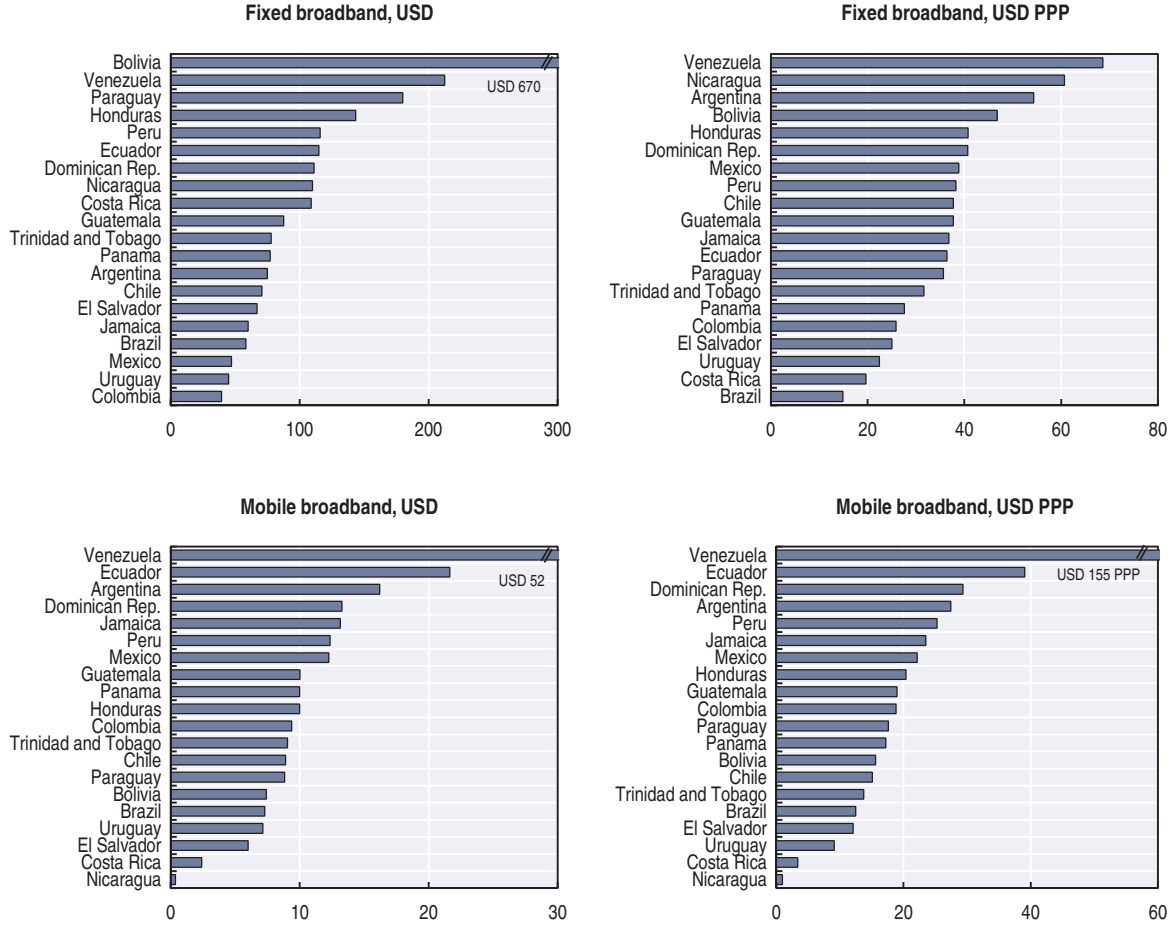
Sources: INEGI (2008), *Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH)*, *www.inegi.org.mx/est/contenidos/Proyectos/encuestas/hogares/regulares/enigh/*; OECD analysis.

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Mobile telephony charges have decreased steeply in recent years, but this is not the case for fixed telephony and broadband. Mobile operators have invested in and developed service innovations in LAC by introducing prepaid services and daily tariffs for mobile broadband. As a result, more affordable services are now offered, and at least 80% of mobile access in the region is on a prepaid basis (GSMA, 2015).

Nevertheless, in terms of affordability, average products in the market do not tell the full story. A much better picture of the situation can be obtained by reviewing the least expensive option available in each market, on the assumption that access is important to the user even if consumption amounts are capped (and usually very expensive on a per-unit basis). In the second quarter of 2015, the cheapest available prices for fixed broadband plans ranged from USD 14.92 PPP in Brazil to more than USD PPP 50 in Argentina and Venezuela. For mobile broadband (1 gigabyte plans), plans ranged from USD PPP 3.35 in Costa Rica to more than USD PPP 30 in Venezuela and Ecuador (Figure 6.3).

Figure 6.3. **Cheapest available plans for fixed and mobile broadband (second quarter of 2015, in USD and USD PPP)**



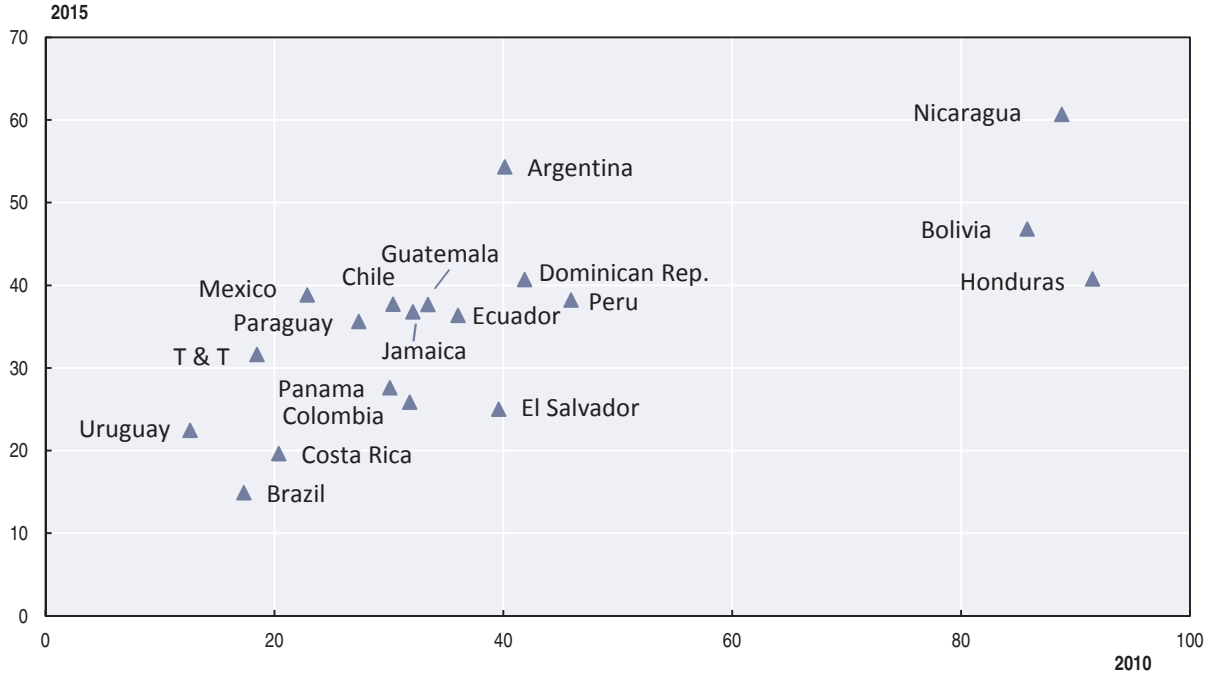
Source: DIRSI Broadband Price Database (2015), *Dialogo Regional sobre Sociedad de la Información*, *http://dirsi.net/web/web/en/news-and-events/news/new/dirsi-publishes--broadband-in-latin-america--market-prices-and-trends-*.

StatLink http://dx.doi.org/10.1787/888933354287

For fixed broadband, in the five years to 2Q2015, prices for the cheapest plans did not change substantially in the LAC region. Three countries (Nicaragua, the Plurinational State of Bolivia [hereafter "Bolivia"] and Honduras) saw large decreases, but they are still three

of the most expensive countries. Nine countries saw marginal increases, whereas seven saw marginal decreases. The average cheapest regional price went down by less than 10% (excluding Venezuela) in the same period (Figure 6.4).

Figure 6.4. **Cheapest available plans for fixed broadband (2Q2015 vs. 2Q2010) (in USD PPP)**



Note: T & T = Trinidad and Tobago.

Source: DIRSI Broadband Price Database (2015), *Dialogo Regional sobre Sociedad de la Información*, *http://dirsi.net/web/web/en/news-and-events/news/new/dirsi-publishes--broadband-in-latin-america--market-prices-and-trends-*.

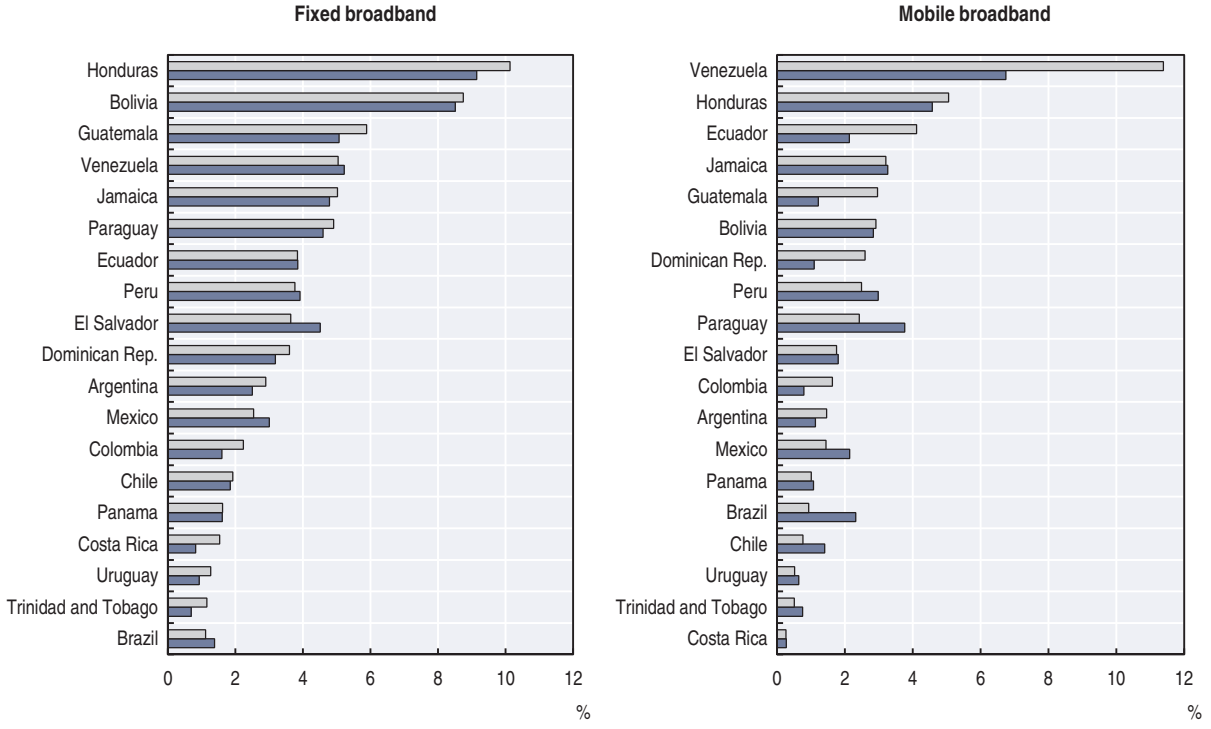
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In relative terms, six countries had fixed broadband minimum prices of less than 2% and six above 5% of GDP per capita. For mobile broadband, all countries except one offer plans priced under 5% of GDP per capita, with ten of them at under 2% (Figure 6.5). Roughly speaking, these numbers translate into around half those percentages in terms of income per household. As households buy other telecommunications products (mainly voice services), these minimum expenditure percentages are affordable for the average consumer, but an almost unsurmountable burden for the bottom of the pyramid.

Affordability is still an important hurdle for broadband adoption in the LAC region, as prices are still high when compared to income levels and wealth distribution, especially for the most economically disenfranchised segments of the population. A number of LAC countries have started to address this issue. Many operators in the LAC offer "social" service plans ("popular" in Brazil, "social broadband" in Costa Rica). Some governments have subsidised access devices (tablets for students in Colombia and Mexico, while Costa Rica offers a subsidy for families assessed to be living in poverty to buy a computer with Internet access).[3] Most countries have free Internet access in certain public places (in Costa Rica, four programmes financed by the *Fondación Nacional de Telecomunicaciones* (FONATEL) pursue this objective – Connected Communities, Equipped Public Centres, Connected Public Spaces and Solidarity Broadband). Some countries increase affordability by reducing taxes on plans

for those with low income (as in Brazil and Colombia's *Vive Digital*). Though not specific to telecommunications services, most countries have income redistribution policies that also increase affordability of ICT services.

Figure 6.5. **Cheapest available plans as a percentage of GDP per capita (second quarter of 2014 and 2015)**



Source: DIRSI Broadband Price Database (2015), *Dialogo Regional sobre Sociedad de la Información*, *http://dirsi.net/web/web/en/news-and-events/news/new/dirsi-publishes--broadband-in-latin-america--market-prices-and-trends-*.

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Taxation and other government-imposed charges

Taxation is necessary in any economy to finance current government spending, support public investment and redistribute income among citizens. That being said, taxation affects supply and prices, influencing demand and reducing affordability. The fiscal regime that applies to the ICT sector must thus be put in perspective with other national goals. Government intervention also needs to consider spending programmes, including income support for low-income households.

ICTs are general-purpose technologies with a positive measurable effect on growth and productivity. From a theoretical perspective, because these technologies have positive economic externalities and generate other social benefits, governments may consider them as goods and services that are potentially useful to promote, including by reducing the tax burden on their supply, adoption and usage. A neutral tax structure that allows for positive externalities can lower barriers to affordability and increase investment. This can result in economic and infrastructure development, increasing productivity and employment and benefiting education, health care and overall development, which in turn can promote growth and additional tax revenues.

In practice, however, many governments impose additional and sometimes substantial industry- specific taxation on telecommunications services. Revenue collection may be carried out efficiently and at a low cost, as the sector is a significant part of the economy, concentrated in a handful of large formal corporations. For example, the two largest telecommunications companies in Brazil accounted for 6.3% of the revenues collected from the 20 largest taxpayers in 2014 (11.2%, if Petrobrás, the state-owned oil company, is excluded). In the short term, higher tax revenues collected by a small number of large taxpayers may often win out over the longer-term potential economic and social benefits for development and may entail other detrimental effects, where they are, for example, not neutral (e.g. favour one technology over another).

This creates a dilemma, because overtaxing the sector to generate revenue conflicts with a more neutral taxing approach (or, at least, applying the general taxation regime), which potentially has a more positive, less distorting effect on the economy going forward. Most LAC countries have chosen the first option. Most studies that argue for neutral taxation, however, stress the value of the second option.

There are many ways to develop a taxonomy of taxes. This report groups them into three almost non-overlapping categories. It is important to stress that many payments to governments are not strictly considered taxes, but since their effect is similar to that of levying a tax, they are included in the following classification.

The first are **general taxes**, broad-based taxes that usually apply to all activities in the economy and should be considered the basis for evaluating how much distortion special taxes cause. These taxes on consumers comprise value-added taxes (VAT), sales taxes or their equivalent. On companies, these are regular taxes that are imposed on profits, as well as non-recoverable taxes on investments (e.g. product-type VAT). Labour contributions (social security, payroll taxes, etc.) and other taxes that apply to all players in the economy also belong in this category. Of course, broad-based taxes often have numerous exemptions and exclusions for distributional, administrative or political reasons.

The second, **special taxes or fees to consumers**, which are levied on the sales price and take several different forms, all have a negative effect on demand:

- **On overall spending on a specific product or service.** This is usually an additional percentage on a consumer's bill, in addition to VAT. For example, Mexico applies a 3% "special tax" on all telecommunications services except Internet and public and rural telephony. It was imposed in 2010 with other tax rate increases (VAT and income tax). Since 2003, Colombia has applied a 4% differentiated VAT on mobile services. This tax finances sports at the national and state level. The Dominican Republic charges a 10% excise tax and a 2% tax to finance the regulator and projects for universal service. In El Salvador, at the end of 2015, the government approved the imposition of a 5% tax on telecommunications services to finance security plans.[4]
- **On usage.** Special taxes on usage can either be charged at the actual price (sometimes at different rates for different services – calls, SMS, data) or on a per-event basis (calls, SMS). They are sometimes defined as a percentage of price, sometimes as a fixed amount. For example, Jamaica imposes a surcharge of around USD 0.4 cents per mobile voice minute.
- **On terminal equipment and handsets.** A terminal device is indispensable for access to telecommunications networks. These devices (modems, handsets, dongles, cable boxes, tablets, computers and so on) are expensive and represent an important overall percentage

of the total cost of access to ICTs, even though they could potentially be financed or subsidised by operators (usually at the cost of raising switching costs or charging more for services). Taxes on such devices become a barrier to access (especially for people with lower incomes) and can hinder adoption of newer services and technologies. These taxes can take several different forms (e.g. higher VAT rates, "luxury tax," constant amount per unit, higher import duties). Some countries have gone even further, applying different rates for different types of devices (e.g. feature phone vs. smartphone, or even exemptions, if the price is under a certain amount) or even different origins (e.g. imported vs. locally manufactured). For example, in 2010, Argentina imposed a 26.63% import duty on mobile phones, LCD monitors and PCs; it has recently been reduced to 20.5%. Ecuador imposes quotas on the import of smartphones. Many of these taxes are driven by the need to increase government revenue or influence the international balance of payments, but others are used to give incentives to local production or to address current-account imbalances.

- **On activation or on installed base in service.** Some countries impose a one-time fee per new connection. For example, Jamaica has a 0.8% surcharge on the value of the Subscriber Identity Module (SIM). Brazil charges BRL 26.83 (around USD 8) per new connection. Some countries in the LAC region apply yearly fees for active users; for example, Brazil has imposed this fee (of BRL 13.42, or around USD 4, per connection per year) for many years.

The third and final classification are **special taxes/fees to network and service providers**. Operators and service providers pay a myriad different government charges. Some of these payments are explicitly labelled as taxes, while others are linked to permits, the use or exploitation of publicly owned resources, or to special regulatory conditions. This category can be grouped into five types:

- **Special taxes on revenues, profits or market shares.** Certain countries apply a tax as a percentage of revenues on network and service providers. Brazil, on top of the Universal Service Fund (USF) contribution, imposes a levy of 0.5% for a technological development fund. El Salvador, imposes a tax of 5% of total incomes for entities with incomes above USD 500 000 per year. Sometimes, a different tax rate applies to profits from telecommunication service providers. Panama applied different rates until 2013. Ecuador applies certain fees based on the market share of operators.
- **Regulatory contributions:**
  - Universal Service Funds contributions. As shown in Chapter 6, on the extension of broadband access, operators are sometimes obliged to make payments for funds aimed at increasing universal service. These payments take several forms, but they are usually calculated as a percentage of revenue, such as Brazil's 1% Telecommunications Services Universalisation Fund (FUST) contribution.
  - Licensing and permit contributions. Most regulators charge administrative fees for issuing permits and licenses to operate. In many countries, these fees are either for processes that could be considered unnecessary or are above the cost of providing the license.
  - Inspection fees. Some countries charge a fee (either on a per-event basis or on a yearly basis) to inspect and verify networks. Through *Fistel*, Brazil charges a telecommunications inspection fee (*Taxa de Fiscalização de Instalação* [TFI]) for verifying installation and an annual payment for inspection (*Taxa de Fiscalização de Funcionamento* [TFF]).

- Other regulatory levies. Some regulators impose a charge to support regulatory activities. Certain countries impose charges for other goals, such as Brazil's Technological Development Fund (FUNTTEL), which receives 0.5% of revenues to encourage innovation in the sector, or Costa Rica's FONATEL contribution, which can range from 1.5% to 3% of the gross income of operators, depending on the projects to be financed each year.

- **Exploitation of publicly owned resources.** The deployment of telecommunications networks entails the use of many publicly owned resources, such as buildings, rights of way, public spaces and land, poles, towers, ducts, etc. Governments usually set charges on these resources, sometimes well above costs. Although strictly speaking these are not taxes, they do have similar effects on the production function. Many of these levies represent a substantial part of local income for cities and municipalities, so setting them close to true costs might prove politically difficult. As a general rule, it is recommended that government levies for these concepts be set at the true costs (the so-called Diamond-Mirrlees Efficiency Theorem) (see Hammond, 2000). Of course, when publicly owned resources are scarce (as the appropriate public space for deploying towers can sometimes be), other mechanisms to reflect scarcity should be used instead. See Chapter 4, on competition and infrastructure bottlenecks for good practices in this area.
- **Spectrum fees.** The rights to use spectrum are the ultimate example of exploitation of publicly owned resources, and as such, deserve to be treated separately. Spectrum can represent a significant cost of building and operating a telecommunications network. Chapter 3 addresses the most important aspects of efficient spectrum management. The OECD recommends using auctions as the most efficient way to charge the right price and let spectrum be assigned to those who value it the most. Whereas some countries license spectrum with only an upfront payment, others have opted for a two-part fee, composed of an initial payment (usually the amount offered by the bidder during the auction process) and annual spectrum usage fees. Assuming the cost of capital is the same for public and private funds, in terms of net present value, these two amounts are theoretically equivalent. Nevertheless, such annual government charges impose costs incurred by all players and thus most likely trickle down to final prices; they could also affect competition, because on a per-unit basis, spectrum that is more heavily used pays a lower spectrum unit fee. This is an important consideration for smaller players, which on a proportional basis, pay higher spectrum annual fees than larger players.
- **Special import duties and custom taxes.** In most LAC countries, a significant percentage of network equipment (hardware and software alike, such as switches, base stations, computer systems) is imported. These taxes affect the production value-chain and, as such, should be carefully considered;[5] they could even distort certain decisions, such as using more spectrum instead of installing more radio base stations. Import duties could also translate into underinvestment, compromising quality and supply (especially in remote areas and less profitable deployments).

There is an additional tax that does not fit into the taxonomy described above, because it chiefly affects directly consumers living abroad. Especially in highly regulated environments with monopolistic provision of services, some countries apply high **surcharges on international incoming traffic**. Such measures can have negative implications for the provision of international telecommunications services (OECD, 2009).

While less prevalent in the LAC region than in Africa and some parts of Asia, the practice of applying surcharges to the termination of incoming international calls can also lead to market distortions. In some cases, they entail additional costs for the state, due to

enforcement (e.g. where an arbitrage opportunity is created, such as in the case of so-called SIM box fraud) (OECD, 2014). In addition, this can lead to double taxation for consumers in the country making the call, including in the LAC region. The end result is higher prices and supressed demand, often affecting the diaspora (who tend to be less well off in the countries where they are living) when calling family and friends in the countries applying the surcharges.

With so many different taxes and charges applied to telecommunications services, a straightforward cross-country comparison is extremely difficult. An aggregate comparison can be made by evaluating how much tax is levied on handset acquisition and service costs over the expected life of the service contract (total cost of ownership [TCO]). Though this approach reveals how substantial the additional charges are, it does not help assess the level of distortion caused by the different charges.

According to the GSMA, which periodically assesses taxes in the mobile sector worldwide, LAC countries on average charged 20.1% on TCO in 2014. For the set of countries analysed in previous studies,[6] from 2010/2011, total tax on TCO increased from 17% to 18.4% (Figure 6.6). For the 27 OECD countries tracked by the GSMA (excluding Turkey, which currently taxes mobile services at 38.32%), total tax went from 20.0% to 20.95% in the same period.

Figure 6.6. **Government charges as a percentage of total cost of ownership in selected LAC countries**



Source: GSMA (2015), *2014 State of the Industry. Mobile Financial Services for the Unbanked*, *www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/03/SOTIR_2014.pdf*.

StatLink http://dx.doi.org/10.1787/888933354316

Most LAC countries apply some sector-specific taxes along the production chain. Most of these taxes end up affecting end-user prices, which in turn decrease demand and affordability. These charges also have implications for the deployment of networks, which

have a negative effect on supply, quality and coverage. They can also distort choices if not applied in a technologically neutral manner, something that is particularly important in an industry dependent on dynamic technological change.

Financial inclusion

While communication services have become widespread in the LAC region (109% penetration of mobile telecommunication services, for example, according to GSMA), a large proportion of low-income populations are still largely excluded from financial services. Average banking penetration for high-income OECD countries is 94%; in the LAC region, an average of 51.3% of the adult population has accounts in financial institutions (e.g. banks) (World Bank, 2014).

Although there has been considerable growth (around 10 percentage points) in account ownership in financial institutions in the region (World Bank, 2014), some population groups remain at the top of exclusion levels in the use of financial services – women who are not heads of households, youth, pensioners, students, people of lower income and education levels, and the rural population (Garcia et al, 2013).

ICTs, especially mobile telephony and broadband, are becoming key enablers of financial inclusion. Online banking, payment and transfers are increasingly used to access financial services world wide. Mobile services have played a central role in connecting lower-income populations. Mobile financial services are bringing financial services to millions of unbanked and under-banked people. As of 2014, more than 250 services had been deployed in 89 countries, most in the sub-Saharan region, where M-Pesa has had considerable success, but LAC has also seen its share of mobile financial service deployments, with around 50 currently active (Table 6.1) (GSMA, 2014).

Table 6.1. **Mobile financial services available in the LAC region**

	Financial services providers	
Argentina	Sicom (m, s)	
Bolivia	Tigo (Millicom) (m)	
Brazil	Vivo (Telefónica) (m)	Oi (m)
Colombia	DaviPlata (m)	BanColombia (s)
Dominican Republic	Orange (m)	
El Salvador	Tigo (Millicom) (m)	
Guatemala	Tigo (Millicom) (m)	
Guyana	Guyana Telephone and Telegraph Company (m)	
Haiti	Digicel (m)	Haitipay (m)
Honduras	Tigo (Millicom) (m, i)	
Mexico	eZuza (m)	Telcel (América Móvil) (m)
Paraguay	Tigo (Millicom) (m, i, c)	

Note: m: Mobile money; i: Mobile insurance; c: Mobile credit and s: Mobile savings. For further details on each service, GSMA (2016), *Mobile Money Deployment Tracker*, is available at *www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/tracker*.

Source: Adapted from GSMA (2014), *Mobile Taxes and Fees, A Toolkit of Principles and Evidence*, *www.gsma.com/publicpolicy/wp-content/uploads/2014/02/Mobile-taxes-and-fees-A-toolkit-of-principles-and-evidence_fullreport-FINAL1.pdf*.

Despite having a mobile financial accounts penetration of only 2.1% (World Bank, 2014), the LAC region has witnessed the highest growth of mobile financial services subscriptions in the world, with the number of financial accounts growing by 50% between

December 2013 and December 2014, and reaching 14.9 million registered accounts (GSMA, 2014). It should be noted, though, that the number of active accounts is less than half that figure, at 6.2 million, and small by comparison with the 61.9 million accounts in sub-Saharan Africa.

The LAC region is unusual in having a high percentage of people using accounts to receive government transfers (9%). Among other regions in the world, it lags only behind high-income OECD countries, with 17.2% of people receiving transfers in this fashion. The LAC region is also ahead of other regions, with the exception of the OECD countries, with respect to the use of credit and debit cards, at 18% and 27%, respectively (World Bank, 2014).

Given the LAC region's more developed financial sector and use of financial services, the implementation of government programmes of cash transfers has probably been an important force in bringing people into the formal financial sector, minimising the demand for mobile financial services by comparison with other regions of the world. Governments can play an important role in harnessing ICTs, mobile telephony and broadband to spur more inclusive development.

Individuals with special needs

While methodologies among countries may vary, the prevalence of individuals with special needs in Latin America and the Caribbean has been reported to range from 2.9% in the Bahamas to 23.9% in Brazil (CEPAL, 2013). Around 12%, or 66 million individuals, in Latin America and the Caribbean live with at least one disability, such as visual and mobility limitations, hearing and speaking disabilities and intellectual and developmental limitations. This last group, which includes people with mental or cognitive disabilities, includes those, according to CEPAL, who face the greatest challenges in integrating themselves in social and economic activities in the LAC region.

A key challenge in the LAC region is collecting basic statistics on people with disabilities. Gathering disaggregated data on their specific limitations, gender, income and use of technology is an even more difficult task for certain countries. The lack of knowledge of the conditions such individuals face contributes to the fact that people with special needs continue to be remain in low-income groups. In tackling the issue of digital inclusion, initiatives that target both the affordability and the accessibility of ICTs are crucial to help the entire population benefit from the digital dividends.

Good practices for the LAC region

Affordability

The Sustainable Development Goals include, in Goal 9, the objective of significantly increasing access to information and communications technology and striving to provide universal and affordable access to the Internet in the least developed countries by 2020. Thus, affordability of broadband services has become a worldwide priority and a task for all stakeholders, governments and businesses included.

Affordability is defined in terms of the relative burden of paying for broadband services with a given income, for a given set of benefits derived from access. Thus, broadband affordability can be increased in three different, non-mutually exclusive ways: by increasing income, by lowering prices (especially entry-level prices) or by increasing the utility derived from broadband access (such as by shifting the perceived importance broadband access in people's spending priorities).

Increasing income at the national level is one of the main objectives of almost every government. Though broadband uptake plays a relevant role in increasing income, governments take a much more comprehensive approach to economic development. Thus, increasing affordability through higher national income is beyond the scope of the present chapter.

Transfer mechanisms for targeted segments of the population, especially the most disenfranchised – the elderly, women, rural households or even SMEs – could potentially increase affordability. These mechanisms could be distributed through a voucher system (as implemented in the United Kingdom from 2010 to 2015 for SMEs) or through direct subsidies to operators, or through lower prices, which are effectively equivalent to income increases. This is the case for Colombia's *Vive Digital* programme for strata 1 and 2, the poorest of six strata of the population, considering several socio-demographic variables, and the Connected Households Programme in Costa Rica, which aims to help people in vulnerable conditions (from quintiles 1, 2 and 3) to access ICTs. General transfer schemes, such as the conditional cash transfer programmes that have become widespread in the LAC region (as of last count, 18 countries had such programmes) also increase affordability, but allow beneficiaries to choose how to spend the money. As expected, their impact on broadband uptake is lower than a direct broadband-only subsidy.

Apart from the transfer mechanisms outlined above, governments have many tools at their disposal for **efficiently lowering broadband prices**. The Alliance for Affordable Internet (A4AI), a global coalition of private, public and nonprofit organisations,[7] has identified five common success factors that can increase broadband affordability, as addressed in several chapters of this Toolkit:

- **Enhanced competition.** Competition has been shown to result in investment, better quality and lower prices. Overall, liberalised markets with an open and competitive environment have more affordable services than markets with imperfect competition (see Chapter 4 on competition and infrastructure bottlenecks). Nevertheless, competition alone is not sufficient, as it needs to be effective. Independent regulators with enforcement capabilities, a clear licensing regime, technology and service-neutral rules, as well as a regulatory framework that minimises barriers to entry are common characteristics of markets where competition has thrived (see Chapter 2, on regulatory frameworks and digital strategies). Since around 1990, most countries in the LAC region have started to liberalise the telecommunications sector. Starting with the privatisation of the public national incumbent, they have moved on to creating regulators (not all of them independent) and to allowing competition. Some approaches worked better than others; a second wave of regulatory restructuring is now starting to reach the region. Competition and governance frameworks are now being reviewed. Mexico, with its creation of a constitutionally autonomous regulator and the implementation of asymmetric regulation, provides an example of how much the approach has changed in the last quarter of a century.
- **Effective broadband strategies, usually laid out in national broadband plans.** As shown in Chapter 2 on regulatory frameworks and digital strategies, many countries in the LAC region have developed broadband plans in the last decade. If they are to be successful, they need to address not only supply (deployment of networks, especially in underserved areas) but also demand (awareness, prices, digital and language literacy, relevant content, government services). These plans must be time-bound and measurable. One example is Colombia's *Plan Vive Digital*, launched in 2010, which outlines three overarching goals to be achieved over five years: triple the number of municipalities reached by at least one

fibre-optic network; connect to the Internet at least 50% of microenterprises and SMEs, as well as 50% of households; and quadruple the number of broadband connections nationwide. It also aimed at having shared access in all towns of more than 100 inhabitants. Through a private-public partnership, it built a fibre-optic network reaching more than 62% of municipalities. It also started overhauling the regulatory framework to allow for full convergence and established rules for promoting local software and content providers. Certain import taxes were reduced or eliminated. Digital literacy courses were developed and implemented. In an A4AI's report (A4AI, 2014), Colombia ranked second on the affordability index. Another example is Costa Rica's PNDT, "Costa Rica: A Connected Society", which defines goals such as "100% of the elderly day care centres with an intelligent community centre in operation by 2021" and "100% of CEN-CINAI (Nutrition and Education Centres-Comprehensive Care Child Centres) will have Technology Corners by 2021". Each of these goals is assigned to an institution that is accountable for it, with a defined budget, and progress in implementation is evaluated annually.

- **Efficient spectrum allocation.** As described in Chapter 3, spectrum is a scarce resource essential for providing wireless telecommunication and broadcasting services. As such, it needs to be managed efficiently and, given its huge opportunity cost, should be made available promptly on a competitive and non-discriminatory basis. Spectrum should be assigned through transparent processes that guarantee that economic and social benefits are maximised. In one case of good practice in the region, Peru, which lagged behind in addressing the potential benefits of the digital dividend only a few years ago, has recently adopted new measures to catch up with the rest of the world. Although some barriers to spectrum trading still exist, the government has recently promoted competitive access to spectrum, auctioning off the AWS, 2.5 gigahertz (GHz) and 2.3 GHz bands, which is more than other countries in the region have achieved.
- **Infrastructure-sharing models.** Deploying broadband networks requires large capital disbursements and ongoing operational expenses, which in effect act as significant barriers to entry. As explained in Chapter 4, on competition and infrastructure bottlenecks, infrastructure sharing can potentially reduce broadband provision costs: up to 80%, by some estimates). Regulators have the tools to monitor, encourage and when efficient, mandate infrastructure sharing, not only for passive infrastructure (such as towers) but also for active infrastructure (such as backbone); or even go further by mandating other types of resource sharing, such as spectrum (as described in Chapter 3). Sharing translates into a more efficient use of capital, accelerates deployment, is more environmentally friendly and, most importantly, translates into lower industry costs that allow for lower prices and thus increase affordability. Passive infrastructure sharing is not widespread in the LAC region. Many countries have attempted, but have not fully achieved, to set rules for sharing towers, ducts and poles. As noted in Chapter 4, in 2012, Chile passed its new "Antenna Law" *(Ley de Antenas*), which not only transferred certain regulating powers to local authorities, but established basic rules for mobile telecommunications tower deployment. Among the several aspects that were regulated was mandatory sharing of towers.
- **Universal access to affordable Internet services.** For countries where broadband prices remain a barrier for adoption, even after accounting for some or all of the previous success factors, shared services play an important role for uptake. These services, provided free or for a minimum fee, can be made available at community centres, public plazas, schools, libraries and other anchor institutions. They are important in poor urban areas as well as rural communities. More information on extending broadband access is included in Chapter 5.

A third way of increasing affordability is by changing the relative value of broadband services and **increasing the utility (benefits) derived from accessing the Internet**. The higher the benefits, the more people will be willing to pay for broadband access, changing the relative importance of Internet in their spending priorities, provided that incomes are high enough to allow for expenses beyond basic goods and services. People must have a reason to access the Internet: user awareness and digital literacy are critical, but so are relevant content and experiences. Governments can play a fundamental role in increasing the benefits of accessing the Internet, from providing basic services and simplifying the interactions between governments and citizens, to sending and receiving payments. Such actions will increase demand and increase broadband's value in promoting development and inclusion.

Taxation and other government-imposed charges

Given the potential influence ICTs have on social and economic development, as well as on reducing inequality, government charges in the sector should be a matter of national policy, and the cost-benefit analysis of the government charges should be carefully analysed. Some general guidelines can help to maximise adoption and use and minimise distortions:

- The tax regime should be **simple, transparent and easy to understand**. Simple systems are easier to comply with, minimise arbitrage opportunities and evasion, and decrease operating costs.
- The taxation regime should be **fair**, should not impose unreasonable burdens on any party and should not be regressive.
- **Sector-specific taxes should be avoided**, unless it is clear that the benefits outweigh the costs. The analysis should include externalities arising from higher penetration and use of broadband. In some cases, higher tax rates on one sector can result in lower government revenue[8] (through lower spending in that sector and lower sectoral growth).
- The same argument applies for **sector-specific tax incentives**, which distort the allocation of capital in the economy. Even accounting for spillover effects and externalities, incentivising ICTs through tax subsidies or spending programmes may not be the way to achieve public policy goals.
- **Administrative fees** should be set as close as possible to the real cost of providing the services. Extracting government fees throughout the production process can potentially lead to inefficient allocations of capital. This could stifle growth and investment and potentially increase ICT usage inequality.
- **Taxation regimes** should be competitively neutral. Even in the face of sector-specific taxation, the same levies should be imposed on all players. They should also strive for technologically neutrality.

Financial inclusion

Lack of access to formal financial services does not mean that unbanked or underbanked people do not conduct financial activities. Those without access to formal financial services usually find alternative mechanisms for saving and protecting themselves. However, the informal services available to them are often risky and expensive.

ICTs have influenced the expansion and convenience of financial services since the early stages of computing and telecommunications. Automated teller machines (ATMs),

telephone banking, Internet banking (e-Banking) and point of sale (POS) have made transfers, withdrawals and debit and credit payments effortless activities. These applications continue to evolve, and they involve a new set of solutions and challenges. Online peer-to-peer (P2P) transactions, crowdsourcing, virtual wallets, digital money, and completely branchless banks have been reducing the costs of traditional banking and changing the way consumers with access to fixed and/or mobile broadband access financial services. Most importantly, ICTs address two of the most important barriers to financial inclusion: affordability and availability.

At the centre of the disruptive effect of ICTs for financial services are **mobile financial services**, or mobile money applications. Mobile money applications comprise not only basic transfers and transactions, but also savings, credit and insurance. Despite the possibilities mobile money offers to include a large proportion of the unbanked population, many barriers, and in particular, regulation, still block widespread adoption. To unlock the potential of mobile money in the LAC region, the following good practices could be encouraged:

- **Allowing nontraditional financial institutions** to provide financial services to business and personal customers: adapting financial frameworks for non-banks is key for harnessing the potential of ICTs.
- **Simplifying the process of opening accounts:** "Know your customer" (KYC) requirements, such as requiring a formal address and identification, increase operation costs, reducing the affordability of services and acting as a deterrent for vulnerable populations.
- **Reducing capital requirements for financial services providers:** requirements need to be proportional to the risks undertaken by smaller agents and non-banks in offering these services.
- **Relaxing conditions for agents** that can execute certain operations, such as cash in and cash out, to expand the geographical coverage of simple financial services.
- **Improving the conditions for international remittances**, one of the fastest-growing uses of mobile banking: regulations tend to be restrictive, and many countries allow inbound remittances but forbid outgoing services.
- **Promoting interoperability of systems.** Although mandating specific interoperability models rather than spurring a market-based approach may slow deployment, initiatives that encourage interoperability are desirable.

In this ecosystem, governments can play an important role in promoting mobile banking, because they have the capacity to use these systems to transfer money, make payments (e.g. salary payments, social security, benefits and redistribution disbursements, and subsidies) and receive payments (e.g. services, taxes, fines). They have the potential to catalyse the system by adding significant volume, which can allow service providers to reach economies of scale faster.

For widespread adoption, the value proposition needs to be compelling for consumers, the interface has to be user friendly, transactions should be speedy, and the system must be trusted by users. Building such an ecosystem is not an easy task and involves many stakeholders.

In the LAC region, some policy makers have realised that mobile financial services could provide a steady route for financial inclusion and are adapting their regulatory frameworks. Colombia and Costa Rica are two examples (Box 6.2).

Box 6.2. **Adapting regulation for mobile financial services in LAC**

Colombia

In 2014, Colombia issued new regulations, creating a new financial institution that specialises in electronic payments and deposits (SEDPE). The rules consider two types of account holders, which involve different processes. For the simplified process, no physical presence is required and only basic documentation is needed, but deposits are limited to a maximum of three minimum salaries per month, around USD 600, except when the account is linked to government payments. The regular process – subject to know your customer (KYC) regulations – is intended for businesses, so that a payment ecosystem can be formed. The new regulations allow SEDPEs to use agents. It also establishes that mobile operators cannot discriminate in providing access to any financial institution, and a minimum capital of COP 5.8 billion (around USD 1.7 million) is required.

Costa Rica

One of the goals of the National Telecommunications Development Plan for 2015-21, known as "Costa Rica: A Connected Society" (PNDT) is allowing access to 3 749 150 people over the age of 15 to the banking system by 2019, providing them a "proximity card" ("contactless" smart card which can be read without inserting it into a reader device) and access to the SINPE mobile service, a payment and transfer system linking different banks. One of the principal measures used to achieve this goal was the creation of the Simplified Record Accounts (CES), which allow users to activate a bank account without visiting a branch and with very little documentation. In addition, the "electronic purse", SINPE Mobile allows transactions by cell phone (via short message service, or SMS, or by linking the telephone number to a bank account).

In 2016, the National Treasury of the Ministry of Finance will begin to implement the Social Resources Single Payment System (SUPRES), for the payment of all social transfers. These transfers will be made through the national financial system, creating a strong incentive for lower-income citizens to access and use it.

Individuals with special needs

According to the World Health Organization, approximately 5% of the world's population has disabling hearing loss, and more than 4% are visually impaired (of whom about 13% are blind). Broadband, and, more generally, ICTs, could help to reduce the exclusion and inequality faced by individuals with these and other physical and cognitive challenges. However, to enable all citizens to fully realise their potential, broadband access without services and applications adapted to the special needs of users is not enough. The full potential of ICTs needs to be implemented to improve labour market opportunities and social empowerment of those with special needs.

This would involve several goals and specific good practices:

- **Improving awareness**, at the earliest stages of conception, of developing ICT products and services compatible with and adaptable to the requirements of those with special needs.
- **Including and engaging people with special needs and their organisations** in the design of public policies.
- **Ensuring that governments lead by example** and incorporate into their day-to-day routine ICT products and services appropriate for those with special needs. Requirements that take into account the needs of people with special needs in public procurement is a key tool for promoting inclusion and developing a robust market of accessible ICT products and services.

Article 27 of the United Nations Convention on the Rights of Persons with Disabilities (UN, 2006) recognises the rights of people with disabilities to work on an equal basis with others, including the opportunity to make a living by work "freely chosen or accepted in a labour market" in an environment that is open, inclusive and accessible to people with disabilities. The Convention also prohibits all forms of employment discrimination, promotes access to vocational training and opportunities for public, private and self-employment, and calls for reasonable accommodation in the workplace, among other provisions.

As documented in several studies, both in developed and developing countries, adults of working age with special needs have significantly lower employment rates and much higher unemployment rates. Lower rates of labour market participation often lead to poverty. ICTs help people with special needs obtain employment, by opening new fields of work, providing better access to education and training for existing opportunities, and allowing governments and non-governmental organisations (NGOs) to track and organise employment initiatives. People with special needs use ICTs to work, for example as retail associates, telecommuting service agents and self-employed entrepreneurs with online storefronts. In terms of training and social mobility, ICTs promote distance learning and reduce the cost of certification for various workforce positions. Finally, governments and NGOs use ICTs to ensure that accessibility initiatives are on track and to respond to evolving trends in the labour market and the special needs community.

Technology is creating new tools for the diverse population of individuals with special needs, whether physical, intellectual or developmental. In some countries, a broadband connection coupled with the capabilities of Internet Protocol-based technology has created a unique opportunity to expand the possibilities available to individuals who struggle with disabilities and cognitive impairment. The United States (Box 6.3), with several other OECD countries, has been at the forefront of spurring inclusion and advancing the integration and independence of those with physical and cognitive disabilities and special needs.

Box 6.3. **United States measures to enhance access to ICT for individuals with special needs**

In the United States, the Twenty-First Century Communications and Video Accessibility Act (CVAA), enacted in 2010, introduced the requirement that communications products and services use broadband to be fully accessible to persons with disabilities.[1] The CVAA required that smartphones be usable by blind and visually impaired people as well as people with hearing aids, and made it easier for people with disabilities to view video programming on television and the Internet. Among other things, the CVAA included provisions to ensure that people with disabilities can respond to emergency situations by having access to emergency information shown on television and by ensuring that their accessibility needs are considered in the rollout of the next generation of "911 emergency services" (for advanced IP-based devices and applications).

The CVAA directed the FCC to establish rules to provide up to USD 10 million annually from the Interstate Telecommunications Relay Service Fund (TRS Fund) to support programmes that distribute communications equipment to low-income individuals who are deaf-blind. In accordance with this directive, in 2011, the Commission established the National Deaf-Blind Equipment Distribution Program (NDBEDP) as a two-year pilot programme and, in 2015, the FCC proposed to establish permanent rules for the programme, using lessons learned during the pilot programme.

Box 6.3. **United States measures to enhance access to ICT for individuals with special needs** *(Cont.)*

Through the NDBEDP, thousands of people with disabilities in the United States have obtained equipment and received training on how to operate it, to help them function independently in society and the workplace and lead productive, fulfilling lives. The equipment distributed must be designed to access telecommunication services (such as wireline and wireless telephone communication), advanced communication services (such as Internet-based voice communication, e-mail, instant messaging and interoperable video conferencing services) and access to the Internet (including information services). The equipment distributed may be hardware, software or applications, separate or in combination, mainstream or specialised. The equipment must meet the needs of the deaf-blind individual to achieve access. Before distributing equipment, certified programmes conduct a thorough assessment of each individual to determine the equipment best suited to his or her needs. These programmes may also provide equipment warranties, maintenance and repairs for such equipment, depending on the available funding.

One example of the type of device that can be made available to deaf-blind people through the NDBEDP is the "refreshable" braille device (Hellen Keller National Center, 2013), which is used to render the text on a computer screen in braille (an array of raised dots on a flat surface). This is done using screen reader software technologies such as JAWS (for the PC) or Voiceover (for the Mac) to navigate on-screen content and tell the refreshable braille display what to render. Other types of equipment distributed under the NDBEDP include large-screen monitors, zoom text reader software, portable electronic magnifiers, sound amplifying headsets, braille keyboards, a variety of smartphones, tablets and other mobile devices, as well as other accessories and support devices. The programme also pays for training to use the equipment.

Today, many accessibility features are built into telecommunications devices sold to the general public. These may include screen and text modifications (such as magnification capabilities and colour changes), voice output (such as a computer-generated voice response to commands), speech recognition, programmable visual and audio and vibration alerts, captioning capability, tactile adaptations for interfacing with touch screens, and other programmable functions.[2] The NDBEDP allows people who are deaf-blind to receive these off-the-shelf products, along with assistive technology devices specifically designed for their population's accessibility needs.

An important aspect of this experience was the effort expended to provide a comprehensive outreach and education nationwide – through publications, advertisements, billboards, public meetings and other means – to notify the public of the availability of the NDBEDP. These outreach efforts have been effective, as indicated by the increase in the number of individuals receiving equipment over the past few years. Each US state and territory manages the NDBEDP for its own residents. In addition to outreach conducted by the national outreach co-ordinator, certified programmes provide education to inform their communities about this equipment distribution programme and verify that applicants are eligible to receive equipment. They assess each applicant's needs for communications equipment and select equipment to meet those needs. They help install and provide training on the equipment distributed.

The FCC continues to work with state governments and the special needs community to notify the public about the NDBEDP and to improve the programme by identifying new technologies that should be included for distribution. Feedback received from the special needs community attests to the positive impact the programme has had in the lives of deaf-blind people across the country.

1. In 2009, a study conducted by the US Federal Communications Commission (FCC) revealed that Americans with disabilities are less likely to use Internet-based communications technologies: 65% of the population had broadband at home, as compared with only 42% of those with disabilities (Horrigan, 2010). This gap is due in part to physical barriers that people with disabilities confront in using the Internet.

2. See *www.afb.org/info/living-with-vision-loss/for-job-seekers/careerconnect-virtual-worksites/retail-worksite-for-blind-users/refreshable-braille-display-3652/12345*.

Source: FCC (2016), "Twenty-first century communications and video accessibility act", *www.fcc.gov/general/twenty-first-century-communications-and-video-accessibility-act-0* (accessed on 29 February 2016).

Colombia also provides a good example of initiatives for improving access to ICT products and services for people with disabilities (Box 6.4).

Box 6.4. **Colombia's initiatives for people with special needs**

- **Visually impaired.** The government of Colombia acquired a four-year license of JAWS (screen reader) and a license for MAGIC (screen magnifier) that is available to any blind or visually impaired person in Colombia. Training is included, and the government provides digital literary courses for the use of this software. As part of this project, technical support as well as installation in libraries, in kiosks (*Vive Digital*) and other locations, is provided. This programme makes it possible to access a screen reader and magnifier that would not be affordable otherwise.
- **Identification of needs and development of solutions (Ayudapps)**. Ayudapps is a project to develop technological solutions to fulfil the needs and overcome the barriers that those with special needs face in their daily life. The project involves several stages. First, individuals present or explain the type of barrier they encounter and outlines what their needs are. Second, developers of solutions are invited to present their proposed solutions to address the need or eliminate the barrier. Projects for funded development are then chosen.
- **Communication with other people (TalkTo).** TalkTo is a platform that enables people with certain types of special needs (such as cerebral palsy) to communicate. This platform allows communication between persons with special needs and others. This platform was developed by a professor and four students within the project of the Colombia's *Ministerio de Tecnologías de la Información y las Comunicaciones* (MinTIC) AyudApps.
- **Taxi hailing.** Transpecial is a project by Inncluyo, an entrepreneurial project aimed at inclusion. It consists of an application allowing a person with special needs to request a taxi that complies with accessibility requirements. The drivers of accessible taxis register through the application and are allocated an accessible taxi number. People with special needs use the application to request taxi service, using the application's global-positioning feature. Users may subsequently evaluate the taxi service.
- **Mapping of facilities.** MappAcc is an application informing those with special needs about the level of accessibility of different places, products and services. It allows a person with disabilities to arrive at a location and evaluates the level of accessibility or notes in which aspects the location is not fully accessible or are not accessible at all. A user accesses MappAcc, which geographically locates the place and allows the user to select among categories (e.g. hotel, restaurant, hospital), displaying a checklist, so that each relevant item is assessed for accessibility. Such information is intended to be useful for other users, and in the long run, MappAcc hopes to be able to evaluate whether a given location has improved in accessibility over time (if so, possibly issuing a certification).
- **Deaf people.** The *Centro de Relevo* Project, a joint project of the Colombian national federation for deaf people (FENASCOL) and the ICT ministry, uses the Internet and ICTs to address the needs of deaf people. In the past, when deaf people needed to reach customer-service centres or information points in the public sector, customer-service agents were not able to help them since they could not communicate in sign language. The *Centro de Relevo* project built a platform to link deaf users via an app to online translators. To facilitate this task, public entities now ensure that customer service centres are equipped with devices that can run the application.

Conclusion

This chapter focused on good practices aimed to increase the affordability of broadband services and promote digital inclusion. It outlined three ways affordability can be increased: by increasing income (such as through transfer mechanisms for targeted segments of the population); lowering the cost of broadband services (such as through enhanced competition, effective broadband strategies, efficient spectrum allocation, infrastructure sharing models and universal-access programmes); and increasing the utility of accessing the Internet (such as by enhancing digital awareness, literacy and the provision of local content).

Additionally, this chapter analysed the effect of government charges such as taxation in the ultimate cost of broadband services and ICT devices. Good practices to maximise adoption of broadband services in this area relate to developing simpler, more transparent and neutral tax regimes; not imposing unreasonable burdens on any party; avoiding sector-specific taxes; and setting administrative fees close to real costs of providing the services.

Finally, good practices were presented for furthering digital and financial inclusion. As for financial inclusion, unlocking the potential of ICTs for financial services involves adapting financial services frameworks to include nontraditional financial institutions; simplifying the process of opening accounts; reducing capital requirements for financial service providers; promoting interoperability of systems; and encouraging user-friendly and trustworthy systems. As for expanding digital inclusion, particularly for people with special needs, it is crucial to improve the need to develop and design ICT products and services appropriate for people with special needs, by including and engaging people with special needs in the design of public policies, and ensuring that governments lead by example in this regard.

Notes

1. The average for the eight LAC countries included in the GSMA/Deloitte study is 28%. The countries are Panama, Uruguay, Ecuador, Chile, Colombia, Brazil and Jamaica.
2. See *www.gsma.com/publicpolicy/tax/research-and-resources*.
3. Under the Connected Households Programme, launched as one of the programmes of the National Strategy for Solidarity Universal Access and Service, known as *crdigit@l*.
4. *www.telegeography.com/products/commsupdate/articles/2015/11/03/el-salvador-approves-5-telecoms-tax/*.
5. For many developing countries, import duties and customs taxes are an important source of revenue, and their reduction is likely to entail significant short-term revenue loss. Abolition or reduction of special import duties should thus be carefully considered and coupled with measures to meet revenue needs.
6. The 2011 study did not include Panama, Jamaica and Uruguay.
7. More at *www.a4ai.org*.
8. This is a clear example of the Laffer curve. A Laffer curve refers to the concept of taxable income elasticity. It states that tax revenue will be zero at the extreme rates of 0% and 100% and that there should be at least one rate that maximises taxation revenue. This implies that potentially lower tax rates could translate into higher government revenues or vice versa, and that higher tax rates do not always increase revenue.

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Chapter 7

Convergence

This chapter addresses trends in network and service convergence, its implications for broadband competition, innovation and investment dynamics, and provides a set of good practices to respond to opportunities and challenges. It examines changes in the value chain of broadband access and services and suggests that they be addressed in a holistic fashion, covering not only network infrastructure and traditional service providers, but also content, application and the so-called over-the-top providers (OTTs). The main policy and regulatory practices relevant to convergence are explained, including convergent regulators, convergent licensing regimes and bundling practices, and issues related to Internet openness.

Historically, distinct communication networks and their underlying technologies provided voice, data, radio and television services. Today, communication networks are shifting towards Internet Protocol (IP)-based solutions that, together with developments in terminal devices, allow access to IP-based applications on a multitude of devices, in a multilayered process that can be termed digital convergence. Convergence between traditional telecommunication operators and content providers (e.g. video delivery), has introduced an increasing number of new products and services in the Latin American and Caribbean (LAC) region.

This transition from public switched telephone networks (PSTN) to IP-based networks is closely linked to market-based broadband developments. Broadband has facilitated convergence, and convergence has stimulated demand for new services, which in turn has been a catalyst for the growth of broadband. Convergence must thus play an important role in developing a forward-looking broadband strategy.

Convergence is encouraging competition, content creation, collaboration, interoperability, mobility and product and service innovation. At the same time, however, it poses new challenges for businesses, consumers and governments in the Latin American and Caribbean region, some of which are described below.

Effects of convergence

The implications of convergence fall into three major categories:

- **Disruptions of the traditional communications industry.** Technological innovation, digitalisation and increased connectivity have fused previously separated value chains (such as fixed/mobile and telecommunications/broadcasting) into mixed-value chains of access, which include content distribution service and device providers. Convergence has encouraged the upgrading and remixing of new configurations of products and services. The advent of the so-called over-the-top (OTT) players has profound implications for the telecommunications and broadcasting industries. The creation of new business models has blurred the lines between fixed and mobile communication services, and between telecommunication and content providers. This has removed the boundary between fixed-wireless and cellular connectivity, and between broadcasting and Internet services, with, for example, catch-up television, video on demand, streaming and cloud-based television.
- **Increased choice and new vulnerabilities for consumers.** Users are at the centre of digital service delivery, and now have greater control over what they want to access, when and where. They are taking on an entrepreneurial role, creating their own content and services. The increased availability of broadband and convergence have resulted in the "on demand" market, which is connecting consumers and producers directly and making it possible to customise goods and services. Meanwhile, the new services are changing the relationship between suppliers and consumers. The digitalisation of media is increasing data security and privacy vulnerabilities, requiring consumers to assess more carefully what they are sharing and contracting with.

- **Regulatory boundaries have become less clear, challenging governments' ability to deal with cross-cutting issues.** Before convergence, communication regulation was dealt with in separate silos, and regulators dealt only with a few established traditional players. Convergence has blurred the distinctions between different sectors of policy and regulatory frameworks, reducing regulators' ability to impose and enforce regulations and requiring that government departments and regulators co-operate on addressing cross-cutting issues. Jurisdictional issues are also becoming more relevant. Regulators and other national bodies may have difficulty enforcing their national legal frameworks if services are provided by players based in other countries. The rise of new technologies and players has been driving policy makers to rethink their traditional approaches, creating opportunities to lift some legacy requirements and to build, as much as possible, more technologically neutral and regulatory and policy frameworks that will prove serviceable in the future. In many cases, this has led to a review of regulations and regulatory bodies and to merging the existing bodies.

This chapter aims to shed light on the opportunities and challenges of convergence in the LAC region. In the coming years, as broadband speeds increase and the networks become more capable of delivering added-value services, policy makers in the LAC area will have to deal with issues related to, for example, adapting their own communications governance models to convergence trends, treatment of bundles and convergent offers, and Internet openness.

While Internet openness is a multidimensional concept that includes technical, economic, social and other dimensions (OECD, forthcoming), this chapter addresses a limited set of policy and regulatory issues related to Internet national governance arrangements, traffic prioritisation and network neutrality, zero rating, liability of Internet intermediaries and IPv6 (Internet Protocol version 6). Issues related to convergence of communication providers with adjacent sectors of the economy, such as banking, transport and tourism, will not be dealt with in this chapter, but the principles introduced in this section should offer a good basis for considering other cross-sectorial implications of ubiquitous connectivity.

Key policy objectives for the LAC region

Given the multilayered convergence of networks and services, policy makers are reassessing their policy and regulatory frameworks to adjust them to current and future developments. Policy objectives like those exemplified below should be at the centre of convergent policy:

- **Expand access to and use of services, applications and content.** Users should be at the centre of communication policies. Policy makers should focus on frameworks that ensure that consumers and businesses benefit from greater choice in convergent networks and services over connectivity, access and use of IP-based services, applications, content and terminal devices. Consumers should be able to access any service at any time and from any place, and the regulatory framework should not only allow but facilitate the development of convergent services. Consumer choice, consumer protection and enforcing consumers' rights should be the priority, no matter what the supporting technology and type of provider supplying the service.
- **Encouraging investment and competition in a convergent environment.** Policy makers should establish an environment conducive to competition and investment. The goal should be for users to affordably and efficiently access the multitude of bundled or standalone voice, data and video services in the IP convergent world provided by such actors as access and content providers (as discussed in Chapter 4 on competition and infrastructure bottlenecks).

- **Promoting the free flow of information and innovation.** Governments should promote the free flow of information both within and outside their borders to spur innovation, knowledge sharing and trade. Policy makers need to ensure the open, distributed and interconnected nature of the Internet and the functioning of its architecture and interoperability.

Tools for measurement and analysis in the LAC region

To assist policy makers in fulfilling their objectives, it is crucial to conduct regular assessments of the rapidly changing and converging communications ecosystem. Policy makers need sound evidence to construct a policy framework adapted to the challenges of convergence. The indicators below offer a roadmap of areas where data is needed to understand some of the salient issues of convergence.

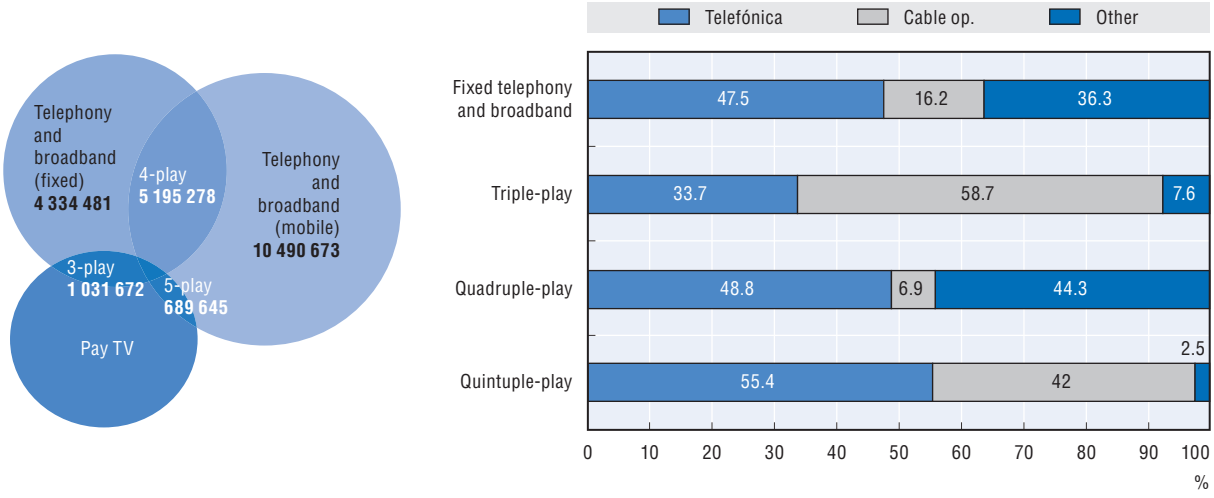
In relation to understanding the main **players in the converging ecosystem**, the following indicators are important:

- number of subscribers and revenues of integrated service operators (offering either fixed and mobile services or voice and broadcasting services) and data on market shares and evolution trends (as recommended in Chapter 4)
- data on OTT Internet providers competing for "traditional" communication services (such as voice and audio-video services or Voice over Internet Protocol [VoIP]), including collection of number of subscribers, revenues and any other data that would be relevant for understanding competition trends and the evolution of the market.

To assess the state of **bundled services**, it is necessary to carry out:

- collection of data on bundled services, such as the number and percentage of bundled services, prices paid, data caps and length in time of the offer (Figure 7.1)
- development of methodologies for market analysis of convergent offers.

Figure 7.1. **Example of visualisation of bundled communication services**



Source: Adapted from CNMC (2014), *Informe Económico de las Telecomunicaciones y del Sector Audiovisual 2014, http://data.cnmc.es/datagraph/files/Informe%20Telecomunicaciones%20CNMC%202014.pdf.*

The exercise of **benchmarking the Internet's openness** is a complex one and demands, at least:

- Compilation of quantitative and qualitative information and analysis of any complaints or reports of blocking and throttling by consumers and service providers (including conflicts between operators).

- Collection of information on peering and transit agreements for monitoring the interconnection market.
- Collection of information on bottlenecks and restrictions to openness across the whole value chain for broadband-based services (network providers, as well as content, application and terminal equipment providers).
- Collection of data on zero rating offers, when they are permitted and exist. Information about any other offers where broadband access to contents and application is restricted is also useful to assess trends, bottlenecks and dominance issues.
- Measuring the extension of use of IPv6 in the country and the proportion of government services supported by IPv6 (Box 7.1).

Box 7.1. **Measuring the adoption of IPv6 online**

Establishing metrics to trace the progress of IPv6 adoption is not a simple task. Over the years, a variety of approaches and associated measurements have been attempted, reflecting the fact that the Internet is not a single integrated system but a collation of component subsystems, so that IPv6 measurements can be performed within any particular subsystem. The list below shows several possible measurements at the level of different sub-systems, giving a snapshot of the overall transition:

- **Measurements using the routing system:** The Internet routing table can be used to track the number of *advertised routes* that constitute the IPv4 Internet, which may be compared with a comparable count of the number of routes in the IPv6 protocol. A complementary measure is to compare the number *of unique autonomous system numbers* contained in the routing table, which indicate the number of entities that have IPv6 networks interconnected to the Internet.[1]
- **Measurements using the domain name system:** The domain name system can provide a useful measurement, since only *domain names* that can be resolved to an IPv6 address will be able to be accessed. One approach is to use the most common source of popular domain names, the Alexa list, and query this set of domains over time to establish the proportion of the names with an IPv6 address.[2]
- **Measurements using Internet traffic statistics:** Another option is to look directly at *traffic volumes* in IPv4 and IPv6. Although most such data is generally considered to be proprietary and is not released publicly, an increasing number of Internet exchange points publish data about their volumes of IPv6 traffic so that estimations of the adoption over time can be made.[3]
- **Measurements of end client capabilities:** For an end client system to be able to make a connection using IPv6, all the Internet subsystems must also be functional in supporting IPv6. One simple way of measuring the number of IPv6-capable clients is to use a dual-stack service point and offer both IPv4 and IPv6 capability. Counting the number of systems that prefer IPv6 to IPv4 gives a good indication when the sample is large enough.[4] Another measurement technique is to carry out IPv6 connectivity tests with a sample of clients to determine their preferences.[5]

1. RIPE NCC measures the number of IPv6-enabled networks in a country. See *http://v6asns.ripe.net/v/6?s=_ALL*.
2. Lars Eggart started a study using this approach in 2007. The current results can be seen at *www.eggert.org/meter/ipv6*.
3. PCH maintains a directory of Internet exchanges with traffic statistics for IPv4 and IPv6 subnets. See *www.pch.net/ixpdir*.
4. Google measures the number of end hosts preferring to use IPv6 on its service infrastructure. See *www.google.com/ipv6/statistics.html*.
5. APNIC Labs measures IPv6 capability per country using this technique (APNIC, 2016).

Source: OECD (2010), *Internet addressing: Measuring deployment of IPv6*, *www.oecd.org/sti/ieconomy/48459831.pdf*.

Providing reliable measures of convergence is an **ongoing exercise**. It involves improving collection of network parameters, and surveys and statistical systems to measure the changing access and use of communication networks by consumers, businesses and institutions. This is particularly important in preparing for convergence trends.[1]

A major challenge to benchmarking convergence lies in the fact that most regulatory authorities do not have the legal competency to request information from many of the service providers (e.g. OTT) that are not classified as their traditionally regulated communication service providers. This absence of mandate affects the assessment of the impact of these new services and limits the ability of regulators and policy makers to obtain a clear picture of market developments and progress on policy objectives.

The solution to this challenge may be to expand the scope of the information-gathering mandate, while making sure not to overburden firms and taking advantage of new data collection and analysis methods. For example, the exploitation of large volumes of data or "big data" (OECD, 2015) may serve in the future to satisfy policy information requirements. New methods for collecting statistical information and the data produced by them have been receiving considerable attention, due to their timeliness, detail and frequency. They are likely to be increasingly used by national statistics offices and regulators to complement their traditional statistics on issues such as quality of service, security incidents and price statistics (Reimsbach-Kounatze, 2015).

Overview of the situation in the LAC region

The LAC region has seen different levels of development in the implementation of convergence-related regulation and policies. While some countries in the region have been at the forefront of some issues and policy development, such as on network neutrality and IPv6, a general overview of the region shows that most countries still have not addressed key issues related to convergence. It may be the case that many of these emerging issues have yet to affect LAC countries as much as some OECD countries. This is likely to change as broadband penetration rates increase in the LAC region.

Converged regulators

In the LAC region, discussions towards reforming regulators to create converged agencies are still in their beginning. In LAC, only the recently established Mexican *Instituto Federal de Telecomunicaciones* (IFT) and the Argentinean *Ente Nacional de Comunicaciones* (Enacom) can be considered fully converged regulators (Box 7.3). For the OECD/IDB questionnaire for this report, Jamaica reported that it was conducting studies to establish a single information and communications technologies (ICT) regulator. This would involve the potential merger of the Spectrum Management Authority, the telecommunication functions of the Office of Utilities Regulation and the spectrum functions of the Broadcasting Commission. Additionally, Colombia is going through a public consultation process to evaluate the possibilities of establishing a converged regulator (Box 7.3).

Reassessing the role of the regulator in light of current and future convergence trends is useful, as it brings into focus the need for changes in regulatory frameworks, the implementation of these frameworks and the need to avoid inconsistent regulation.

Licensing regimes

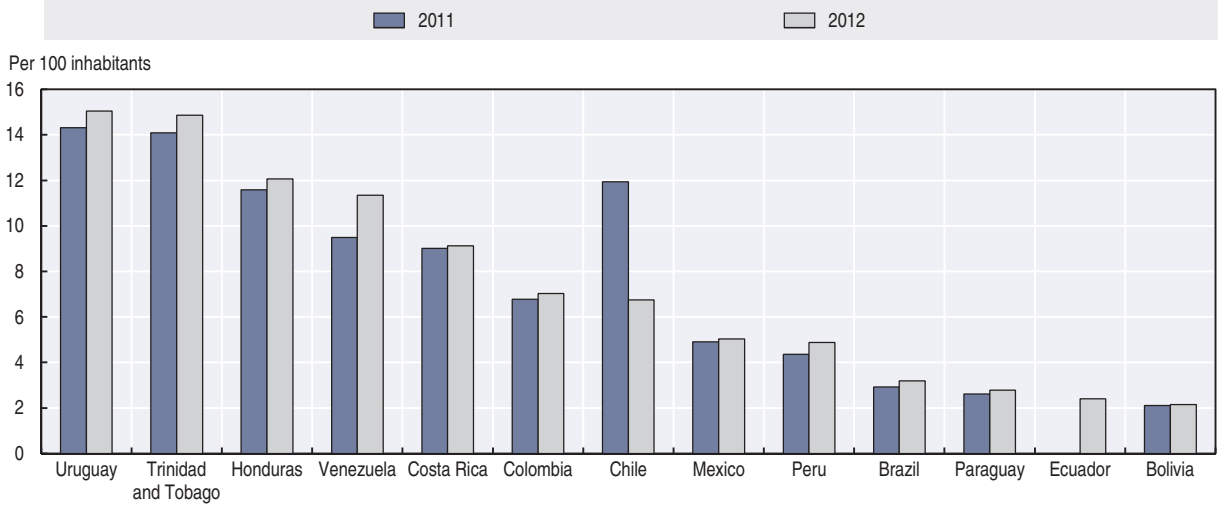
The simplification of the licensing regime is another area in which little development has been undertaken, even when no spectrum licence is involved. Most countries in the region

still use individual licences and/or concessions for specific services, when convergence trends call for general authorisations covering any service or combination of services. Developing more affordable broadband services and a policy framework prepared for the 21st century requires, among other mechanisms, lowering regulatory entry barriers whenever possible, such as through general authorisations.

Bundling practices

The offer of multiple services over the same network is not a new phenomenon in the LAC region. Since the mid-2000s, it has seen bundling of communication services, at least of two or three fixed communication services. This was driven by cable television providers who were able to provide bidirectional services, especially voice telephony and broadband Internet access. It should be stressed that television services, especially free-to-air television, still play a central role in LAC economies, as in many OECD countries, despite increasing reports of "cord-cutting" trends as some users migrate to video on demand (VoD) subscription services.[2] With the exception of Chile, terrestrial multichannel television subscriptions, for example, witnessed continued growth in the LAC region (Figure 7.2).

Figure 7.2. **Terrestrial multichannel TV subscriptions in the LAC region (per 100 inhabitants)**



Source: ITU (2015), *ITU World Telecommunication/ICT Indicators Database*, *www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx*.

StatLink http://dx.doi.org/10.1787/888933354321

Despite their role in the region, many LAC telecommunications and cable operators have not been leaders in shifting their networks and businesses toward advanced services and bundles. However, this situation is changing, driven by demand and market pressures caused by OTT players competing for customers, as well as opportunities for integrated operators owning both fixed and mobile networks.

For this report, data were gathered on the services offered by leading operators in the region. Among some 97 operators (MNOs and MVNOs) in 26 LAC countries, close to 40% offered some type of bundled communication service (including at least a double-play of fixed broadband, fixed voice, television or mobile services). The majority, that is 60% of operators, did not offer any type of bundled services. The most common bundle in LAC is the triple-play, with fixed broadband, fixed voice and television. Quadruple-play

services are rare, found in Brazil (Vivo, Claro and Oi), Barbados (Flow), the Dominican Republic (Claro) and Jamaica (Flow). The few quadruple-play services tend to be flexible and allow users to choose and arrange services with different characteristics as they see fit.

Despite the lack of widespread quadruple-play offers, the LAC telecommunication market shows signs of innovating on bundling with OTTs and other agents (such as banks and retail shops). Indeed, the review of services for this report suggest a growing trend in the region of reaching out to partners and added services to retain and gain new customers. This is undertaken by offering a range of services via set-top boxes or mobile apps of VoD content, music streaming, cloud storage (e.g. mClou from Movistra in Chile) and mobile payments (e.g. Vivo's Zuum in Brazil, TigoMoney in Honduras and Paraguay and Orange's M-peso). Operators in the LAC region are increasingly adding to their own services, the "premium" subscriptions of other digital partners such as Evernote (i.e. note taking and cloud storage) and Duolingo (i.e. language learning), as well as services from partners from other sectors such as e-book publishers (e.g. Vivo's *Nuvem de Livros* in Brazil) and banks.

Retail chains in the LAC region, as in OECD countries, are beginning to create their own MVNOs. This often involves converting consumers' loyalty to their retail chain to minutes of calls, such as the MVNO *Móvil Éxito* (using Tigo's network) in Colombia.

As a regulatory response to that trend, according to the OECD/IDB questionnaire, half of LAC countries require that operators that offer communication services as a package (or bundle) also offer the different elements on a stand-alone basis. In addition, in just over half of LAC countries, whenever bundled services are sold (including handsets and mobile telecommunication services), companies are also required to provide invoices with information on the price of individual services and products.

In addition to these obligations for bundles related to consumer protection and information, competition authorities and sector regulators in the region should be ready to address the challenges arising from this trend, such as conducting market analysis, definition and competition enforcement in a rapidly changing ecosystem. In the LAC region, Colombia, Costa Rica and Nicaragua report that they include bundling considerations in their competition monitoring frameworks. Good practices on these issues will be addressed in the next section of this chapter.

VoIP regulation

In some LAC countries, Voice over IP (VoIP) services are subject to the general telecommunications regulatory framework. In others, VoIP services are framed in specific instruments. In 2015, according to information provided by countries in the OECD/IDB questionnaires, just over half of the LAC countries (56%) had VoIP services subject to general telecommunications regulation. Additionally, 31% stated they had specific policies or regulations to deal with VoIP. In all LAC countries analysed, VoIP is allowed, and no regulatory restrictions were found. Further examples of VoIP regulation in the region are included below (Box 7.8).

Internet openness

In OECD countries, a key principle for policy making related to the digital economy has been the concept of "Internet openness", with governance approached through

co-operation, using a multi-stakeholder model.[3] In 2014, Brazil invited governments and other stakeholders from around the world to pursue a similar path, convening the NetMundial meeting (as discussed below). Alongside their participation in both these events, a number of LAC countries have been at the forefront of international discussions on issues such as network neutrality and IPv6.

On network neutrality issues, some countries, notably Chile (2010), Brazil (2014), Colombia (2011) and Ecuador (2015), have taken decisions to prohibit blocking, throttling and paid prioritisation by broadband Internet access providers (Box 7.12). Other countries, such as the Dominican Republic, Guatemala, Suriname, Trinidad and Tobago and Uruguay, are reported to be carrying out consultations on the topic. Policy makers in the region appear to be inclined to lay out principles to ensure network neutrality. Based on the rationales given by the initial countries to do so, they see this as essential to stimulate competition, promote innovation on the margins and ensure that consumers are able to access any lawful content, application or service provided over the Internet. According to the responses collected from the OECD/IDB questionnaire for this report, ten countries said they now have or are planning to introduce regulation addressing network neutrality.

Although principles related to network neutrality have been introduced in a number of countries in the LAC region, their interpretation or implementation may vary for fixed or mobile networks and for different commercial developments. A case in point is the approach taken by some authorities on the practice of "zero rating", where data for specific applications or services are not charged relative to other usage. Zero rating is an issue currently being debated in LAC countries, and careful consideration by authorities should be given to this question and its effect on different policy objectives (such as affordability of services and competition dynamics). The good practices section of this chapter will discuss this issue.

Zero rating is becoming increasingly popular among LAC operators. Out of the 97 operators reviewed in the LAC region here, at least 23% offered some type of zero-rated offers. Examples of zero-rating social media applications (such as Facebook, WhatsApp, Twitter and Instagram) can be found, within different schemes, in Barbados, the Plurinational State of Bolivia (hereafter "Bolivia"), Brazil, Colombia, the Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Panama, Peru and Suriname. In most countries, these zero-rated services are offered under specific conditions (under a certain basic data plan, during a limited time and where VoIP services do not apply).

A few operators in the LAC region also offer music services (their own or under partnerships with OTTs such as Spotify, Deezer and Napster) under similar zero-rated plans that do not subtract from users' data caps, such as the one offered by Tigo, Honduras. Others have started offering their own zero-rated chat apps to compete with OTT services, either native in their devices or downloadable in app stores, such as Twnel from UFF!, a MVNO operating on Tigo's network in Colombia.

IPv6

As for IPv6, the Americas region is a leader, with 12.74% of end hosts capable of undertaking an IPv6 network transaction, followed by Europe, Oceania, Asia and Africa. In the LAC region, the five leading countries in IPv6 adoption are Peru, Ecuador, Brazil, Bolivia and Trinidad and Tobago, according to the measurements of their end-to-end IPv6 capabilities (Table 7.1). Other measurement options are available (see Box 7.1).

Table 7.1. **World and regional statistics on IPv6**

Region/country	APNIC IPv6-capable	APNIC Ipv6-preferred	Google IPv6 adoption
World	4.54%	4.00%	
Unclassified	82.70%	55.86%	
Americas	12.74%	11.14%	
Europe	6.34%	5.79%	
Oceania	3.27%	2.54%	
Asia	1.49%	1.28%	
Africa	0.07%	0.06%	
Argentina	0.02%	0.02%	0.02%
Bahamas	0.09%	0.00%	0.00%
Barbados	0.01%	0.00%	x
Belize	0.01%	0.01%	0.05%
Bolivia	3.57%	3.22%	1.69%
Brazil	4.18%	3.81%	4.77%
Chile	0.05%	0.04%	0.01%
Colombia	0.02%	0.02%	0.02%
Costa Rica	0.01%	0.01%	0.02%
Dominican Republic	0.05%	0.00%	0.00%
Ecuador	5.23%	4.93%	7.39%
El Salvador	0.00%	0.00%	0.00%
Guatemala	0.08%	0.07%	0.09%
Guyana	0.06%	0.06%	0.06%
Haiti	0.00%	0.00%	0.00%
Honduras	0.00%	0.00%	0.00%
Jamaica	0.00%	0.00%	0.00%
Mexico	0.02%	0.02%	0.04%
Nicaragua	0.00%	0.00%	0.00%
Panama	0.01%	0.00%	0.00%
Paraguay	0.01%	0.00%	0.01%
Peru	14.41%	13.86%	15.40%
Suriname	0.00%	0.00%	0.02%
Trinidad and Tobago	0.87%	0.85%	0.13%
Uruguay	0.02%	0.02%	0.02%
Venezuela	0.02%	0.01%	0.01%

Note: x = *not applicable.*

Source: APNIC (2015), *Use of IPv6 for Americas*, *http://stats.labs.apnic.net/ipv6/XC*.

Good practices for the LAC region

Guiding principles for adapting regulatory frameworks for convergence

Given the increasing convergence towards IP broadband networks, it is necessary to review whether existing policy and regulatory frameworks will continue to apply and what measures should be taken to facilitate and seize the benefits of the transition.

A first step in assessing whether to update the current communication policy and regulatory frameworks involves evaluating if the reasons that inspired and justified their introduction still hold in the new environment. Such an evaluation should consider that regulation is usually applied to correct a market failure, such as lack of competitive choice, resource scarcity or to safeguard public policy objectives (e.g. widespread access, public safety, emergency communications, economic growth, privacy, consumer empowerment and security). In areas of traditional market failure, convergence may have created opportunities for market players to play a greater role by increasing choice and diversity and reducing scarcity, while in others, market failures may still exist.

OECD countries have carried out regulatory reforms in the light of convergence. Some of the general principles guiding such policies can be used as a source of good practices for the LAC region:

- **Simplify.** The guiding principle behind creating a regulatory framework adapted to convergence should be simplification of rules and procedures. Complex regulatory systems increase the costs of transaction, especially for new entrants and new services.
- **Uphold technologically neutral regulation when possible.** Technology-neutral and device-agnostic regulatory frameworks are not only desirable, but critical to enable convergence of communication services. In a context where most services are shifting to IP-based networks and content is being accessed on a multitude of platforms and devices, it is not advisable to tie general frameworks, which do not involve scarce resources such as spectrum, to specific networks, technologies or devices.
- **Promote investment along the whole value chain for broadband access services.** Encouraging investment by all market players is fundamental for increasing broadband access infrastructure and services. Any regulatory reform to address convergence issues should ensure that adequate incentives exist to encourage investment both in the network layer (access and transit infrastructure deployment) and in the applications layer (innovative services using broadband access).
- **Promote competition and innovation.** The promotion of competition and innovation should be maintained as a guiding principle of any policy reformulation seeking the benefits of convergence. Policy makers should promote an environment for innovation without favouring particular platforms or participants. New convergent regulatory frameworks should above all promote a level playing field.

Some countries have actively engaged in convergence reviews for telecommunication and audio-visual markets and can therefore provide some firsthand experience for the LAC region. For example, Australia's 2012 Convergence Review conducted a comprehensive consultation process to inform the examination of the operation of media and communications regulation. It aimed to assess the effectiveness of the Australian framework in achieving policy objectives in areas of media ownership, content standards, production and distribution of local content and the allocation of spectrum.[4] In LAC region, the new Telecommunications Act of Ecuador is an example of a regulatory framework that takes convergence into account (Box 7.2).

Box 7.2. **Ecuador's new Telecommunications Act**

The new Telecommunications Act in Ecuador, enacted in 2015, embraces the opportunities of convergence and stipulates in its Article 12 that the Ecuadorian state will "propel the establishment and exploitation of telecommunication networks and services that promote the convergence of services, in conformity with public interests and with the dispositions of the Act and its normative". According to the new Act, the regulator ARCOTEL will be responsible for "regulations and norms that allow for the provision of multiple services on the same network to drive, in an effective manner, the convergence of services and assist with the technological development in the country, following the principle of network neutrality".

Source: Ecuador (2015), *Ley Orgánica de Telecomunicaciones*, *www.arcotel.gob.ec/wp-content/uploads/downloads/2015/03/ro_ley_organica_de_telecomunicaciones_ro_439_tercer_suplemento_del_18-02-2015.pdf*.

Converged regulators

Policy makers need to respond to the changes brought about by convergence, over broadband networks, with a whole-of-government approach. These changes touch on a number of different sectors, increasing the chance of overlap between the responsibilities of different agencies and ministries.[5] It is important to address all market actors in any review of legal and regulatory frameworks, to ensure a balanced approach across all services. The emergence of OTT content service providers and the popularisation of triple- or quadruple-play service bundles, including premium content, for example, have made it difficult to draw boundaries between content and data transmission (OECD, 2014a). Other issues, such as must-carry/must-offer obligations, copyright and retransmission issues are not easily classified in any of the two categories (audiovisual content or telecommunication regulation). Convergent trends affect competition dynamics among broadband and content/application providers, and these need to be analysed taking a holistic approach. Likewise, cross-sector mergers and acquisitions and market analysis (of fixed and mobile, content providers and telecommunications providers or OTTs) have a profound influence on the need to reinforce collaboration between competition and communications authorities.

Several types of institutional arrangements address regulatory convergence when assigning powers to the different agencies in OECD countries. Some combine *ex ante* with *ex post* regulation, as in the Netherlands; others combine *ex ante* regulators of several sectors into a single body, as in Australia; and others have created a unique regulatory authority for all sectors, acting both *ex ante* and *ex post*, as in Spain. In general, converged regulators address regulatory issues holistically, and serve as a one-stop shop for stakeholders, simplifying regulatory decisions, saving public resources and facilitating knowledge sharing.

Converged regulators integrating powers for both audiovisual and telecommunications services, including content-related issues for video/television services, can assess and impose regulatory measures on the full value chain of communications services (from networks to content), identify bottlenecks and detect possible leverage of market power in adjacent markets (such as bundling issues). Converged entities that combine *ex ante* and *ex post* powers have a better ability to co-ordinate regulatory decisions, and improve consistency, coherence and enforcement.

Any reform seeking to address convergence requires new tools, procedures and updated information requirements. Collecting data from OTTs and analysing their effects on broadband markets is challenging, but needs to inform policy making and regulation. The substitutability of new services is a crucial part of convergence, as is ensuring the availability of statistical and technical skills and resources so that competition analysis can be conducted. Mexico and Argentina in the LAC region have recently joined other OECD countries, such as Australia, Canada, the United Kingdom, the United States, Hungary, the Netherlands and Spain, in introducing a converged structure for its communication authority.

Box 7.3. **Converged regulators in LAC**

Mexico

The IFT is an independent and converged regulator, established in September 2013 in the context of the constitutional reform, with the objective to promote competition and efficient development of telecommunications and broadcasting in Mexico.

Source: IFT (2016), "Objectivos Institucionales", Instituto Federal de Telecomunicaciones, *http://www.ift.org.mx/conocenos/objetivosinstitucionales*.

Argentina

The Enacom was created in December 2015 as a decentralised agency with the objective of overseeing the converged sector, including Internet services, fixed and mobile telephony, radio, postal and broadcasting services in Argentina.

Source: Enacom (2016), "Que és Enacom", *Ente Nacional de Comunicaciones*, *http://www.enacom.gob.ar/*.

Colombia

In March 2016, the Colombian Ministry of ICT started in March 2016 rounds of multistakeholder consultations in the several regions of the country to develop a new policy and regulatory framework for telecommunications and broadcasting in that country. A key issue raised, and one where consensus is emerging Is on the need to have a unified regulator to deal with convergence in communications markets. This new regulatory framework is expected to be finalised in 2017.

Licensing regimes

Licensing requirements in broadcasting and telecommunication should be reduced to a minimum, to facilitate entry of new providers and to promote innovation and competition. This can be a notification-based, class-licensing approach, as typical of telecommunication services in most OECD countries. One of the few exceptions to this rule would be services using scarce spectrum resources, where licences involve coverage and QoS obligations. In such cases, consultation with the regulatory authority should ensure that competition is encouraged. In a converged environment, the difference between telecommunications and audiovisual services may no longer be as relevant, especially in the scenario where audiovisual services are provided over the Internet. Here, it is advisable to keep licensing requirements as uncomplicated as possible. Some countries in the LAC region have made considerable progress in this respect. Peru, in 2006, Colombia, in 2009, and Mexico, in 2014, for example, have recently taken steps to simplify licensing requirements for most services (Box 7.4).

For licensing, Colombia and Mexico take a similar approach to that of the European Union, and only require previous notification to the relevant authority (Box 7.5). In the United Kingdom, television services are licensed by the Office of Communications, Ofcom, in an approximate time frame of 25 working days (non-committal) for a USD 3 500 fee. Video-on-demand services are licensed by the ATVOD (Authority for Television on Demand) based on providers' revenue, starting at about USD 250.

In general, operators should be allowed to provide any service, facilitating economics of scope and convergent services on a national basis. This will help promote economies of scale. Any potential issue for competition and obligations should be addressed after conducting a market analysis.

Box 7.4. **Simplified licensing regimes in the LAC region**

Peru

The Telecommunications Act of 2000 (*Reglamento General de la Ley de Telecomunicaciones*) was modified in 2006 by Law No. 28737 to include a single licence granted by the Ministry of Transport and Communications (MTC) to any public telecommunications service. The Law embodies the Peruvian government's objective to "promote the convergence of networks and services, facilitating the interoperability of different network platforms, as well as the offering of different services and applications on the technological platform, recognising convergence as a fundamental element to the development of different regions in the country". Available at *http://transparencia.mtc.gob.pe/idm_docs/normas_legales/1_0_892.pdf*.

Colombia

The licensing regime implemented by Law No. 1341 of 2009 (*Ley de TIC*) laid out a single-licensing regime in Colombia (*Título Habilitante Convergente*) that only requires registration, reducing administrative barriers and easing the entry of operators into the market. This licensing regime aims to favour convergence and the supply of different services over the same network. However, broadcasting licences continue to require a specific licence (also simplified) and could benefit from further regulatory convergence. Available at *www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=36913*.

Mexico

In the context of the Constitutional Reform (2013) and the Federal Telecommunications and Broadcasting Law (2014), Mexico's licensing regime moved to a single-licensing system (closer to class licensing) which allows the provision of all telecommunications and broadcasting services with a single licence (with the exception of services involving radio-electric spectrum or orbital resources), awarded for renewable 30-year terms. To obtain a unique concession, a request that complies with the minimum requirements must be submitted. The request is then reviewed by the IFT within 60 calendar days, with the understanding that the IFT will grant the concession after this period, assuming all requirements are met. This single license however is not available to all actors in the Mexican market, as additional regulatory requirements are currently applied to Mexico's incumbent operator (Telmex). Available at *http://www.diputados.gob.mx/sedia/sia/spi/SAPI-ISS-64-15.pdf*.

Box 7.5. **General authorisation model in the European Union**

The model for authorisation applied in the European Union to provide electronic communications services is defined in a directive on the authorisation of electronic communications networks and services (Authorisation Directive) 2002/20/EC of the European Parliament and of the Council of March 2002 (updated in 13 November 2009).

According to Article 3, member states must ensure freedom to provide electronic communications and services, and companies may not be required to obtain explicit decisions by regulatory authorities. To get authorisation, it is enough to submit a notification with information limited to what is necessary for the identification of the provider, such as company registration numbers, and the provider's contact persons, the provider's address, a short description of the network or service, and an estimated date for starting the activity.

Source: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32009L0140.

Bundling practices

Broadband IP-based networks facilitate a bundling of communication services. These range from basic double-play to triple and quadruple-play offers of fixed and mobile broadband Internet access, pay-television, fixed telephony and mobile voice. Operators in the LAC region are increasingly including innovative services in their bundles, such as those resulting from partnerships with OTT providers as well as home monitoring, mobile payments, e-learning applications, computer security and cloud storage services.

Bundles can be beneficial to consumers, allowing them to purchase several services at a significant discount over the cost of stand-alone equivalents (OECD, 2011b, 2006) and can also reduce complexity of subscribing to multiple services of multiple providers. Conversely, bundling of services may also complicate choices for consumers by increasing complexity, making price comparisons more difficult, and reducing billing transparency. Operators may also benefit from bundling practices, which may lead to cost savings, through economies of scope and scale or simplified distribution and marketing. In competitive conditions, these should, in turn, benefit consumers via price reductions. Bundling services also allows for the use of a single platform (such as through the use of "boxes" that allow for the provision of triple-play bundles over the same device (OECD, 2011b).

One of the biggest challenges of bundling practices for policy makers, however, is to determine their impact on competition. Operators that are in a position to offer bundles based on their own infrastructure may leverage dominance from one market to other markets, and alternative operators may not be able to compete on an equal footing. Policy makers should consider that account bundling may be a potential barrier to competition when performing market analysis, while also taking into account the potential benefits to consumers. Some good practices in this area are summarised below:

- **Obligation to provide separate prices for stand-alone services and billing.** A lack of transparent information about services and their prices makes consumer price comparisons more difficult and may lead to market inefficiencies. To facilitate consumer choice, it is good practice to require that the prices of bundled services be provided separately. Regulators and consumer-protection agencies should encourage providers to make available more information on the characteristics of packages they are selling and to make prices clear and understandable for consumers. Many regulators, including those in the LAC area, have tried to increase billing transparency by issuing regulations that require operators to disaggregate the price of each service component (including handsets, if included) in the bundle. These practices are in line with what is set out in the OECD Consumer Toolkit and its application to communication services (OECD, 2008; OECD, 2010; OECD, 2013). Additionally, websites and tools that can help users compare bundled offers are beneficial to consumers and lead to stronger price and service competition. Regulators are in a good position to provide these tools to the public (Box 7.6).
- **Monitoring the market for anti-competitive practices.** Regulators and competition authorities need to work together to address problems with market dominance in bundles. They should co-operate on developing new market analysis frameworks and tools, to address issues related to bundles and cross-effects, such as those between competition in content provision and competition in telecommunications and OTT services (Box 7.7).

Box 7.6. **Price comparison of bundled services in LAC**

Colombia

To increase transparency of offered prices and to allow for users to directly compare different types of communication services and bundles, the Colombian regulator, the *Comisión de Regulación de Telecomunicaciones* (CRC) has issued the *Comparador de Tarifas*, so that users can choose to match several services and filter per region, budget, etc., to see the best available offers.

Brazil

The Brazilian regulator *Agência Nacional de Telecomunicações* (ANATEL) announced the creation of a mobile app for early 2016, to allow users to compare services they wish to include in their bundled plans and see the best available services in their regions. This comparison has only been made possible since ANATEL started requesting that operators offer in their websites all available stand-alone and combined offers, in an easily comparable and standardised format.[1] ANATEL will gather this information, filter per region and systematise it in the mobile app.

1. *Resolução No. 632 do Conselho Diretor da ANATEL* of 7 March 2014, approved by the General Regulation for the Rights of Consumers of Telecommunications Services, *www.anatel.gov.br/legislacao/resolucoes/2014/750-resolucao-632*.

Source: ANATEL (2015), *Projeto de aplicativo sugerido pela Anatel receberá prioridade*, *www.anatel.gov.br/institucional/index.php?option=com_content&view=article&id=688:projeto-de-aplicativo-sugerido-pela-anatel-recebera-prioridade&catid=104&Itemid=354*.

Box 7.7. **A proposed definition and taxonomy of OTT services by BEREC**

Despite the growing importance of Internet-based services commonly known as "over-the-top" (OTT), their definition and implications for the analysis of telecommunications and broadcasting services does not generally have a legal status. The term OTT is commonly used but often not clearly defined. With this in mind, the Body of European Regulators for Electronic Communications (BEREC) carried out a report on OTT services, addressing their implications for competition and on the current EU regulatory framework for electronic communications (ECN/S Framework, available at *https://ec.europa.eu/digital-agenda/en/telecoms-rules*), which offers a useful definition and taxonomy of OTT.

BEREC defines OTT service as "content, a service, or an application that is provided to the end user over the open Internet". This includes what is provided as content, service or application, meaning *anything* provided over the open Internet, generally without involvement of the Internet Access Provider (ISP for end users, in "retail Internet access markets") in the control or distribution of the service. According to BEREC, OTT services thus include "the provision of content and applications such as voice services provided over the Internet, web-based content (news sites, social media, etc.), search engines, hosting services, email services, instant messaging, video and multimedia content, etc."

Other taxonomies of OTT exist, for example those based on the type of service offered (as suggested in the 2014 OECD Report on "The Development of Fixed Broadband Networks" (OECD, 2014b). Others are based on business models (direct payment from users or advertisement, for example). BEREC, however, compares the relevancy of each OTT service against electronic communications services (ECS) categorisation. The taxonomy is summarised below:

OTT-0: OTT services that qualify as ECS (e.g. OTT voice services with the capacity to make calls to PSTN/PATS as a substitute for traditional voice services).

OTT-1: OTT services that do not qualify as ECS, but potentially compete with ECS and are therefore relevant for market analysis to assess dominance (e.g. OTT voice or instant-messaging

Box 7.7. **A proposed definition and taxonomy of OTT services by BEREC** *(Cont.)*

services that do not convey signals to the PSTN/publicly available telephone service (PATS) and that require the caller and called party to subscribe to the same service).

OTT-2: Other OTT services that do not qualify as ECS or compete with them, but which are relevant for ECS analysis, since they are sometimes bundled with ECS. These might include OTT non-voice and non-instant messaging that aggregate value to ECS bundles through services of e-commerce or video and music streaming.

BEREC's proposal may serve as a guide to regulators to evaluate the standing of certain OTT services within their national legal definition of electronic communication services. Categorising different types of OTT services according to their interaction with existing definitions may serve as an exercise for monitoring new anti-competitive practices on the market and to benchmark possible changes towards a converged legal framework.

Source: BEREC (2015), "Draft Report on OTT Services", *http://berec.europa.eu/eng/news_consultations/ongoing_public_consultations/3320-public-consultation-on-the-draft-berec-report-on-ott-services*; OECD (2014b), *The Development of Fixed Broadband Networks*, *http://www.oecd-ilibrary.org/science-and-technology/the-development-of-fixed-broadband-networks_5jz2m5mlb1q2-en*.

Some additional good practices covered in Chapter 4, on competition and infrastructure bottlenecks, are especially relevant in addressing competition issues in a convergent world: encouraging inter-platform competition to ensure replicability of bundle offers by alternative operators and regulating wholesale markets when needed.

Policy makers should, when possible, carefully consider exclusive long-term deals for premium content, especially when supply of premium content is bundled with broadband access. The impact on market competition of premium content acquisition by dominant providers should be assessed with caution. If needed, obligations to share content can be mandated to ensure competition.

VoIP regulation

Traditional telecommunication operators have widely regarded VoIP services provided by third parties as a threat to their revenues from legacy voice services. In response, some of them have excluded, surcharged and restricted VoIP services, or used price discrimination, absent explicit network neutrality rules or when permitted by the regulator.

Efforts to block VoIP service have not successfully discouraged offers by content and application providers, such as Skype or Viber. Other OTT messaging applications equipped with voice features such as WhatsApp, Facebook Messenger, FaceTime and LINE, have proven popular in the LAC region, as they have elsewhere. Some operators have sought to restructure tariffs, such as by including unlimited voice and text for particular locations or destinations, or have included their own or third-party VoIP pre-installed applications in order to increase the attractiveness of their own services in the face of competition from OTTs (e.g. Twnel from Tigo Colombia).

Authorities should analyse if and when VoIP services should be regulated in their countries against their policy objectives. In many OECD and LAC countries, regulators have taken the approach that VoIP providers that act as traditional voice operators and connect to the PSTN (having numbers assigned and a certain critical mass of subscribers or revenue, for example) should be subject to similar obligations. In Japan, there are various requirements if a telephone number is assigned. At the same time, other countries such as Australia, impose these obligations only on network operators.

A neutral approach focusing on services provided rather than technology may help to clarify some issues for applying obligations and including VoIP in numbering regulation frameworks. Belize and Colombia offer an interesting example of technology neutrality, while Chile is a good case of allocating "nomadic" or "non-geographic" numbers for VoIP services (Box 7.8). Other issues such as number portability are likely to arise in the future in the LAC area. In most OECD countries, portability between fixed voice service and equivalent VoIP service has already been instituted. In addition, local number portability to VoIP and portability between VoIP services can become more important if they become increasingly used to replace fixed telephony.

Box 7.8. **Regulation of VoIP in LAC**

Belize

Since 2006, Belize has categorised VoIP services into two types in Belize: services where the end-user is not publicly available by means of an assigned unique telephone number, and those where the end user can be reached via an assigned telephone number (PSTN). The first type is not subject to licensing procedures with the regulator, while the second category is, including those used in private networks. They are also subject to the provisions of consumer protection, emergency calling and universal access. See PUC (2006).

Chile

Since 2007, Chile has regulated VoIP services that offer calls using PSTN. These services are subject to licensing regimes and have had nomadic numbering assigned by the Chilean regulator, the *Subsecretaría de Telecomunicaciones* (SUBTEL). They are also subject to interconnection, public security (interception), emergency services, among several other obligations of traditional voice services. See SUBTEL (2007).

Colombia

Due to the technology neutrality principle in Colombia established under the Law 1341 of 2009, all regulatory measures, including the assigning of numbers, are equal to all telecommunications network and service providers, without discriminating by technology. Therefore, no specific measures are applied to VoIP in the country. See Colombia (2009).

Costa Rica

VoIP fixed telephony was made equivalent with the traditional basic telephone service and is subject to the same regulations for telecommunications services available to the public.

Content distribution and regulation

Convergence has given rise to new models for content distribution, where consumers have gained the ability to access content over different networks and devices and interact with multiple providers. New digital content distributors, such as OTT video providers (e.g. Magine TV, Netflix, Sling TV and Hulu), now coexist and competition with traditional content providers. Moreover, users are producing content themselves. Seamless access to content providers over the Internet is fundamentally challenging the traditional location, time of day; device and technologically based regulatory frameworks that are widely in place to meet policy objectives in different countries.

Policy objectives in media and broadcasting have traditionally included goals such as ensuring diverse ownership, plurality of opinions, meeting community standards for programmes for children, protection of intellectual property rights and the production and distribution of local content. During convergence reviews, long-held objectives are unlikely to be changed. Rather, the issue is whether existing approaches are meeting these objectives and whether modifications can better meet such goals.

Broadband networks bring with them changes to the nature of media consumption. Some are more passive and linear, and most importantly, requiring a certain amount of scarce resources, such as spectrum frequencies (e.g. television and radio). Others are more interactive, transient and allow more freedom to shift providers or platforms, such as Internet-based services. Service providers can be classified by their reach, revenue and type of content created. Accordingly, content regulation should be as technology neutral and flexible as possible, but also account for the nuances of how content is delivered and to whom.

Each public policy objective regarding content regulation should be periodically reviewed. Any decisions taken should be applied consistently and clearly, as technological change continues and as convergence over broadband networks integrates a wider range of devices, services and content. At the same time, attention needs to be paid to the opportunities convergence makes possible, including empowering consumers, enhancing competition and innovation and upholding freedom of expression.

These innovations in the video delivery and content navigation technologies have convinced a majority of OECD countries to adopt a less onerous licensing regime. In many OECD countries, audiovisual services provided over the Internet are not subject to the same set of rules as traditional broadcasters and a few OECD countries have relaxed their broadcasting obligations (Box 7.9).

Box 7.9. **Updating content regulation**

Canada

The Canadian regulator, Canadian Radio-Television and Telecommunications Commission (CRTC) has long promoted content created by Canadian artists by imposing obligations on broadcasters. However, in March 2015, after a long public consultation, the CRTC relaxed its Canadian content quotas on television. The CRTC chairman acknowledged that technological change has upended the TV business model and that the industry is an "age of abundance".

Source: CRTC (2015), "CRTC Chairman speech to the Canadian Club of Ottawa", *http://business.financialpost.com/fp-tech-desk/crtc-relaxes-quotas-on-canadian-content-for-tv-broadcasters?__lsa=cda6-e620#1*.

European Union

The European Union's Audio-visual and Media Services (AVMS) Directive regulates television broadcasts and on-demand audiovisual media services,[1] for which providers have editorial responsibility. The AVMS Directive includes a set of criteria to establish whether a given service falls under the scope of the Directive: i) editorial responsibility by the media service provider; ii) the principal purpose is the provision of programmes; iii) provided to the general public; iv) in order to inform, entertain or educate; v) service normally provided for remuneration, and so on. This list is not exhaustive. It should be noted that these criteria are technology-neutral, as they refer to the characteristics of the service provided, as opposed to the underlying technology. Furthermore, in July 2015, the EU Commission published a public consultation on the review of the AVMS Directive that sought out the views of all interested parties on Europe's audiovisual media landscape, and a full report on the results of the consultation is forthcoming.

1. In the Directive, the term "on-demand audiovisual media service" is defined as follows: "'On-demand audiovisual media service' (i.e. a non-linear audiovisual media service) means an audiovisual media service provided by a media service provider for the viewing of programmes at the moment chosen by the user and at his individual request on the basis of a catalogue of programmes selected by the media service provider" (European Parliament and CoE, 2010).

Source: European Parliament and CoE (2010), *Audiovisual Media Services Directive – 2010/13/EU*, *http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0013&from=EN*.

Internet openness

The Internet's decentralised nature and openness to new devices, applications and services has played an important role in advancing convergence and in its success in fostering the free flow of information, innovation, creativity and economic growth. This openness stems from the continuously evolving interaction among and independence from the Internet's various technical components, enabling collaboration and innovation while continuing to operate independently of one another. It stems also from globally accepted, consensus-driven technical standards that support global product markets and communications.

At the international level, the roles, openness and competencies of the global multi-stakeholder institutions that govern standards for different layers of Internet components have served to expand the decentralised networks that the Internet is made up of today. The OECD Internet Policy Making Principles (2011) offer a reference framework, not only for OECD countries, but also those in the LAC region, as indicated by its endorsement by countries such as Costa Rica and Colombia (Box 7.10).

Box 7.10. **OECD Principles for Internet Policy Making**

In 2011, consistent with the growing recognition of the critical role played by ICTs and broadband networks, and in particular the Internet, the OECD community came together through a multi-stakeholder process, to draw on the experience of participants in good practice for Internet policy and governance, which led to the adoption of the OECD Principles for Internet Policy Making, a cornerstone of the OECD's work in the area. The Principles are:

1. promote and protect the global free flow of information
2. promote the open, distributed and interconnected nature of the Internet
3. promote investment and competition in high- speed networks and services
4. promote and enable the cross-border delivery of services
5. encourage multi-stakeholder co-operation in policy development processes
6. foster voluntarily developed codes of conduct
7. develop capacities to bring publicly available, reliable data into the policy-making process
8. ensure transparency, fair process, and accountability
9. strengthen consistency and effectiveness in privacy protection at a global level
10. maximise individual empowerment
11. promote creativity and innovation
12. limit Internet intermediary liability
13. encourage co-operation to promote Internet security
14. give appropriate priority to enforcement efforts.

Source: OECD (2011a), *OECD Principles for Internet Policy Making*, *https://www.oecd.org/sti/ieconomy/oecd-principles-for-internet-policy-making.pdf*.

At the national level, multi-stakeholder arrangements for governing Internet issues are also advisable, as exemplified by the case of CGI.br in Brazil or the Internet Advisory Board in Costa Rica (Box 7.11). Maintaining technology neutrality and appropriate quality for all broadband networks and services is also important in ensuring an open and dynamic Internet environment.

Box 7.11. **Multi-stakeholder experiences in Internet policy making**

Brazil

The Brazilian experience in promoting a multi-stakeholder approach to Internet policy making has received international praise and contributed to the organisation of the 2014 NETMundial conference in São Paulo to discuss principles and a roadmap for Internet governance. Brazil's success in implementing a participative and cross-sectoral framework for Internet policy making is the result of an innovative framework embodied by the Internet Steering Committee (CGI.br).

The CGI.br is responsible for establishing strategic directives related to the use and development of the Internet in Brazil, as well as guidelines for the implementation of Domain Name registration, allocation of IP (Internet Protocol) and administration of the Top Level Domain (TLD) ".br". The CGI.br follows a multi-stakeholder model and consists of 21 members, including nine representatives from federal government, four from the business sector, four from civil society, three from the scientific and technical community, and a renowned Internet expert. Typically, this steering committee meets once a month and publishes its agendas and minutes online. A group of multi-sectoral consulting chambers support the steering committee by discussing specific topics in depth, such as changes to the technical structure of Port 25, which resulted in a drop in online spam.

The Internet Steering Committee's decisions are supported and executed by the Centre for Information and Co-ordination (NIC.br), established in 2005 as a nonprofit organisation. NIC.br has a mandate to register and maintain .br domain names, respond to and treat security incidents, promote studies, measure indicators and recommend procedures and standards, among other operational assignments. CGI.br and ANATEL also counsel the President of the Republic on implementing exceptions to the network neutrality principle.

Source: CGI (2015), *Comité Gestor da Internet no Brasil*, *www.cgi.br/*.

Costa Rica

Costa Rica's Internet Advisory Board is a multidisciplinary group composed of representatives from various sectors in Costa Rica, and has as its main purpose to discuss issues in the field of Internet and the Superior Domain .cr to encourage and promote the country's development. The role of the Advisory Board is to discuss issues of national scope proposed by NIC Costa Rica (a unit of the National Academy of Sciences) and/or Advisory Board, related to the development, universal access and operation of the Internet; make policy recommendations to NIC Costa Rica; and create working groups to follow up on specific issues.

Source: Consejo Consultivo de Internet (2015), *cr! Consejo Consultivo de Internet*, *https://consejoconsultivo.cr/*.

Broadband networks are a key platform for innovation, economic opportunities and civic engagement. The extent to which these networks are open to facilitating these objectives has thus become a chief concern for all stakeholders. In the network neutrality or traffic prioritisation debates, different actors take their own assessment of the value that others bring to commercial negotiations over the exchange of traffic. For the most part, the system works with extraordinary efficiency, and most of the thousands of networks that exchange Internet traffic do so without a written contract or formal agreement.

In this increasingly converged environment, Internet service providers (ISPs) become gateways for content and applications, as they control content providers' final access to consumers. This does not mean that IP termination for content and applications should be regulated. The nature of these markets tends to be two-sided, and content providers also

have considerable bargaining power. Policy makers should monitor for any market failures and, above all, encourage competition for broadband access. Some good practices related to Internet openness issues are provided below:

- **Policies for traffic prioritisation/network neutrality.** Prioritisation of certain applications or services may raise competition concerns related to the leveraging of dominant positions or favouring one competitor against another. If there are no particular issues in a market, given sufficient competition, and the available information suggests an efficient exchange market is in place, policy makers can forbear from direct action. This strategy is reliant on policy makers and regulators having appropriate information in areas such as the competitiveness of broadband access, the effectiveness of transit and peering markets and the efficiency of IXPs. Policy makers in some countries, including in the LAC region, have chosen to directly disallow prioritisation by ISPs, based on their assessment of available competition or its potential implications for competition (Box 7.12). In these cases, they should allow reasonable traffic management and the development of new innovative services that may need prioritisation, such as those in the telemedicine field.[6] There should be no need in principle to act at the wholesale level, such as regulating interconnection agreements, as long as a market has sufficient competition.

Box 7.12. **Network neutrality in Latin America**

Chile

In 2010, Chile was among the first countries to enact a specific law to protect network neutrality in electronic communications. The Network Neutrality Act, Law No. 20.453/2010, promotes transparency, by requiring the publication of the characteristic of Internet access, speed, quality of link, distinguishing between national and international connections and the nature and guarantees of the service; and prohibits blocking, interfering, discriminating, disrupting or restriction of any content, application or legal service through the Internet. Furthermore, the Act adopts a flexible view of traffic discrimination, by granting suppliers the ability to adopt measures or actions needed for traffic management and network administration, provided they are not intended to affect free competition or could do so.

Source: SUBTEL (2014), "Ley de Neutralidad y Redes Sociales Gratis", Subsecretaria de Telecomunicaciones, *http://www.subtel.gob.cl/ley-de-neutralidad-y-redes-sociales-gratis/*.

Brazil

In 2014, the Brazilian Congress passed the *Marco Civil da Internet*, Law No. 12.965/2014 (or the Internet Civil Framework Act), which, among consolidating rights, duties and principles for the use and development of the Internet in Brazil, enshrined the principle of network neutrality. Its importance lies not only in its principles, but also in the way in which it was drafted, based on an open and collaborative consultation process, implemented at an unprecedented scale across the country. On network neutrality, the law sets the tone for promotion of transparency of information, by asking service providers for clear and complete information on service provision contracts, where details of the data protection regime and network management practices should be included; and for non-blocking, by affirming that it is a duty of the entity responsible for the transmission, switching or routing to treat all data packages equally, without distinction on grounds of content, origin and destination, service, terminal or application. The law goes on to prohibit traffic discrimination or degradation, which can only be implemented as a result of essential technical requirement and prioritisation of emergency services (regulatory exceptions are under discussion with several stakeholders).

Source: Brazil (2014), *Marco Civil da Internet*, *www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l12965.htm*.

Box 7.12. **Network neutrality in Latin America** *(Cont.)*

Colombia

Since 2009, the Colombian ICT Law has ensured network neutrality in principle, by guaranteeing users access to services and lawful content and applications of their choice. In addition to the general ICT law, Resolution 3502 of Colombia's regulator, the *Comisión de Regulación de Telecomunicaciones* (CRC), passed in 2011, developed the principle laid down by Resolution CRT 1740 in 2007 and adopted some network neutrality principles for fixed ISPs, similar to those laid down by the FCC in the United States. These are: i) free choice; ii) non-discrimination; iii) transparency; and iv) and free information. The CRC Resolution incorporated two key elements: first, ensuring appropriate conditions regarding net neutrality by establishing defined QoS levels for access to the Internet, and second, clarifying the conditions for content blocking due to security reasons. The latter aimed to prevent ISPs from blocking, interfering with, discriminating or restricting the user's right to use, send, receive or offer any content, application or service over the Internet. This resolution stated that traffic management should be applied in a non-discriminatory way with respect to content providers and allows for ISPs to engage in prioritisation of "time-sensitive traffic" and QoS management only if it does not degrade the user's experience of the services provided.

Source: CRC (2011), Resolución No. 3502 de 2011, *https://www.crcom.gov.co/resoluciones/00003502.pdf*.

Peru

Since 2014, the Regulation on Quality of Service (*Reglamento General de Calidad de los Servicios Públicos de Telecomunicaciones)*[1] has stipulated that telecommunications operators or ISPs that provide services for Internet access will not be allowed to limit the use of any application in any path (user-ISP or ISP-user). Moreover, in 2015, the Law for Broadband Promotion and Construction of the National Fibre Backbone (*Ley de Promoción de la Banda Ancha y Construcción de la Red Dorsal Nacional de Fibre Óptica*), Law No. 29904, established the principle of network neutrality, defined as "freedom of the use of applications and protocols of broadband". Under Article 6 of this Law, providers of Internet access will respect network neutrality and are prohibited from blocking, interfering, discriminating or restricting the right of users to use an application or protocol, independent of its origin, nature or property.

Source: OSIPTEL (2014), *Resolución de Consejo Directivo No. 12302014-CD-OSIPTEL de 10 Octobre 2014*, *https://www.osiptel.gob.pe/Archivos/ResolucionAltaDireccion/ConsejoDirectivo/Res123-2014-CD.pdf*.

Ecuador

In 2015, the new Telecommunications Act of Ecuador (*Ley Orgánica de Telecomunicaciones*) included a clause specifically addressing network neutrality. The Act prohibits "limiting, blocking, interfering, throttling, prioritising or restricting the right of users to use, send, receive or offer any legal content, applications, development or service through the Internet or in their networks or other technologies of information and communications". The Act also forbids limiting "the right of the user or subscriber to incorporate or use any class of instrument, dispositive or device on the network", whenever legal, with the exception of cases established under the legal framework of Ecuador and those in which the competent authority decides, or when the client, subscriber or user expressly demands the limitation or blocking of content. Providers are allowed to carry technical actions to manage their networks, when considered necessary, and when within the exclusive scope of activities, they are authorised to perform to guarantee the provision of service.

Source: Ecuador (2015), *Ley Orgánica de Telecomunicaciones*, *http://www.arcotel.gob.ec/wp-content/uploads/downloads/2015/03/ro_ley_organica_de_telecomunicaciones_ro_439_tercer_suplemento_del_18-02-2015.pdf*.

- **Policies to address zero-rating practices.** Offering certain services based on a zero rate to consumers is becoming a common practice in some countries in the LAC region. This practice may in some circumstances promote competition, in markets with a sufficient number of players to offer choices for consumers, benefiting existing and new users by providing innovative and less expensive offers. However, zero rating may also raise serious concerns in markets with insufficient competition. It may favour some applications or over-the-top service providers, very likely already dominant, at the expense of smaller or emerging ones. Additionally, zero-rate offers that result in "walled gardens" may limit the Internet experience of consumers, raising public policy concerns. In this context, when zero rating is permitted, it is advisable that policy makers monitor its existence and effects, and continue to encourage competition at the broadband services level, since zero rating becomes less of an issue when there is increased competition and higher data allowances. Directly prohibiting zero rating may have implications for a market where there is lower competition for transit and may reduce the effectiveness of peering. Nevertheless, in any market with limited competition for access, zero rating can affect competition among content providers. In general, zero-rating effects on competition and on consumers' experience should be analysed on a case-by-case basis. Depending on the situation, regulators may consider that zero rating should not be allowed to preserve competition and/or Internet openness, while in other situations, mainly when there is sufficient competition, it may not have enough negative implications to justify intervention.
- **Limiting liability of Internet intermediaries.** Internet intermediaries (e.g. ISPs, search engines, portals) host, transmit and index and give access to content originated by third parties. These are critical attributes to fostering digital economies and the benefits they offer. A good practice for policy makers is to set appropriate limitations of liability for Internet intermediaries with regard to third-party content. Internet intermediaries can play an important role by addressing and deterring illegal activity, fraud and misleading and unfair practices conducted over their networks and services. Policy makers may, therefore, choose to convene stakeholders in a transparent, multi-stakeholder process, to identify the appropriate circumstances under which Internet intermediaries might take steps to educate users, assist rights holders in enforcing their rights or reduce illegal content (OECD, 2011). Any policy in this regard should seek to minimise burdens on intermediaries and in ensuring legal certainty for them.

IPv6

In mid-2014, the Latin American and Caribbean Network Information Centre (LACNIC), the organisation responsible for assigning Internet resources in the region, announced the exhaustion of its IPv4 address pool and expressed its concern regarding the pace of the deployment of Internet Protocol version 6 (IPv6) in the region (LACNIC, 2014). The IPv6 protocol was developed by the Internet Engineering Task Force (IETF) in 1996 as a response to the evident rapid growth of the Internet after its commercialisation in the 1990s. While hardware manufacturers, network vendors and the software development community have been ready for more than a decade, the deployment and rollout of IPv6 is still at an early stage in the LAC region, as elsewhere.

Following the announcement by LACNIC that its pool of available IPv4 addresses had reached the 4.1 million mark, stricter Internet resource assignment policies were implemented. In practice, this means that IPv4 addresses are now exhausted for

Latin American and Caribbean operators. As agreed by the regional community, LACNIC's pool of IPv4 addresses is considered officially exhausted and the Gradual Exhaustion and New Entrants policies have come into effect, introducing new procedures and requirements for those requesting resources. Two million of the remaining addresses may be assigned during this phase, in blocs of limited sizes. In addition, an organisation may only request additional resources six months after receiving a prior assignment. Once these 2 million IPv4 addresses are exhausted, LACNIC members will no longer be able to receive any IPv4 assignments. During this final phase, only new members will be able to request IPv4 addresses and only be able to receive one assignment from this space.

In 2008, OECD governments signed the Seoul Declaration on the Future of the Internet Economy, which specifically mentioned the transition to IPv6, declaring the need to "encourage the adoption of the new version of the Internet protocol (IPv6), in particular through its timely adoption by governments as well as large private-sector users of IPv4 addresses, in view of the ongoing IPv4 depletion" (OECD, 2008).

Governments can facilitate adoption through a number of policy measures and actions. The following measures have been recognised as having some positive effects on the deployment of IPv6:

- **Adoption of IPv6 within government agencies.** Transition deadlines, IPv6 Days or switch-over dates can incentivise regional and local governments to shift their internal network and services to IPv6.[7] This can be useful in stimulating human capital development on how to implement IPv6 and, more broadly, promoting expertise among third-party service and support firms that can facilitate IPv6 deployment.
- **Requirement of IPv6 compatibility in procurement procedures.** Several countries have incorporated obligations for procurement of IPv6-compliant hardware (CPEs, network equipment), software (in-house applications) and services (e.g. requiring Internet service providers to support IPv6).
- **Monitor the impact of CGNAT in the quality of service.** Significant efforts have been made to ensure that IPv4 can continue to work in an environment where the number of addresses is depleted. However, the use of carrier-grade NAT techniques (CGNAT) by large service providers is slowing the adoption of IPv6. Authorities should encourage ISPs to provide unique and global IP addresses to their subscribers, whether IPv4, IPv6 or both. One possible expedient would be to monitor the effects of CGNAT in the quality of service of end users to help regulators detect bottlenecks in specific service providers.
- **Support and promote awareness of IPv6.** Building IPv6 awareness requires collaboration between governments, the private sector and the Internet technical community. Examples of good practices are the organisation of capacity-building activities to educate service providers and prepare them for the transition. The activities can be organised jointly by government, universities and ISPs. The technical community provides ongoing operational support and technical training through outreach programmes.[8]
- **Creation of multi-stakeholder IPv6 work groups.** The establishment of task forces co-ordinating the transition among ISPs, government entities and other players is an effective way to encourage and support the transition to IPv6. In addition, observatories on IPv6 implementation can disseminate case studies and implementation plans used by institutions. Brazil, for instance, has formed a national IPv6 task force led by the regulator to co-ordinate efforts between government, ISPs, universities and LACNIC.

- **IPv6 research and development.** The transition to IPv6 and its effects on network topology and on the availability of domestic Internet services might benefit from research and development efforts. Possible research projects might include the establishment of a networking environment to benchmark different migration strategies, carry out partial migrations and measure the effects on end users, simulate incidents affecting core components of the national infrastructure and assess its costs and risks.

The Number Resource Organization (NRO),[9] of which LACNIC is a member, recognises the role of government organisations in the transition to IPv6 and suggests that they co-ordinate with industry to support and promote awareness and educational activities; adopt regulatory and economic incentives to encourage IPv6 adoption; require IPv6 compatibility in procurement procedures; and officially adopt IPv6 within government agencies.[10]

In the LAC region, a group led by Colombia, Costa Rica and Peru has developed a number of policies to increase the adoption of IPv6 in governmental and associated agencies. Brazil's approach was to establish a multi-sectorial IPv6 work group to co-ordinate support to service providers. Other countries have benefited from the support of the Internet technical community, mainly through LACNIC (Box 7.13).

Box 7.13. **IPv6 initiatives in Latin America and the Caribbean**

In **Colombia**, a ministerial mandate from the Ministry of ICT (MinTIC) urged government agencies in 2011 to update their procurement process for ICT equipment (hardware and software), applications, ICT platforms and services equipment and software. The ministry also led the development of a transition strategy with agents from different government sectors, including the participation of RENATA (*Red Nacional Académica de Tecnología Avanzada*), or the National Research and Education Network (NREN). RENATA was actively involved in providing IPv6 workshops to more than 100 institutions nationwide. The central government, agencies and other government bodies have been encouraged to develop a "Transition Plan for the Adoption of IPv6 in coexistence with IPv4". Formal and informal institutions in the education sector have also been asked to encourage adoption, by offering IPv6 courses as part of their regular education syllabus.

Costa Rica has promoted the use of IPv6 in all government agencies through several measures. Firstly, decision makers in public institutions were asked to update their ICT procurement processes, including IPv6-supported products and services. Secondly, it was suggested that government agencies prepare an IPv6 implementation plan; an inventory of noncompliant hardware and software; and include in the procurement list the noncompliant equipment. Finally, a deadline was identified for the provision of public e-services to citizens and other agencies using IPv6. The Ministry of Science, Technology and Telecommunications (MICITT) initiated a capacity-building programme in co-ordination with the *Instituto Nacional del Aprendizaje* (INA). Civil servants and IT personnel will benefit from training sessions that aim to develop practical competences to deploy IPv6 within their department.

Peru has included in its Digital Agenda a specific initiative for the implementation of innovative public services using IPv6. Since 2008, Peru has encouraged the interconnection of government agencies using IPv6, and has updated the procurement mechanism and providers to support both protocols. The Peruvian Academic Network (RAAP), which is in charge of building and managing a transport network, system and services across Peru, is giving support to research projects through its native IPv6 network.

Box 7.13. **IPv6 initiatives in Latin America and the Caribbean** *(Cont.)*

In response to the low IPv6 adoption rates in comparison with other neighbouring countries, the **Brazilian** regulator, ANATEL, established an IPv6 work group (GT-IPv6), to co-ordinate the adoption of IPv6 in the networks of providers of telecommunication services, and the adoption of solutions for the transition to IPv6. The GT-IPv6 was co-ordinated by ANATEL with the participation of ISPs and NIC.br, and the national domain administrator. The work group published a report at the end of its mandate that includes lessons learned and future actions required to attain total adoption of IPv6 by 2018.

Panama, **Trinidad and Tobago**, **Uruguay** and **Nicaragua** have promoted the adoption of IPv6 by facilitating educational and awareness activities such as forums, seminars and training, in co-operation with LACNIC, the regional registry for Internet numbers.

Source: ANATEL (2016), "Relatório Final de Atividades", GT-IPv6 – grupo de Trabalho para implantação o protocolo IP-Versão 6 nas redes das Prestadoras de Serviços de Telecomunicações, *http://www.anatel.gov.br/Portal/verificaDocumentos/documento.asp?numeroPublicacao=325769&assuntoPublicacao=null&caminhoRel=null&filtro=1&documentoPath=325769.pdf*.

Conclusion

Policy makers and regulators should prepare for the convergence of networks and services. Along with innovative offerings, these have presented a range of challenges in the LAC region.

As indicated in this chapter, a key task lies in evaluating and updating policy frameworks that can respond to the current and future effects of convergence. Policy makers should work towards developing less complicated regulatory and policy frameworks that uphold technology neutrality when possible and that promote investment, competition and innovation along the whole value chain.

This involves looking at the arrangement of regulators, and making sure that independent regulatory authorities are well positioned for the growing converged landscape; simplifying licensing regimes; monitoring bundling practices; enabling new business models (such as VoIP and VoD) to flourish while assessing the suitability of traditional policy objectives; and, finally, promoting Internet openness by encouraging multi-stakeholder Internet governance arrangements, monitoring market failures and encouraging further competition and investment.

Notes

1. In February 2016, for example, the United Kingdom's Ofcom, in its Strategic Review of Digital Communications, noted the need to publish service quality performance data on all operators. See *http://stakeholders.ofcom.org.uk/telecoms/policy/digital-comms-review/*. At the same time, regulators are adjusting data collection to include the use of new technologies and therefore include all providers of such services. For example, the United States' Federal Communications Commission (FCC) now collects data from any actor engaged in providing Voice over Internet Protocol (VoIP) service connected to the public switched telephone network (PSTN) between the United States and any foreign point, including traffic between the United States and LAC (*https://transition.fcc.gov/ib/sand/mniab/traffic/*).
2. The new Baird study, for example, found that the percentage of US online households that do not pay for cable or satellite TV had risen to 18.3% in the third quarter of 2015 from 14.1% in the prior year. *http://news.investors.com/technology-click/092115-771999-aapl-nflx-akam-to-benefit-from-cord-cutting.htm*.
3. In 2011, this resulted in a high-level meeting and led to an *OECD Council Recommendation on Principles for Internet Policy Making* (OECD, 2011a).

4. The Australian Convergence review offers an interesting example of how a comprehensive convergence review can be conducted in a country to assess both telecommunications and broadcasting issues (including media ownership and content matters). The Australian Convergence Review recommends that a common flexible and technologically neutral scheme be applied across all media platforms, and that content providers that have professional content (excluding user-generated content) with large audience reach and revenue (such as "television-like" services and newspapers) should be subject to general standards. These should be established by the communications regulator and by an independent self-regulatory body, with an obligation to promote fairness, accuracy and transparency. See full document at *www.abc.net.au/mediawatch/transcripts/1339_convergence.pdf*.
5. In March 2015, in the United States, President Barack Obama signed an Executive Memorandum creating the Broadband Opportunity Council, an interagency group comprised of 25 federal agencies and departments. The Council is tasked with promoting broadband deployment, adoption and competition. See *www.whitehouse.gov/sites/default/files/docs/ERP_2016_Chapter_5.pdf*.
6. Some services, such as telemedicine or telemetry, for example, may demand special treatment due to their specific bandwidth and latency requirements for service delivery. As the Internet is a "best effort" network of networks, generally an operator may only influence such services on its own network.
7. World IPv6 Day was announced on January 2011 with five anchoring companies: Facebook, Google, Yahoo, Akamai and Limelight Networks. More than 400 participants (ISPs, search engines and content providers) joined the action, and major carriers measured an increase of the percentage of IPv6 traffic from 0.024 to 0.041. After its success, a World IPv6 Launch took place on 6 June 2012, with the intention of leaving IPv6 permanently enabled on all participating sites.
8. Internet technical organisations such as the Latin America and Caribbean Network Information Centre (LACNIC), ISOC (Internet Society) or NSRC (Network Startup Resource Center) and Network Operators Groups such as CaribNOG provide IPv6 training and operational support.
9. The Number Resource Organization (NRO) is a co-ordinating body for the five Regional Internet Registries (RIRs) that manage the distribution of Internet number resources, including IP addresses and Autonomous System Numbers. Each RIR consists of the Internet community in its region. See *www.nro.net*.
10. IPv4 Depletion and IPv6 Deployment FAQs (*www.nro.net/ipv6/nro_depletion_deployment_faq*).

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Chapter 8

Regional integration

This chapter covers broadband access and regional integration. It addresses how broadband policy makers and regulators can benefit from closer regional co-ordination by sharing experiences, setting common principles or through harmonisation, if that is justified by economics of scale. Good practices to promote infrastructure deployment are also discussed, as well as competition and international connectivity among countries in the region and farther afield. Finally, the discussion turns to the question of how broadband access policy makers can advance regional integration, by responding to the challenges and opportunities of the developments in international mobile roaming and the Internet of Things (IoT).

Regional integration can be defined as the process of increasing social and economic relations among the countries in a given geographical area. This relates to broadband policies in two different ways. First, policies to increase broadband use and access can help regional integration, by lowering barriers for the exchange of information among businesses and people in different countries. In particular, policies for developing international broadband connectivity, through cross-border backbones and international submarine cables, and through services such as international mobile roaming, are critical tools for regional integration. Second, collaboration between policy makers and regulators in a region, through participation in policy and regulatory networks, can also be useful for improving regulatory frameworks, improving trans-border services and encouraging investment.

This chapter addresses several issues associated with regional integration in the context of broadband policy: regional co-ordination among policy and regulatory authorities, international connectivity infrastructure (both regional and international), international mobile roaming and the Internet of Things (IoT).

Broadband serves not only as a general-purpose network that can help increase regional integration, but also as an arena for public policy in which regional negotiations can be conducted and models and good practices disseminated. This chapter assesses the space it offers for **regional public policy arena** and the need for regional co-ordination mechanisms that can harmonise information and communication technology (ICT) and broadband public policy, regulatory frameworks and technological standards.

With broadband services, data typically flows seamlessly across national borders for business and consumers. Many applications and content are located in data centres overseas. This means that inadequate or inefficient **international connectivity** can become a bottleneck for broadband services, reducing the quality of service (through congestion and reduced speed) and raising the cost of the final delivery of services. The availability of international connectivity infrastructure and services (e.g. regional terrestrial backbones, international submarine cables and international gateways), and the need to encourage competition in these markets are thus key questions for policy and regulatory attention.

Internet exchange points (IXPs) are a fundamental building block for increasing local content and developing a competitive ecosystem of more affordable broadband services (OECD, ISOC and UNESCO, 2012). IXPs serve as interconnection hubs for Internet service and content providers and network operators at large. IXP participants benefit from exchanging traffic directly, rather than using transit providers to exchange traffic in foreign countries, which increases speeds and lowers the cost of the transaction. Use of IXPs can dramatically reduce the cost of Internet service supply, enabling lower prices for end users and make Internet connectivity more reliable and robust within a given country or region. An additional area for regional co-operation is in the allocation and management of Internet Protocol (IP) addresses, managed by the Latin America and Caribbean Network Information Centre (LACNIC). Implementation of IPv6 (Internet Protocol version 6) is another issue for attention, not just for regional integration, but also for ensuring international connectivity under

extended IP address schemes and helping stakeholders to tackle issues arising from the depletion of IPv4 addresses (OECD, 2014a, 2008).

In a digital and globalised economy, convenient, affordable access to telecommunications services when travelling abroad is a necessity in commercial and social exchanges. Lower prices for **international roaming** reinforce economic integration within the region and overseas. Regulatory measures to encourage the use of international roaming services, and especially mobile broadband access, also need to be addressed.

Finally, encouraging the deployment and use of the **IoT**, which is discussed in this chapter, makes it possible to extend the benefits of broadband to the physical world through machine-to-machine (M2M) interactions in a growing number of activities, such as health care, transport and agriculture. Although policies to encourage IoT development are mainly national, the area demands regional and international collaboration in policy domains such as spectrum availability, numbering, double taxation when roaming and standardisation. Economies of scale involving millions of devices are critical for innovation, investment and development.

Policy objectives in the LAC region

Policy makers and regulatory authorities should cultivate the **sharing of good practices** and approaches and, when possible, their experience with demonstrable outcomes. Co-ordination among LAC countries will ultimately lead to better policies and encourage economies of scale, investment and competition in the region.

In general, and in the context of regional integration, broadband policy should aim to lower barriers and increase competition for the use of cross-border broadband services, optimise cross-border data flows and develop a regional market. Common public policies should attract investment to the region, where economies of scale are in place, and improve cross-border trade.

As for **international connectivity**, policy goals should focus on encouraging (and funding when needed) deployment of regional terrestrial backbones, submarine cables and international gateways. Effective regional co-operation is essential for co-ordinating the effort to build international connectivity infrastructure. Countries should also aim to develop a competitive marketplace for Internet traffic exchange to meet domestic demand for Internet bandwidth and self-sufficiency in a cost-efficient way. IXPs are the key tool in this respect. Above all, competition should be encouraged and dominance issues addressed so all players can benefit from international connectivity (Chapter 4 on competition and infrastructure bottlenecks addresses issues related to dominance and regulatory measures).

Regional integration implies that a flow of people, goods and data should be efficiently facilitated across borders. In a data-dependent world, users travelling abroad and connected machines operating across borders to facilitate trade and travel should not be burdened with uncompetitive international roaming prices. Policies governing **international roaming** should focus on good practices, as discussed below: promoting transparency for customers and awareness of substitutes for international roaming; protecting them from inadvertently high bills ("bill shock") and inadvertent roaming; developing trans-national roaming offers; ensuring a competitive wholesale market, and promoting competition at the retail level.

Finally, any regional integration policy should adopt a long-term perspective, preparing for future demand and **emerging cross-border services**. Online services tend to defy national boundaries. Given the increasing number of connected devices, including for vehicles, policy

makers should anticipate future challenges and the opportunities for regional agreements as well as for national frameworks. Preparing for the future requires, for example, evaluating policy frameworks to ensure the adoption and deployment of IoT applications and services. Adequate resources (such as spectrum and number identifiers) and solutions that are flexible and that avoid lock-in are essential. The goal is to make sure IoT development is addressed in both national and regional public policy.

Tools for measurement and analysis in the LAC region

As in any other policy area, collecting data and empirical evidence is a vital part of ensuring that policies are hitting their targets and that corrective action can be taken if necessary.

In recent years, various studies have assessed the level of integration in the LAC region. Several indexes aggregate indicators measuring characteristics of the several stages of regional integration (Free Trade Areas, Customs Union, Common Market, Economic Union and Total Economic Integration).[1] Work in other regions has looked at indicators to assess variations in the degree of regional free movement of people, trade, co-operation on statistical measurement, governance, industry, investment, energy and infrastructure (as in the case of the Africa Regional Integration Index [African Union, 2014]) or have focused on trade, foreign direct investment, labour mobility and finance indicators to monitor progress on regional co-operation and integration, such as those used to assess integration of firms in global value chains (OECD and World Bank, 2015) or the Asia Regional Integration Indicators Database.[2]

Despite these efforts, quantifying co-operation with other countries and international organisations is not a simple task. The indexes mentioned above offer a general framework for broadly considering different proxies for tracking regional integration (defined as the outcome of policy decisions). In the context of ICT/broadband policy co-operation and co-ordination, assessments for progress in **regional co-operation** could include:

- Qualitative and quantitative assessment of the participation in international/regional forums and organisations, as well as the main issues discussed and policy decisions taken.
- Periodical assessment of resources (in terms of budget and human resources) and benefits obtained (even if they cannot be quantified) to guide international activity, as well as to set priorities in the allocation of resources for different lines of work.

For **international connectivity infrastructure and services**, measurement could include:

- Maintaining an inventory of existing infrastructure providing connectivity to other countries (such as submarine cables, international trunks and international gateways) and publishing aggregated data that protects the confidentiality of sensitive information from operators.
- Monitoring traffic and prices through regular information requests to operators, complementing this with normalised benchmarking with other similar and/or leading countries. Maintaining regular contacts with operators is also useful for identifying existing bottlenecks or future needs.

Measurement of **IXPs** should include the following tools:

- Data collection and benchmarking on domestic Internet bandwidth at IXPs over time relative to other countries, within the region and internationally. Measurements especially useful for supporting policy guidance are: total available capacity at the IXP, total number of connected autonomous system numbers (ASNs)[3] and the number of content delivery networks (CDNs)[4] hosted at the IXP.

- Monitoring of membership fees and the conditions for participating in IXPs, to ensure a competitive and neutral interconnection platform.
- Establishing measurement points at service providers to analyse the performance of the IXPs.

Establishing metrics to trace the progress of **IPv6** adoption in the Internet is not a simple task. Over the years, many approaches and associated measurements have been used, reflecting the fact that the Internet is not a single integrated system but a collation of component subsystems, so that IPv6 measurements can be taken in any particular subsystem. The list below compiles several possible measurements, at different sub-systems and thus with a snapshot of the overall transition (OECD, 2010a):

- Measurements using the routing system: The Internet routing table can be used to track the number of **advertised routes** that constitute the IPv4 Internet, and compare this with a comparable count for the number of routes in the IPv6: A complementary measure is to compare the number of **unique autonomous system numbers** contained in the routing table that indicate the number of entities that have IPv6 networks interconnected to the Internet. LACNIC has a portal to assist with IPv6 deployment that includes statistics for the region.[5]
- Measurements using the domain-name system: The domain-name system can provide a useful measurement, since only domain names that can be resolved to an IPv6 address can be accessed. One approach is to use the most common source of popular domain names, the Alexa list, and query this set of domains over time to establish what proportion of the names have an IPv6 address. This is public information available to policy makers.[6]
- Measurements using Internet traffic statistics: Another option is to look directly at traffic volumes in IPv4 and IPv6. Although most such data is generally considered to be proprietary and is not publicly released, an increasing number of Internet exchange points publish data about their volume of IPv6 traffic, to make it possible to estimate the number of adoptions over time.[7] Regulators could request this type of information from IXPs.
- Measurements of end-client capabilities: For a client end system to be able to make a connection using IPv6, all the Internet subsystems must also be able to support IPv6. One simple way of measuring the number of IPv6-capable clients is to use a dual-stack service point and offer both IPv4 and IPv6 capability. Counting the number of systems that prefer IPv6 to IPv4 provides a good indication, if the sample is large enough. Another measurement technique includes carrying out IPv6 connectivity tests with a sample of clients to determine their preferences. Both measurements are regularly carried out by some content providers[8] and regional Internet registries[9] and can be accessed by policy makers.

Policy making and regulatory action in the area of **international roaming** should also be based on evidence, such as by monitoring the evolution of prices, volumes and revenues for each roaming service, and – when available – data on real costs for international roaming services. To collect these data from operators, communications regulatory authorities must have the corresponding powers specified in the regulatory framework. Benchmarking with other countries can also identify trends and specific characteristics of national markets. Publishing costs and price comparisons should not lead to disclosure of confidential commercial information, for which aggregation of data can be considered. The Body of European Regulators for Electronic Communications (BEREC) is a useful reference on the type of measurements and indicators that can be used to monitor prices and volumes for international roaming services (Box 8.1).

Box 8.1. **Measurement of International Roaming by BEREC**

The European Union's regulations on international roaming require regulatory authorities in each country to collect relevant data on the evolution of prices for international roaming services, both at the retail and the wholesale level. While the monitoring obligations are addressed to individual regulatory authorities, the European regulatory authorities agreed to co-ordinate the specific data requested from operators, as well as to compile a common unique benchmark report through the Body of European Regulators or Electronic Communications (BEREC). This gives a better picture of the evolution of international roaming volumes and prices across the EU, simplifies the process of collecting and processing data, saves resources in all regulatory authorities and applies the same data collection model, as well as simplifying the data collection efforts for operators.

Over 150 providers of international roaming services supplied information for the latest 14th BEREC Benchmark Report on International Roaming. These include virtually all of the mobile network operators in the EU (and the European Economic Area and European Free Trade Association countries), as well as a significant number of mobile virtual network organisations (MVNOs) that provide EU roaming services. The information gathered for BEREC's report covers both retail and wholesale prices and volumes for voice, SMS and data roaming services. Each network national regulatory authority (NRA) aggregated individual provider data, to provide BEREC a national aggregate. Only national aggregated data appears in the BEREC report. This information is public and available on the BEREC website (BEREC, 2016a), which shows data produced by BEREC on the evolution of prices for international roaming data services at the European level.

Figure 8.1. **Evolution of average price (EUR) per megabyte for retail EU/EEA and rest of the world (RoW)**



Source: BEREC (2015a), "International Roaming BEREC Benchmark Data Report April 2014-September 2014", *http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/4922-international-roaming-berec-benchmark-data-report-april-8211-september-2014*.

StatLink http://dx.doi.org/10.1787/888933354334

Finally, monitoring the development of IoT can be done by:

- Using proxy measures, such as the number of SIM cards dedicated to IoT services (i.e. M2M). Despite the limitations of this approach, it provides an idea of the use of IoT and makes subscriptions aimed at traditional mobile services more relevant for the intended use (which is not possible if consumer and M2M subscriptions are bundled).
- Keeping track of market developments and spectrum use in licensed and unlicensed frequency bands, to ensure sufficient spectrum is available to meet the increasing demand for M2M/IoT services.

Overview of the situation in the LAC region

Regional co-ordination among policy makers and regulatory authorities

The American and Caribbean region has one of the very earliest regional intergovernmental organisations in the world, the Organization of American States (OAS), which was established in 1890. The linguistic, cultural and political commonalities of Latin America and the Caribbean have inspired a significant number of attempts to increase economic, commercial and political co-operation in the region. However, the complexity and heterogeneity of the LAC region has also prompted different sub-regional co-operation and integration initiatives, with varying degrees of success. In the area of broadband policy, the multiplicity of memberships and the number of regional bodies has equally had mixed results in advancing regional integration and a common digital agenda.

In addition to international organisations with members around the world, including those with regional programmes or presence, the LAC region has several **regional co-ordination** bodies with some mandate over issues related to the supply and demand for broadband.[10] A summary of these regional bodies and resources, with more information on their work, can be found in Table 8.1. An additional table showing the membership of these institutions appears in Annex 8.A1 of this chapter. Some of these bodies have a broader mandate and strive to establish a more integrated Latin American market in general (e.g. MERCOSUR and the Pacific Alliance). Others specifically focus on the ICT sector and a co-ordinated approach towards ICT policies (e.g. CITEL, REGULATEL).

Several factors drive regional integration in the LAC countries. They include geographical proximity, engaging political leaders to help disseminate regulatory models and good practices, and the existence of the regional organisations that co-ordinate and collaborate on ICT and broadband issues. One such example recently is the Economic Commission for Latin America (ECLAC's) Digital Agenda for LAC (Box 8.2). Meanwhile, the global telecommunications operators present in the LAC region promote the adoption and use of good practices. The benefits of economies of scale in the region have attracted increasing attention, especially in Caribbean countries (Katz, 2013).

Despite the effort to increase regional co-ordination on broadband policy and to find more effective spaces for doing so in the LAC region, progress has been slow and many policy objectives remain unrealised. This is partly due to divergent national interests and political and economic approaches that favour different regulatory models. Regional initiatives for long-term broadband policy integration have lacked sustained political and financial support.

Table 8.1. **Regional bodies with mandates on telecommunications issues in the LAC region**

Organisation	Description	Websites
Asociación Latinoamericana de Integración (ALADI)	ALADI is a regional organisation created in 1980 to promote a common market through preferential tariffs and regional agreements.	*www.aladi.org*
Asia Pacific Economic Co-operation's Telecommunications and Information Working Group (APEC-TELCWG)	APEC is a regional forum created in 1989 to promote sustainable economic growth and prosperity in the Asia-Pacific region. APEC-TELWG is APEC's Telecommunications and Information Working Group, established in 1990.	*www.apec.org APEC-TELWG*
Central American Bank for Economic Integration (CABEI)	CABEI is a regional development bank, established in 1960, to promote socioeconomic development and economic integration in Central America.	*www.bcie.org*
Development Bank of Latin America (CAF)	CAF is a regional development bank, created in 1970, to promote sustainable development and regional integration in Latin America.	*www.caf.com*
Andean Community (CAN)	CAN is a regional organisation for integration of the Andean region created in 1969. Its telecommunication branch is executed by CAATEL, created in 1991.	*www.comunidadandina.org CAATEL*
Caribbean Community and Common Market (CARICOM)	CARICOM is a regional organisation, created in 1973, to accelerate socio-economic development and establish economic relations in the Caribbean region.	*www.caricom.org*
Community of Latin American and Caribbean States (CELAC)	CELAC is a regional organisation, created in 2011, to promote improvement in the dialogue and political agreement in Latin America and the Caribbean. Parlatino is the Latin American Parliament, created in 1964, which has been considered the Legislative Branch of CELAC since 2011.	*www.celacinternational.org Parlatino*
Economic Commission for Latin America and the Caribbean (CEPAL)	CEPAL is the UN Regional Commission in LAC for regional integration and UN goals. The eLAC (Digital Agenda for LAC) is its action plan on ICT issues.	*www.cepal.org/ eLAC*
Comisión Técnica Regional de Telecomunicaciones (COMTELCA)	COMTELCA is a regional organisation for technical co-operation between telecommunication regulators in Central America.	*www.comtelca.int*
Commonwealth Telecommunications Organisation (CTO)	CTO is the Commonwealth organisation focused on ICT/telecommunications issues.	*www.cto.int*
Caribbean Telecommunications Union (CTU)	CTU is a regional organisation to facilitate the development of the regional information and ICT sector in the Caribbean.	*www.ctu.int*
Eastern Caribbean Telecommunications Authority (ECTEL)	ECTEL is a regional regulatory body for telecommunications for Eastern Caribbean telecommunications authorities established in 2000.	*www.ectel.int/*
Inter-American Development Bank (IDB)	The IDB is a regional development bank seeking to enhance development and regional co-operation in the LAC region.	*www.idb.org*
Iniciativa para la Integración de la Infraestructura Regional Suramericana (IIRSA)	IIRSA is a regional body for co-operation on regional infrastructure.	*www.iirsa.org*
Latin America and Caribbean Internet Addresses Registry (LACNIC)	LACNIC is a nongovernment organisation responsible for assigning and administering Internet numbering resources in the LAC region.	*www.lacnic.net*
Mercado Común del Sur (MERCOSUR)	MERCOSUR is a regional forum intended to create common commercial opportunities and regional investment in South America.	*www.mercosur.int*
Organisation of Caribbean Utility Regulators (OOCUR)	OOCUR is a regional body whose objective is to facilitate the improvement of utility regulation and understanding of regulation in the Caribbean.	*www.oocur.org/*
Inter-American Telecommunication Commission (CITEL)	CITEL is the OAS telecommunications and ICTs body, a regional organisation to strengthen collaboration among member states. The OAS Cyber-Security Programme on cyber-security issues works in collaboration with CITEL.	*www.citel.oas.org OAS Cyber Security Program*
Pacific Alliance	The Pacific Alliance is a regional organisation to promote joint businesses, foreign investment and regional integration for economic growth.	*www.alianzapacifico.net*
Foro Latinoamericano de Entes Reguladores de Telecomunicaciones (REGULATEL)	REGULATEL is a regional organisation to promote co-ordination and co-operation between telecommunications regulatory authorities in the LAC region.	*www.regulatel.org*
Latin American and Caribbean Economic System (SELA)	SELA is a regional organisation whose goal is to promote a system of consultation and co-ordination for economic strategies in the LAC region.	*www.sela.org*
Sistema de la Integración Centroamericana (SICA)	SICA is a regional organisation aiming to enhance regional integration in Central America.	*www.sica.int*
Union of South American Nations (UNASUR)	UNASUR is a regional organisation seeking to build a space for cultural, economic, social and political regional integration in South America.	*www.unasursg.org*

Box 8.2. **eLAC2018 objectives related to access and infrastructure**

The Economic Commission for Latin America's Digital Agenda for Latin America and the Caribbean (eLAC2018) includes as an area of action "access and infrastructure". The objectives of the proposed agenda are:

- **Objective 1:** Scale up and achieve universal access to digital services and content production, ensuring the inclusion of vulnerable groups and mainstreaming the gender perspective in policy implementation.
- **Objective 2:** Promote regional co-ordination in the allocation and efficient use of the radio spectrum to facilitate the development of telecommunications services and to take advantage of economies of scale.
- **Objective 3:** Strengthen the regional and sub-regional telecommunications infrastructure by deploying fibre- optic and wireless networks, including user-centred community networks and deep-sea cables; encourage the establishment of new Internet exchange points (IXPs); and promote the installation of content distribution networks (CDNs).
- **Objective 4:** Promote investment in next-generation broadband networks for substantial improvements in service capacity and quality, with a special emphasis on rural, vulnerable and isolated areas.
- **Objective 5:** Support and co-operate processes to adopt digital terrestrial television (DTT) in the region.

Source: ECLAC (2015), "Digital Agenda for Latin America and the Caribbean (eLAC2018)", *http://conferenciaelac.cepal.org/sites/default/files/15-00757_elac_digital_agenda.pdf*.

International connectivity

Despite significant improvements in the last few years, persistent gaps in **LAC region's infrastructure deployment** remain, posing a major challenge to inclusive growth and the provision of public services. In communications infrastructure, the situation is no different. For historic reasons, much of the data traffic between LAC and the rest of the world, or even among LAC countries themselves, went through the United States (IDB, 2011a), notably Florida and the West Coast (Jordán, Galperin and Peres, 2013). Around 85% to 90% of communications with Europe, for example, still rely on undersea cables going to the United States, since the existing cable between Latin America and Europe is outdated and is only used for voice transmission. A public-private partnership initiative to deploy a new submarine fibre-optic cable between Europe and South America, linking Lisbon (Portugal) with Fortaleza (Brazil), is under discussion (EC, 2015).

The region has recently seen improvements, through efforts to deploy regional submarine cables, terrestrial connections and IXPs. However, the lack of competition, redundancy, high-capacity connections and shorter communication paths to and, more important, among LAC countries still constitutes a major infrastructure bottleneck for regional integration of the LAC region's digital economy.[11]

There are multiple potential landing points for submarine cables in the LAC region, and only one country out of 26 with ocean access does not have a submarine cable.[12] Regulatory barriers do not seem to be an impediment for additional international cable deployment. The lack of submarine cables and infrastructure may be due to the lack of financial incentives for private investment. This could justify state or region-led initiatives, including public-private partnerships to improve infrastructure deployment. Experience elsewhere suggests that increased broadband penetration and the demand for services associated with greater competition is a strong driver for the private sector to increase international cable capacity.

Initiatives have been mounted to expand the connectivity capacity and pathways of LAC countries with other regions of the world. Submarine cables have connected South America with the Pacific region (South America Pacific Link, or SAPL) Brazil and Europe (EULALINK) and Brazil and Africa (South Atlantic Express, or SAEx, South Atlantic Cable System, or SACS, and Cameroon-Brazil Cable System, CBSCS). Projects of a terrestrial fibre connecting South America and Central America, will also address this strategic infrastructure challenge.

The Caribbean region has suffered several major natural disasters in recent years, which have hampered domestic investment in telecommunications infrastructure. It does, however, have the natural advantage of its position between the two much larger markets of South America and the East Coast of the United States, which has brought a number of submarine cables that land in the region.

Some of these initiatives have been slow to progress. Terrestrial connections, for example, have faced considerably more obstacles due to co-ordination problems among countries and operators. The following section on good practices provides more details of some of these infrastructure initiatives. An overview of the regional situation follows, for other key components of international connectivity such as IXPs and CDNs.

IXPs are key elements of Internet infrastructure. According to Packet Clearing House, there are 480 Internet exchange points operating worldwide, but 84 countries do not yet have an IXP (PCH, 2015; Cisco, 2015). The number and distribution of IXPs are largely the result of the availability of demand and supply, market conditions and the policy and regulatory environment in each country.

Broadly speaking, the LAC region has a small number of large Internet service providers (ISPs), many of which are dominant operators acting as multinational regional carriers. The relatively low rate of entry of new ISPs within the region hampers the growth rate and competition in the industry overall by comparison with other regions.

Even at a time when IP transit service prices continue to decline throughout the world, significant price and performance disparities persist between primary Internet traffic hubs (such as London, Los Angeles and Miami) and those in the LAC region. Prices have fallen much more slowly, and transit is more expensive in regions that remain largely dependent on long-haul links to Europe or the United States to gain access to international connectivity. In the LAC region, many service providers still incur the high costs of transport to and from Miami for national traffic, and must set much higher prices than when using local IXPs for domestic traffic exchange. There are, however, positive signs of change.

In recent years, the South American broadband environment has seen significant improvement. Firstly, a major infrastructure building effort led by Brazil and Argentina has resulted in a total of 42 IXPs in these two countries. Secondly, the advent of content distribution networks (CDNs) at the exchange points has promoted a more active peering community, increasing the opportunities for local and regional traffic exchange. As a result, the fibre previously used in Miami for domestic traffic exchange between neighbouring countries is now used more efficiently to route international traffic to North America and Europe.

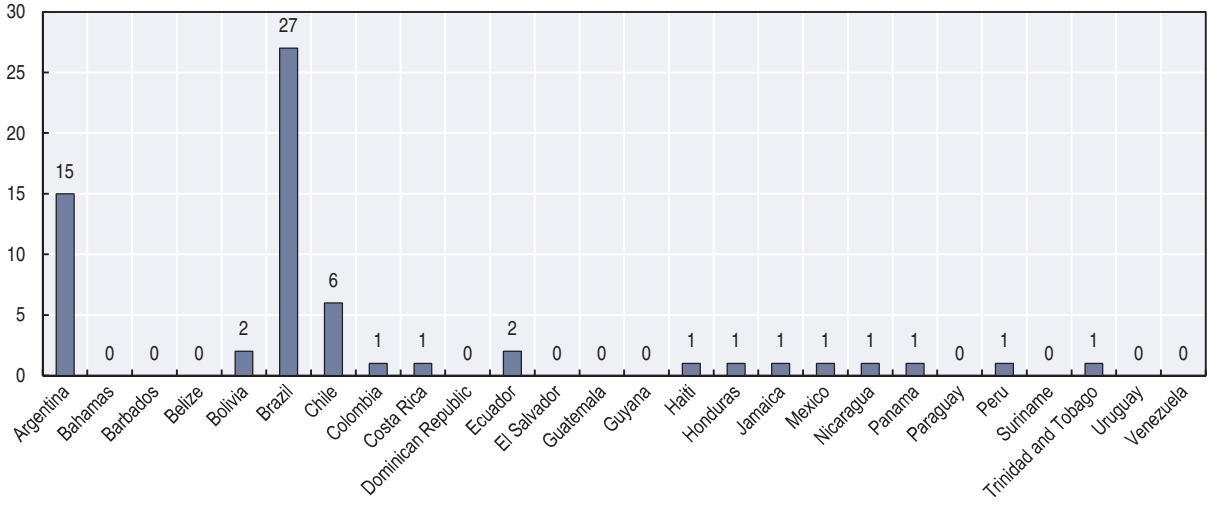
The relatively few attempts at localising traffic exchange in Central America have met with mixed success. Panama, Nicaragua and El Salvador have deployed IXPs that are either no longer active or are not growing. Belize and Guatemala have not yet attempted to form exchanges. By contrast, the ICT Ministry of Costa Rica (MICIIT), together with

multiple stakeholders, as well as the regulator in Honduras, initiated IXP projects in 2014 that have led to exchanges neutrally managed by nonprofit associations. Despite the ongoing refusal of incumbents to participate in the exchange, the CRIX, for example, now has 21 participants.[13]

In the Caribbean, several countries have formed IXPs that have attracted enough interest to grow significantly, as in Sint Maarten (2008), Curaçao (2009) and Grenada (2011). In 2014, IXPs in Trinidad and Tobago and Jamaica were built with the help of regional players like the Caribbean Telecommunication Union (CTU), Packet Clearing House (PCH) and LACNIC. Other IXP attempts in the region have had limited success, given the divergent interests of the incumbent and the major mobile players operating in the region.

Eleven LAC countries still do not have their own IXP and rely on slow, expensive international connections for internal traffic. The number of active IXPs in each country is illustrated here (Figure 8.2).

Figure 8.2. **IXPs in the LAC region, by country (September 2015)**



Source: OECD research on individual IXP websites; PCH (2015), *Internet Exchange Directory*, *https://prefix.pch.net/applications/ixpdir/*.

StatLink *http://dx.doi.org/10.1787/888933354346*

Besides IXPs, **CDNs** have become increasingly relevant for international connectivity. By 2019, Cisco predicts that they will carry nearly two-thirds of global Internet traffic, up from 39% in 2014 (Cisco, 2015). Akamai, the leader in the content delivery sector, estimates that between 15% and 30% of the world's web traffic is delivered today through their platform.[14] In recent years, an increasing number of content providers and content delivery networks (CDNs) such as Google, Akamai and others, have been entering the markets in the LAC region by interconnecting to ISPs at existing IXPs. In the LAC region, content delivery networks currently have infrastructure deployed at IXPs in Argentina, Brazil, Mexico, Ecuador and Peru. In Costa Rica, discussions are ongoing with several content providers.

IXPs are an efficient way to establish direct interconnections with a large number of networks in the same location, increasing quality of service for the traffic (direct paths and low latencies). The number of CDNs participating in IXPs can be a proxy for the presence of CDNs in the region. Results show that CDNs and content operators are operating in Brazil, Argentina and Curaçao, although not in comparable proportions (Table 8.2).

Table 8.2. **CDNs and IXPs in the LAC region**

	Curaçao	Argentina	Brazil				
	AMS-IX Caribbean	CABASE Buenos Aires	PTT SP	PTT RJ	PTT RS	PTT DF	NAP do Brasil
Akamai	Yes		Yes				Yes
Cloudflare		Yes	Yes				Yes
Facebook			Yes				Yes
Google	Yes	Yes	Yes				
Netflix			Yes	Yes	Yes		Yes
Yahoo						Yes	Yes
Total CDNs	**2**	**2**			**13**		
Total IXPs	**1**	**15**			**27**		

Note: Summary of the results for Akamai, Cloudflare, Limelight, Google, Netflix, Yahoo and Facebook, based on their own public peering records. Except for Limelight, which was not found to be active in any IXP in Latin America and the Caribbean, all other networks are present at IXPs.

Source: OECD, based on PeeringDB (2015), *Peering Database*, *www.peeringdb.com*.

The results on CDN deployment at IXPs in Brazil and Argentina are in line with the CGI.br and *Cámara Argentina de Internet* (CABASE) efforts to facilitate the construction and operation of neutral IXPs in each country. As for the Caribbean, AMS-IX Caribbean, in Curaçao, seems to be the only location chosen by two CDN and content players to serve the sub-region.

Brazil stands out in the LAC region, and in the world, with its 13 CDNs connected to 27 IXPs. Most traffic to the Brazilian market should therefore be hosted in Brazil, to stimulate consumption, given that CDNs use high-speed connections to other networks via those IXPs.

International roaming

Although progress has been made in recent years, and several providers have introduced initiatives to reduce retail roaming prices, international roaming prices in the LAC region, as in many other locations, remain high and unrelated to costs. This is an area of concern for regulators in the region, prompting several studies in the region with the support of the IDB. A few LAC countries are moving to **implement bilateral agreements** to reduce prices for international roaming services, such as Colombia with Peru and Ecuador, and Chile, Argentina and Peru.[15] An agreement in the context of the Pacific Alliance was reached between regulators in Mexico, Colombia and Chile to share information and conduct studies of roaming services in the region (REGULATEL, 2016). It is worth nothing that currently no LAC country applies price regulations for international roaming services.

Some countries in the region, such as Chile, Colombia, and Costa Rica, have **regulation** on blocking roaming by default, to reduce "bill shock" and inadvertent roaming. These issues have also been addressed in Chile, Peru[16] and Costa Rica. In Colombia and Costa Rica, a consumption cap is set by consumers, together with SMS notification by operators when 80% of the cap is reached and a daily SMS is available informing users of incurred charges. Billing per second and per kilobyte is mandated in Chile, to avoid unfair charging. Brazil, Chile and Costa Rica have also imposed the obligation for operators to send an SMS when roaming is activated, informing users of the price of each specific service, as well as the implementation of limits for data consumption.

Apart from the preceding examples, however, most LAC countries do not have transparency and "bill shock" regulations for international roaming. The first **roam-like-at home (RLAH) offers**, or plans that offer such features at an additional charge, have begun to

emerge in the region, but – as elsewhere – they are still very much the exception (ICR News, 2015; Murray, 2015). In addition, some of the countries included in these plans are outside the LAC region, which, while a welcome development, is ahead of including LAC countries. To date, the most notable RLAH offers have been between Mexico and the United States, though some are offered linking Costa Rica and Central American and North American countries. Experience shows that such plans emerge where competition is increasing in response to customer demand for more integrated plans that include regional roaming.

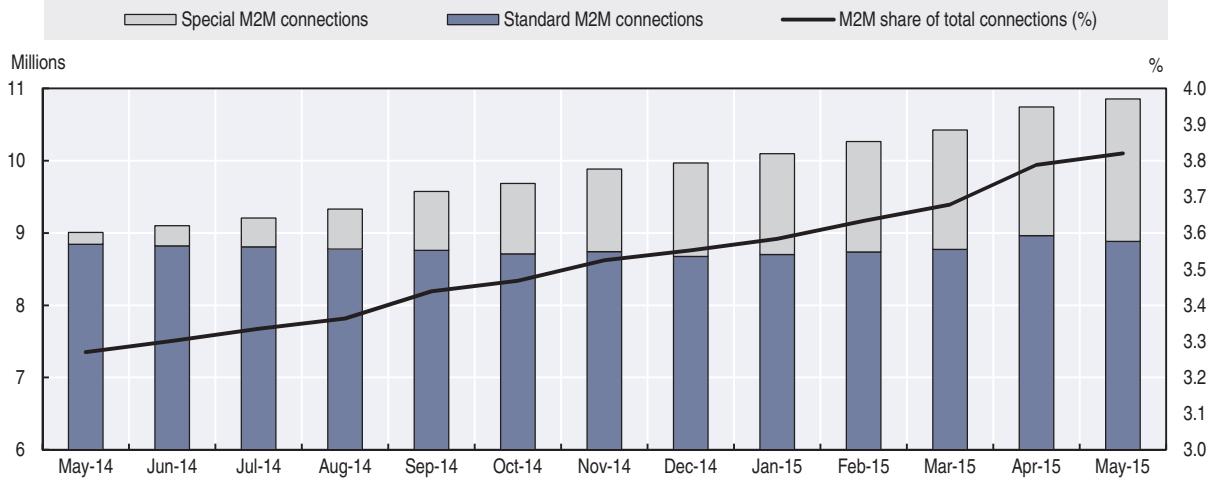
Double taxation on roaming (indirect taxes both in the visited country for wholesale services and the home country for retail services) is still an important issue in the LAC region, as are general issues on the government charges and taxation for all broadband services addressed in Chapter 6. Double taxation applies to 72% of roaming routes in Latin America (IDB and REGULATEL, 2013a). According to the GSMA, this results in price increases of up to 40% (GSMA, 2013).

IoT

The use of devices, applications and services under the terms "IoT" and "M2M communication" is expected to grow significantly around the world, as well as in the LAC region. The total number of connected devices in use globally is projected to grow from 10 billion in 2013 to anywhere from 19 billion to 40 billion by 2019 (Castillo and Thierer, 2015).

LAC countries see IoT as an **emerging opportunity**. Policy makers are increasingly interested in promoting and monitoring its growth, removing barriers to it and considering both consumer protection and taxation and the potential privacy and security risks. Colombia's national regulatory agency is currently analysing technological and legal ramifications of the growth of its digital ecosystem, so that it can implement and recommend policies to increase use of IoT. Colombia has already studied mobile numbering policies, without adopting any specific measures. Brazil recently passed legislation to stimulate IoT deployment. In May 2014, a special tax regime for M2M systems without human intervention was introduced, increasing M2M connections in Brazil from 161 000 to 2.3 million in 2015 (Figure 8.3).

Figure 8.3. **Number of standard and special M2M connections in Brazil (May 2014 – May 2015)**



Source: ANATEL (2015), *Telefonia Móvel – Acessos – Dados*, *www.anatel.gov.br/dados/index.php/destaque-1/283-movel-acessos-maio*.

StatLink http://dx.doi.org/10.1787/888933354350

Good practices for addressing opportunities/challenges/objectives in the LAC region

Regional co-ordination among policy makers and regulatory authorities

Regional and international co-ordination among LAC policy makers and regulatory agencies can help ensure co-ordinated, consistent approaches on cross-border issues. A culture of sharing policy and regulatory approaches among peers not only leads to better policies, but can encourage investment. It can also promote agreements on issues where economics of scale might encourage investment and innovation and help formulate common LAC positions in international fora, to negotiate common LAC positions at international forums (e.g. at the UN and the Internet Corporation for Assigned Names and Numbers, or ICANN). Helping to apply common views on policy aspects can lead to a more predictable, stable regulatory framework.

Steps for enhancing the effectiveness of regional co-ordination forums might include:

- **Building stronger and more transparent organisations.** A concentrated effort should be made to build stronger and more transparent organisations. The LAC region could benefit from drawing on good practices identified by international bodies. Countries should ensure their interests are reflected in the constitution of the regional co-ordination body. Stronger ownership in regional institutions will increase the benefits of membership, making a forum more stable and relevant. A careful assessment of existing bodies might reveal whether some could be merged to bundle resources and capacities.
- **Moving beyond intentions.** The goal should be to set up clear action plans with concrete project outlines, timelines for action and performance indicators, supported by realistic mid-term programmes for work and budgets.
- **Identifying common problems to explore common solutions.** Countries should attempt to strengthen regional co-ordination mechanisms so they can share their experiences and conduct peer reviews to identify good practices for the region.
- **Involving national experts.** National experts working on policy making and/or regulatory measures should take a leading role in the analytical work of regional forums. Expert groups could meet regularly to discuss relevant issues, either physically or virtually. Relying only on a secretariat may not be feasible for regional organisations subject to budgetary constraints. Meanwhile, outsourcing work to consultants limits the benefits of sustained interaction between experts from a region's different national authorities. The direct involvement of experts in regional co-ordination organisations helps create a strong network of peers that can play an important part in sharing common solutions and building regional integration.

The Body of European Regulators for Electronic Communications (BEREC) is one example of a well-functioning regulatory forum for sharing information among regional regulatory authorities (Box 8.3).

Box 8.3. **The Body of European Regulators for Electronic Communications (BEREC)**

The Body of European Regulators for Electronic Communications (BEREC) is the main regulatory network in Europe bringing together national regulatory authorities (NRAs) for electronic communication services in the European Union. It helps the internal market for electronic communications networks and services develop and function more effectively. Its goal is to ensure consistent application of the European Union (EU) regulatory framework and to promote an effective internal market in telecommunications, for the benefit of both consumers and businesses.

BEREC is a key forum for sharing information among European regulatory authorities on best practices. It provides them with assistance on regulatory issues, delivers opinion on EU draft decisions, provides advice and assists European institutions. Work is conducted via expert working groups (EWGs). These focus on key regulatory issues (such as next-generation access, market and economic analysis and network neutrality) and are conducted with the collaboration of national experts. Experts meet regularly, but most of the work is done by e-mail. Small drafting teams may organise audio and videoconferences. This close interaction reinforces linkages among experts in specific areas of knowledge within Europe.

Of several working groups, the benchmarking EWG is in charge of collecting data and preparing statistics at the European level. This is useful for NRAs, as it facilitates peer and regional comparisons. Moreover, it is possible that NRAs themselves take the initiative when analysing specific regulatory issues to send questionnaires to other NRAs. Responses are aggregated and shared with the group. This is a quick and effective way of benchmarking specific issues across countries. Although some studies are commissioned by external organisations, most BEREC reports are prepared directly by experts on issues under analysis within NRAs, which helps increase collaboration between NRAs. BEREC reports are available online, and the most relevant are subjected to public consultation before they are finalised.

Source: BEREC website, *http://berec.europa.eu/*.

International connectivity

Encouraging investment and competition on international connectivity in the LAC region requires a broad strategic programme, involving analysis of existing and estimated capacity needs, estimating timeframe and costs for infrastructure provision, and deployment of submarine cables and terrestrial backbones. Adapting regulatory frameworks should, among other objectives, reduce regulatory and administrative barriers to encourage investment and competition. For regulatory frameworks, the following issues are worth considering:

- **Terrestrial international interconnection**. A competitive environment allowing alternative operators to use existing connectivity infrastructure at reasonable rates should be encouraged, addressing dominance issues when present. If necessary, measures could be taken to implement alternative gateways, using public-private partnerships and setting open access conditions for all actors, with the monitoring of regulatory authorities.
- **Submarine cables**. Considerations similar to those for terrestrial interconnections apply to submarine cables. The existence of alternative connections is crucial, especially in the case of the Caribbean, where submarine cables are vital for providing international connectivity. As is the case for terrestrial backbones, dominance issues should be addressed through regulatory measures to ensure access to submarine cables. Introducing redundancy to cope with cable failures and public funding when needed should also be considered.

- **Internet interconnection (peering and transit)**. A market-led environment is preferable for Internet interconnection, and regulation for access operators is not in general recommended in this area, but intervention could be justified if competition problems are detected and competition law is not enough to address these problems successfully (see Chapter 4 on competition and infrastructure bottlenecks). Regular monitoring of the market and eliciting stakeholders' feedback is key information for formulating regulatory decisions as necessary.
- **International termination rates**. When possible, market-led approaches are preferable in dealing with international termination rates. These should be monitored by regulatory authorities, and regulation may be needed to avoid high termination rates that are not related to costs. Letting innovative businesses reduce communication costs can increase trade, develop service industries and enhance competitiveness. Conversely, policies aiming to raise payments from foreign carriers by increasing international termination rates may have the undesirable effect of reducing competitiveness and trade, and even reduce termination revenue, because it suppresses demand (OECD, 2014b).

Infrastructure deployment connecting multiple countries requires co-ordination between stakeholders. Installing regional fibre cables (whether terrestrial or submarine) can be carried out in the context of bilateral or multilateral agreements, although regional organisations can play a key role in facilitating dialogue. Extending broadband infrastructure is the key to increasing investment, competition and demand.

Policy makers seeking to strengthen projects on regional connectivity should, in general:

- advance actions to improve feasibility **studies** and other scoping projects in order to attract different sources of financing
- ensure that these projects are contracted and conducted in a **transparent and open** manner, setting up a fair and competitive environment for all operators
- streamline **co-ordination** between the national institutions responsible for governmental decisions, particularly among ministries of Communication/Infrastructure and ministries of Planning/Economy.

Several projects of this nature are under way or in the planning phase in the LAC region. In Central America, the *Autopista Mesoamericana de la Información* (AMI) project aims to connect Central-American countries from Guatemala to Panama (Box 8.4).

In South America, the design of a fibre-optic "ring" is being carried out within the framework of a broader infrastructure integration plan for the region supported by COSIPLAN, which plans to connect 13 countries (Box 8.5).

The establishment and operation of **Internet Exchange Points (IXPs)** is largely market-driven and led by the private sector. Internet service providers and network operators usually decide the location and the conditions upon which they interconnect and exchange traffic. Governments have not traditionally been involved in the construction of IXPs, but in recent years, they have taken a pro-active role in creating and enabling an environment conducive to the emergence of IXPs. This trend has been particularly true in the LAC region, in which many countries have a small number of players with limited incentives to compete.

In some cases, particularly in countries without an IXP, governments can play an important role in stimulating dialogue among the different market players: network operators, ICT businesses and providers, universities and government agencies (Box 8.6).

Box 8.4. **The Mesoamerican Information Highway (AMI)**

The Mesoamerican Information Highway (AMI) is an initiative launched in January 2015 to connect six Central-American countries (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) with 1 800 kilometres (km) of high-capacity fibre. The network is being deployed using passive infrastructure of the Electric Interconnection Central American System (*Sistema de Interconexión Eléctrica de América Central*, or SIEPAC), so as to save resources. The initiative has been completed and is part of the broader framework of the Mesoamerican Project, launched in 2008, which seeks to strengthen regional integration and promote economic and social development in the region.

The AMI initiative was co-ordinated by COMTELCA, financed by the IDB, CABEI, CAF and CEPAL, and is being executed by REDCA (*Red Centroamericana de Fibras Ópticas*), a public-private partnership. The initiative was planned in two phases, the first integrating the backbone of Central America and then, in a second phase, connecting it to Mexico, Colombia and to national networks, and includes three components: fibre backbone connecting the main cities in the region; complementary fibre connecting other cities to the backbone stations, and IXPs in each country.

Source: Proyecto Mesomerica website, *www.proyectomesoamerica.org/*.

Box 8.5. **Connecting South America**

UNASUR-CAF

The South-American Connectivity Network for Integration (or *Red de Conectividad Suramericana para la Integración*) aims to integrate the fibre networks of South American countries, to guarantee safer, more efficient and less costly traffic in the region. The initiative is intended to connect the 13 countries of South America. When completed, it should extend over 10 000 km. It also hopes to attract servers and data centres to increase the production and sharing of local content in the region.

The project is led by the Working Group on Telecommunications of COSIPLAN (*Consejo Suramericano de Infraestructura y Planeamiento*), the co-ordinating council responsible for implementing the objectives of infrastructure integration of Union of South American Nationals (UNASUR), and assisted by the IIRSA (*Iniciativa para la Integración de la Infraestructura Regional Suramericana*), the technical forum for physical integration of COSIPLAN.

An initial segment of the regional connectivity initiative was inaugurated in June 2013, connecting the municipality of Santana do Livramento in Brazil to Riviera in Uruguay, through a partnership between Brazil's Telebrás and Uruguay's ANTEL. The remaining segments are being studied by a UNASUR partnership with the *Corporación Andina de Fomento*.

INTERNEXA

Internexa is a subsidiary of the Colombian Electric Company, ISA (owned 51% by the Colombian government), and aims to be the regional backbone of the LAC region. It is currently operating the first open network to support IPv6 and connect six countries (Venezuela, Colombia, Ecuador, Peru, Chile, Argentina and Brazil) with 29 000 km of fibre deployed over electric grids and access to seven submarine cable landing points.

Source: Internexa website, *www.internexa.com/*.

In some LAC countries, despite the existence of IXPs, the number of service providers connecting to the IXPs is limited. In such cases, it is good regulatory practice to remove artificial barriers such as high entry fees, or to require that members of the IXP have an

international licence. In other cases, incumbents have declined to participate in the exchange point, stalling efforts to establish an IXP. It is not advisable to force players to use domestic IXPs, but rather, to create an environment where the benefit for those connecting becomes increasingly evident to all players.

Box 8.6. **Governments' role in promoting dialogue**

Regulators in Latin America and the Caribbean have had success in facilitating a policy dialogue forum among Internet service providers and other actors in the highly competitive sector of telecommunications.

In **Costa Rica**, the telecommunications ministry, along with other stakeholders, including the regulator, initiated a project in 2014 to establish an IXP. One of its early achievements was to identify the national domain registry, NIC.CR, as a neutral entity responsible for administering and operating the IXP. Once this had been determined, the stakeholders handed over responsibility for the process, but remained part of the project, as NIC.CR drew up its agenda. Several roundtables and meetings with the potential IXP participants then decided on the location and policies of the IXP. A year later, the IXP was operational, including 21 participants, including domain-name system root zone services. The only remaining task, currently under negotiation, is to connect the incumbent's network to the exchange point, which could be accomplished by designing a requirement for players successful in receiving Universal Service Fund (USF) funding.

In **Honduras**, the national telecommunications regulator has also taken a leading role in facilitating dialogue among industry players to build the necessary trust among them. In 2014 and 2015, several stakeholder meetings with national players and international experts from LACNIC and Packet Clearing House (PCH) have resulted in the establishment of an IXP in Tegucigalpa. The regulator is now analysing which entity can operate the exchange to hand over the responsibility.

In **Colombia**, the national communications regulator, CRC, and the National Planning Department (DNP) are reviewing the state of traffic exchange and IXPs in the country. Currently, it has only one significant IXP (Network Access Point Colombia in Bogotá), which has a relatively low volume of traffic and is only open to ISPs. In addition, it charges a high member fee. The CRC published a recent report (CRC, 2015) in which it acknowledged this situation and noted that it is investigating ways of increase network efficiency in the country. It concluded that more open and efficient traffic models are necessary and that regional approaches should be considered. It also noted that players in the Internet value chain rather than the government should take the lead and that solutions should be developed through a multi-stakeholder approach. A public consultation was launched to solicit the views of stakeholders in the country.

Sources: NIC.cr (Costa Rica); CONATEL (Honduras); CRC (Colombia).

Governments should also promote national and regional dialogue between Internet service providers and other stakeholders by encouraging seminars and forums with national and international experts to promote the benefits of IXPs (Box 8.7).

Without a critical mass at the IXP, CDNs and content operators have little incentive to deliver traffic directly to the exchange point. Measures to facilitate the interconnection of new participants at the IXP, such as incentives to deploy fibre terminations or general subsidies to compensate for the initial operational expenditure might be considered to support the initial phase of the exchange. However, the costs of establishing IXPs are modest and members can quickly recoup their investment in the lower costs. This is why the most successful ISPs are voluntary and industry-driven (Box 8.8). Lack of an IXP generally points to insufficient competition.

Box 8.7. **The Caribbean ICT Roadshow**

Since 2009, the Caribbean Telecommunications Union (CTU) has conducted a continuous travelling "ICT Roadshow" promoting telecommunications self-sufficiency and local production in each of the countries in the region. Such initiatives have helped governments and regulators understand the nexus of routing economics and regulatory policy. It has also prompted governments to take a more informed and active role in developing the telecommunications industry and digital economy.

Workshops, forums and educational activities organised as part of the roadshow aim to build capacity in technical and regulatory policy areas, and increase awareness of the role of IXPs in economic and social growth. The initiative aims to cultivate a spirit of innovation in developing ICT-based practical solutions, to raise awareness and to harmonise efforts to adopt ICT solutions for inclusive economic and social development. CTU is working collaboratively with its members, partners and other interested organisations and institutions, such as the regional Internet registry, LACNIC, and Packet Clearing House (PCH). The aim is to design a programme that demonstrates the transformative power of ICT innovation.

Sources: Caribbean Telecommunication Union website (*www.ctu.int*); Connected Caribbean CarPIF Forum (*www.connectedcaribbean.com*).

Neutral Internet exchange points with good governance and following best operational practices will attract **CDN** players. As with any other network, content providers and CDNs select their interconnection locations according to a number of criteria. Besides the cost-benefit advantages, the neutrality of the IXPs also plays a role, since networks interconnected there can be certain that the IXP is operated with good governance and transparency.

Box 8.8. **Some examples of good practices in IXP governance in the LAC region**

The *Cámara Argentina de Internet* (CABASE), the **Argentinean** Internet services industry association, founded the first Latin American IXP in Buenos Aires in 1998. Today, it operates a nation-wide network of 15 exchanges, with 12 planned over the next few years. Participants joining one exchange are required to peer with all CABASE participants. This strategy provides an incentive to use the IXP for small and medium players, facilitating growth and decentralisation in the sector at the expense of larger players. In June 2015, CABASE reported that 68% of the total network capacity is available in Buenos Aires, leaving 32% of the country, a vast geographical scope, yet to be covered.

The **Brazilian** Internet Steering Committee or CGI.br (*Comitê Gestor da Internet no Brasil*) is a public-private partnership funded principally by revenue from domain-name registrations within the .BR country-code top-level domain. One of its flagship projects is the PTTMetro (*Punto de Troca de Trafego*, or traffic exchange point) which promotes and co-ordinates the creation of IXPs in the country. From 4 IXPs in 2006 to 27 in 2015, Brazil now interconnects 3 493 networks. Of these, 25.3% use the largest regional exchange point, the PTTMetro São Paulo, in São Paulo state, which leads the expansion of the Internet market in Latin America.

In April 2014, **Mexico** was the final OECD country to establish an Internet exchange point, though much of its domestic traffic is still being exchanged in the United States, Latin America or Europe. The first neutral Internet exchange was set up in Mexico's Federal District by the *Corporación Universitaria para el Desarrollo de Internet* (CUDI), the Mexican National Research and Education Network. In 2016, there are prospects of building other IXP facilities in Guadalajara, Querétaro and Monterrey, which could improve performance and lower costs.

Sources: CABASE website (*www.cabase.org.ar/*); IX.br website (*http://ix.br/documentacao*); CITI (*http://ixp.mx/*).

The introduction of IXPs creates opportunities to develop content and services hosted by local data centres. First, high-speed, low-latency connections among ISPs improve the quality of service for transit of local content inside the country. Secondly, ISPs have a strong economic incentive to access local content, exchanging traffic through peering agreements without having to pay for expensive international transit.

The availability of local data centres also provides an incentive for IXP deployment. Promoting deployment of local and neutral datacentres is the key for encouraging growth in the local content industry and this, in turn, encourages further deployment of IXPs, allowing for the reduction of international transit to access content. In sum, IXP deployment and the development of local data centres are interrelated, and policies to foster IXPs and local data centres should be co-ordinated.

With the emergence of CDNs, the structure and organisation of Internet networks has changed for some players in recent years from a hierarchical model to a flatter one. The incorporation of specialised intermediary networks delivering content is the key factor in this transformation. Large content operators increasingly use CDNs to reach their customers in a cost efficient way. Content operators and CDNs have to interconnect with other networks to exchange traffic. The physical locations, number and types of interconnections are critical elements for the CDNs, because they influence their ability to deliver their customers' traffic in the most cost-effective way.

CDN interconnection at IXPs is beneficial for both the participating networks and the CDN. First, IXPs aggregate individual demand, so that it becomes financially and technically viable for CDNs to provide direct interconnection. Second, traffic accessed locally improves the user experience, with lower latencies, and also reduces the average per-bit delivery cost for the networks. Third, the network effect produced at the IXP by several ISPs accessing popular content improves the efficiency of the CDN (multiple downstream, with just one upstream). Regulators should also monitor CDNs to identify barriers to competition and potential dominant positions and abuses by global CDN players.

Successfully run IXPs can become regional references for IP-related connectivity services. LINX, AMS-IX and DEC-IX are regional hubs for Europe and bring together a large number of networks with regional coverage. In practice, IXPs become regional, as networks find them efficient and cost effective, and grow as the market develops. In the LAC region, the PTT Metro of São Paulo has the largest concentration of networks (local, national and regional) and traffic exchange on the continent. Other IXPs also aim to become attractive to regional players, such as NAP CABASE in Buenos Aires and the Mexican IXP.

International mobile roaming

International roaming services offer convenience and productivity for those travelling abroad. In the context of social and economic globalisation, not to mention regional and international integration, international roaming has become increasingly important. This is especially true for broadband access when roaming in other countries, as the use of smartphones and growing requirements of online applications become ubiquitous.

Extensive work has been done by the OECD on good policy and regulatory practices on international roaming (OECD, 2010b, 2011, 2013b, forthcoming a). The IDB, in collaboration with the *Foro Latinoamericano de Entes Reguladores de Telecomunicaciones* (REGULATEL) has produced a large number of reports, listed in the section on documents and references for good practices. Of the work done by the OECD, the recommendation of the Council on International Roaming Services summarises key good practices in this area (OECD, 2012b).

LAC countries should take an active role in improving **consumer education and protection** and promoting consumer awareness of prices, functionality and substitutes for roaming services (such as Wi-Fi, acquisition of SIM cards in the countries visited, and use of VoIP applications), so consumers may select the best option for them.

Policy makers and regulators should encourage domestic communication providers to make **information on prices and features available**. Collaboration with consumer organisations to disseminate information on alternatives and price comparisons may also be useful. Finally, regulators and policy makers can also take an active role in providing such information to consumers on their websites, as well as providing information to consumers in the media. The information provided to consumers by the Office of Communications (Ofcom), the British regulator,[17] the Australian Competition and Consumer Commission (ACCC)[18] on their website, as well as video information provided by CRC, the Colombian regulator, to consumers[19] are good examples. ComReg, Ireland's regulatory authority, has created a simple tool to help consumers predict their expenses[20].

Usage of mobile data services is in general difficult to estimate. Relatively simple tables and tools can be developed to help consumers estimate consumption of data services, based on simpler parameters such as browsing webpages, music downloading, minutes of video streaming or number of e-mails accessed while travelling abroad, such as the one developed by AT&T[21].

Awareness of roaming prices can also be reinforced by requesting operators to send an **SMS to consumers when roaming is activated**, informing them about prices in the visited country, as Brazil, Mexico and Chile have started to do. Experience shows that this, while not necessarily reducing prices, allows consumers to make more informed choices and can be implemented rapidly by network operators.

In many situations, especially for data services, consumers are not aware of the costs they are incurring when using international roaming services. Given the relatively high prices, this may inadvertently result in high bills when travelling abroad. **"Bill shock" prevention measures** can help consumers to set limits on their consumption (typically in monetary terms, as is the case in Colombia) and setting default limits applicable to all consumers (as in the European Union). Such measures usually include notifications when a certain consumption threshold is reached (typically 80% of the limit). "Bill shock" measures resulting from the decision on international roaming (Box 8.9) have been implemented by all European countries, allowing customers to better control their consumption.

Citizens living in border areas must be protected from inadvertent roaming, and policy makers should encourage operators to offer tariffs adapted to the use of mobile services in the **border areas**. Inadvertent roaming issues in the LAC area, as well as best practices applied in the region, are the subject of a study by the IDB and REGULATEL (IDB and REGULATEL, 2013b). The report's recommendations are a good reference for regulators and operators. In general, inadvertent roaming can be prevented by co-ordinating frequencies, location of base stations, allowing consumers to block roaming and the use of border gateways. Regulators may also publish specific regulations to ensure that operators take reasonable steps to avoid inadvertent roaming in border regions. As the technical measures to be taken may vary and evolve depending on technical evolution and standardisation of roaming features, general provisions combined with regular monitoring are usually enough to ensure that inadvertent roaming is effectively addressed by operators (Box 8.9).

Box 8.9. **Inadvertent roaming in the European Union**

Regulation of inadvertent roaming in the European Union

Regulation No 531/2012 of the European Parliament and of the Council of 13 June 2013 on roaming on public mobile communications networks within the European Union states in its Article 14.4: "Roaming providers shall make available information to their customers on how to avoid inadvertent roaming in border regions. Roaming providers shall take reasonable steps to protect their customers from paying roaming charges for inadvertently accessed roaming services while situated in their home Member State".

Source: European Parliament (2012), *Regulation No 531/2012 of the European Parliament and of the Council of 13 June 2013 on roaming on public mobile communications networks within the Union*, *http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0531&from=EN*.

Measures taken by operators in the European Union to protect customers against inadvertent roaming

- co-ordination with neighbouring operators to plan the radio network, as well as optimising location and power in border areas
- offering customers the possibility of explicitly requesting to block the use of networks in neighbouring countries, to avoid inadvertent roaming
- use of border roaming gateways to prevent registration on foreign networks where home coverage is available
- information about being connected to a foreign network in the start page for customers when using data roaming services
- offering specific tariffs with relevant discounts for neighbouring countries if an operator has a footprint from another operator that is part of the same group
- checking the terminal regularly to verify if the home public mobile network (HPMN) is available and if so, redirecting it to the home site
- sending customers e-mails when abnormally high use is detected, and/or refunding inadvertent roaming charges on a case-by-case basis.

Source: BEREC (2013, 2015a, 2015b, 2016a).

Additionally, policy makers should look into options that help reduce **prices for international roaming**. International roaming is a sophisticated service involving networks from at least two countries as well as signalling, transmission, billing and customer care co-ordination. Although this complexity may result in costs somewhat higher than domestic services, prices paid by consumers not only in the LAC region, but in most of the world, usually force consumers to pay much higher prices than the underlying costs of providing the service. High prices for roaming services inhibit its use, discouraging social and economic exchanges among countries and regional integration.

A first reason for these high prices is the lack of competition at the **retail level for roaming services**. Roaming services are sold in a bundle with domestic services, and the relative weight of roaming services in the bundle is low, making it less likely that those who do not travel frequently will choose their mobile network operator based on prices for international roaming.

In an increasingly global world, however, people are travelling more and more, and use of broadband mobile access is increasing (for access to mail, social networks, maps, etc.). Consumers are starting to become more sensitive to international roaming prices, and specific offers for international roaming at local prices in all regions, including the LAC,

area are gaining momentum, as operators have identified a market opportunity in this area (Box 8.10). Although the number of "Roam Like at Home" (RLAH) offers in the LAC region are still few, and mainly based on add-ons to be paid by consumers, in the future this type of offer will probably increase.

Box 8.10. **"Roam Like at Home" (RLAH) offers in the LAC region**

Mexico

Since July 2015, Telcel has offered its post-paid customers local prices for traveling in the United States and Canada, paying about USD 3 per month (MXN 50 per month, tax included) to use voice, SMS and data. From June 2015, Telefónica has offered unlimited calls/SMS in Mexico, the United States and Canada and a shared data communication allowance in the United States, starting at about USD 12 per month.

El Salvador

In August 2015, Tigo started to offer RLAH plans with unlimited voice/SMS and shared local data communication allowance, valid for the United States and seven LAC countries, starting at USD 24.99 per month.

Central America

In April 2015 in Central American countries (Panama, Guatemala, El Salvador, Honduras and Nicaragua), the mobile operator Claro started to offer RLAH plans based on add-on monthly payments valid among these Central American countries. In November 2015, the plan was expanded to include Canada and the United States.

Sources: Operators' websites.

Some market actors, such as Apple[22] or Xiaomi[23], are introducing virtual SIMs that allow for convenient use of international roaming services without changing the SIM card in the terminal device. In the future, virtual SIMs can exert competitive pressure on traditional operators. More generally, the GSMA's Embedded SIM Specification provides a single, de-facto standard mechanism for the remote provisioning and management of M2M connections, allowing the "over the air" provisioning of an initial operator subscription, and the subsequent change of subscription from one operator to another. There are trials underway to use this technology for which the GSMA sees many beneficial aspects (GSMA, 2016).

These SIM developments should be monitored to ensure that there are no regulatory barriers for their use, to increase competition. Where such services are available, they are offered in co-operation with operators in those markets. Operators are free to set wholesale or retail prices depending on whether the service is sold directly to an incoming roamer or via wholesale offers to an intermediary, such as a mobile virtual network operator (MVNO), using agreements negotiated by their home mobile network operator (MNO).

A second reason for high prices for international roaming services is the high **prices for wholesale services**. A high wholesale price for roaming services in a visited country sets a high minimum level for retail prices. The market for international roaming services is far from perfect, as the number of operators selling these services is limited and affected by bilateral issues (buyers and sellers often exchange traffic). Lack of price transparency is also a factor. However, competition for wholesale services has improved in recent years, due to the availability of steering techniques and the increasing demand for data services, reducing prices at least in markets where there is price monitoring, as in the European Union.

To ascertain whether retail roaming prices are justified, regulators need to be aware of the wholesale prices in the countries visited. This can only be accomplished if regional regulators agree to obtain and share information. By monitoring wholesale prices, regulators can apply pressure on mobile network operators to reduce retail roaming prices. Since there is little competitive pressure on international wholesale termination rates in many countries, a significant reduction in roaming prices may require co-ordinated regulatory intervention at a regional level. Any price regulation measure should consider a wide body of evidence in setting the level of retail and wholesale price caps, ensuring consistency of both caps, and especially that no margin squeeze arises.

One relevant issue to consider is the Most Favoured Nation (MFN) principle of the WTO General Agreement for Trade in Service (GATS). The MFN principle means, in essence, that countries should not discriminate among the services and services suppliers of other members, so that any country granting more favourable conditions to another country (as would be the case for an agreement to cap prices for wholesale services) should extend this more favourable treatment to third countries. The MFN principle may be waived in some cases, if an adequate Free Trade Agreement (FTA), for example, exists between two or more countries.

The European Union offers the best example of a multilateral agreement on the regulation of international roaming. Its aim was not only to reduce high prices for intra-European roaming, but to build an internal market in Europe. The European legislators have imposed common regulations on all EU members. A whole set of regulatory measures aims to address issues such as transparency, bill shock, inadvertent roaming, as well as wholesale and retail prices. The next regulatory round in June 2017 will abolish intra-European roaming charges, when a transition period in force since June 2015 ends, subject to fair-use policy and sustainability. European consumers will then be able to benefit from domestic prices when roaming in any country of the European Union.

Another interesting reference for the LAC region is the Gulf Cooperation Council (GCC), including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates, which implemented an agreement using price caps with price reductions staggered over 2010 and 2011. The agreement, which was fully implemented by February 2012 and which covers price regulation for outgoing roaming calls, resulted in price reductions of up to 70%. The GCC Roaming Working Group is proposing to extend the existing regulation to cover incoming calls, SMS and mobile data roaming (see OECD, 2013 for more detailed information on bilateral and multilateral agreements). Australia and New Zealand agreed in February 2013 to regulate high trans-Tasman mobile roaming rates through a bilateral agreement, and released a joint report that recommended that the regulators in both countries be provided with the authority to co-operate and to intervene in the international mobile roaming (IMR) market. This would allow regulators to apply price caps on wholesale and retail roaming charges, regulated terms of access and mobile-local access services (MBIE and Australian Department of Broadband, Communications and the Digital Economy, 2013).

Many of the LAC countries are members of regional organisations, have signed trade agreements within the area (e.g. Mercosur or CARICOM) or have included countries in other regions (such as the Trans-Pacific Partnership, TPP) that could be used as platforms for multilateral agreements. The *Mercado Comun do Sul* (Mercosur) and the TPP are addressing international roaming issues, with the Trans-Pacific Strategic Economic Partnership Agreement explicitly considering regulation of wholesale roaming services (Box 8.11).

Box 8.11. **International Roaming in MERCOSUR/MERCOSUL and the TPP**

MERCOSUR/MERCOSUL

MERCOSUR/MERCOSUL is a common market (Southern Common Market: *Mercado Comun do Sul*) based on the Treaty of Asunción, signed by Argentina, Brazil, Paraguay and Uruguay on 26 March 1991. Its aim is to promote free trade of goods, services and production inputs.

A project initiated by MERCOSUR, whose member states are Argentina, Brazil, Paraguay, Uruguay and Venezuela, is attempting to address the issue of roaming in border areas between members. The MERCOSUR and the 2010 Citizenship Statute aims to consolidate rights and benefits for citizens of these countries. About 15 million people live in remote border areas between the countries, where incomes are generally low. Intense cross-border movement and a certain level of commercial integration have created an identified problem with roaming, in particular inadvertent roaming. The 2010 Citizenship Statute stipulates reduced prices for fixed and mobile communications among MERCOSUR member states, including roaming services. The intent is to extend Resolution 66/97, which requires that fixed service calls in border areas be charged as local calls, whether or not they originate in cities from different countries. This "charge as a local call" rule for wireless telecommunications in border areas is expected to be achieved chiefly by network infrastructure sharing. The limitation in the fixed-call context is that the connections must cover distances of less than 50 km as the crow flies.

Source: OECD (2013).

Trans-Pacific Partnership

The Trans-Pacific Partnership (TPP) is a trade agreement among 12 Pacific Rim countries (including Chile, Mexico and Peru) on a variety of economic policy issues. It was reached on 5 October 2015, after seven years of negotiations. The agreement's stated goal was to "promote economic growth; support the creation and retention of jobs; enhance innovation, productivity and competitiveness; raise living standards; reduce poverty in our countries; and promote transparency, good governance, and enhanced labour and environmental protections".

The telecommunications provisions in Article 13.6 of the TPP trade pact explicitly address international roaming issues. They note their relevance for promoting trade among the parties, the need for transparency and competition and the possibility of co-operation among countries in the partnership on regulating wholesale roaming services.

Source: Trans-Pacific Partnership agreement, *https://ustr.gov/trade-agreements/free-trade-agreements/trans-pacific-partnership/tpp-full-text#*.

Finally, attention should be paid to cases where **double taxation** affects international roaming prices. This when the government in a visited country taxes wholesale services provided to foreign operators, and the government in the home country taxes retail international roaming services, using the wholesale services that have already been taxed. This increases the prices for international roaming even more than taxes applied for domestic services.

The IDB-REGULATEL report (IDB and REGULATEL, 2013a) analysed different regulatory options that could be applied to solve the issue of double taxation, ranging from bilateral/multilateral agreements among countries to tax exemptions and reclassification of wholesale international roaming services as exported services. In any case, discussion on co-ordinating measures at regional forums is advised, to prevent double taxation. This would encourage regional trade and social exchanges among countries in the LAC region, as well as with countries in other regions.

IoT

In recent years, the ITU,[24] OECD (2012a, forthcoming b)[25] and BEREC (2016b) have examined potential initiatives and approaches to IoT services to identify barriers to their deployment, and have produced work aimed at ensuring competition, interoperability and consumer benefits. A growing number of regulatory authorities are also considering these issues. Some good practices in this area include:

- **Ensuring that spectrum is readily available for IoT services**. While most regulatory bodies do not consider spectrum availability to be a major barrier to the development of the IoT in the short term, more spectrum may be needed in the longer term to cope with the increasing demand of IoT traffic. Some regulators, such the United Kingdom's Ofcom, are taking steps to make additional spectrum available and to monitor its use to predict significant changes in spectrum demand in the long term (Box 8.12).

Box 8.12. **Ofcom's experience in the UK of spectrum management for the IoT**

In the United Kingdom, Ofcom is responsible for the efficient management of radio spectrum, including assessing future demands for spectrum and the mechanisms by which it can be made available for a range of uses. In a recent report, "Promoting investment and innovation in the Internet of Things", the regulator analysed the role of spectrum as an enabler for the IoT market in the United Kingdom and offered the following insights:

- IoT networks will use a range of technologies and spectrum options. The diversity of applications and their requirements (e.g. range and penetration, power consumption, throughput, number of supported devices) are likely to require a range of technologies (e.g. GSM, LTE, SIGFOX, Weightless, ZigBee, WiFi, Bluetooth) and spectrum bands.
- Spectrum availability is unlikely to be a barrier to the development of IoT in the short to medium term. However, spectrum continues to be a key enabler for the IoT, and Ofcom has made available licence-exempt access to the band at 870 megahertz (MHz) and 915 MHz. It has also proposed to allow high duty-cycle network relay stations to operate on a light licensed basis in the 870-873 MHz band.
- More spectrum may be required in the long term as the IoT matures. Later generations of IoT devices are likely to transmit greater volumes of data if significant demand for video-based services emerges. Some suggestions raised were to accommodate an IoT allocation as part of any future release of spectrum at 700 MHz, additional spectrum for licence-exempt use below 1 gigahertz and greater use of spectrum on a shared basis.

Source: http://stakeholders.ofcom.org.uk/binaries/consultations/iot/statement/IoTStatement.pdf.

- **Ensure adequate numbering space for the emergence of IoT services**. The identifiers used for IoT applications in public networks are E.164 (e.g. MSISDN) and E.212 (IMSI) numbers, as well as IPv4 and IPv6 addresses. In the short and medium term, E.164 and E.212 numbers will continue to be used to identify IoT entities, and regulators should make sure the numbering space can accommodate future growth. In the long term, however, the use of IPv6 might become the preferred solution, and regulators should encourage the migration of service providers to IPv6.
- **Adapt numbering policies to ensure effective competition and avoid lock-in**. Some IoT applications might require the operation of millions of IoT devices. A major issue for competition is consumers' ability to switch between connectivity service providers. A potential solution, already adopted in the Netherlands and being introduced by Belgium,

is to reform the numbering policies to allow large-scale IoT users to be directly allocated E.212 identifiers (IMSI numbers) effectively becoming Private Virtual Network Operators (OECD, 2015).

- **Ensuring that existing policies do not hinder development of the IoT**. Existing regulations in sectors such as tax, health or transport could impede the adoption of innovative approaches such as smart-metering, remote health monitoring or self-driving vehicles. Some countries are also adapting their tax policies to provide incentives for IoT services, to encourage mass adoption (Box 8.13). Another way to encourage the adoption of IoT is to facilitate experimental programmes in innovative topics. Allowing experimental temporary licences and numbering could reduce the regulatory burden for research and development of new services.

Box 8.13. **Brazil's use of tax breaks to boost adoption of M2M**

In May 2014, the Brazilian Government Decree 8/234/2014 created a new category of special M2M connections for "systems without human intervention" that would benefit from a special tax regime. The decree reduced two fees in the Telecommunications Inspection Fund (FISTEL): the Installation Inspection Tax (TFI), which is charged when a SIM is first activated, and the Operation Inspection Fee (TFF), an annual charge on each active SIM. This is the equivalent of a combined reduction of 80% of the previous tax.

The FISTEL tax has been applied to all telecommunications equipment since the General Telecommunications Law was passed in 1999. Brazil does not have a single VAT, since the country operates on a multiple rate and indirect tax system. Each of the 26 states and Federal District have their own legislation and indirect taxes. FISTEL is just one of the tax regimes, but in this complex scenario, any tax cut can have a very dramatic effect.

According to M2M data published by the regulatory body ANATEL, Brazil now has approximately 11 million M2M connections, the fourth-highest in the world and the largest by far in Latin America. Of these, 2.3 million are special M2M connections and 8.7 million are standard M2M connections. The rapid growth of connections between May 2014, when the decree took effect, and July 2015 shows impressive growth in the "special" category, from 161 000 to 2.3 million; while "standard" connections have fallen from 8.8 million to 8.7 million.

One question that has inspired debate is how to separate M2M involving human intervention and M2M that does not, for example for environmental sensors, car control systems or home appliances. The law defines the scope of M2M as "those devices that, without human intervention, use telecommunication networks to transmit data to remote applications, with the objective to monitor, measure and control that same device, the environment around or data systems connected to it by this network". Some analysts suggest that applying the tax break to all M2M applications will remove the uncertainty over which services qualify and which do not, to continue to boost momentum in the sector.

Source: ANATEL (2015), *Telefonia Móvel – Acessos – Dados*, Agência Nacional de Telecomunicações, *www.anatel.gov.br/dados/index.php/destaque-1/283-movel-acessos-maio*.

Policy considerations that prepare LAC countries for the future, whether on IoT or convergent services (as discussed in Chapter 7), should aim to ensure that existing and evolving connectivity and usage gaps continue to be mitigated. IoT has the potential to contribute to broader policy objectives such as public health, energy and water management (through smart grids), and environmental monitoring (addressed in Chapter 1); and to maximise the dividends of ICTs throughout LAC economy and society.

Conclusion

This chapter covered such aspects of regional integration as regulatory and policy regional co-ordination, international connectivity, international mobile roaming and the IoT. Policy makers and regulators in LAC countries should seek to share their experiences, common principles and harmonised rules, when feasible and justified. The region would benefit from closer regional co-ordination and integration.

Governments, in co-ordination with regulatory agencies, should take an active role in promoting and funding national, regional and international backbone and wireless infrastructures under open and competitive processes. Increasing competition and lowering prices for international connectivity, such as internalising national traffic via IXPs, should be a priority, to increase the quality of broadband service.

Consumer protection measures to protect consumers from bill shock and inadvertent international mobile roaming charges should be enforced. Monitoring prices, complemented by regulatory action if necessary, is also advisable.

Policy makers should encourage the development of new services, such as the IoT, removing administrative barriers and ensuring that numbering or spectrum are not a hindrance for future development. Migration of service providers to IPv6 should be encouraged and supported.

Notes

1. Balassa (1961), in his seminal contribution, identifies these five main stages of regional integration. Dorrucci et al. (2002) use this framework to construct an institutional index of regional integration and compare the path taken and status of the European Union and Mercosur.
2. See *https://aric.adb.org/integrationindicators*.
3. An Autonomous System (AS) is a group of IP networks operated by one or more network operator(s) that has a single and clearly defined external routing policy. Each public AS has a globally unique number, an AS Number, associated with it. This number is used both in the exchange of exterior routing information (between neighbouring ASs) and as an identifier of the AS itself.
4. A content delivery network (CDN) is a globally distributed network of proxy servers deployed in multiple data centres. The goal of a CDN is to deliver content to end users with high availability and high performance.
5. See *http://portalipv6.lacnic.net/en/ipv4-depletion-report/*. In addition, the *Réseaux IP Européens* Network Coordination Centre (RIPE NCC) measures the number of IPv6 enabled networks per country. *http://v6asns.ripe.net/v/6?s=_ALL*.
6. Lars Eggart started a study using such an approach in 2007. See current results at *www.eggert.org/meter/ipv6*.
7. PCH maintains a directory of Internet exchanges with traffic statistics for IPv4 and IPv6 subnets. *www.pch.net/ixpdir*.
8. Google measures the number of end hosts preferring to use IPv6 on their service infrastructure. *www.google.com/ipv6/statistics.html*.
9. APNIC Labs measures IPv6 capability per country using such a technique. *http://stats.labs.apnic.net/ipv6*.
10. The intergovernmental organisations with mandates to work on broadband supply and demand include the ITU, OECD, World Bank and UNESCO, as well others that use broadband in their work, from health to transport.
11. See Latin America and Caribbean international submarine cables map. *http://latin-america-map-2012.telegeography.com/*.

12. El Salvador is the only country in the region with access to the ocean and no submarine cable. The Plurinational State of Bolivia (hereafter "Bolivia") and Paraguay also have no submarine cable, but are land-locked.
13. Members of the Costa Rica Exchange point, *www.crix.cr/miembros* (accessed on 11 January 2016).
14. Akamai's CDN platform delivers 15% to 30% of global web traffic (Akamai, 2015).
15. According to information provided by OSIPTEL, the Peruvian regulator, Peru has signed agreements on international roaming with Ecuador, Brazil, Bolivia and Colombia.
16. Besides SMS, the operator can inform users through a phone call and/or a similar mechanism, at no cost to the consumer. In addition, for roaming data with consumption limits, the operator suspends data access when a subscriber reaches the contracted data volume.
17. *http://consumers.ofcom.org.uk/phone/mobile-phones/mobiles-abroad/check-your-phone-before-you-roam/*.
18. *www.accc.gov.au/consumers/internet-phone/using-your-mobile-overseas*.
19. *https://youtu.be/9-DcimA9ToI*.
20. ComReg's online roaming calculator can be accessed on *www.callcosts.ie/mobile_phones/roaming_calculator.293.LE.asp*.
21. AT&T "International data calculator" can be accessed on *www.att.com/att/international-data-calculator/*.
22. In October 2014, Apple introduced a new feature for its iPad: the Apple SIM. This SIM card is reprogrammable, allowing consumers to choose an operator to provide roaming from among those that have reached an agreement with Apple. This allows customers to choose operators from country to country without purchasing a separate SIM card in each. Only a limited number of operators have so far participated in this programme, and the Apple SIM was not available in any LAC country at the time this report went to press, but in the long term, the system may be adopted in more countries by more operators.
23. Xiaomi, a Chinese smartphone manufacturer, announced in August 2015 that it would introduce virtual SIM function in its newest operating system, MIUI7, valid in 36 countries, including OECD member countries such as Canada, Japan and the United States (Xiaomi Advices, 2015).
24. Several related reports are available at *www.itu.int/en/ITU-T/techwatch/Pages/internetofthings.aspx*.
25. Several other related reports are available at *www.oecd.org/sti/ieconomy/telecomandinternetreports.htm*.

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ANNEX 8.A1

Regional and international bodies with regional presence in LAC

Country	ALADI	APEC-TEL	CABEI	CAF	CAN	CARICOM	CELAC	CEPAL	COMTELCA	CTO	CTU	ECTEL	IDB	IIRSA	ITU	MERCOSUR	OOCUR	OAS	OECD	Pacific Alliance	RegulaTel	SELA	SICA	UNASUR
Antigua and Barbuda						●	●	●			●				●			●						
Argentina	●		●	●	◦		●	●					●	●	●	●		●			●	●	◦	●
Bahamas						●	●	●			●		●		●		●	●				●		
Barbados				●		●	●	●		●	●		●		●		●	●				●		
Belize			◦			●	●	●			●		●		●		●	●				●	●	
Bolivia	●			●	●		●	●					●	●	●	◦		●			●	●		●
Brazil	●		◦	●			●	●					●	●	●	●		●	◦		●	●	◦	●
Chile	●	●		●	◦		●	●					●	●	●			●	●	●		●	◦	●
Colombia	●		●	●	●		●	●					●	●	●			●	◦	●	●	●	◦	●
Costa Rica	◦		●	●			●	●	◦				●		●			●	◦		●	●	●	
Cuba	●						●	●			●				●						●	●		
Dominica						●	●	●			●	●			●		●	●						
Dominican Republic	◦		●	●			●	●	●				●		●			●		◦	●	●	●	
Ecuador	●			●	●		●	●					●	●	●			●		◦	●	●	◦	◦
El Salvador	◦		●				●	●	●				●		●			●		◦	●	●	●	
Grenada						●	●	●		●	●	●			●			●						
Guatemala	◦		●				●	●	●				●		●			●		◦	●	●	●	
Guyana						●	●	●		●	●		●	●	●		●	●				●		●
Haiti						●	●	●					●		●			●		◦		●	◦	
Honduras	◦		●				●	●	◦				●		●			●		◦	●	●	●	
Jamaica				●		●	●	●		●	●		●		●		●	●				●		
Mexico	●	●	●	●			●	●					●		●			●	●	●	●	●	◦	
Nicaragua	◦		●				●	●	◦				●		●			●			●	●	●	
Panama	●		●	●			●	●	◦				●		●			●		◦	●	●	●	
Paraguay	●			●	◦		●	●					●	●	●	●		●		◦	●	●		●
Peru	●	●		●	●		●	●					●	●	●			●		●	●	●	◦	●
Saint Kitts and Nevis						●	●	●			●	●			●			●						
Saint Lucia						●	●	●			●	●			●		●	●						
Saint Vincent and the Grenadines						●	●	●			●	●			●			●						
Suriname						●	●	●			●		●	●	●			●				●		●
Trinidad and Tobago				●		●	●	●		●	●		●		●		●	●		◦		●		
Uruguay	●			●	◦		●	●	◦				●	●	●	●		●		◦	●	●	◦	●
Venezuela	●			●			●	●					●	●	●	●		●			●	●		●

Notes: This table does not include British overseas territories, US territories, constituent countries of the Netherlands, French departments, nor other dependencies. Bullets in gray are non-members, but hold a special status in these organisations by virtue of being either associate members, in the process of adherence, observers or beneficiaries. Other international organisations with regional presence are mostly UN agencies, such as UNCTAD, UNESCO and WHO. They are not included in the table, since their membership includes all selected countries.

Broadband Policies for Latin America and the Caribbean
A Digital Economy Toolkit
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Chapter 9

Skills and jobs in the digital economy

This chapter examines the increasing role of information and communication technologies (ICTs) in the workplace, and policies that can support the development of the skills necessary for workers and firms to thrive in the digital economies emerging in the Latin America and Caribbean (LAC) region. It highlights the need for policy makers to develop a comprehensive and coherent approach to expanding connectivity, encouraging learning, activating digital skills and promoting their use, while measuring progress and managing the effects of the digital economy on the reorganisation of businesses, skills and jobs around the world.

Broadband connectivity brings with it many opportunities, but also new challenges. Policy makers need to understand how the Internet and investment in broadband networks can help boost productivity and create new jobs for the Latin America and Caribbean (LAC) area. At the same time, it is important to acknowledge and address the impact on employment and skills, as well as the social disruptions caused by technological advances. This chapter examines the increasing role of information and communication technologies (ICTs) in the workplace, and policies that can support the development of the skills necessary for workers and firms to thrive in the new digital economies emerging in the LAC region.

A significant body of literature links ICT, broadband and Internet adoption to increased productivity (OECD, 2012a). Many policy makers see the Internet as a tool that can support businesses to grow and hire employees. Chapter 10 addresses some of the policy issues related to broadband uptake and entrepreneurship. This chapter focuses on the implications of broadband networks and the policy responses necessary for creating jobs and skills in the digital economy.

Broadband networks are often viewed as a source of new job growth, both in the ICT sector and as a catalyst for new business innovation across all other sectors of the economy. At the same time, it is clear that the Internet is driving a significant reorganisation of businesses around the world, and this affects labour demand and ultimately, employment. The net effects of the Internet – and ICTs more generally – on jobs are complex and still poorly understood.

When any significant new technology emerges, workers and users need new skills to capture the potential productivity gains. This phenomenon has been seen in the past, and is apparent with the expansion of high-speed Internet connectivity. The Internet's effect on jobs can be classified into four broad categories:

- **New jobs**. A broadband-enabled Internet leads to the creation of new jobs. Some of these are directly tied to the technology (e.g. engineers, networking specialists, hardware), while others extend to the related ecosystem (e.g. mobile app developers, data scientists, community specialists in social networks). Most importantly, however, the Internet can lead to job growth in traditional occupations by supporting the creation of new businesses (e.g. entrepreneurship) or the expansion of existing firms (e.g. growth from tapping into foreign/new markets or more effective marketing).
- **Transformed jobs**. Technology transforms the work practices in existing jobs. The introduction of new communication technologies means that work processes can be adjusted but that workers must learn new skills to take advantage of the new technological advances. This transformation is also partially driven by the way the Internet makes it possible to outsource different parts of the production process. Transformed jobs can also outsource jobs to other domestic firms.
- **Outsourcing of jobs**. The Internet also permits global outsourcing of tasks to more-specialised locations or workers (e.g. offshoring), allowing firms with access to broadband networks to

benefit from different cost and productivity conditions, or from the availability of specific skills or firms. This implies some direct job losses in one country but job gains in another.

- **Lost jobs**. Greater use of the Internet can also lead to the loss of certain jobs, as technology replaces tasks formerly carried out by individuals (e.g. as online travel booking has replaced travel agents).

Job creation from ICTs occurs as resources – financial capital, knowledge assets and labour – move across firms and sectors. By its very nature, this process of structural change takes time and may be hampered by institutional barriers and market impediments. More fundamentally, entrepreneurial skills, intangible assets and workers' skills tend to be industry-specific and may not be appropriate for the business environment, work organisation and tasks required where they have to move. This is likely to be the case in new markets that did not previously exist, like those created by new ICT goods and Internet-based services (OECD, forthcoming a). This implies that there can be a difference between the short run, when ICTs may reduce employment, and the long run, when labour markets have had time to adjust.

The **structure of labour markets** also changes with new technologies. Lower-skilled occupations are particularly affected by labour market changes. Existing studies find that new technologies such as the Internet are leading to job growth in the low-skilled service sector but job declines in occupations that require routine tasks that can increasingly be mechanised (Marcolin, Miroudot and Squicciarini, 2016).[1] Workers with advanced technology skills (new jobs and transformed jobs) tend to fare well in the new and transformed jobs resulting from technological change. While technical skills need to be refreshed regularly, those with the necessary skills typically have many options for employment. This is a key consideration for the education and training of young people in LAC countries.[2]

Workers increasingly need both **generic and specialised ICT skills** to accomplish their tasks at work, as the Internet becomes more ingrained in work processes. Existing data show the growing demand for skills related to ICTs and the Internet. This includes employment directly in the ICT sector, ICT specialists in other sectors (e.g. health care), and also ICT-intensive users in all sectors who rely on ICT skills to perform their work (OECD, 2012b).

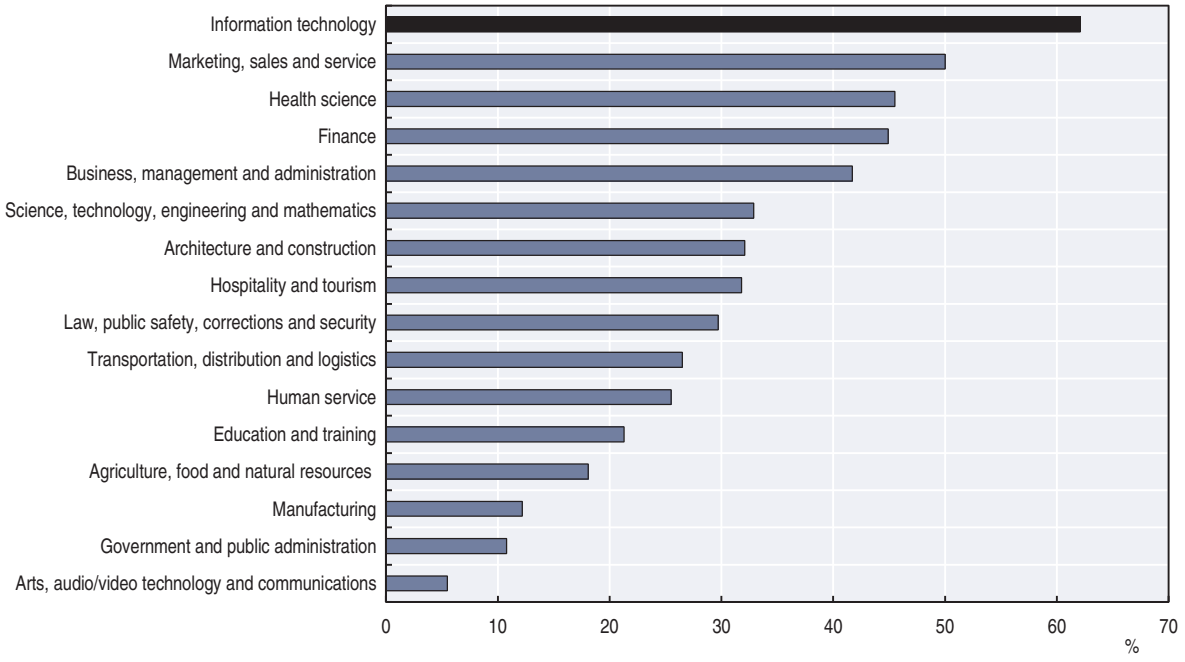
Relatively little data exists to measure the extent of ICT skills needed across occupations, but an analysis of the United States' Occupational Information Network (O*NET) database shows that information technology occupations category has the highest percentage of occupations categorised as having a "bright outlook" through 2013 (OECD, 2014a). While this data focuses only on the US situation, the overall trend of growing demand for ICT occupations globally suggests that demand for ICT skills and the need to promote these skills will continue (Figure 9.1).

These new jobs account for an increasing percentage of overall employment, even though they represent only a small portion of the people who need general ICT skills at work. Data from OECD countries highlights the growth of ICT specialist jobs between 2011 and 2014. ICT specialists now account for between 1% and 6% of total employment.

Data from the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) provides a view of how ICT skills are increasingly important in different sectors of the economy. Managers, professionals, technicians and clerical support workers use more ICT skills at work than other occupational clusters. Workers in smaller firms are less likely to use ICTs than workers in much larger firms. Smaller firms typically lag behind larger firms in adopting ICTs, but such firms are likely to need to leverage ICTs more effectively to stay competitive.

Figure 9.1. **"Bright outlook" occupations across occupation clusters (2013)**

Percentage of occupations in the category that are considered to have a bright outlook



Source: OECD (2014a), *Skills and Jobs in the Internet Economy*, *http://dx.doi.org/10.1787/5jxvbrjm9bns-en*.

StatLink *http://dx.doi.org/10.1787/888933354366*

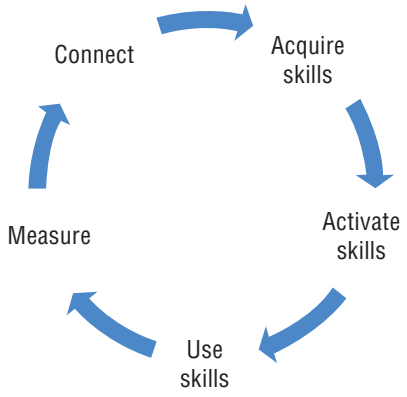
Additionally, the diffusion of ICTs is also changing the way work is carried out, raising the demand for **ICT-complementary skills**. These are skills that are not related to the capability to use the technology effectively but to work in the "technology-rich environment" shaped by ICTs (e.g. the capability to communicate on social networks, to brand products on e-commerce platforms, etc.). OECD analysis based on PIAAC and O*NET shows that intensive use of ICT at work is associated with tasks that require higher use of influence, problem solving and interactions with co-workers and clients, as well as less physical work. Furthermore, changes in ICT-complementary skills will be more radical for workers with low education levels, presenting a challenge for the national educational and training systems that are less capable of reaching these workers (OECD, forthcoming b).

ICT skills are becoming an important requirement for employment across the economy, but a significant portion of the population still lacks the basic skills necessary to function in this new environment.[3] PIAAC data shows that the demographic factors most commonly associated with a lack of core skills and no computer experience are people aged 55-65, people with less than an upper secondary level of education, and people in semi-skilled occupations.[4] This lack of ICT skills in the adult population is of particular concern for policy makers, because the groups with the least ICT skills tend to be among the demographic groups at the most risk of losing jobs in the current technological transformation of the workforce. Labour market disruptions will affect some workers more than others, and often these people will be precisely those with the lowest levels of ICT skills and those who are the least prepared to update their skills.

Key policy objectives for the LAC region

The evolving landscape for skills and jobs highlights the need for policy makers to develop a comprehensive and coherent approach to expand connectivity, encourage learning, activate digital skills and promote their use throughout their populations, while measuring progress. This is an ongoing process (Figure 9.2). Each of its elements is explained briefly here, with more detailed analysis using country examples from the region presented later in the chapter.

Figure 9.2. **Innovation in the digital economy for new and better jobs**



StatLink http://dx.doi.org/10.1787/888933354372

- **Connecting individuals and communities.** Without fast and affordable connectivity, the economic benefits of the Internet will be beyond any community and, if the lack of access is widespread, challenge a country's economic competitiveness. Chapter 1 provides an overview of the state of connectivity in the LAC region and Chapter 5 highlights the importance of extending broadband access by connecting schools, community access centres and other places of public access that can provide a platform for teaching digital skills.
- **Developing skills.** Once networks and hardware are in place, they can be used as tools for learning and skills development. At the most basic level, people at work need to be comfortable using a computer, tablet or mobile phone and to understand how to perform basic tasks, such as watching a video or searching for information (e.g. being digitally literate). At the other end of the spectrum, ICT specialists often need specialised skills that closely follow technology developments.
- **Activating and using skills.** Once broadband access networks are in place and people have the necessary skills, the next step is ensuring that ICTs are used to the greatest extent possible throughout the economy. Policy makers can focus on how to activate existing and new skills throughout the economy and put them to effective use. Benefits of activating and using skills effectively include higher levels of labour productivity, improving the competitiveness of domestic firms, and opening doors for innovative services that benefit users and the economy as a whole.
- **Measuring policy initiatives.** The measurement component is important because it illuminates areas of strength and weakness that can be targeted by policy. More importantly, measurement is important for evaluating whether policy actions have been successful, and areas that need more attention in the next cycle.

Tools for measurement and analysis in the LAC region

Surveys and statistical studies outside the region can be good models for policy makers building initial data collections.

- **Connectivity data.** Governments need information on connectivity across schools, public access centres, and throughout the population in general. Policy makers have an incentive to promote digital skills, but efforts will be less effective if proper infrastructure is not in place. Understanding where the gaps are can help policy makers target specific priority areas for support.
- **Other infrastructure data.** Data from the International Energy Agency (IEA) on electricity penetration and data on school electrification from UNESCO are important inputs in policy making. Countries that do not already collect and submit such information could look for ways to move in this direction.
- **Computer access.** A key input in policy making is information on access to computing resources. Mobile phones have become important access terminals, but computer skills will remain important tools for workers throughout the economy for the foreseeable future. Data on access to computers often comes from population or business surveys (see Chapter 10).
- **Job and skills surveys.** The OECD's Programme for International Student Assessment (PISA) and PIAAC studies are important tools for measuring skills, and digital skills in particular. Involving more LAC countries in both studies would be a good way to assess recent developments, both domestically and internationally. The US O*NET is one of the best sources for data on skills required for different occupations. They provide useful information for policy makers who would like to highlight growth trends over the next five to ten years, share the information with students and teachers, and adjust academic strategies accordingly (O*NET, 2010).
- **Research on ICT usage and educational outcomes.** One important area of academic and policy research, including the OECD's PISA study, has attempted to assess the complex relationship between ICT usage and educational outcomes. International research offers some insights, yet country-specific factors may play an important role. Domestic studies can help policy makers find the best ways to integrate ICTs into education.

A key challenge facing policy makers is that these functions are often handled by different segments of the government. Communications ministries and regulators focus on expanding connectivity, while the education and labour ministries may take the lead on curriculum in schools and retraining workers. Economic ministries are often the core group tasked with promoting business creation and growth. Finally, the national statistical agency is likely to be responsible for collecting the statistics that follow progress in each of these areas. While the responsibilities fall on different areas of the government, any successful transition to a digital economy will require strategic planning and co-ordination across the different governmental agencies. As a result, it becomes necessary to adopt whole-of-government approaches, such as those of the OECD's *Better Skills, Better Jobs, Better Lives* publication (hereafter "OECD Skills Strategy") (OECD, 2012c), whereby different ministries can align their respective policies and identify more clearly potential or existing policy trade-offs. These approaches may help avoid duplication of efforts and ensure policy efficiency.

Overview of the situation in the LAC region

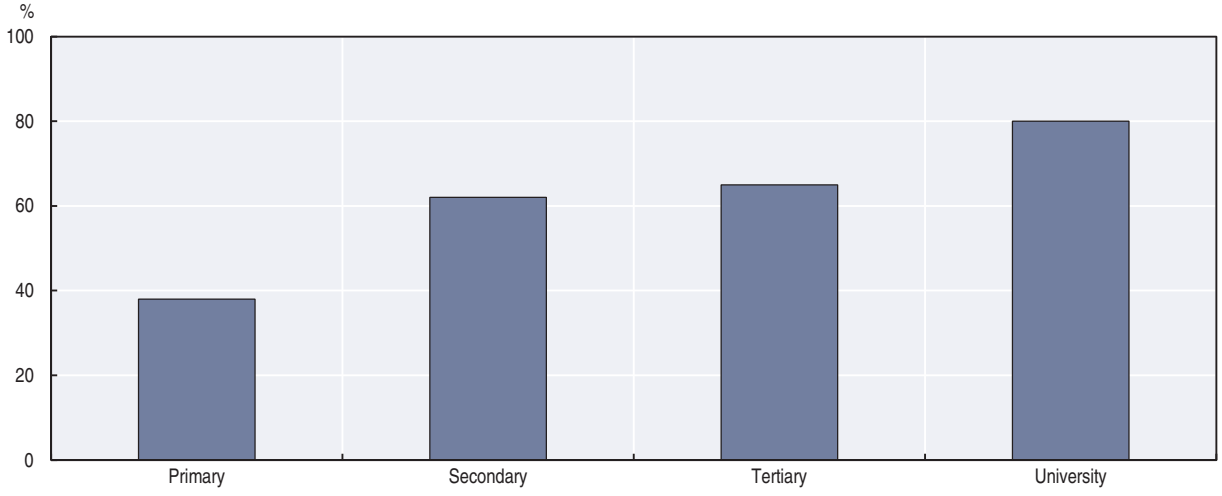
This section offers examples of the data available for policy makers on the digital economy and on assessing the situation in the LAC region. It is followed by a section examining specific policies and best practices around the region.

State of connectivity

Connecting schools has been a key policy goal for many governments, yet there is relatively little comparable information about the number of schools connected to high-speed broadband in the LAC region. However, the level of connectivity in schools varies considerably between primary, secondary and tertiary institutions. Among countries responding to the OECD/Inter-American Development Bank (IDB) survey, primary schools were the least likely to have an Internet connection, while levels of connectivity increased through secondary, tertiary and university levels (Figure 9.3). The low level of connectivity among reporting primary schools indicates that many children may be subject to digital divides in access, potentially putting them at a disadvantage in developing digital skills.

Figure 9.3. **LAC schools with an Internet connection**

Percentage of schools, by grade, 2015



Note: Includes a relatively small sample of countries that reported data throughout the region. The results should therefore be considered only as broad trends.

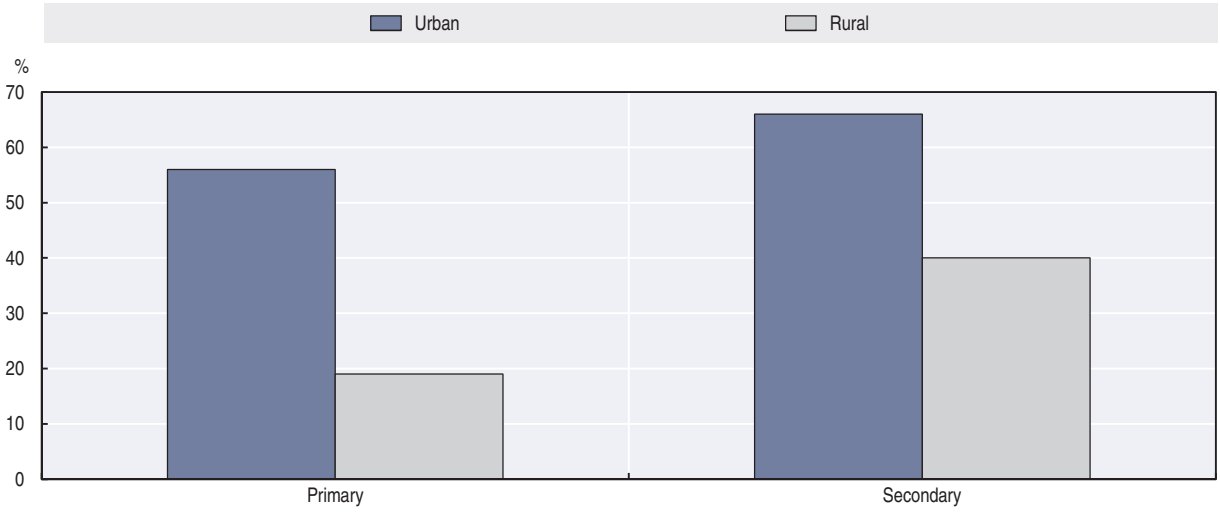
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There is also a significant connectivity gap between schools in rural and in urban areas. Urban primary schools are more than twice as likely to have an Internet connection than rural schools (Figure 9.4). The gap narrows slightly for secondary schools, but is still pronounced. In some cases, these gaps are linked to a lack of electricity, but they represent an important hurdle for policy makers working to advance a digital economy agenda.

A power source is needed to provide electricity to desktops, run equipment and charge portable devices. Schools without a stable electricity supply face additional challenges in adopting technology during classroom instruction. The United Nations Educational, Scientific and Cultural Organization (UNESCO) produces data on the number of educational institutions with electricity. Over half the countries in the region are fully powered, while others struggle to provide electricity to primary and secondary schools (Figure 9.5).

Figure 9.4. **LAC schools with an Internet connection**

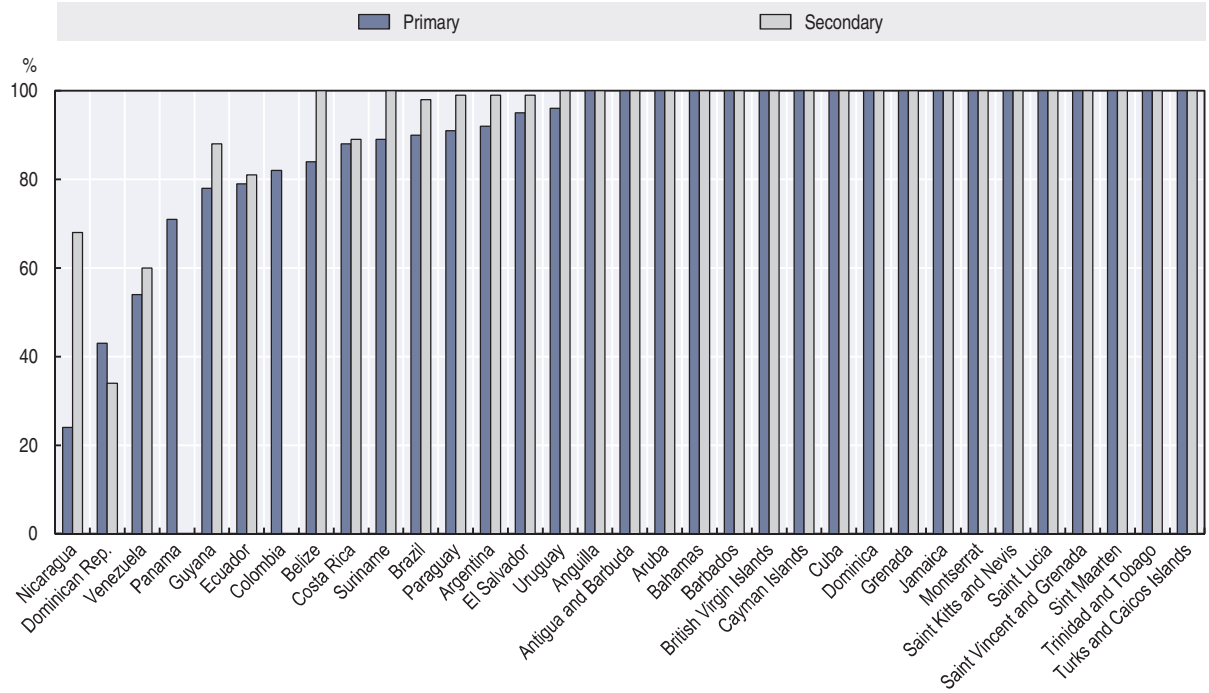
Percentage of schools, by urbanisation, 2015



Note: Includes a relatively small sample of countries that reported data throughout the region. The results should therefore be considered only as broad trends.

StatLink http://dx.doi.org/10.1787/888933354391

Figure 9.5. **Proportion of educational institutions with electricity (2010)**



Source: UNESCO (2012), *ICT in Education in Latin America and the Caribbean – A Regional Analysis of ICT integration and e-readiness*, *www.uis.unesco.org/Communication/Documents/ict-regional-survey-lac-2012-en.pdf*.

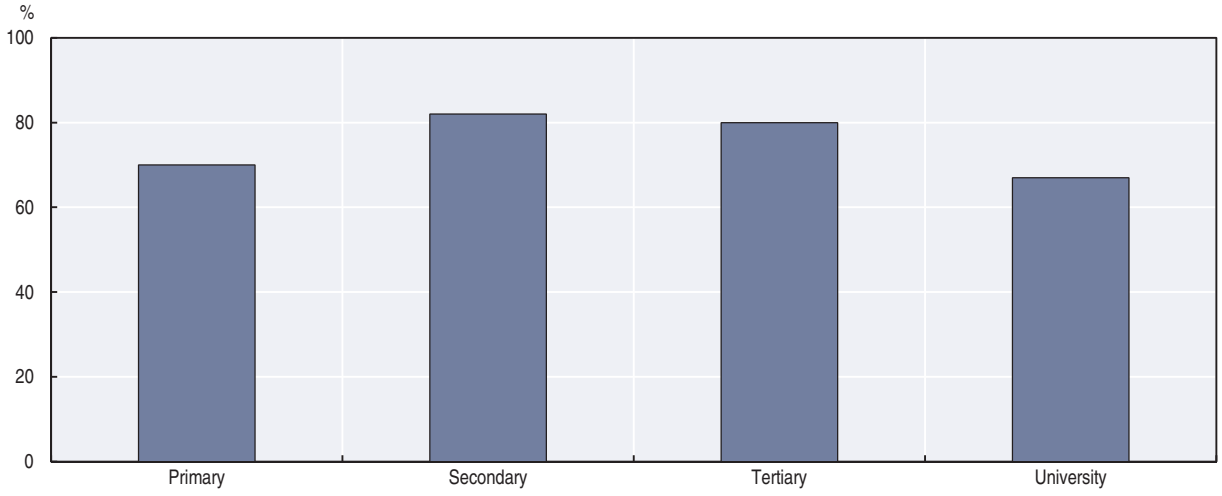
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Policy makers are keenly aware of the need to connect schools in rural areas. Nearly 87% of countries in the region have a plan or initiative to connect schools in those countries. The data on connected schools shows that the process is still under way and that more needs to be done. The targets of these plans range from connecting primary schools up through universities, but secondary and tertiary institutions are receiving slightly more attention from policy makers in the region (Figure 9.6).

On the whole, primary schools are the least likely to be connected, and yet still receive less attention than secondary and tertiary institutions in policy initiatives to introduce Internet access.

Figure 9.6. **LAC governments with a plan/initiative to connect schools**

Percentage, by type of school, 2015



Note: Includes a relatively small sample of countries that reported data throughout the region. The results should therefore be considered only as broad trends.

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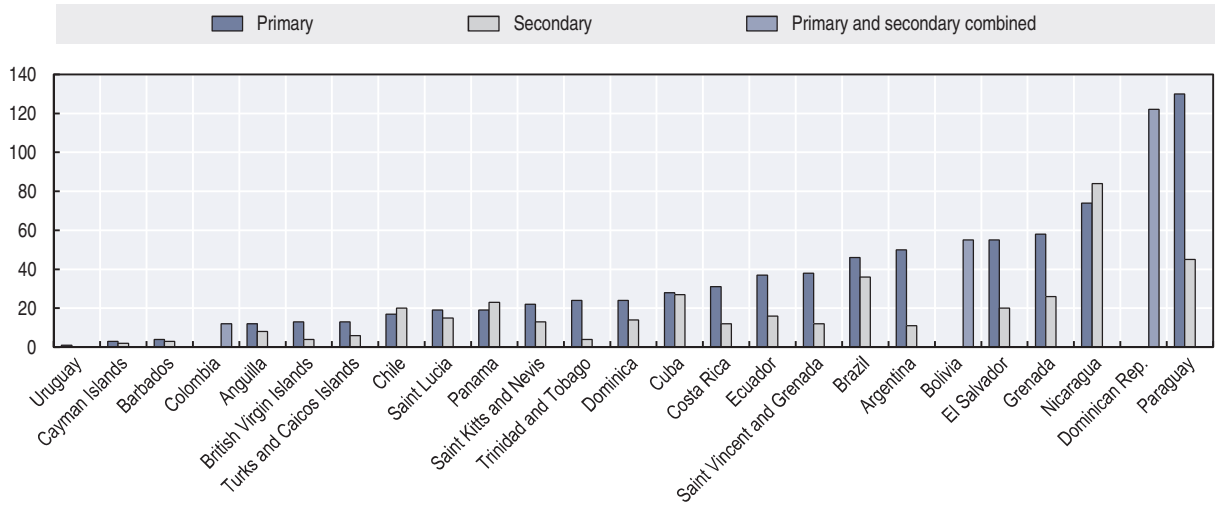
In terms of hardware, UNESCO data shows that the learners-to-computer ratio varies significantly across the region, from Uruguay with a 1-to-1 ratio, rising to more than 100 students per computer in several countries (Figure 9.7).

State of developing skills

While some countries, such as the Dominican Republic and Costa Rica, have promoted ICT skills, the majority of countries in the LAC region appear to be active proponents of e-learning. A high percentage of countries (92%) reports having an initiative to promote e-learning or tele-learning in the country (Figure 9.8). One key element of these policies is to make classroom content available online for wider dissemination. Roughly 86% of countries report policies to create and disseminate content to the general public.

A lower proportion of countries have implemented e-learning projects to train teachers how to integrate digital learning in the curriculum. These include Brazil, Colombia and Costa Rica. By contrast, roughly 20% of countries report that they have no plans in place to provide teachers with digital skills.

Figure 9.7. **Learners-to-computer ratio in primary and secondary education (2010)**



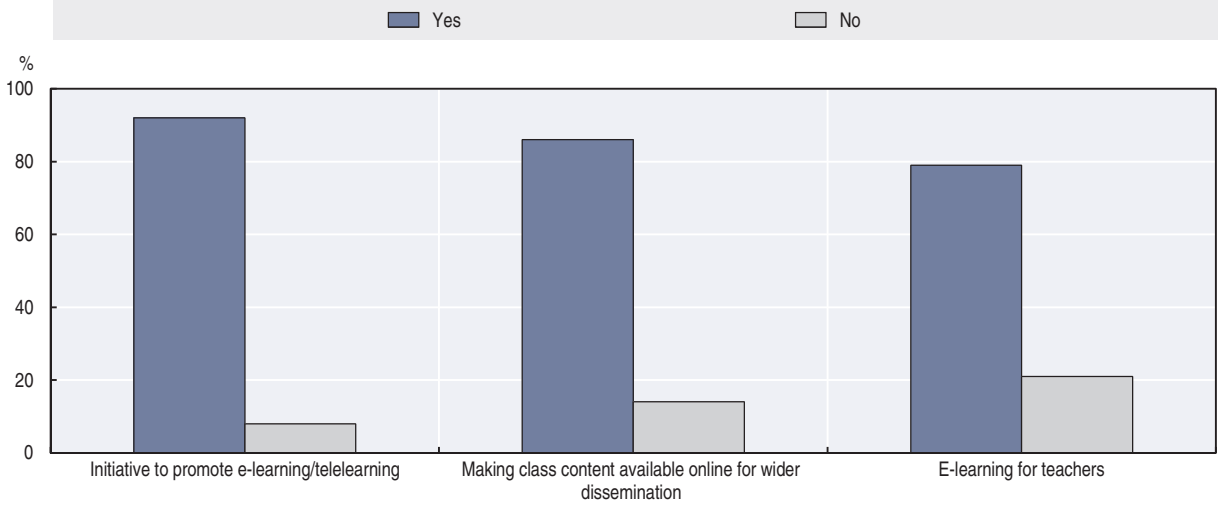
Notes: In Argentina, Barbados, the Plurinational State of Bolivia (herafter "Bolivia"), Chile, El Salvador, Trinidad and Tobago, and Uruguay, data are for 2009. In Anguilla, secondary education data reflect the public sector only. In the Dominican Republic, Nicaragua, St. Lucia, and Trinidad and Tobago, primary- and secondary-level data reflect the public sector only. In Uruguay, secondary-level data are missing. In Turks and Caicos, primary-level data include the lower secondary level.

Source: UNESCO (2012), *ICT in Education in Latin America and the Caribbean – A Regional Analysis of ICT integration and e-readiness*, *www.uis.unesco.org/Communication/Documents/ict-regional-survey-lac-2012-en.pdf*.

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Figure 9.8. **LAC government projects to promote e-learning**

Percentage, 2015

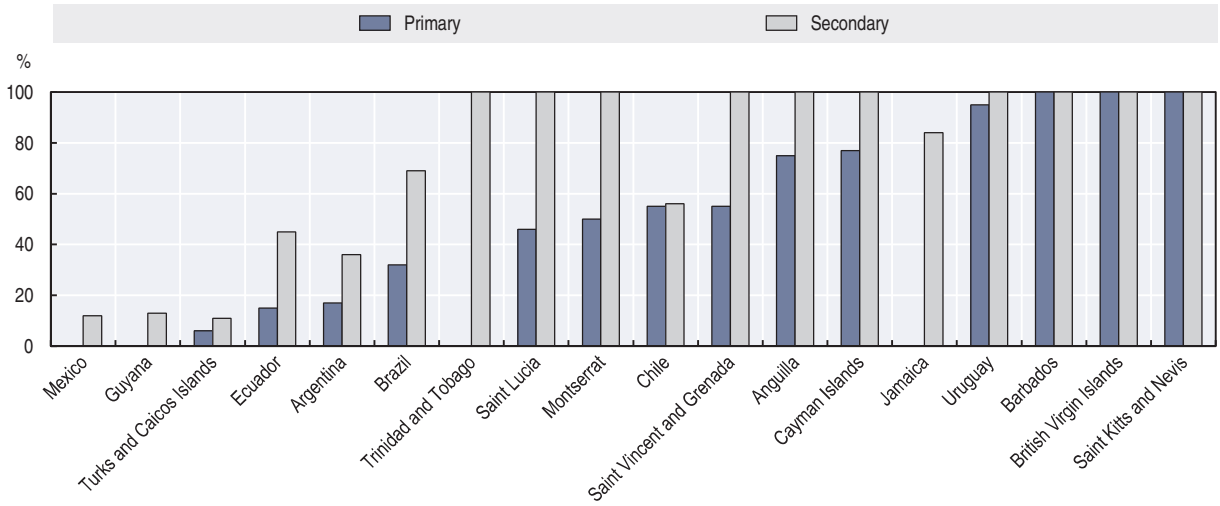


Note: Includes a relatively small sample of countries that reported data throughout the region. The results should therefore be considered only as broad trends.

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Online learning uses the Internet to deliver educational materials to students. These can be in the form of text-based or multimedia resources delivered over an Internet connection. UNESCO data show a significant variation among countries in terms of educational institutions with Internet-assisted instruction (Figure 9.9).

Figure 9.9. **Proportion of educational institutions with Internet-assisted instruction in LAC (2010)**



Notes: Data for Barbados and Trinidad and Tobago reflect public educational institutions only. For Jamaica, data reflect ISCED 3 level in public institutions only. For Guyana, data reflect ISCED 2 level in public institutions only. For Argentina, Chile, Montserrat, Suriname, Trinidad and Tobago, and Uruguay, data are for 2009.

Source: UNESCO (2012), *ICT in Education in Latin America and the Caribbean – A Regional Analysis of ICT integration and e-readiness*, *www.uis.unesco.org/Communication/Documents/ict-regional-survey-lac-2012-en.pdf*.

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State of measurement

ICT jobs account for up to 6% of total employment in OECD countries, and the percentage is growing. Accurate data on demand for ICT workers helps policy makers target specific markets or segments of the population. In 2015, only 43% of respondents in the LAC area reported gathering information on ICT jobs in the economy. In a related area, only about half of countries gather data about job matching and job search.

Despite the high number of countries reporting initiatives to promote e-learning, less than a quarter have a survey in place to gather data on e-learning adoption and use. As a result, countries lack the means to assess the level of success of e-learning programmes. In the LAC area, the Centre for Studies on the Development of the Information Society (Cetic.br) is a reference centre for the production of indicators and statistics on the use of ICTs in Brazil. Cetic.br has been conducting national surveys on ICT use in schools since 2010 and leading ICT measurement partnerships in the whole LAC region as an official UNESCO centre since 2012 (Nic.br/Cetic.br, 2011).

Countries in the LAC region could benefit from the participation in regional and international surveys of competences measuring digital literacies and ICT skills, such as the OECD's PISA and PIAAC study. These international studies could also illuminate the discussion of the influence of ICT adoption on learning outcomes and shed light on the use of digital skills across the economy. Last but not least, important measurement efforts should be directed towards assessing the impact of the Internet on job creation/destruction in the country, with a special attention to the sharing economy.

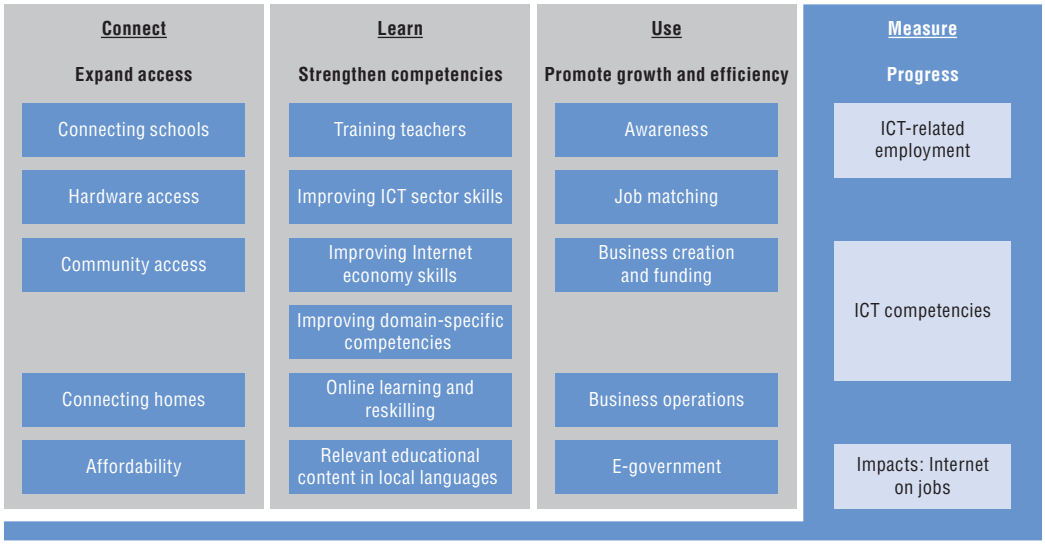
Good practices for the LAC region

As mentioned earlier, the evolving digital economy requires a comprehensive approach that focuses on expanding connectivity, encouraging learning and promoting the use of digital skills, while measuring progress. The growth of the digital economy will require updated and new skills from most workers. People, as well as governments, will have to prepare and position themselves with the appropriate skills for the opportunities being created.

First, it is important that policy makers develop a comprehensive strategy to address issues related to skills and jobs in the digital economy. The OECD Skills Strategy (OECD, 2012c) provides a systematic framework that helps countries identify the strengths and weaknesses of their national skills systems, to benchmark them internationally and to develop policies that can transform better skills into better jobs, encouraging economic growth and social inclusion.

The OECD Skills Strategy provides a framework for developing, activating and putting skills to use. This chapter adds to this framework the elements of expanding networks to institutions and measuring progress. Four categories are identified as being crucial for public policy action: connect, learn, use and measure (Figure 9.10). This section provides examples of good practices to assist LAC countries with the development of skills and jobs in the digital economy.

Figure 9.10. **Policy innovation in the digital economy for new and better jobs**



Connect

Improving connectivity is a fundamental step for making sure that the economic benefits of the Internet are within the reach of individuals, businesses and government. Key among connectivity goals are often targets to extending broadband access to tertiary, secondary and primary schools throughout the country. In some cases, these connected schools are the first to go online in the entire community and become an "anchor" tenant, supporting the expansion of future commercial products and boosting the acquisition of digital skills by the population.

Across Latin America and the Caribbean, connectivity varies considerably, both across countries in the region and between rural and urban areas. Some countries, such as

Brazil, have had significant success connecting schools across the country, with an overall penetration rate of over 95%. Other countries face a significant challenge bridging the connectivity gap between rural and urban areas. Peru, for example, has connected 56% of urban primary schools, but only 6% of rural schools. Primary schools are less likely to be connected than secondary and tertiary institutions. Bolivia, Suriname, Trinidad and Tobago, and Uruguay have reached near universal connectivity for tertiary schools. Several initiatives throughout the LAC region focus on extending broadband connectivity to schools (Box 9.1).

Box 9.1. **Initiatives in LAC for extending broadband connectivity to schools**

Costa Rica has been successful in extending Internet connectivity to over 95% of its schools, though many connections were initially slower than 2 megabits per second. Another challenge was that some connected schools only had Internet connectivity to the front office. In 2013, the Ministry of Public Education (MEP) and the Omar Dengo Foundation (FOD) launched an initiative to connect schools with a fibre-optic network and then share connections throughout the schools using wireless technology (MEP, 2013).

Peru has a national education project for 2021 that aims to equalise learning opportunities and resources for students across the entire country. Every school needs to have fundamental learning elements that include services such as water and electricity, as well as educational materials, a library and Internet connectivity (CNE, 2006). Peru is building a National Fibre-Optic Backbone, through a public-private partnership (PPP) project, which aims to expand broadband to almost all the country. Primary and secondary schools in the digital inclusion project will be the first beneficiaries.

Nicaragua has worked with partners to launch a pilot project connecting five remote schools to the Internet as a way to introduce connectivity into the community. The schools in rural areas often serve a dual purpose as a community access centre. The schools were connected by a range of wireless technologies (microwave, 3G wireless and satellite) and used donated computers and connectivity.

Brazil has a programme to reach schools by first connecting municipalities with high-speed fibre-optic networks that can extend connectivity to local schools. In 2013, the digital cities project (*Cidades Digital*) selected 262 municipalities, each with a population of up to 50 000 inhabitants, to expand connectivity (MC, 2016). In addition, Brazil included provisions in the auctions for the 450 megahertz and 2.5 gigahertz frequencies that required winners to connect any schools located within 30 kilometres of the municipality (MC, 2015).

1. *www.mc.gov.br/cidades-digitail.*

Connecting a school to the Internet requires **basic infrastructure** such as electricity that can present a challenge in rural and remote areas. Electrification projects are also an important opportunity to install wired telecommunication infrastructure, preferably fibre-optic networks.

In addition to broadband connections, communities need access to **hardware**, such as computers or tablets and routers/networking equipment that can effectively use and share a broadband connection throughout a school or access centre. The initial Internet access may have been supplied in one place within a school (often the front office), but a significant amount of networking may be necessary to reach all the classrooms in larger schools. This internal networking often requires both additional funding and expertise to install. In other cases, schools had a computer in a classroom, or a dedicated lab students could use on a rotating basis. The costs of outfitting a computer lab and keeping it updated are a significant challenge for many schools. These investments have shown some positive

payoffs in terms of digital skills. IDB research suggests that adding just one more computer per 40 students in Peru was associated with a large increase in the students' digital skills (Bet, Cristia and Ibarrarán, 2014).

One approach to the problem was making inexpensive laptops available to students. Partnerships between foundations and the One Laptop Per Child (One Laptop, 2015) initiative provided primary school children with an inexpensive but rugged laptop they could use at school and take back home in the evenings. In countries such as Nicaragua, foundations have distributed over 30 000 laptops to over 104 schools (One Laptop, 2013a, 2013b).

Evidence of the effectiveness of these programmes is mixed at best. Finding from a Randomized Controlled Trial experiment in Peru (Beuermann et al., 2015) showed that, despite an increased familiarity with the computer, the intervention had few effects in the short run. No significant differences between the treatment and control group were found in academic achievement in mathematics and science and in cognitive skills, and in some cases, teachers observed students exerting lower levels of academic effort. In another experiment, Bet, Cristia and Ibarrarán (2014) found that introducing students to computers led to improved general cognitive skills, verbal fluency and coding skills. However, the programme did not show significant effects on enrolment and test scores. Another randomised experiment in Ecuador found that providing computer-aided instruction in mathematics to students in primary school had a positive effect on mathematic test scores (Carrillo, Onofa and Ponce, 2011). Some projects across the region focus on providing computers for Internet access (Box 9.2).

Box 9.2. **Providing computers for Internet access in LAC**

Mexico has a federal programme, Mi Compu.mx, that provides computers for learning at school and at home. The programme takes a novel approach to bridging the digital divide, devoting part of the resources on computers for school-aged children, and part to adult learning by other members of the household. The content is pre-loaded on the computer, and can be used either online or without an Internet connection.

Argentina's federal programme *Conectar Igualdad* aims to provide a laptop to all students and teachers (ANSES, 2013).

Uruguay has a programme funded by the Inter-American Development Bank (IDB) to provide computer access to all students in the country. The IDB team also focused on training teachers/staff, strengthening the educational components of the plan, improving monitoring activities to better gauge outcomes, and extending the use of computers to the broader society, particularly in low-income areas (IDB, 2015).

The Bahamas has benefitted from the IDB programme for Investing in Students and Programmes for the Innovative Reform of Education (INSPIRE). In 2014, all 78 public high schools were equipped with computer labs and Promethean boards. The IDB's two-part strategy matched infrastructure investment with teacher training on using these technologies in the classroom (IDB, 2016).

1. *www.conectarigualdad.gob.ar/seccion/directivos-4*.

In some countries, the target of providing hardware to school-aged children has shifted to inexpensive mobile tablets. Colombia has been a pioneer in this area, as part of its Computers for Education programme that focuses on bringing ICTs and ICT education to schools in rural and remote areas. The programme aims to i) equip all public education institutions with terminals (PCs, laptops, tablets) to achieve a ratio of 12 students per computer; ii) train teachers how to integrate ICTs in their course work and pedagogics; iii) train parents; and iv) recycle old terminals (OECD, 2014b).

Mobile smartphones may also become an important hardware platform for education. Studies have found that mobile learning can significantly reduce barriers to education, attaining educational outcomes comparable to traditional educational methods (Valk Rashid and Elder, 2010). However, mobile phones have small screens, a lack of properly formatted content, less-than-robust software and costs comparable to other hardware platforms'.

Too often, advocates for education technology have extolled its benefits without recognising that technology alone will not transform education. Initiatives such as the One Laptop per Child clearly illustrate that technology needs to be guided by expert teachers and pedagogical leaders to be used effectively in the classroom. A failure to address teacher training in ICTs and the need for new pedagogical models need to be overcome before the benefits of technology in education can be fully realised.

In OECD countries, **schools, governments' offices and hospitals** were often the first connections installed in remote communities and served as the first community access centres. These served as anchor tenants and aggregated the initial demand for a broadband connection in that area. Once network edges reached the community, it was much easier to provide commercial and residential service.

Installing connectivity in **community centres** is one way to ensure that basic connectivity is available to as broad a segment of the population as possible. Community access centres also serve another critical role; they provide a physical space to give people their first exposure to the Internet and obtain help getting online from other people in the community. These initial experiences can prepare the way for a richer online experience once advanced services become widely available. Some of the best-connected countries in the world, such as Korea, began expanding connectivity by installing public computers with Internet access in municipal government offices. The LAC region has a number of examples of community access programmes (Box 9.3).

Box 9.3. **Community access projects in LAC**

Costa Rica's CECI project provides community access centres across the country with computers and access to the Internet. They are staffed by government workers, university students, and volunteers. The next stages of the programme will train people in SMEs on how to use online government services (Costa Rica, 2015).

The government in the **Dominican Republic** has installed community access centres in shopping areas where they will be close to students and the community. These classrooms offer free Internet access, newspapers, magazines and even books that can be checked out. It is notable that the centres also have audio books, a reading room, a playground, puzzles, chess and various other board games. The goal is to introduce digital access in centres that offer a broad range of community services (CTC, 2015).

Brazil has 7 755 telecentres throughout the country that offer free Internet access. These also act as a gathering place for culture and leisure. They were installed through a partnership between ministries, municipalities and the agencies responsible for administering them. Brazil's Assistance to Citizens Service (GESAC) also offers Internet connections free for telecentres, schools, medical facilities and indigenous communities in areas of social vulnerability. About 29 000 such centres have been set up throughout the country under the programme.

Mexico has an extensive programme, *México Conectado*, offering connectivity in community access centres. An online database maps access points by geography, or the type of type of centre offering the access (e.g. health clinics, schools, government offices, or public spaces).

The role of community access centres has evolved in the smartphone era. Expensive computers are no longer barriers to Internet access as inexpensive smartphones and affordable data plans become more available. Yet, the support community and learning potential of community access centres are still important as more of the economy moves online. As a result, community access centres can be an important component of teaching online skills and providing broadband access to a community.

The digital skills necessary for the new economy cannot be learned effectively only at schools. It is important that people have **access to the Internet** on devices in the places where they live. The PISA study finds a hill-shaped relationship between the uses of computers at home for leisure and digital reading performance. Moderate users tend to perform better than both intensive users and rare users. In contrast, computer use at school may be better than no use at all, but levels of computer use above the current OECD average are associated with significantly poorer results (OECD, 2015b).

These data on connections from home are from developed countries, but connectivity and computer access is much lower in many parts of the world. These data can still provide an important lesson for policy. Governments focusing on ICT skills may need to broaden their policies beyond simply serving community locations such as schools, and include elements that introduce connectivity at home as well.

A lack of affordable Internet access for individuals will slow the adoption of digital services and development of digital skills that could be used throughout the economy. As the PISA data show, Internet access plays an important role in developing digital skills, so efforts to make access more affordable will have an effect on the skill level of users across the economy. As shown in Chapter 6 on affordability, governments are taking steps to make access affordable through policies such as ensuring effective competition. This benefits not just the users, but the economy at large.

Skills development

Once networks and hardware are in place, they can be used as tools for learning and skills development. In the past, much of the emphasis was placed on connecting schools, and less attention devoted to building digital skills. Evidence suggests that infrastructure investments are necessary but not sufficient conditions for promoting digital skills and learning. Hardware needs to be complemented with content, teacher training and guidance on pedagogical uses (Arias Ortiz and Cristia, 2014). Recent OECD work shows that schools have yet to take advantage of the potential of technology in the classroom to tackle the digital divide and give every student the skills needed in today's connected world (OECD, 2015b).

At the most basic level, people should be comfortable using a computer, tablet or mobile phone and understand how to perform basic tasks, such as watching a video or searching for information. At the other end of the spectrum, ICT specialists often need specialised and evolving skills.

Internet economy skills are broader than ICT specialist skills and represent the **skills people need to interact in the digital economy**. In 1998, the IDB noted, "technological fluency may stand alongside reading and mathematics as one of the essential skills for a successful life" (Wolff et al., 1998). While most users need not be specialists, they must have the skills to use digitally supported services such as downloading and running apps on a smartphone and searching for information online. This also includes the ability to use e-mail, spreadsheets, word processors and conduct transactions online. The OECD finds that these skills are often linked to personal attitudes, cultural attributes and experiences that shape the level

of generic skills in the economy (OECD, 2014c). Governments in the LAC region have taken steps to help increase basic skills for interacting with the Internet throughout the economy as a way to build a baseline of skills (Box 9.4).

Box 9.4. **Initiatives in the LAC region for enhancing skills**

In 2012, **Peru** passed the National Digital Literacy Plan, which seeks to train every citizen in the use of computer tools and mobile devices. In addition, Peru made 107 online courses available to teachers online as part of the Educate Peru Programme. Eight of these courses focus on developing digital skills incorporating ICTs in the classroom. Over 25 000 teachers have received training online, with 2 000 taking courses on integrating ICTs in the classroom (Perueduca, n.d.).

Uruguay has a broadcast television programme, *Ceibal Channel*, that teaches a course about computers that can be applied to different schooling levels. The programmes are broadcast over local television channels and available online so students and the public have permanent access.

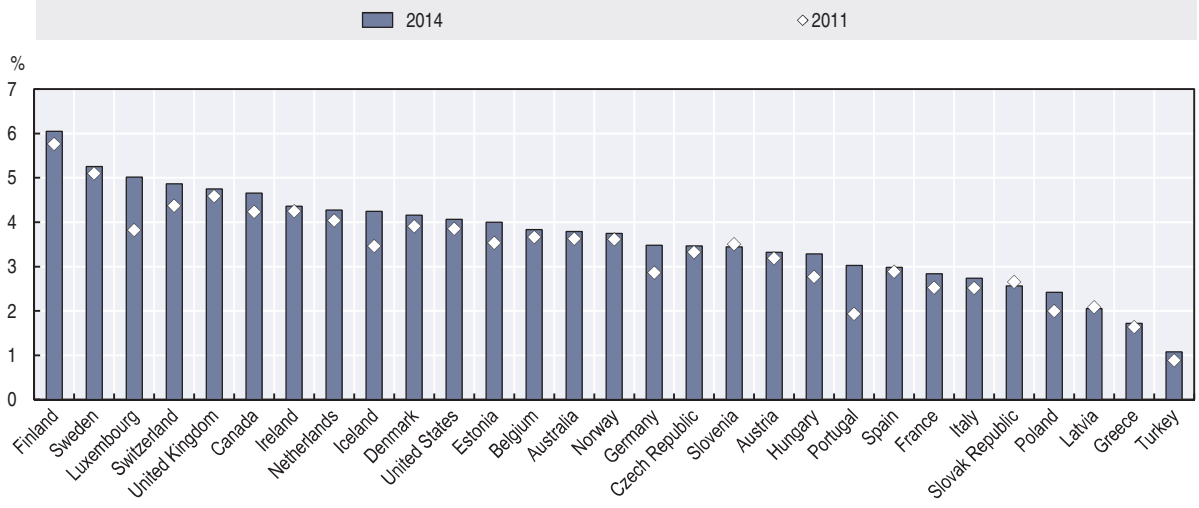
Costa Rica's state universities offer ICT training courses for the general population, particularly its vulnerable segments (e.g. the elderly and disabled). Examples include the National University's Informatics Assistance and Training Institute (ICAI) (ICAI, 2013), the National Technical University's Centre for Communication and Information Technologies (CETICS)[1] and Costa Rica University's Integral Programme for the Elderly (UCR, 2016).

Trinidad and Tobago has a National Training Agency that offers jobs search and career coaching services, including ICT training (NTATT, 2016).

1. *http://extension.utn.ac.cr/.*

Demand is growing for **ICT specialists** with skills in telecommunications networking, databases and app development. These specialised skills are in demand across all sectors of the economy. In developed countries, ICT specialists typically account for between 1% and 6% of total employment in OECD countries, and their percentage in total employment has grown over the past decade in most countries (Figure 9.11).

Figure 9.11. **Growth in ICT specialist jobs**



Source: OECD (2015a), *OECD Digital Economy Outlook 2015*, *http://dx.doi.org/10.1787/9789264232440-en.*

StatLink http://dx.doi.org/10.1787/888933354457

Some countries in the LAC region have developed policy initiatives to promote ICT specialist skills (Box 9.5). These programmes tend to fall under digital agendas (as discussed in Chapter 2) or national plans for education or innovation.

Box 9.5. **Public programmes in LAC to encourage ICT specialist skills**

Uruguay is developing a programme to train specialised technicians in the ICT area and in medical informatics that will be run from the Technological University of Uruguay. The programme is part of the Digital Agenda of Uruguay 2011-2015.

Brazil's "Science without Borders" programme aims to increase Brazilian competitiveness by sponsoring graduate studies and research abroad for Brazilians and also supporting foreign researchers who come to do research in Brazil in priority subjects. The programme helps train ICT specialists and brings workers into the economy. Brazil has also developed an initiative under the "*TI Maior*" Strategic Programme for Software and IT Services, *Brasil Mais TI*, intended to develop ICT skills by providing online courses and job postings. In three years, the initiative has trained more than 208 000 young people in courses ranging from 16 to 380 hours.

In **Peru**, PRONABEC (the public agency in charge of granting scholarships) through its BECA 18 (Social Scholarship Programme) sponsors the studies of graduate and college students for ICT-related careers in national universities and abroad. The National Council for Science and Technology (CONCYTEC) finances postgraduate studies and research in ICT.

Colombia's ICT Ministry leads the "Transversal Skills Development" programme and funds training programmes to develop soft skills for professionals linked to the IT industry.

Adapting skills should also include targeted actions for **domain-specific ICT skills** linked to an industry or enterprise. This can include specific software for a sector (e.g. computer aided design, or CAD) or software specific to a role in an office environment (e.g. SAP). These skills are commonly learned on the job or via work-sponsored training. Policy makers in the LAC region have also established policies to encourage these specific ICT skills (Box 9.6).

Box 9.6. **Building domain-specific ICT skills in the LAC region**

Brazil's *Banco Nacional do Desenvolvimento* **(***National Development Bank* or BNDES) programme supports training and professional qualifications for workers. The government provides tax incentives to firms that provide software training for their employees (BNDES, 2012).

Chile provides tax credits for firms that invest in on-the-job or industry training for their employees. The goal of the credit is to promote job skills and train more people in IT skills.[1] Another programme, *ChileValora*, provides certification for labour skills, regardless of the means by which an individual obtained the skill set (e.g. formal education, individual learning, online courses). The programme has 753 unique occupational profiles that apply to different industries and sectors, including IT (Chile Valora, 2014).

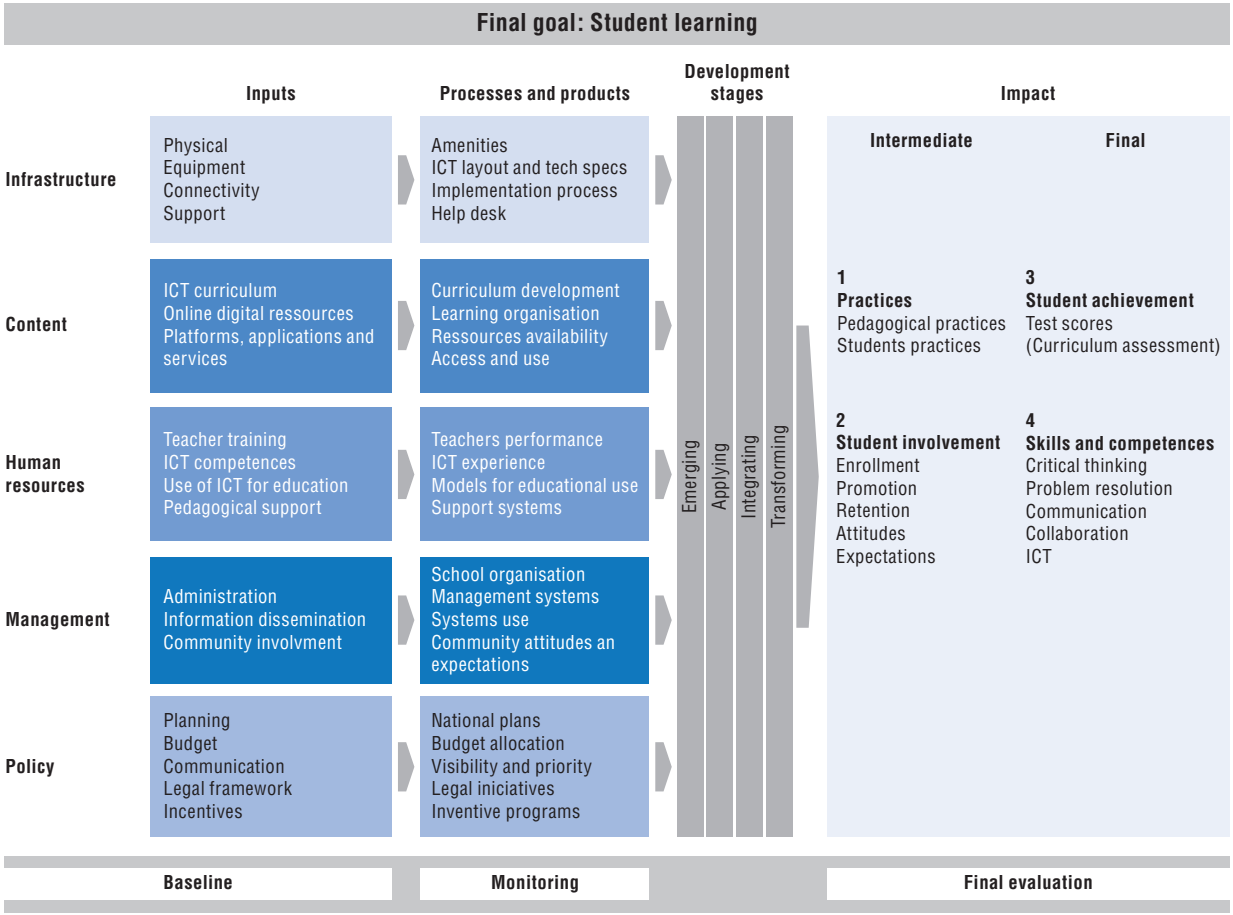
1. *www.sence.cl/portal/*.

Finally, developing **teachers' skills** is a crucial part of any ICT skill development strategy. Teachers can integrate technology into the subjects they teach as a way to improve the digital skills of students. If they lack ICT training and skills, an opportunity is lost to improve students' skills.

IDB research has shown that integrating ICT in instruction depends on teachers' belief in the usefulness of technology and their level of confidence using computers. This provides additional support for incorporating ICT teacher training in education policy. It also suggests that such training should address not only ICT mastery, but also teachers' readiness for the pedagogical integration of technology (Hinostroza, 2011). Successful ICT countries, such as Korea, have also made training teachers in ICT skills a top priority (Severin and Capota, 2011).

Teachers and administrators can then apply one of the recommended frameworks for integrating ICTs into the classroom. The IDB has developed a conceptual framework for ICTs in education that maps out student learning from inputs, processes and products through to their effects (Figure 9.12).

Figure 9.12. **IDB conceptual framework for using ICTs in education**



Source: Severin (2010), *Projects for the Use of Information and Communication Technologies in Education: Conceptual Framework*, *https://publications.iadb.org/handle/11319/3468?locale-attribute=en*.

UNESCO has also developed a framework for teachers that sets out the competencies required to teach ICTs effectively by focusing on technology literacy, knowledge deepening and knowledge creation (Table 9.1) (UNESCO, 2011). The framework starts with basic technological literacy and progresses to a state where users are actually creating content for others.

Table 9.1. **UNESCO ICT Competency Framework for Teachers**

Technology literacy	Knowledge enrichment	Knowledge creation
Increasing the extent to which new technology is used by students, citizens and the workforce, by incorporating technology skills into the school curriculum.	Increasing the ability of students, citizens and the workforce to use knowledge to add value to society and the economy, applying it to solve complex real-world problems.	Increasing the ability of students, citizens and the workforce to innovate, produce new knowledge and benefit from this new knowledge.

Source: UNESCO (2011), *ICT Competency framework for teachers*, *unesdoc.unesco.org/images/0021/002134/213475e.pdf*.

Initiatives to encourage ICT competences for teachers should be supported by national plans aiming to strengthen teaching skills throughout the country. Some governments in the LAC region have launched such initiatives (Box 9.7). Teachers should be involved in their design and implementation, and the targets of these initiatives should also be routinely evaluated.

Box 9.7. **Training teachers with ICT skills in LAC**

In **Costa Rica**, the Ministry of Public Education created a virtual training campus targeting teachers and public servants. It offers virtual and bimodal training to strengthen teaching throughout the country.[1] There is also a training platform for teachers, which helps them to integrate technology in their classrooms. The creators of the platform understood that it could be leveraged across countries in the region as well as just in the home. The result is a platform serving an educational community throughout Central America and the Dominican Republic, CEDUC@R (CEDUC@R, 2016).

In **Peru**, the Ministry of Education developed and published digital resources for teaching through the platform PerúEduca.[2]

Chile has a platform that provides digital mathematics and English resources to teachers and schools. The content includes training for teachers on how to install and use the platform in schools.[3]

Colombia is implementing a training programme for teachers and guidance counsellors of basic and secondary institutions, to disseminate information on the dynamics of the IT industry, starting with basic IT concepts. In 2014, this reached 3 526 people. The strategy will continue until 2017, and is aiming to reach 25 000 teachers and counsellors.

1. *www.capacitacion.mep.go.cr/*.
2. *www.perueduca.pe/recursos*.
3. *www.enlaces.cl/index.php?t=44&i=2&cc=2372&tm=2*.

Once users have sufficient skills to get online, they will need rich **content** that is accessible in local languages and with a local context. The content that is most important to people is typically in their own language and relevant to the communities in which they live and work. OECD research shows a strong correlation between the development of network infrastructure and the growth of local content, even after controlling for economic and demographic factors (OECD, ISOC and UNESCO, 2013).

Universities have been making more of their rich content available for free online in collaborations such as "The Open Education Consortium".[5] Online video distribution sites such as YouTube and DailyMotion have also become an important repository of nontraditional, specialised learning, but the content is often in English. Efforts are under way to translate the content (such as the Khan Academy's)[6] into languages such as Spanish, but the process takes time and funding. Even when content is in a locally spoken language, the context may be different for geographical or other reasons.

Governments have various policies to promote the development and use of online and digital content. One example is Haiti's "Library for All", a digital library platform that provides e-books to students via an app on inexpensive tablets. The programme provides over 500 books in Haitian Creole, English, French and Spanish in a format that is easily searchable, device-agnostic and works offline if necessary. During the pilot project, the books in Haitian Creole proved the most popular with readers (Library for all, 2015).

Local "master teachers" also have an important role to play in teaching concepts to the broader public. Governments can help identify educators with exceptional teaching skills and provide resources and support to make their lessons available online. Teachers can play an important role in creating local and digital content tailored to national or regional needs. Online platforms are increasingly being used for these purposes, both as resources that facilitate content and application creation, and for networking with other educators (Box 9.8). Other aspects of policies to increase local content are discussed in Chapter 10.

Box 9.8. **Teaching programming online platforms**

Scratch[1] is a free tool developed by MIT's Media Lab to help students aged 8-16 learn computer programming. Students can programme interactive stories, games and animations and share their creations with the online community. Scratch is used in more than 150 different countries and is available in more than 40 languages. Educators in Peru are using it to teach programming skills to primary and secondary school students.

MIT's **App Inventor**[2] is another free tool for learning programming. It is a blocks-based programming tool that enables people to learn programming and build fully functional apps for Android devices. In 2015, nearly 3 million users in 195 countries had built more than 7 million Android apps. In any given week, more than 100 000 people use the platform.

1. *http://scratch.mit.edu*.
2. *http://appinventor.mit.edu/explore/about-us.html*.

Skills activation and effective use

Once networks are in place and people have the necessary skills, these skills must be activated and used. Activation policies encourage people to supply their skills to the labour market, particularly by reintegrating newly skilled workers outside the workforce, or retaining skilled workers. Policy should also focus on transitioning to efficient use of ICTs throughout the economy, which requires both specialist and general ICT skills. This section provides examples both promote both the activating and using skills.

The Internet has significantly reduced the transaction costs of **matching employers and employees**, through powerful search capabilities, the emergence of social networks and the Internet's global reach. It is now the foundation for the largest job/skills-matching platforms in the world and benefits users who have connectivity and a baseline level of digital skills.

Sites such as Monster,[7] Indeed,[8] and CareerBuilder[9] offer global employment-matching services. Sites such as CompuTrabajo[10] provide job matching to Spanish speakers in Latin America. In September 2015, it listed 320 000 jobs in 91 countries (CompuTrabajo, 2016). In other cases, specialised sites provide employment-matching services in specific fields such as technology (Dice),[11] tourism and hospitality (Turijobs)[12] or health (eMedCareers).[13]

Social networks have recently become powerful tools, making professional networking much easier and matching workers with job openings that require specific skills. Companies such as LinkedIn,[14] Viadeo,[15] and Xing,[16] geared towards professionals, offer networking services and job boards. These companies have started leveraging their large databases to help firms find employees with particular skills.

ICTs also have the potential to make a significant contribution in **enhancing and extending guidance career services**, particularly for young people completing their education and older adults in career transitions.

Many governments are taking steps to improve the **availability of labour market information**, in most cases by providing Internet-based portals for job ads and searches. In a few cases, governments provide lists of occupations and skills, and where shortages have been observed or are most likely to occur in the near future. In Canada, for example, the Labour Market Information (LMI) portal provides "detailed labour market information at the local or community level". This includes job and skill requirements, wages and salaries, as well as employment prospects by occupations and locations, allowing workers to better plan their career path and employers their recruitment (ESDC, 2014). As part of its services, the Canadian government also has a searchable job bank.[17] Some examples of such initiatives can also be found in the LAC region (Box 9.9).

Box 9.9. **Improving labour market information in LAC**

In **Chile**, the government runs an online portal called the National Employment Exchange (BNE),[1] a free site where companies publish job offers and workers can submit CVs for consideration. In addition to offering job matching, the BNE portal also contains links to programmes, training and career guidance.

Mexico has several programmes to link students, teachers and jobs. The "*Circuito conectados contigo*" portal ("Circuit connected to you") helps match companies with both students and teachers.[2] In 2013, the "*Total Uni*" portal launched to help high school students to connect to jobs in the market (Total Uni).[3]

In the **Dominican Republic**, the Ministry of Labour has a job portal that matches employers with potential workers. Candidates can register their information and apply to jobs. In September 2015, 11 000 businesses were listed on the platform and nearly 42 000 jobs posted.[4]

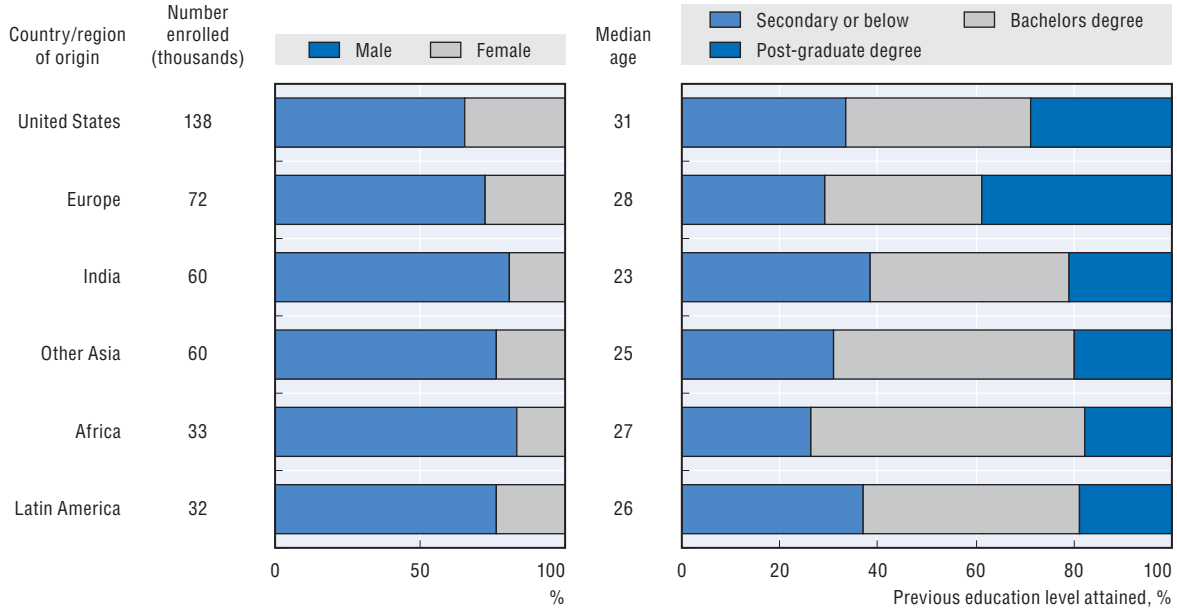
Brazil has a publicly certified platform for CVs managed by the National Centre of Scientific Research, the CNPQ (Lattes platform).[5] It is often used by university graduates. In September 2015, the site hosted nearly 1.2 million CVs.

1. *www.bne.cl*.
2. *www.sems.gob.mx/en_mx/sems/programa_circuito_conectados_contigo*.
3. *www.totaluni.com*.
4. *http://ovi.mt.gob.do/empleateya/home/*.
5. *http://lattes.cnpq.br/*.

Online learning offers a significant opportunity to leverage broadband network access to spread knowledge across the economy in a cost-effective way. Online learning can take many forms. It can be delivered as traditional university-style courses online, or as informal task training related to specific work skills or lifetime learning activities. It can increase the opportunities for people in the LAC countries to access relevant material, irrespective of its location in the region or around the world.

One example of broadband networks supporting online learning is the growth of massive open online courses (MOOCs) that allow students around the world to follow courses taught by instructors at well-known universities. MOOCs are academic courses offered online, often for free, that aim at large-scale interactive participation from around the world (Figure 9.13). The number of students signing up for these services and participating in parts of the courses is significant. The online course provider Coursera (coursera.org) had 10 million registered users in 2014 and edX (edx.org) 4 million. The majority of courses on both platforms are in English, but other languages such as Spanish are coming online.

Figure 9.13. **MOOCs from edX**



Notes: MOOCs : Massive open online course; data provided by edX : Harvard University and Massachusetts Institute of Technology. Student statistics, 2012-13 academic year.

Source: The Economist (2014), "The staid higher-education business is about to experience a welcome earthquake", *www.economist.com/news/briefing/21605899-staid-higher-education-business-about-experience-welcome-earthquake-digital*.

MOOCs can also be used to fill workplace training needs efficiently and provide alternative routes to training for employment for the unemployed. MOOCs have the potential to address many shortcomings of workforce training. First, they avoid the cost of setting up expensive training boot camps whose effects are limited in time. Second, semi-synchronicity allows learners to go through the materials at their own pace, while motivating them to collaborate on common learning objectives. Lastly, certificates allow employees to demonstrate the acquisition of specific skills (Meister, 2013). Internationally recognised badges and certifications may also help workers show their proficiency in certain programming skills.

Other new online services take a broader focus and offer courses on a wide range of work and life subjects. One example is SkillShare[18] which caters to learners looking for specific skills, which can range from promoting a business, making meals or interior design. One of the interesting aspects of SkillShare is that it allows people to propose their own courses to teach. Teachers can charge for their courses and SkillShare keeps 12% of revenues. Students from more than 150 countries use the service with active participation from the LAC region. A class in 2015 on drawing with ink attracted students from Argentina, Chile, Columbia, Mexico and Peru (Skillshare, 2015).

Conclusion

The expansion of broadband networks in the LAC region is often viewed as a source of potential new job growth, both in the ICT sector and as a catalyst for new business innovation across all other sectors of the economy. At the same time, it is clear that the Internet is forcing a significant reorganisation of businesses around the world, and this affects skills and labour demand and ultimately, employment. This evolving landscape of skills and jobs requires policy makers to develop a comprehensive, coherent approach to expand connectivity, encourage learning, activate digital skills and promote their use throughout their populations, all while measuring progress.

It is crucial that policy makers develop a comprehensive strategy to address the evolving issues needed for skills and jobs in the digital economy. Improving connectivity to community centres and schools is a first step. Individuals need access to hardware so they can effectively use a broadband connection, and to attain sufficient levels of digital literacy and specialist ICT skills. Finally, they need to use them proficiently in workplaces. Infrastructure investments are necessary but not sufficient conditions for promoting digital skills, and learning as hardware needs to be complemented with content, teacher training and guidance on pedagogical approaches.

Policy makers are beginning to realise that expert teachers and pedagogical leaders are needed if technology is to be used effectively in classrooms. Developing teachers' skills is a crucial part of any ICT skill development strategy.

Digital skills development is needed from the most basic levels to the acquisition of specialist ICT. Digital skills are not only learned in schools, but through computer use at home, so strategies should be comprehensive. Providing universal and affordable access to broadband is fundamental, but monitoring of school performance in relation to use of computer at home should also be carried out.

Many governments in the LAC region have improved the availability of labour market information, chiefly by providing Internet-based portals for job ads and searches. Online learning also presents a cost-effective way of leveraging broadband network access to spread knowledge throughout the economy. MOOCs can be used to target workplace training needs and provide alternative training for the unemployed.

Notes

1. Autor and Dorn (2013) and Autor, Levy and Murnane (2003) called this "routinisation" and find that within industries, occupations and education groups, computerisation is associated with reduced labour input of routine manual and routine cognitive tasks and increased labour input of nonroutine cognitive tasks. Service jobs that require cognitive and interpersonal skills are believed to be growing because it is more difficult for these jobs to be automated. The wages of these service-based jobs tend to rise relative to other low-skill occupations. This phenomenon is significant because it offers insight into the polarisation of employment and earnings in the United States and, potentially, other industrialised countries (Autor, Katz and Kearney, 2006; Goos and Manning, 2007). Recent work by the OECD on routinisation shows that technological innovation matters for employment across all levels of routinisation, and that ICT capabilities are positively correlated with employment levels in all groups of work except for those with high-routine occupations (Marcolin, L., S. Miroudot and M. Squicciarini, 2016).
2. According to the United Nations, there are approximately 156 million young people between age 15 and 29 in Latin America and the Caribbean, representing over one-quarter of the region's population.
3. PIAAC data across developed economies reveal that between 7% and 27% of adults have no experience in using computers or lack the most elementary computer skills, such as the ability to use a mouse. In addition, only 33% to 40% have the skills to succeed in a technology-rich environment

(OECD, 2012b). In OECD countries, only 6% of the population is categorised with the highest level of ICT skills, meaning that they can complete tasks involving multiple applications, a large number of steps, impasses and the discovery and use of *ad hoc* commands in a novel environment.

4. Young adults, those with tertiary levels of education, and those in skilled occupations are the most likely to have the ICT core competences and experience with computers.
5. *www.oeconsortium.org/*.
6. The Khan Academy provides an extensive set of short videos to teach educational concepts in subjects such as mathematics and science.
7. *www.monster.com*.
8. *www.indeed.com*.
9. *www.careerbuilder.com*.
10. *www.computrabajo.com*.
11. *www.dice.com*.
12. *www.turijobs.com*.
13. *www.emedcareers.com*.
14. *www.linkedin.com*.
15. *http://us.viadeo.com*.
16. *www.xing.com*.
17. *www.jobbank.gc.ca*.
18. *www.skillshare.com/*.

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Chapter 10

Business uptake, entrepreneurship and digital content

Most of the value of the Internet and the underlying infrastructure lies in the adoption and use of ICTs. This chapter describes how the Internet and ICTs support businesses, entrepreneurship and the development and distribution of local content. It examines the situation in the region and further presents a set of policy instruments that governments can use to promote ICT adoption, digital entrepreneurship and the production of local content. Overall, while some countries now have systematically included demand-side policies in their national digital agenda, more needs to be done to increase ICT adoption among firms, especially among small companies. This includes fostering entrepreneurial skills in LAC countries and promoting the development of content in the region that serves their needs.

Most of the value of the Internet and the underlying infrastructure lies in the adoption and use of information and communication technologies (ICTs). For this reason, this Toolkit has placed emphasis on broadband demand as well as supply. The uptake of the opportunities enabled by broadband is essential for achieving economic and social benefits (OECD 2015a), and for encouraging inclusive development in the Latin American and Caribbean (LAC) region.

Global value chains (GVCs) are increasingly managed digitally. Firms that are not connected to the Internet and do not use ICTs risk being excluded. This is why many countries are devoting increasing attention to demand-side policies. This means addressing the question of how to increase ICT adoption among companies and also, how to create digital content that serves the needs of firms operating in these countries, as well as the needs of citizens (OECD 2015a).

In the past, LAC countries have largely focused on supply-side policies and the deployment of broadband infrastructure, which is a necessary condition for the adoption and use of ICTs. More recently, however, several Latin American countries, such as Colombia, Brazil and Mexico, have increasingly focused on demand-side policies in their national digital strategies. At this stage, the region has overall lower ICT usage rates than the OECD area.

The objective of this chapter is to describe how the Internet and ICTs supports businesses, business development and entrepreneurship and to present a set of policy instruments that governments can use to promote ICT adoption and use. In particular, the chapter discusses:

- ICT adoption by companies
- Internet and ICT-based entrepreneurship
- development of digital content, including local content.

An introduction to each topic is provided, before policy objectives and potential measurement tools are presented. An overview of policies in the LAC region follows, as well as a list of good practices.

Key policy objectives for the LAC region

ICT adoption by companies

Being connected to the Internet and using ICTs in daily operations offers companies many benefits. The Internet and related ICTs connect businesses to digitally managed global value chains and offer an important platform for selling to customers world wide. This allows firms of all sizes to scale up quickly and compete with other firms not only on the national but on the global level. In areas where access to knowledge faces certain obstacles – as is often the case in rural areas in Latin America – the Internet is an important source of information supporting business innovation and knowledge accumulation. ICT applications, ranging from basic accounting or inventory applications for smaller companies, to more complex services such as customer relationship management software or enterprise

resource planning systems, for larger companies, render business processes more efficient. Overall, the Internet and ICTs drive firm productivity and reduce barriers to market entry.

Several studies have analysed the link between ICT adoption, firm performance and contribution to economic growth and have been able to show the positive effects of increased ICT adoption on firms' productivity, performance and the economy as a whole (e.g. Gaggle and Wright, 2014; Grazzi and Jung, 2016; Haller and Siedschlag, 2011; OECD, 2012).

Grazzi and Jung (2016) especially analyse the effects of broadband and ICT adoption in Latin American firms and the effect on firm performance. They analyse several determinants of ICT adoption in Latin America and find that bigger firms, firms that are more exposed to foreign markets and firms that are located in a capital or big city have a higher likelihood of having a broadband connection and a website. Moreover, they show that the skill level in a company is an important determinant of ICT adoption. This confirms results of previous studies and underlines the importance of education and training (see also Chapter 9 on education and skills for the digital economy). In addition, firms that are operating in an environment where many firms have already adopted ICTs have a higher probability of getting connected.

Grazzi and Jung (2016) are also able to demonstrate the positive effect of ICT adoption and firm performance. Firms that adopted broadband are more likely to innovate. In addition, they also found evidence that ICT adoption leads to productivity growth in Latin American firms.

The findings above provide the evidence base for policy makers that increased ICT adoption by companies leads to better firm performance, higher productivity and thus to economic benefits. Since low levels of productivity are of particular concern in many Latin American countries, policy makers should work on the elaboration and implementation of policies aiming to increase ICT adoption.

The key policy objectives for increasing ICT adoption (discussed in detail in the good practices section) include:

- **Foster good Internet connectivity** and **ensure an open Internet** so that firms can benefit from the full breadth of digital services and applications (see Chapters 4 on competition and infrastructure bottlenecks, Chapter 5 on extending broadband access and services and Chapter 7 on convergence for further details).
- **Develop policies to increase ICT adoption in firms**, with a focus on small and young firms. These measures are discussed further in this chapter and include such policies as targeting large companies that have extensive business relations with a high number of SMEs, seconding ICT experts to companies that are lagging behind or encouraging the development of applications and services targeted to the needs of emerging economies. Governments can also use e-government services to provide incentives for companies to use the Internet and ICTs (see also Chapter 12).
- **Develop a measurement agenda** to monitor the use of ICTs in businesses. One of the major challenges in Latin America is monitoring firms' actual use of ICTs. Only limited data are available on ICT adoption in Latin America, beyond data on the number of firms with a website or using e-mail for business. Governments have an important part to play in extending the measurement of ICT adoption.
- **Promote e-commerce**. Promoting e-commerce in Latin America requires countries to educate firms on the possibilities of electronic commerce and its potential to increase business performance, but also to review legacy regulations and to reduce barriers to foreign markets.

- **Promote the development of digital skills** with a focus on ICT usage (see also Chapter 9 on education and skills for the digital economy).
- **Promote the use of ICTs through e-procurement and e-government policies** (see Chapter 12 on digital government for information and recommendations).

Promote ICT and digital entrepreneurship

Another important area for policy makers is how to foster entrepreneurship using the Internet and ICTs, especially in the area of digital entrepreneurship. Entrepreneurs and young firms are an important part of the dynamic economic environment in which inefficient companies are replaced by younger, more productive companies. They thus ensure that economic resources are used more efficiently. In addition, entrepreneurs increase the available choice in the market, and are often more responsive to market needs and more innovative.

In terms of entrepreneurs' role in the labour market, young businesses significantly contribute to job creation. According to a recent OECD study that analysed the effect of young firms in 15 countries from 2001 to 2011, young firms created about 50% of all new jobs and were more resilient to the financial crisis, with a positive net job growth during this period (OECD, 2013a). Finally, several studies have shown that a greater number of entrepreneurs and start-ups contribute to more rapid economic growth (e.g. Arzeni et al., 2012; OECD, 2010).

Given the key role of entrepreneurs, encouraging entrepreneurship in Latin America is an important area of work for policy makers. This section will mainly focus on digital entrepreneurship, which can be defined as "a subset of overall entrepreneurship that can be distinguished by links to the digital economy". Encouraging digital entrepreneurship in a country is a challenging and time-consuming task, since different policy areas are involved. However, a number of policies can help reach this goal:

- **Strengthen entrepreneurial capabilities**. A lack of skills is holding back digital entrepreneurship in Latin America, both in terms of managerial and ICT-related skills, such as programming and coding. Governments help strengthen entrepreneurial capabilities by promoting and/or establishing training programmes for entrepreneurs and to remedy this.
- **Foster an entrepreneurial culture with the private sector and, in particular, successful entrepreneurs**. Fostering a digital entrepreneurial culture could include facilitating the exchange among entrepreneurs, establishing mentoring programmes between established firms of the private sector and start-ups, and organising hackathons and trade shows.
- **Review regulatory barriers to entrepreneurship**. In many LAC countries, setting up a company is complex and burdensome. Labour market and bankruptcy regulations can also render entrepreneurship difficult. Regulations in LAC countries should be reviewed to identify the main obstacles and make it easier to create start-up firms in the region.
- **Improve access to finance**. Access to finance is often difficult for entrepreneurs, especially in an environment with few organisations to provide seed capital and venture capital, as is the case for many LAC countries. Ways should be found to ease the access to finance for entrepreneurs, including reviewing the possibilities offered by the digital economy, such as crowd funding and online micro-credits.
- **Promote the use of cloud computing in Latin America**. Cloud computing provides flexible and scalable access to software (e.g. customer-relationship management, or CRM, software), applications and computing power in general. The services can be easily scaled up or down, used on demand, and are typically paid by capacity used. For small companies and

start-ups, cloud computing can provide easy access to ICTs, requiring no large capital investment. Starting with low amounts of capacity, new firms can and rapidly scale up computing resources as necessary.

Promoting the creation and distribution of digital content and applications, including local content

Digital content, and especially local content, and applications are crucial in increasing ICT adoption. They are not only an important source of information, but render businesses and administrative processes more efficient. A developed content market is also beneficial for the development of network infrastructure. A joint report prepared by the OECD, the internet Society (ISOC) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) found that more developed local markets tend to lead to lower international prices for bandwidth and that conversely, markets with more intense international traffic tend to report lower local prices for Internet access, particularly in emerging countries (OECD/ISOC/UNESCO, 2013).

Different cultures have a rich heritage of content in local languages. Most of this content, however, remains inaccessible, sometimes even locally. The Internet makes digital content widely available and can empower users to create local content. As a major content distribution platform, including crowd-sourced platforms, it facilitates dissemination of content and can be a repository to store content.

For policy makers in the LAC area, encouraging digital content and applications that serve the needs of businesses and society can increase overall ICT adoption and advance inclusive development.

In Latin America and the Caribbean, policy makers face two important challenges. First, the majority of content available online is in English, across many content aggregation platforms. Content in languages other than Spanish and Portuguese, such as Quechua, is only just emerging. The content and applications currently available do not always serve the needs of people and businesses in emerging countries, especially those at the bottom of the pyramid. There is thus a need to foster the development of content and applications tailored to the region.

The main policy objectives in this area include:

- **Foster the creation of digital content, including local content**, and in particular content and applications that address the needs of the region. This includes directly encouraging content production, for example in specialised IT centres, but also indirect measures such as improving basic literacy and digital literacy.
- **Foster multilingualism on the web**. Foster the creation of content in Spanish, Portuguese and other regional and local languages of the region through, for instance, governmental funding of educational and cultural content in indigenous languages.
- **Access to hardware and software**. This includes measures such as educating content creators on the availability of open and free online tools, and facilitating access to hardware and software (e.g. by lifting trade barriers or taxes).
- **Promote local hosting services** so content providers can host content within the country, rather than buy hosting capacity overseas (see Chapter 8 on regional integration for information on IXPs, global interconnection and hosting).
- **Open up government data and public sector information**. By making data and information available, easily accessible and reusable, digital government lets governments collaborate

with citizens on innovation that can create public value. In turn, non-institutional actors, whether individuals, the private sector or civil society, can help develop content based on the cultural and local content already developed by the public sector (see also Chapter 12 on digital government).

Tools for and measurement and analysis in the LAC region

To assess the state of ICT adoption in Latin America and the Caribbean, policy makers need a holistic set of measures and surveys. Measurement is further discussed in the good practices section of this report, and Annex 10.A1 contains a comprehensive set of indicators for measuring ICT adoption used by OECD countries (OECD, 2015b). Measures and indicators policy makers are advised to collect include:

- **connectivity:** indicators to measure, for example, broadband access (e.g. the proportion of businesses with a broadband connection (by speed tiers, fixed/mobile) and the proportion of employees using ICTs such as computers and/or Internet-enabled portable devices
- **Internet use:** indicators to measure the use of the Internet, including the proportion of businesses i) using a website: ii) having a website equipped for online ordering; and iii) online marketing activities
- **information management tools in companies:** proportion of businesses using enterprise resource planning (ERP) software, customer relationship management (CRM) software, electronic data interchange (EDI), radio-frequency identification (RFID) and cloud computing, as well as the proportion of businesses sharing supply chain management (SCM) information electronically
- **e-commerce:** proportion of businesses receiving orders online, via EDI messages, making sales through the Internet, as well as the proportion of turnover received through computer networks
- **e-government** and the **availability of open government data** (see Chapter 12 on digital government for more information)
- **ICT skills:** indicator to measure, for instance, the proportion of employees with digital literacy or the proportion of businesses offering ICT specialist positions
- **social media activities:** indicators such as the proportion of businesses using social networks or blogs
- **local content:** indicators to measure the penetration of applications and services available in local languages, as well as applications adapted to local needs
- **digital entrepreneurship:** indicators that include the number of digital entrepreneurs in a country, the number of young firms, the number of citizens trained in entrepreneurship through public initiatives or the amount of venture capital investments.

Overview of the situation in the region

In the past, LAC governments have focused on supply-side policies and the deployment of broadband infrastructure. This is a necessary first step before countries can move on to strengthen ICT adoption. More recently, however, several countries in the region, such as Brazil (*TI Maior* Programme), Colombia (*Vive Digital* strategy), Mexico (*Prosoft* 3.0 agenda) (OECD, 2015a) or Uruguay (*Agenda Digital Uruguay*) (AGESIC, 2016) have a broader focus on demand-side policies in their national digital strategies.

This trend can also be seen in regional LAC fora. eLAC, for instance, just published its new "Agenda Regional Digital 2018" (CEPAL, 2015a). One of the five key areas of the agenda consists in the "development of the digital economy, innovation and competition" (Area 2). In addition, one sub-goal of Area 1, on access and infrastructure, relates to encouraging content production, especially for vulnerable groups (see Box 10.1).

As for the general implementation of demand-side policies, especially increasing ICT adoption among businesses, the general finding based on the analysis of the questionnaire is that some LAC countries have developed holistic demand-side policies in the past few years. The first positive results can now be seen in the increasing rates of ICT adoption among households and companies, including micro-companies (see Box 10.3).

However, a significant number of countries have not developed demand-side policies to increase ICT adoption by firms or to foster the production of local content. While noting this weakness, it must also be acknowledged that some countries in the LAC region still face major obstacles, such as lack of electricity (see also Chapter 1).

Box 10.1. **Overview of action areas of eLAC2018 related to ICT adoption in businesses and content production**

Access and infrastructure

The Latin America and the Caribbean digital agenda objective in this area is:

- **Objective 1:** Scale up and provide affordable, universal access to digital services, taking advantage of the opportunities created by technological convergence and mobile technologies.

Digital economy, competitiveness and innovation

In this area, the Latin America and the Caribbean digital agenda objectives (eLAC2018) are the following:

- **Objective 6:** Develop and promote both the traditional ICT industry and emerging sectors, for the production of digital content, goods and services; and promote digital economy ecosystems and public-private co-ordination, with an emphasis on generating greater value-added, increasing skilled work and training human resources.
- **Objective 7:** Increase the productivity, growth and innovation in the productive sectors through the use of ICTs and propel the digital transformation of micro-enterprises and small and medium-sized enterprises (SMEs), taking into account technological and productive trajectories, innovative financing and revenue models, and capacity-building.
- **Objective 8:** Strengthen e-commerce at the national and regional levels, adapting consumer protection regulations to the digital environment and co-ordinating aspects related to taxes, logistics and transportation, electronic payment mechanisms, systems for international settlement and personal data protection.
- **Objective 9:** Incentivise the adoption and development of new technology trends in the public and private sectors, promoting in particular big data analytics, capacity-building and access options.

Source: CEPAL (2015a), *Agenda Digital para América Latina (eLAC2018)*, *http://conferenciaelac.cepal.org/es/documentos/agenda-digital-para-america-latina-y-el-caribe-elac2018*.

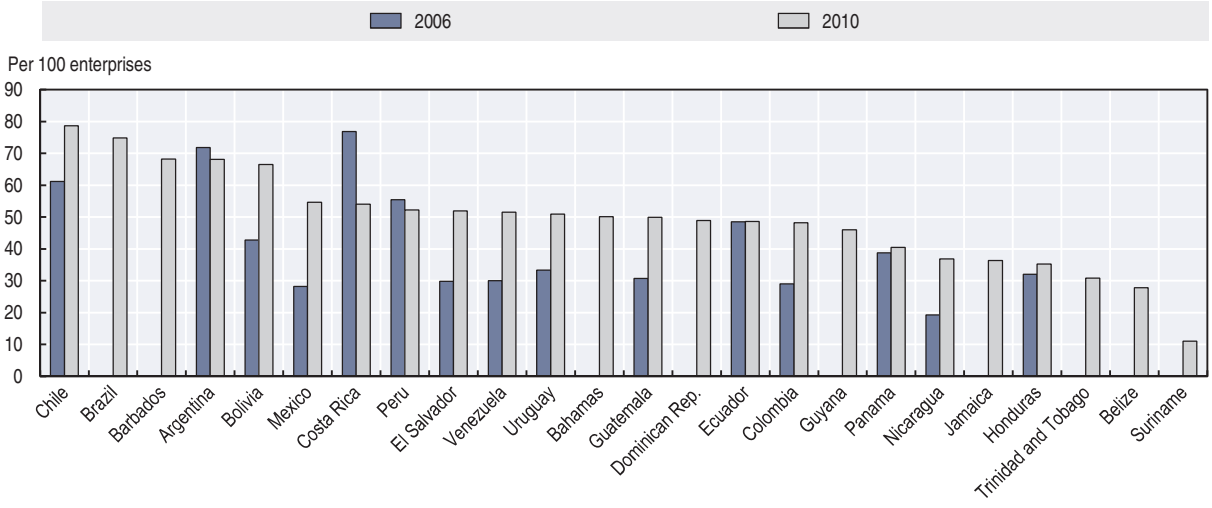
The state of ICT adoption in business

Assessing the state of ICT adoption for the LAC region is a difficult task. Few data are available comparing the state of ICT adoption across countries of the region. However,

measuring and being able to show accurate uptake levels among companies of different sizes is key to designing effective policies to increase the level of ICT adoption. The *Partnership on Measuring ICT for Development* (ITU, 2010) proposes a set of key indicators, but this must be implemented at the regional level. An important recommendation discussed in the section on good practices is to increase the regional effort to collect data on firms' ICT adoption.

Data that are currently available to compare ICT adoption in the LAC include World Bank data on the use of websites and emails in companies, and data on the use of the Internet at work collected through the household survey conducted by the *Comisión Economica para Latina América* (CEPAL, or ECLAC) (CEPAL, 2015b).The 2010 World Bank Enterprise Survey, based on interviews conducted with firms in LAC countries, shows major differences in the percentage of enterprises with their own webpage, from 11% in Suriname to over 70% in Chile and Brazil (Figure 10.1). The average for the region was about 60%, below the 2010 OECD average of 71%.

Figure 10.1. **Enterprises with a website or home page (per 100 enterprises) (2006 and 2010)**



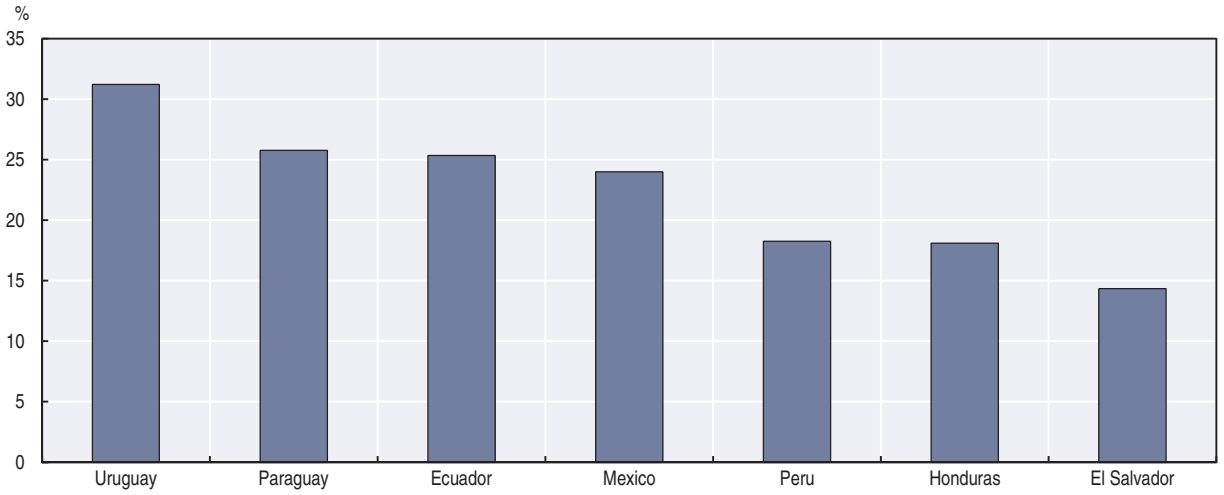
Source: OECD, based on World Bank (2016), *World Bank Enterprise Surveys (WBES)*, *www.enterprisesurveys.org/*.

StatLink http://dx.doi.org/10.1787/888933354468

Data from ECLAC provides the users' perspective and are collected through household surveys in the different countries. Data are only available for selected countries, and the methodology for 2010 is based on the recommendations of the *Partnership on Measuring ICT for Development, Core ICT Indicators 2010* (ITU, 2010). In this survey, users indicated whether they used the Internet at work in 2010. Usage rates reported ranged from 14.3% in El Salvador to 31% in Uruguay, leaving room for further progress (Figure 10.2). Taking the two indicators together, many countries in the region should increase efforts to foster ICT adoption within firms.

These statistics only show basic ICT usage patterns, and more work needs to be done on collecting comprehensive data at the regional level. In the OECD/Inter-American Development Bank (IDB) questionnaires conducted for this Toolkit, ten countries reported that they conduct national surveys for the use of ICTs by firms. This is a good start for working towards a regional measurement agenda including metrics that go beyond those already collected by the World Bank and the Economic Commission for Latin America and the Caribbean (CEPAL).

Figure 10.2. **Use of the Internet at work (percentage of total users aged 15-74) (2010)**



Source: OECD, based on the CEPAL ICT database.

StatLink http://dx.doi.org/10.1787/888933354479

When countries were asked in the OECD/IDB questionnaire what main current barriers they face for increasing their use of the Internet, the main reported barriers included i) insufficient broadband infrastructure; ii) firms' belief that they do not need the Internet and ICTs for their business; iii) the cost of ICT equipment; iv) a lack of ICT skills and talent; v) difficult access to finance; vi) a lack of confidence in online transactions.

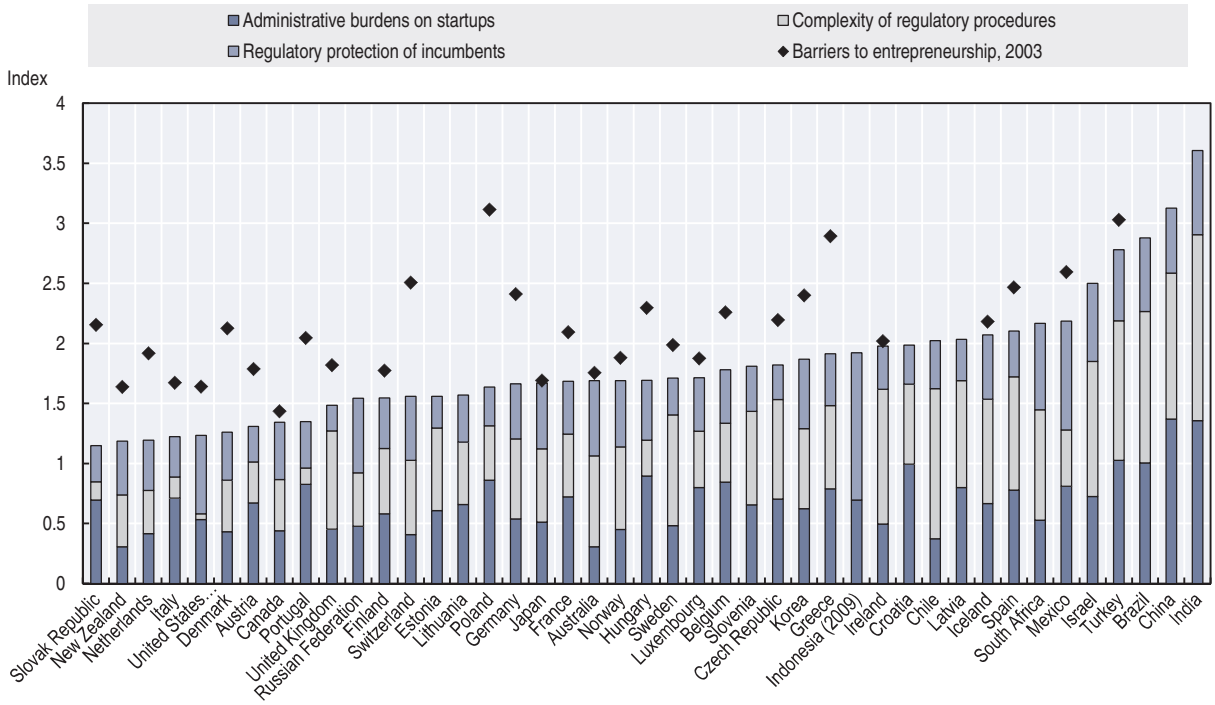
When Colombia launched its strategy in 2010, it conducted a broad survey of firms on why they had decided not to use the Internet and ICTs. The main barrier reported was the belief that there was no need to be connected to the Internet to conduct business. The government consequently set up a series of programmes that focused on clearly demonstrating the economic benefits for businesses (see Box 10.3).

Other measures put in place by different LAC countries include providing training and website assistance, trade fairs, joint activities with industry associations, the provision of public funding for i) increasing ICT adoption by firms; ii) financial inclusion and loans for SMEs and micro-companies; as well as iii) establishing incubators.

Promote ICT and Internet-based entrepreneurship

Start-ups face more challenges obtaining access to finance in LAC than the overall OECD area. Financial markets tend to be less mature and banks less willing to provide financing to start-ups: "In the United States, for instance, bank loans provide 15%-30% of the initial finance of high-growth start-ups, well above the figure in Latin America (7% in Brazil and close to zero in Chile and Mexico). Similarly, in the United States, start-ups obtain 20%-47% of their finance from venture-capital funds and angel investors, compared to 23% in Brazil, 17% in Chile and 5% in Mexico." (OECD, 2013b). This finding was mirrored by the replies to the OECD/IDB questionnaire on the question of the current obstacles to entrepreneurship in the region. The main reported barriers for Internet-based start-ups included: i) difficult access to finance, especially to seed capital; ii) lack of public support; iii) lack of (ICT) skills; iv) lack of online payment systems; *v)* a lack of entrepreneurship culture; vi) lack of electricity; vii) the fact that the ICT sector is a "new industry sector"; and viii) the cost of Internet access. In addition, administrative and regulatory burdens for start-ups tend to be higher in the LAC area than for most OECD countries, such as in Brazil, Chile and Mexico (Figure 10.3).

Figure 10.3. **Barriers to entrepreneurship (2013)**



Notes: For the People's Republic of China (hereafter "China"), data are based on preliminary estimates, as some of the underlying data has not been validated with national authorities. Subsequent data validation may lead to revisions to the indicators for this country. For Indonesia, data refer to 2009. For the United States, data refer to 2007.

Source: OECD (2015c), *OECD Science, Technology and Industry Scoreboard 2015*, *http://dx.doi.org/10.1787/sti_scoreboard-2015-en*, based on OECD (2014c), *OECD Product Market Regulation Database*, *www.oecd.org/economy/pmr*.

StatLink http://dx.doi.org/10.1787/888933354487

Although LAC countries lag behind OECD countries in establishing policies to encourage entrepreneurship, many countries in the region acknowledge the important role of entrepreneurs for their economy. Replies to the questionnaire show that existing policies include (holistic) entrepreneurship training programmes, tax incentives, incubators, programmes designed to develop software, financial support for entrepreneurs, and efforts to develop an entrepreneurship culture. An overview of policy tools used in selected LAC countries in 2012 is provided below (Table 10.1).

Promoting the creation of digital content and applications, including local content

While much of the content available online is in English, the volume of content in Spanish, Portuguese and other regional languages has increased. The ranking of languages on Wikipedia, measured by the total number of content pages by language, is shown in Figure 10.4. All languages with more than a million content pages, and statistics for the languages with Wikipedia content pages that are spoken in the region. Spanish and Portuguese are ranked 10th and 14th, with 1.2 million and 890 000 content pages respectively (see Table 10.2 for more statistics on Spanish and Portuguese content on Wikipedia).

Besides content in these two languages, Wikipedia also lists pages in four other languages of the region: Haitian (Haiti's official language, and a recognised minority language in Cuba), Quechua (official language in the Plurinational State of Bolivia [herafter "Bolivia"], Ecuador and Peru), Aymara (official language in Bolivia) and Guarani (official language in Paraguay). The total number of pages in these languages, however, is low. Figures for other indigenous

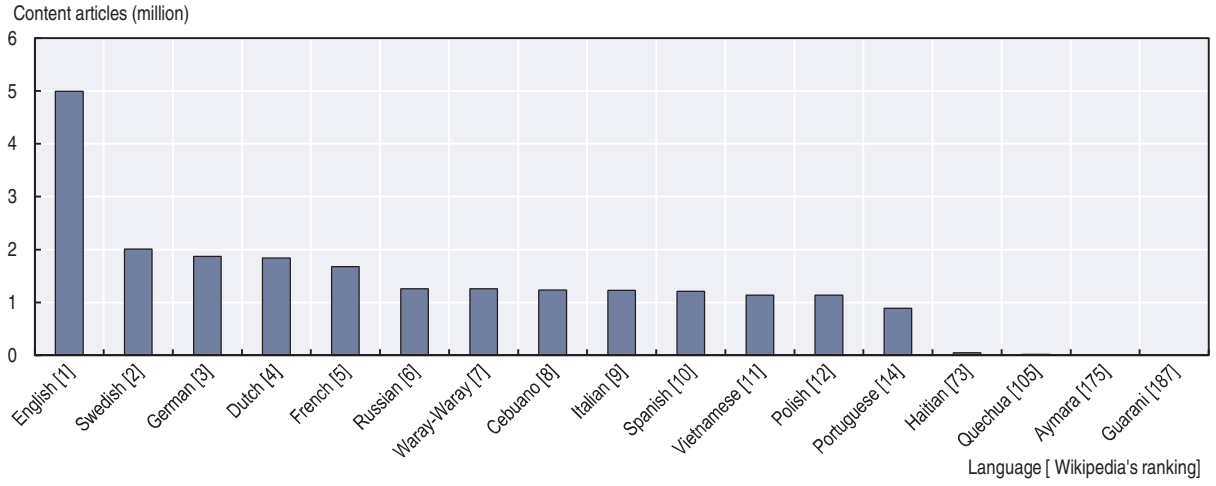
languages in the region are not listed on the Wikipedia site. While this is only one indicator of local content made available online, Wikipedia plays an important role as a dictionary as well as for knowledge diffusion and knowledge storage. Content production on this site should thus be encouraged.

Table 10.1. **Targeted policy tools to promote start-ups in Latin America: A country comparison (2012)**

	Tool	Argentina	Brazil	Chile	Colombia	Mexico	Peru
Financing	Seed capital	D	I	I	R	N	R
	Angel investors	N	I	D	R	N	N
	Venture capital	N	I	I	R	D	N
Business services and entreprenerial training	Incubators	I	I	I	D	D	R
	Accelerators	D	D	D	N	D	N
	Corporate spin-offs	N	N	N	N	N	N
	Technology transfer and university spin-off	D	I	D	N	I	N
	Business training	I	I	I	D	D	D
Regulatory framework	Ease of creating or closing down businesses	N	N	D	D	D	D
	Taxation and special legislation	N	D	D	N	D	N
I	Implemented						
D	In development						
R	Recently created						
N	Need to be created or reformed						

Source: OECD (2013b), *Start-up Latin America: Promoting Innovation in the Region*, *http://dx.doi.org/10.1787/9789264202306-en*.

Figure 10.4. **Number of content articles for selected languages (2015)**



Source: OECD based on Wikipedia (2015), *Wikipedia Statistics*, *https://en.wikipedia.org/wiki/Wikipedia:Statistics*.

StatLink http://dx.doi.org/10.1787/888933354490

Another important form of digital content, especially for education, are so called "massive open online courses" (MOOCs) (see also Chapter 9 on education and skills for the digital economy), university courses for which people can enrol online, free of charge. Platforms such as EdX, Coursera, Udacity and Miriada X provide courses from different universities. The website Class Central tracks the global course offerings from different platforms and publishes statistics on the number of courses available online. According to

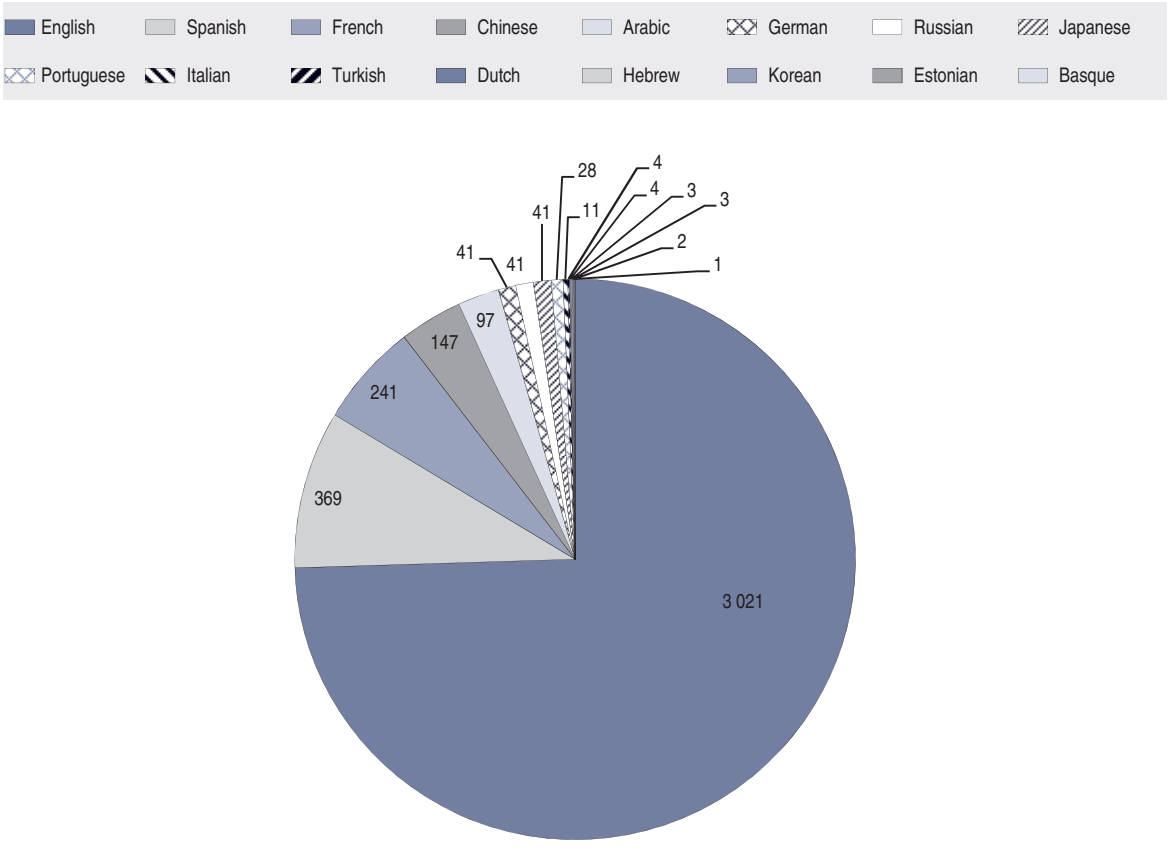
the site, MOOCs are currently available in 16 languages (see Figure 10.5). The large majority of courses, 75%, are taught in English. Spanish is the language with the second-highest number of offerings (9%), which is mainly due to the platform Miriada X, which includes a consortium of close to 30 universities in the LAC region and Spain (Shah, 2014). This platform is a good example of encouraging the creation and distribution of educational content relevant to the region.

Table 10.2. **Wikipedia statistics on Spanish and Portuguese content**

	Statistics on Spanish content	Statistics on Portuguese content
Page statistics		
Number of content pages	1 209 725	892 330
All pages	5 196 941	3 937 187
Edit statistics		
Page edits since Wikipedia was set up	91 372 123	44 710 167
Average edits per page	17.58	11.36
User statistics		
Registered users	16 509	6 053

Source: Wikipedia (2015), *Wikipedia Statistics*, *https://en.wikipedia.org/wiki/Wikipedia:Statistics*.

Figure 10.5. **Number of MOOCs by language, as measured by Class Central (2015)**



Source: OECD, based on Class Central (2015), "Languages", *https://www.class-central.com/languages*.

StatLink http://dx.doi.org/10.1787/888933354502

The majority of countries that responded to the OECD/IDB questionnaire report that the government fosters the creation, distribution and access to digital content, including local content. Through the development of digital, and especially local, content, LAC countries are striving to make the Internet and ICTs more attractive to low-income groups and people in remote and rural areas, and to provide social services in areas such as education, health and public services. In addition, countries aim at developing content and applications for micro-companies and SMEs. The number of apps that have been developed for SMEs in the region is, however, harder to measure at this stage, as only information of use cases is available.

Several countries, such as Honduras, Colombia and Mexico, also reported that they promote the development of content in indigenous languages and/or about indigenous cultures. A number of countries in the region also plan to develop educational content. Countries in the region also promote the use of public sector data for further use and reuse. A majority of the LAC countries that responded to the OECD/IDB questionnaire reported having set up an Open Government Data Strategy, and by December 2014, six LAC countries had also dedicated national open data portals: Brazil, Chile, Colombia, Costa Rica, Mexico and Uruguay (see also Chapter 12).

Good practices for the LAC region

The previous sections have indicated that policy makers in the LAC region have an important task in increasing ICT adoption, especially within firms. The next section presents good practices from the LAC and other regions.

Increase ICT adoption by companies

The first step towards an increase in ICT adoption among firms is to **develop a measurement agenda**, ideally harmonised across countries. A major challenge in the LAC region is measuring the actual use of ICTs in companies, not simply whether firms have a website or use emails.

A good starting point is the list of indicators drawn up by the Partnership on Measuring ICT for Development in 2010 (Table 10.3). In addition, LAC countries should engage in a regional approach to discussing additional indicators to include in business surveys to reflect recent developments. For example, a significant number of young companies use cloud services, which are not yet part of the list of indicators of the Partnership on Measuring ICT for Development. Some LAC countries, such as Costa Rica, already try to reflect these new developments in their measurement approaches, but more remains to be done.

The OECD has developed an extensive list of indicators on ICT usage of businesses (Annex 10.A1). Some LAC countries, including Chile, Brazil, Colombia and Mexico, already participate in this survey, which is conducted every two to three years. LAC countries could use this extensive list of indicators and experience to jointly identify other key indicators for measuring ICT adoption by firms in the region, in addition to those recommended by the Partnership on Measuring ICT for Development. Using indicators developed for this survey would also allow direct comparisons with ICT adoption in OECD countries.

In addition to developing this measurement framework in the regional context, countries should also ensure that the business surveys they conduct are truly representative, not always an easy task. Reliable business registers are not always available, and developing such registers should be the first step. Countries should also make sure that the informal

sector is duly represented. Otherwise, results will not reflect the business uptake in the region. In general, for all surveys, countries should carefully report sample statistics and the concrete methodology used.

Table 10.3. **Core indicators on use of ICT by business – Partnership on Measuring ICT for Development**

B1	Proportion of businesses using computers
B2	Proportion of persons employed routinely using computers
B3	Proportion of businesses using the Internet
B4	Proportion of persons employed routinely using the Internet
B5	Proportion of businesses with a web presence
B6	Proportion of businesses with an intranet
B7	Proportion of businesses receiving orders over the Internet
B8	Proportion of businesses placing orders over the Internet
B9	Proportion of businesses using the Internet by type of access Narrowband Fixed broadband Mobile broadband
B10	Proportion of businesses with a local area network (LAN)
B11	Proportion of businesses with an extranet
B12	Proportion of businesses using the Internet by type of activity Sending or receiving e-mail Telephoning over the Internet/VoIP Posting information or instant messaging Getting information about goods or services Getting information from general government organisations Interacting with general government organisations Internet banking Accessing other financial services Providing customer services Delivering products online Internal or external recruitment Staff training

Source: OECD (2011), *OECD Guide to Measuring the Information Society 2011*, *http://dx.doi.org/10.1787/9789264113541-en*.

The second step should be to **develop policies to increase ICT adoption in firms**. One of the most important challenges for policy makers is how to directly increase the adoption of ICTs among companies and how to connect these companies to the applications and services in use in the supply chains they are part of. In the LAC area, micro-companies and SMEs should receive special attention, since these firms represent a significant majority in these countries, and because small players often struggle the most to adopt ICTs.

One policy approach that has proved to work well is to target big companies in supply chains and connect small companies through this entry point, since they are often either suppliers to or buyers from larger companies. Colombia offers an illustration of this policy approach (Box 10.2). From 2010 to 2014, Colombia managed to increase ICT adoption among micro-companies and SMEs from 7% to 70%.

Peru is connecting small and medium firms in remote locations through a national fibre backbone network, to provide these businesses with access to the Internet and thus the opportunity to use e-commerce and other digital tools for running their enterprises.

Another policy measure successfully used in several countries, not only in increasing R&D activities, but increasing ICT adoption, is **facilitating the secondment of ICT experts**, also known as "expert transfer". Seconded ICT experts can be sent by the private sector or

public research and education institutes. Arrangements should be found to combine public and private funding. For example, experts can be sent for a fixed period and employment costs shared. If companies' business models could be significantly enhanced through the use of ICTs, other solutions worth considering include encouraging longer-term transfers of groups of experts to support firms moving into new activities.

Box 10.2. **Colombia's digital policy approach to increase ICT adoption among SMEs**

The Colombian ICT Ministry (MinTIC), together with Innpulsa (a government programme to foster private sector development) set up the "Mipyme" policy programme to i) increase ICT adoption by micro-companies and SMEs; and ii) develop applications and services that fit specific sector needs across entire supply chains.

The programme addressed the fact that only 7% of all micro-, small and medium companies ("mipymes") were connected to the Internet in 2010. Larger companies can put forward proposals through public tenders on how they connect SMEs via Internet applications in their supply chains, in order to increase the productivity of small firms and to digitise the entire supply chain. Only companies with existing relationships with SMEs that are able to demonstrate that the programme will benefit at least 200 SMEs (not so far connected to the Internet) can apply. Companies with the most promising proposal, showing they can connect a large number of SMEs, win the tenders. Funds provided by the programme do not need to be reimbursed and amount to a maximum of 65% of the total project value and up to COP 2000 million (USD 765 000). The targets of the programme are to:

- connect 70% of micro-companies and SMEs to the Internet by 2018
- increase the number of "mipymes" using e-commerce from 2% to 30% by 2018
- increase the number of "mipymes" with their own website to 63% by 2018
- increase the number of "mipymes" with a social media presence to 54% in 2018.

Projects have been launched in different sectors, such as agriculture, tourism, construction, telecommunications, transport and the energy sector. SMEs in the construction sector reported that they could increase their revenues by 20%. Taxi drivers connected via apps and tablets reported that they could increase profitability by up to 70%, since they could add seven or eight trips to their daily total, because they spent significantly less time finding customers.

From 2010 to 2014, the number of connected micro-companies and SMEs was increased from 7% to 70% and 32 000 SMEs benefitted from the programme. To accompany the programme, the government launched application development competitions, SME ICT trainings and certifications, and "EXPO mipyme" fairs.

Source: MinTIC (2015), "MiPyme Vive Digital", *www.mintic.gov.co/portal/vivedigital/612/w3-propertyvalue-7235.html*.

Policy makers should also **promote the development of digital skills**. ICT adoption in companies can only be increased if employees have the skills to use ICTs, including generic and specific ICT skills to to adapt applications and services to their needs. Digital literacy is vital, and LAC policy makers should develop a comprehensive approach to expand ICT skills at different levels. This would include such measures as digital and online courses tailored to firms' needs, with a focus on micro-companies and SMEs, working towards integrating courses on digital skills in training on the job, and vocational training and in integrating the teaching of ICT skills in early school education (see Chapter 9 on education and skills for the digital economy). Brazil, Colombia, Peru and Costa Rica already have such programmes.

Peru is currently implementing its *Competitiveness Agenda 2014-2018*, one of whose goals is to enhance scientific-technological and business innovation capabilities to work towards a knowledge-based economy.

These actions should be undertaken in parallel with the **promotion of e-commerce**. E-commerce is an important tool for LAC firms, since it enlarges the market firms can reach, sometimes even to the global level. Compared to other regions, however, the uptake of e-commerce is still relatively low in Latin America and the Caribbean. Policy makers in the region can promote e-commerce in several ways. Many firms, particularly smaller ones, are not aware of the benefits e-commerce can bring to their businesses and how they can use e-commerce to increase their revenues. Educating firms about the benefits of e-commerce, providing insight into the tools they need, how to use online payment systems and how to secure their website is particularly important in this situation of low uptake. The Mexican Chamber of Electronic, Telecommunications and Information Technology Industry (CANIETI) and the Ministry of the Economy have developed an online Spanish tutorial that is easy to understand and provides a comprehensive overview of e-commerce (Box 10.3). This could be helpful in any Spanish-speaking country.

Box 10.3. **Educating firms about e-commerce in Mexico through online tutorials**

The Mexican Chamber of Electronic, Telecommunications and Information Technology Industry (CANIETI) and the Ministry of the Economy have developed an online course format to educate firms about e-commerce and its benefits, and how to set up an e-commerce business. The tutorial aims to provide an introduction to e-commerce, informing firms of different ways of doing e-commerce, to increase the overall uptake of e-commerce in the country.

The course consists of 18 video sessions. The videos are accompanied by exercises as well as additional material that can be downloaded. The topics include:

- introduction to e-commerce
- overview of different e-commerce business models
- how to create a web presence, engage in online marketing and make use of social networks
- overview of online payment methods
- security
- e-commerce law and ethics in Mexico.

Source: CANIETI/Secretaría de Economía (2015), "Introducción al Comercio Electrónico", *http://canieti.mayahii.com/CANIETI#!*.

Countries should also **review legacy regulations** to examine whether they pose unnecessary barriers to e-commerce. When firms are unable to sell online in a domestic market, this could also limit their international competitiveness. Especially when firms introduce new products that either complement or compete with traditional, regulated sectors, problems might arise. Examples include companies selling travel and transport services online (e.g. Uber, Airbnb) or health and financial services. Chapter 13 on consumer protection and e-commerce provides additional insights from a general perspective.

Finally, countries should **review their tax policy** (Chapter 6 examines taxation and other government charges). Some LAC countries impose special taxes on telecommunications services that make adopting ICTs more expensive. They may deter small businesses

from subscribing to telecommunications services, excluding them from the benefits of e-commerce. Taxes in this area should be reviewed and, if possible, abolished or replaced. A good practice introduced in Colombia is the abolition of the value-added tax on tablets and laptops for devices that cost below COP 2 million, resulting in lower prices. Colombia has also eliminated custom tariffs, and the government gives low-income population groups subsidies to purchase such devices.

Promote ICT and Internet-based entrepreneurship

Given the important role entrepreneurs play in economies, governments in LAC area should carefully assess how they can **foster entrepreneurial capabilities and an entrepreneurship culture** in their countries. Two important challenges experienced by entrepreneurs in the region and reported in the questionnaire were a lack of skills, both digital and managerial, and sometimes a lack of public support. Governments in the region should work towards strengthening entrepreneurial capabilities by promoting or establishing training programmes for entrepreneurs and addressing the lack of ICT skills.

Some countries in the region, such as Brazil, Chile, Colombia, Jamaica and Mexico, have established training programmes for digital entrepreneurs that address managerial and ICT skills. Colombia, for instance, set up a holistic programme that supports entrepreneurs in different phases of the business creation and business upscaling process. The programme includes courses to develop both managerial and ICT skills, depending on the skills level of the different entrepreneurs (Box 10.4).

These programmes can also be used as a tool to increase entrepreneurial culture in LAC countries, although this is a complex task beyond the responsibilities of ICT ministries and regulators. Some countries are using their digital entrepreneurship programmes to systematically bring entrepreneurs together so that they can exchange views on their entrepreneurial experiences. In addition, a number of countries are organising "hackathons" or entrepreneurship fairs. The German National IT Summit, for example, which is held annually and brings together high-level business representatives and policy makers has reserved panels and sessions for entrepreneurs.[1]

The section on the situation in the LAC region has shown that regulatory and administrative barriers are comparatively high. As a consequence, entrepreneurs may be dissuaded from starting a company. Policy makers should carefully **review potential regulatory barriers to entrepreneurship**. Various ways to reduce the regulatory burden on companies have been identified. They include increasing labour flexibility for young firms. They also ensure that regulation allows for bankruptcy and does not hold entrepreneurs back from creating a new company after a first failed attempt, and they create one-stop online government portals for launching businesses.

One-stop government portals can significantly facilitate business creation. Entrepreneurs who want to start a business often need to collect information from and file registrations at various government agencies, entailing multiple, often time-consuming visits. Procedures at the different agencies are not uniform, and agencies often work on different timelines, which can make the overall business creation process lengthy and burdensome. Online one-stop portals that contain both the information for entrepreneurs with respect to the administrative processes they need to follow as well as online forms and communication tools are effective tools for facilitating and speeding up business creation. The EUGO portal of the European Union and the Korean Start Biz Online portal are good practices in this respect. The EUGO portal is an online single point of contact for creating businesses in EU countries,

providing links to the different European Union countries, which contain information on regulation and procedures. In addition, entrepreneurs can complete procedures online (EC, 2016). The Korean portal Start Biz combines the registration procedures of five different agencies, allowing entrepreneurs to complete the entire process online. Mexico is currently also developing a one-stop portal and has a beta version online (*www.gob.mx/*).

Box 10.4. **The Apps.co programme to foster Internet-based entrepreneurship in Colombia**

Apps.co is the digital entrepreneurship initiative of the Ministry of Information and Communication Technologies in Colombia (MinTIC), which supports entrepreneurs in different phases of the business creation process. The programme is part of the *Vive Digital* strategy to promote economic and social development through the use of ICTs. Apps.co promotes the creation of ICT businesses, focusing on mobile/web applications and digital content. It supports entrepreneurs in different phases of the business creation process. The programme consists of the following elements:

- **Boot camps:** Training courses in programming languages for developing web applications and platforms. They include a variety of courses for entrepreneurs who want to learn how to programme and for those who want to strengthen their knowledge in programming languages for platforms such as Android, Microsoft and iOS. The courses are open to entrepreneurs in any discipline, and are designed for entrepreneurs with basic and more advanced programming skills. This phase aims at capacity building for digital applications, to further develop the Colombian talent pool and to equip people with the skills to create job opportunities.
- **Business discovery:** In this phase, entrepreneurs complete an eight-week programme in which they are encouraged to test their ideas in the market. Through a structured mentoring, training and advisory process, they develop an ICT-based business model. The programme follows lean start-up principles and provides entrepreneurial tools such as a business model canvas, allowing for continued testing, learning and implementing in the goal of getting start-ups ready for the market. After eight weeks, each start-up should have a working prototype of its solution and a business plan identifying potential clients, active users, target downloads and, ideally, sales estimates. This programme is offered in 17 cities to provide opportunities to all entrepreneurs nationwide to explore and support ICT solutions for Colombia.
- **Growth and consolidation:** The growth and consolidation programme provides 20 weeks of intensive one-to-one mentorship and activities conducive to building a client pipeline for entrepreneurs. The overall objective is to strengthen the capabilities of all entrepreneurial teams, support refining the value proposition of the start-ups and develop their business models to the point where they can be brought to the market. Funding is viewed as a consequence of this process and not as a goal. Every team is encouraged to think globally from the start, while validating locally. Apps.co supports 234 projects, with revenues of USD 2.5 million.

Source: OECD (2014b), "Cloud Computing: The Concept, Impacts and the Role of Government Policy", *OECD Digital Economy Papers*, No. 240, *http://dx.doi.org/10.1787/5jxzf4lcc7f5-en*.

Another key policy action for advancing entrepreneurship is by **improving access to finance**. Access to finance is a key condition for entrepreneurs, but is more challenging in Latin America than in OECD countries. The Internet, however, creates new ways to access funding sources and digital platforms to provide loans to entrepreneurs and small firms. This is an interesting opportunity, since it is more difficult for these firms to obtain loans from traditional banks.

The digital funding market is growing rapidly and has some potential to change the financial sector significantly, as it is in China. Different funding models have developed over recent years. The Chinese platform Alibaba, for instance, has several models to provide small and medium companies with loans. Its small loans programme, Micro Ant Credit, has provided credits worth USD 64 billion to 800 000 SMEs. In 2014, there were 1 575 digital lending platforms in China.

Amazon is also offering funding to selected small companies in seven countries through the Amazon lending programme (Moshinaly, 2015). Loans can reach a maximum of USD 600 000 at interest rates between 6% and 14%. Other online models match entrepreneurs and start-ups with investors or crowd (P2P lending), enabling entrepreneurs to finance new products and services through platforms such as AngelList or Kickstarter.[2]

Most of these are currently located in the United States, Europe and Asia. Latin American and Caribbean countries should explore the possibility of developing a digital funding platform tool for the region and of facilitating companies gaining access to already existing funding tools. In terms of attracting venture capital funds, progress has been made, and a number of important VC funds have started to invest in start-ups in Latin America (Table 10.4).

Table 10.4. **Venture capital firms active in Latin America**

	Type	Assets under mangement	LATAM investments			LATAM offices
			Ex. 1	Ex. 2	Ex. 3	
NASPERS	VC/PE	USD 62 billion	OLX	M Movile	PayU	São Paulo
GENERAL ATLANTIC	PE	USD 17.4 billion	Despegar	SAS	Bm&f BOVESPA	São Paulo
SEQUOIA CAPITAL	VC/PE	USD 10 billion	NU	SCANNTECH		No office
ACCEL PARTNERS	VC	USD 9 billion	Despegar	edu K	elo 7	No office
ROCKET INTERNET	VC	USD 7.5 billion	Linio	Easy taxi	dafiti	São Paulo
INSIGHT VENTURE PARTNERS	VC/PE	USD 8 billion	ZUMBA	Hotel Urbano	elo 7	No office
TIGER	VC/PE	USD 4.4 billion	99 TAXIS	NETSHOES	B2W DIGITAL	No office
RIVERWOOD	PE	USD 2.5 billion	navent	NETSHOES	ALOG	São Paulo
ATOMICO	VC	USD 640 million	RESTORANDO	bebé store	Connect parts	São Paulo
MONASHEES CAPITAL	VC	USD 270 million	99 TAXIS	Viva Real	elo 7	São Paulo
BLUMBERG	VC	USD 240 million	Lenddo			No office
KaSZeK VENTURES	VC	USD 230 million	RESTORANDO	VivaReal	NETSHOES	São Paulo/ Buenos Aires

Note: Only funds with assets under management larger than USD 250 million were covered.

Source: Téllez (2015), "Top VCs are chasing digital companies in Latin America", *http://techcrunch.com/2015/08/11/top-vcs-chasing-digital-companies-in-latin-america/*.

While P2P lending is a promising area for facilitating access to capital for entrepreneurs, many governments have been reluctant to review regulations so far. The United Kingdom is among the few countries to have taken a pro-active stance on regulating P2P lending platforms. Important issues covered in the United Kingdom regulatory framework on crowdfunding over the Internet include minimum capital requirements, dispute resolution rules, client money protection rules, disclosure and reporting rules, as well as successor loan servicing arrangements (OECD, 2015b). Besides encouraging new forms of financing, policy makers in the region should analyse how to adapt existing regulation of financial markets.

Furthermore, policy makers should **promote the use of cloud computing** in LAC. Cloud computing provides easy and flexible access to information technology (IT) resources. Users of cloud-computing infrastructure and services do not have to make upfront, capital-intensive investments in IT infrastructure and software but pay for computing

resources in a pay-as-you go model, and can easily scale the capacity up or down (OECD, 2014b). This is especially interesting for entrepreneurs, who often lack the means of buying costly computing infrastructure when creating their business.

The benefits of cloud computing, however, can entail challenges. Challenges in the area of privacy and security– including cross-border issues related to privacy protection and data breaches– need to be addressed, as well as issues regarding the liability of service providers in current terms and conditions of standard cloud- computing contracts.

LAC policy makers have an important role to play in educating entrepreneurs about the benefits of cloud computing and issues that they have to consider when it comes to protecting privacy and signing contracts with big cloud computing providers. The German initiative "digital SMEs" has developed a guide "Cloud computing as an opportunity for companies", which is tailored to the needs of small and medium companies (eBusinesslotse, 2014). It explains the concept and guides companies on how to implement and integrate cloud computing into their business processes. This guide can serve as a good reference.

In addition, policy makers in the LAC region should promote the establishment of **data centres** in the region that increase the availability of cloud-computing services and applications. Today, most providers and their data centres are located outside the region, requiring international bandwidth (see also Chapter 8 on regional integration).

Promoting the creation of digital content and applications, including local content

The availability of content and applications for businesses and society are an important factor in increasing ICT adoption. The majority of applications and content available are in English and not always appropriate for the needs in emerging countries. By developing and distributing digital content, and especially local content and applications, LAC policy makers can make the Internet and ICTs more attractive to businesses, low-income groups and firms and people in rural and remote areas. In turn, once the content and applications are available, the Internet can be an efficient tool for content dissemination.

It is crucial that policy makers in the LAC region **promote the development of content and applications at the national strategy level**. Colombia has designated as a strategic priority developing content and applications for emerging countries and low-income groups. One of the three pillars of its *Vive Digital* Strategy 2014-2018 is the development of content and applications with a focus on social applications, government applications, and developing skills for content production. The Start-Up Chile programme, sometimes known as "Chilecon Valley", supports start-ups developing content and applications. Bolivia includes the development of local content and applications as a key objective of its national telecommunications programme for social inclusion. It focuses on content and application development in health, education and e-government. These national initiatives are the most strategic and systematic in fostering content production. They were launched recently, but they have already generated some social apps. Tracking the outcomes of these programmes will be important in the coming years.

Policy makers should make sure that **developing local content and multilingualism** is supported in initiatives to promote content development. Public initiatives to foster content development should be considered. One way of doing this is to create IT centres specialised in content production, such as Colombia's *ViveLabs* (Box 10.5). Training and content development courses can also be offered in ICT centres, which are often set up in rural areas or schools that have been connected to the Internet.

Box 10.5. **Colombia's *ViveLab* programme**

ViveLab is a national Colombian programme to foster the development of digital content and applications throughout the country to drive digital entrepreneurship. Labs have been launched a number of cities, including Manizales, Pereira, Armenia, Cali, Popayán, Bogotá, Bucaramanga, Medellín, Barranquilla, Cartagena, Montería, Sincelejo, Boyacá, Pasto, Pitalito, Villavicencio and Yopal.

The centres provide free training courses as part of the Ministry of ICT's strategy to offer courses on videogame design and creation, 2D and 3D animation, digital video, business models and entrepreneurship, web development, mobile development, special effects and digital advertising.

Source: OECD (2014a), OECD Reviews of Innovation Policy: Colombia 2014, *http://dx.doi.org/10.1787/9789264204638-en*.

Another good practice for fostering local content production is to create platforms that serve not only as aggregators of local content but incentivise the creation of local content, including those in indigenous languages. The *Memoria Chilena* platform offers content from Chile's National Library and other libraries, archives and museums to disseminate content central to Chile's cultural identity.[3] The Colombian projects *En mi idioma* and the *Educatrachos* project in Honduras focus on the development of content in indigenous languages.[4]

Besides the direct measures mentioned above, policy makers in the region also need to work on **indirect measures to promote the development and distribution of digital content and applications**. These include: i) improving basic literacy and digital literacy; ii) easing access to hard- and software; iii) promoting local hosting services; and iv) opening up government data (see Chapter 12 for more information on government data).

Developing digital content and applications requires a certain skills level, both in terms of general literacy skills such as language and drafting skills, and digital literacy (see Chapter 9 on digital skills). Governments of the region, and education ministries in particular, should evaluate skill levels and develop appropriate learning. This should both target the educational system and lifelong learning and training on the job (OECD, ISOC and UNESCO, 2013).

Besides the appropriate skills for developing digital content and applications, firms and individual content producers need ICT equipment, whether computers, smartphones or cameras. Policy makers should ensure that no additional luxury taxes or other levies are imposed on these devices, to make sure that they remain affordable (see Chapter 6 on affordability and government charges).

Finally, as noted above, it is recommended that policy makers in the LAC region promote the **establishment of local hosting services** to host the digital content produced in the region. This can both avoid routing traffic internationally and can stimulate content production in the region.

Conclusion

Since significant value of the Internet lies in its adoption and use, policy makers in the LAC region have an important task in fostering business uptake, ICT entrepreneurship and developing digital content. This is all the more important in the light of low uptake rates in several LAC countries.

In assessing business uptake in the region, policy makers should be able to rely on a sound measurement agenda, to track use and identify usage gaps. A second step involves

the development of policies to increase ICT adoption in firms. This includes the promotion of digital skills. Promoting e-commerce is a third key area for expanding the markets of firms of all sizes.

Fostering digital entrepreneurship is another way of increasing ICT uptake and creating a digital culture. LAC policy makers could review potential regulatory barriers to entrepreneurship, improving access to finance and promote the use of cloud computing as a flexible way of accessing IT resources.

Finally, policy makers can focus on fostering the development of content in the LAC region that serves the needs of businesses and individuals in the regions. This includes promoting local and multilingual content.

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ANNEX 10.A1

OECD Indicators on ICT usage by businesses – Proposed indicators for the second revision

CORE MODULES

Module A: Connectivity

Computer use

Definitions

Information and Communication Technologies (ICT) consist of the hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services.

Computers include personal computers, portable computers, tablets, other portable devices.

Computers here do not include smart phones or any other device, although with embedded computing abilities, having a main function other than computing (e.g. MP3 and other media players, game consoles, electronic dictionaries, GPS navigation devices, e-book readers etc.).

Persons employed is the total number of persons who work in the observation unit (inclusive of working proprietors, partners working regularly in the unit and unpaid family workers), as well as persons who work outside the unit but belong to it and are paid by it (e.g. sales representatives, delivery personnel, repair and maintenance teams). It excludes manpower supplied by other enterprises, persons carrying out repair and maintenance work in the enquiry unit on behalf of other enterprises, as well as those on compulsory military service.

A1.	**Workers using a computer in their daily work** (as a % of persons employed in the enterprise)	This indicator portrays the intensity of computer usage in businesses. Data can be collected as number or % of workers. The item can be used as a general filter question in surveying: if no worker uses a computer then only background data will be collected.

Broadband access

Definitions

Broadband subscriptions have an advertised download speed greater than 256 kbit/s.

- **Wired (fixed) broadband connections** include xDSL, cable modem, optical fibre (e.g. FTTx), leased lines, Ethernet, PLC, BPL;

- **Fixed wireless connections** include public-WIFI, satellite and terrestrial fixed wireless such as fixed WiMAX, LMDS and MMDS;
- **(Terrestrial wireless) Mobile broadband connections** include technologies such as 3G/LTE/4G, UMTS, CDMA2000, and any other future technology.

A2.	**Enterprises with broadband by type (fixed/mobile)** (as a % of total enterprises)	Wired and fixed wireless connections should be kept separated from mobile broadband connectivity. Most countries have by now discontinued.
A3.	**Connection speed (distribution)**	Maximum contracted download speed of the enterprise fastest fixed connection: 2 Mbit/s, up to 10 Mbit/s, up to 30 Mbit/s, up to 100 Mbit/s, up to 1 Gbit/s, at least 1 Gbit/s.

Internet use

A4.	**Workers accessing the Internet** (% of persons employed)	If nil, MODULE ends here.
A5.	**Workers accessing the Internet in mobility** (% of persons employed)	Includes persons employed using a portable device provided by the enterprise (notebooks, mobile phones, etc.) through mobile telephone networks. If nil, MODULE ends here.
A6.	**Remote access to enterprise ICT facilities** (% of enterprises providing access, by facility)	E-mail, documents in servers, dedicated software applications.
A7.	**Barriers to the use of mobile telephone networks for accessing the Internet:** (% relevance of barriers)	Applies to respondents who declared not to use mobile wireless connections. Barriers may include connectivity to networks, hardware, subscription and integration costs, security and technical issues.

Module B: Website

B1.	**Enterprises having a website** (as a % of all enterprises)	This indicator can be used as filter question in survey implementation
B2.	**Website characteristics** (% of enterprises with a website allowing for online ordering; Extension includes % of enterprises with website allowing for other specified functionalities)	Other possible core functionalities include: – Description of products or price lists, – Possibility to customise or design online the products, – Tracking or status of orders placed, – Mobile version of the website, – Personalised content for regular/repeated visitors, – Links to the enterprise's social media profiles, – A privacy policy statement, – Seal or safety certificate, – Advertisement of open positions or online job application.
B3.	**Use of selected strategies to direct traffic to enterprise website** (% of enterprises)	Strategies may include: advertisement on (a) other websites, (b) on search engines, (c) on other media, or (d) presence on social media, etc.
B4.	**Reasons for not having a website**	The following items are usually considered: (a) No need; (b) high set up and maintenance costs, (c) lack of internal technical expertise.

Module C: Information Management Tools

Intranet and Extranet

Definitions

Intranet is an Internet-like system only operating within a single organisation.

Extranet is a linked network of intranets or part of a company's intranet that is extended to users outside the company. They may be used to share securely part of a business's information or operations with suppliers, vendors, partners or customers.

C1.	**Intranet** (% of all enterprises)	
C2.	**Extranet** (% of all enterprises)	

EDI, ERP, CRM and RFID

Definitions

- **Electronic Data Interchange (EDI)** refers to applications allowing for automated exchange of messages between enterprises and organisations:
- Sending and/or receiving of messages (e.g. payment transactions, tax declarations, orders, etc.) in an agreed or standard format suitable for automated processing, e.g. EDI, EDIFACT, XML , xCBL, cXML, ebXML, ODETTE, TRADACOMS;
- Without the individual message being typed manually.

Enterprise Resource Planning (ERP) is a software package used to manage resources by sharing information among different functional areas (e.g. accounting, planning, production, marketing, etc.). ERP software can use EDI technology and be clubbed with or embed CRM (see below).

Customer Relationship Management (CRM) refers to any software application for managing information about business' customers. CRM functions can also be embedded into ERP software.

Radio Frequency Identification (RFID) is an auto-identification technology (like barcodes), which allows contactless information transmission, integration with sensors and the modification of stored data based on radio waves. Information is contained in 'RFID tags' (transponders) applied or incorporated into products or objects. RFID technology has a growing range of applications, from logistics, to retail, to manufacturing and access control.

C3.	**Enterprises using EDI, RFID, ERP and CRM** (% of all enterprises, by technology/application)	Under this heading are grouped very diverse items, each corresponding to a stand-alone indicator.

Sharing information electronically: Supply Chain Management (SCM) and internal integration of information

Definitions

- Sharing information electronically on Supply Chain Management (SCM) means exchanging all types of information with suppliers and/or customers about the availability, production, development and distribution of goods or services.
- This information may be exchanged via websites, networks or other means of electronic data transfer, but it excludes manually typed e-mail messages.

C4.	**Sharing electronically SCM information with suppliers and customers** (% of all enterprises, by type of partner)	This is a double indicator: underlying data ought to be collected asking separately for suppliers and customers.
C5.	**Automated share of information on orders received across different business functions** (% of all enterprises)	The indicator refers to software integration. Business functions may include management of inventory levels, accounting, production or services management, distribution management, etc.
C6.	**Sending or receiving EDI-type messages suitable for automated processing for selected purposes** (% of all enterprises)	Sending and receiving orders, e-invoices, product information, transport documents, paying instructions, data to public authorities.
C7.	**Reasons for sending or receiving EDI-type messages** (% of all enterprises)	Reasons may include: lack of in-house expertise for implementation; low or uncertain expected returns; lack of appropriate software; difficulty in agreeing common standards with business partners; uncertainty of the legal status of the messages exchanged.

C8.	**Using CRM software to manage and analyse information about customers** (% of all enterprises)	Items may include the collection, storing and availability of information about customers to various business functions, as well as the analysis of information about customers for marketing purposes (e.g. setting prices, sales promotion, choosing distribution channels, etc.).
C9.	**Sharing of SCM-related information with suppliers** (% of all enterprises, possibly by type of information)	For both indicators, items considered may include: (a) Demand forecasts, (b) Inventory levels, (c) Production plans, and (d) Progress of deliveries (i.e. distribution of raw materials or finished products).
C10.	**Sharing of SCM-related information with customers** (% of all enterprises)	Note: sharing considered is by electronic means only.
C11.	**Methods used to exchange SCM-related information** (% of all enterprises, by method)	Methods include (a) websites or web portals, and (b) electronic transmission allowing automatic processing methods (e.g. EDI-type systems, XML, EDIFACT, etc.).
C12.	**Barriers to the use of information management tools (ERM, CRM, RFID)** (% relevance of barriers, by tool)	This is a multiple indicator. for each tool, examples of barriers include: lack of relevance, lack of in-house expertise; employees' resistance to changes in work-practices; low or uncertain expected returns; lack of appropriate software; high costs, unavailability of reliable support services. In scope population: enterprises which do not use IM tools.

Electronic invoicing

Definitions

There are invoices in paper form and electronic form. **Invoices in electronic form** are of two types:

- E-invoices in a **standard structure suitable for automated processing** (e.g. EDI, UBL, XML). E-invoices are exchanged either directly or via service operators or *via* an electronic banking system
- Invoices in electronic form **not suitable for automated processing** (e.g. e-mails, e-mail attachment as pdf, images in TIF, JPEG or other format).

C13.	**Types of invoices sent by the enterprise** (% of all invoices; % of all enterprises)	Types include e-invoices in a standard structure suitable for automatic processing (e.g. EDI, UBL, XML, etc.), electronic invoices not suitable for automatic processing (e.g. emails, email attachment in PDF format), paper form invoices.
C14.	**E-invoice received by the enterprise** (% of all enterprises)	

Module D: Electronic Commerce

Definitions

An **electronic commerce (e-commerce)** transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The payment and the ultimate delivery of the goods or services do not have to be conducted online.

- An e-commerce transaction can take place between enterprises, households, individuals, governments, and other public or private organisations. Enterprises' e-commerce sales *(E-sales)* with reference to customers the acronyms B2B *(Business to Business)*, B2C *(– to Consumers), or B2G (– to Government)*.
- To be included are orders made over the web, extranet or electronic data interchange. The type is defined by the method of placing the order. To be excluded are orders made by telephone calls, facsimile or manually typed e-mail.
- EDI transactions take place in an agreed or standard format which allows their automatic processing (e.g. EDIFACT, UBL, XML) without the individual messages being typed manually.

- Web transactions are made *via* an online store (web shop), web forms on a website or extranet. Manually typed e-mails are to be excluded.

D1.	**Enterprises conducting e-commerce sales** (as a % of all enterprises)	Platforms include (a) EDI and (b) web.
D2.	**E-sales value by platform and type of customer** (as % of total turnover)	Platforms include (a) EDI and (b) web. Customers include (a) end consumers and (b-c) other enterprises and government: these two latter categories might need being joined in survey implementation, due to difficulties in getting separate data. On the other hand, survey practice showed that respondents find it difficult to report their total e-sales (e-purchases) and that these figures are better obtained by summing up components. Also, in survey implementation, values can be collected in absolute terms.
D3.	**Web-sales percentage breakdown by type of customer and geographic area**	Customers: (see above, D2). Geographic area: own country; foreign countries. Value data ought to exclude value added taxes.
D4.	**Means of payment accepted web-sales** (% of all enterprises, by means of payment)	Online payment, i.e. payment integrated in the ordering transaction (e.g. credit, debit card, direct debit authorisation, *via* third party accounts). Offline payment, i.e. payment process is not included in the order transaction (e.g. cash on delivery, bank transfer, cheque payment and other non-online payment).
D5.	**Barriers to web-sales** (% relevance among enterprises)	Barriers may include the following: products unsuited for web-sales, logistics, payments, security, legal issues, low expected returns.
D6.	**EDI-sales breakdown by geographic area** (% of EDI sales)	Own country, foreign countries.
D7.	**Enterprises conducting e-purchases** (as a % of all enterprises)	
D8.	**E-purchase value by platform** (as a % of total purchases)	Platforms include EDI and web. In survey implementation, values can be collected in absolute terms, while total is better obtained by asking for components separately (see comments to D2.).

Module E: Security and Privacy

Definitions

Management represent measures, controls and procedures applied on ICT systems to ensure integrity, authenticity, availability and confidentiality of data and systems.

Privacy risks refer to any danger that personal information stored by the enterprise be used for illegal purposes, or any other purpose not explicitly agreed by the interested party.

External attacks: can be determined by injection of malicious software or unauthorised access, pharming (redirection of traffic to a fraudulent website)

E1.	**Formal policy to manage ICT security risks** (% of all enterprises)	This indicator is a twin to the indicator on privacy, and aims at acknowledging the diffusion of formal guidelines to address risks among enterprises.
E2.	**Risks addressed by the security policy of the enterprise and incidents encountered** (% of enterprises, by occurrence)	Risks include IT failures and external attacks. Incidents encountered include loss or disclosure of data or unavailability of services, graded according to their seriousness*.

(*) Incidents self-evaluation guidelines (scale):

Minor: Addressed with routine intervention, which had no relevant impact in terms of time/information/money loss.

Serious: Demanded specific countermeasures (e.g. restoring back-up copies of disk information; in-depth analysis; service denial attack) and thus resulted in some costs in terms of time, information or money.

Critical: An event that implied serious consequences, such as massive loss of information, disclosure of confidential data, system breakdowns and, in general, significant negative consequences in terms of productivity, money or reputation.

E3.	**Security facilities or procedures in place** (% of all enterprises)	A taxonomy of facilities/procedures may include: – Identification and authentication (Strong password, Hardware tokens (e.g. smart cards), Biometric methods), – Intrusion detection systems (e.g. antivirus, antispyware, firewall, etc.), – Spam filter / Web filter, – Offsite data backup, – Staff awareness on their obligations on ICT security related issues (by training, information, contractual obligation), – Other aspects related to security policy management (Security manager, specific resources, regular review and audit plans). In-scope population: Enterprises having a formal ICT security policy.
E4.	**Collection or storage of personal information on end customers for analytical purposes** (% of all enterprises)	Collection or storage in order to analyse socio-demographic characteristics and purchasing behaviour.
E5.	**Methods of obtaining or collecting personal information on end customers** (% of enterprises using each method)	Methods may include: Social media (e.g. Facebook, Twitter), third party (e.g. Marketing firm), directly from customers and loyalty or reward programmes.
E6.	**Formal policy to manage ICT privacy risks** (% of all enterprises)	
E7.	**Methods of protecting digital personal information** (% of enterprises collecting information)	Methods may include the following: Storing data offline, control to limit access (e.g. security clearances, sharing agreements), encryption of data and protection by third party. In-scope population: Enterprises collecting digital personal information.

COMPLEMENTARY MODULES

Module F: E-Government

Definitions

Public authorities refer to both public services and administration activities such as tax, customs, business registration, social security, public health, environment or commune administrations.

Public authorities can be at local, regional or national/federal level.

F1.	**Use of the Internet to interact with public authorities** (% of all enterprises, by type of interaction)	Interactions may include: (a) obtaining information or documents (e.g. tax declaration) from public authorities' websites, (b) returning filled in forms electronically (e.g. for customs, value added tax declaration), (c) treating an administrative procedure completely electronically (e.g. declaration, registration, authorisation request). Interaction may be distinguished between in-house or via a third party.
F2.	**Use of the Internet to manage administrative procedures** (% of all enterprises, by type of procedure)	Declaration of social contributions for the persons employed, corporate tax, value added taxes and customs/excise.
F3.	**Barriers to interact electronically with public authorities** (% relevance of each barrier)	Barriers may include the following: concerns of security, complexity, ineffectiveness, lack of information on electronic procedures.

Module G: Emerging uses of Information Technologies

This module refers to technologies that at present are used by relatively few enterprises (data analytics, and to a lesser extent Radio Frequency Identification - RFID), or whose linkages with economic outcomes are less straightforward (green ICT policies) or are not obvious to assess, and in coming years are likely to spread in a seamless fashion (cloud computing).

In view of the above, this module is considered as "non-core". In addition, its sections will need to be revised in the future, with the possible inclusion or exclusion/displacement of some technologies and uses.

Use of Radio-frequency identification (RFID) technologies

G1.	**Use of RFID technologies for selected purposes** (% of enterprises by purpose)	Aspects monitored may include: – personal identification and access control; – Production and delivery process (control of production, supply chain/inventory tracking, service or asset management); – Product identification (e.g. theft control, counterfeiting etc.); – Payment applications (tolls etc.).

ICT green policies

G2.	**Adoption of selected ICT green policies** (% of enterprises, by policy)	Aspects considered might include policies designed to (a) to reduce paper usage (b) to reduce ICT equipment energy consumption (e.g. automated power-down of devices, multi-function peripherals, virtual servers, etc.), (d) to substitute travel with telephone, web or video conferencing, (d) to introduce dedicated IT applications to reduce energy consumption of business processes.

Use of cloud computing

Definition

Cloud computing refers to ICT services that are used over the Internet to access software, computing power, storage capacity etc., where the service:

a. Is delivered from **servers** of service providers;

b. Can be easily **scaled** up or down (e.g. number of users or change of storage capacity);

c. Can be used **on-demand by the user**, at least after the initial set up (without human interaction with the service provider);

d. Is **paid** for, either per user, by capacity used, or they are pre-paid.

Cloud computing may include as well connections via Virtual Private Networks (VPN).

G3.	**Purchase of selected cloud computing services** (% of enterprises, by service)	Main cloud computing services include: (a) E-mail, (b) Office software, (d) Finance or accounting software, (e) Customer relationship management (CRM) software, (c) Hosting of databases, (d) storage of files, and (f) computing power to run own software.
G4.	**Access to cloud computing services via shared or dedicated servers** (% relevance of each way of access)	
G5.	**Benefits from using cloud computing services** (% relevance of each item considered)	Items considered might include: (a) reduction of ICT related costs, (b) flexibility in up- or down-scaling services, (c) simplicity of (easy and quick) deployment of cloud-based solutions, (d) Increased productivity. Self-assessment might be performed based on a qualitative scale (e.g. high/some/limited/no benefit). Free of charge services might be excluded from evaluation, or considered separately.
G6.	**Factors preventing or limiting the use of cloud computing services** (% relevance of each item)	Items considered might include: (a) Risk of a security breach; (b) Problems accessing data or software; (c) Difficulties in unsubscribing or changing service provider (including concerns with data portability); (d) Uncertainty about the location of the data; (e) Uncertainty about applicable law, jurisdiction, dispute resolution mechanism; (f) High cost of buying cloud computing services, or (g) Insufficient knowledge of cloud computing.

Use of data analytics

Definitions

Data analytics here is intended as the treatment (analysis, modelling) of data concerning, for instance, customers and market behaviours and dynamics, to gain information supporting decisions (e.g. targeting products and marketing, and/or allocation of resources). Data and data analysis can be collected and/or performed by the enterprise itself or purchasing them and/or the service from external providers. The definition excludes the purchase of services where data analytics is not the main purpose of the transaction (such as online advertising, where ads are addressed to potential customers based on data analytics techniques).

Expenditure hereunder covers all types of expenditure made by the enterprise for data analytics purposes, including e.g. personnel costs, databases, third-party services, etc.

G7.	**Use of data analytics, in-house or purchased** (% of enterprises, by way of use)	In survey implementation, this indicator might be translated into a filter question, or joined to G8.
G8.	**Expenditure on data analytics** (value, % of total variable costs)	Underlying data might be collected in national currency or percentage values, and should include personnel costs. Both aspects are deemed relevant to monitor.
G9.	**Reasons for using data analytics** (% relevance of each motivation)	Items considered might include (a) Identification of potential customers, (b) Increasing customers' spending (tailoring of offers and discounts, etc.). (c) Tailoring products to customers' needs (d) Gain effectiveness in internal/production organisation (e.g. identify bottlenecks, best practices, etc.).
G10.	**Impact of data analytics on selected performance aspects** (% relevance of each aspect)	Aspects considered might include: (a) Cost savings; (b) Sales growth (including due to product improvements and more effective marketing), or (c) enhancements in business organisation. Self-assessment might be performed based on a qualitative scale (e.g. high/some/limited/no benefit)
G11.	**Factors limiting or preventing the use of data analytics** (% relevance of each item)	Aspects considered might include: (a) of no use in business (b) limited expected returns vs. costs, (c) lack of skills, (d) legal (e.g. privacy) issues and risks.

Module H: ICT Skills

Definitions

ICT specialists are employees for whom ICT is the main job. For example, to develop, operate or maintain ICT systems or applications.

ICT related functions encompass a wide variety of activities within the enterprise. ICTs are not the main job but a tool.

H1.	**Employment of IT specialists** (% of enterprises)	In survey implementation, this indicator might be translated into a binary filter question or joined to H2.
H2.	**IT specialists** (% of persons employed)	Data might be collected as number of persons employed or percentage.
H3.	**IT training provided to workforce** (% of enterprises, by type of training offered)	It is useful to distinguish specialists' training from training for other users of ICTs for their daily tasks.
H4.	**Recruitment of IT specialists** (% of enterprises which offered positions)	The indicator might distinguish filled and non-filled vacancies.
H5.	**Difficulties in hiring IT specialists** (% of enterprises experiencing difficulties)	In survey implementation this indicator might be translated into a binary question or joined to H6.
H6.	**Difficulties in hiring IT specialists** (% relevance of each reason)	Reasons for hard to fill vacancies might include lack of ICT skills by applicants: (a) technical, (b) managerial (e.g. ICT project, ICT contract or ICT security), or (c) related to ICT business integration, as well as (d) excessive expected remuneration.

H7.	**ICT functions performed in-house or by external specialists** (% of enterprises relying mainly on internal or external resources, by function)	Functions considered might include: – Maintenance of ICT infrastructure (servers, computers, printers, networks, etc.) – Service and support for software installed on employees computers – Development of e-business systems (e.g. ERP, CRM. databases) – Maintenance of e-business systems – Development of web solutions (e.g. websites, e-commerce) – Maintenance of web solutions – Security and data protection (e.g. testing and software) – Development of ICT architecture.
H8.	**Use of foreign suppliers for ICT functions** (% of enterprises)	The use of foreign suppliers might regard any function requiring ICT specialists. The indicator might further distinguish external suppliers from foreign affiliates of the enterprise.

Module I: ICT expenditure and acquisition

Note: Indicators in this module can present some overlaps with indicators on ICT skills (e.g. expenditures for ICT functions) and on use of given applications (e.g. software as a service).

I1.	**Expenditures on hardware, software or services** (% of enterprises)	In survey implementation, indicators I1 to I3 can be produced from values per category and channel.
I2.	**Expenditures on hardware, software or services** (relevance of expenditure by type – values and %)	Categories include ICT equipment (can be divided into IT and CT), software (can be divided into pre-packaged and custom) and consultancy services.
I3.	**Channels used to acquire ICT goods and services** (relevance of each channel by type of expenditure)	Channels can include purchase, lease, own account, and/or capitalised vs. non-capitalised expenditures (split into lease and other purchases). Expenditure on maintenance and repairs might be excluded.
I4.	**Purchase of selected ICT services** (% of enterprises and expenditure on each type of service)	Categories considered might include: (a) Software as a service (SaaS – on demand software); (b) Website design or hosting services; (c) Database services (e.g. database design or management, data storage, data processing and reporting services (this might form a separate item).

Module J: Open Source Software (OSS)

Definition

An **Open Source Software (OSS)** is software where the source code available without any copyright cost and which provides the possibility of modifying and/or (re)distributing it.

J1.	**Use of third party open source software** (% relevance of each type of application)	Classes considered might include – Operating systems (e.g. Linux, Ubuntu) – Internet browsers or email managers (e.g. Mozilla Firefox, Zimbra) – Office software (e.g. OpenOffice) – Software for web servers (e.g. Apache, Tomcat) – Applications for information management (e.g. OpenERP, OpenCRM) – Security software (e.g. Open SSL, SSH) – Other open source software, such as e-learning platforms (e.g. Moodle) or e-mail servers (e.g. Send Mail, Postfix).

Module K: Use of social media

Definition

Use of **social media** refers to the enterprise's use of applications based on Internet technology or communication platforms for connecting, creating and exchanging content online, with customers, suppliers, or partners, or within the enterprise.

Enterprises using social media are considered those that have a user profile, an account or a user license depending on the requirements and the type of the social media. Enterprises that use social media only for posting paid adverts are out of the scope of the module.

K1.	**Presence of a formal policy for using social media** (% of enterprises)	
K2.	**Use of selected social media** (% relevance of each tool)	Social media might include: (a) social networks (other than paid advertisement), (b) blogs, (c) file sharing, (d) wiki-type knowledge sharing tools.
K3.	**Use of social media for selected activities** (% relevance of each activity)	Activities might include: – Develop company image or market products (e.g. advertising or launching products, etc.) – Communicate with customers (opinions, reviews, questions etc.) – Involve customers in development or innovation of products – Collaborate with partners or other organisations – Recruit employees – Exchange views, opinions or knowledge within the enterprise.

Module L: Adopting key ICT tools: perceived benefits, barriers and impacts – open indicators

L1.	**Benefits from selected ICTs not considered elsewhere** (% relevance of each item)	This indicator can be used for applications not considered in specific modules, e.g. Broadband, e-sales, ERP or CRM. Dimensions might include: – Reduced costs of operations and/or labour – Increased ability to respond to customer or supplier requirements – Keeping pace with competitors – Reduced transaction times – Improved goods or services quality – Improved flexibility of production or service provision – Improved information sharing. Impacts might be graded (high, limited, none/not applicable).
L2.	**Changes in selected aspects of business organisation from ICT adoption** (% relevance of each aspect)	This indicator complements L1 with information on specific aspects on business organisation. It may be formulated with respect to specific applications (as above) or in more general term. Elements considered might include (a) re-engineering of business processes, (b) data collection, storage, and maintenance, and (c) greater reliance on job rotation, multi-skilling.

Background information

Information hereunder is often collected in other structural surveys and via administrative records, and is essential to compile basic indicators (industry, employment, turnover, purchases) or indicators based on other characteristics of the enterprise which are deemed to be related with adoption behaviour (belonging to a group, selling abroad).

I.	**Main economic activity of the enterprise**	Usually includes ISIC code and description of activities. Main product classes might also be surveyed.
II.	**Belonging to a group and group features**	Useful information includes (a) the position of the enterprise within the group, (b) whether the group includes enterprises in foreign countries and (c) it is under foreign control.
III.	**Sales on foreign markets**	Information might be binary or expressed in value (or as a percentage of turnover).
IV.	**Number of persons employed**	Usually average employment during the reference year.
V.	**Turnover**	Values (in national currency units) should be expressed net of value added taxes.
VI.	**Purchases**	

Source: OECD, 2015b.

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Chapter 11

E-Health

This chapter examines how broadband-enabled information and communication technologies (ICTs) can improve health care systems in Latin America and Caribbean (LAC) countries. It provides advice on the range of policy options, conditions and practices that policy makers can adapt to their country's particular circumstances. Accelerating adoption and effective use of these technologies can help meet pressing public health needs and improve access to care. The analysis draws upon the considerable body of recent literature and on lessons learned from LAC case studies. Information is central to health systems, and can be put to a wide range of uses. Broadband networks and broader ICTs that permit timely and accurate collection and exchange of health data can also enhance co-ordination of care and more efficient use of resources. The chapter shows how various policy dimensions must be addressed to realise the potential gains from e-health through improved use of broadband and the ICTs it supports.

This Toolkit surveys the many economic and social benefits broadband can bring to the Latin America and Caribbean (LAC) region. One area where it can realise significant gains is in facilitating the development of e-health. Telemedicine is not a new phenomenon, but broadband connectivity allows professionals to share data in new ways and overcome the barriers of distance. Meanwhile broadband networks, coupled with devices such as smartphones and the Internet of Things (IoT), can help health care professionals and individuals meet some of the challenges they face in everyday care and prevention. The fundamental benefit of broadband networks is that they can connect advances in the health care industry, whether transporting new imagery for diagnostics or even using virtual reality[1] so that professionals and individuals can interact remotely. All these new developments require more bandwidth, which broadband networks can provide.

The use of information and communication technologies (ICTs) in general in the health sector, and broadband in particular, can result in care that is of a higher quality, safer and more responsive to patients' needs, as well as more efficient (appropriate, available and less wasteful). Its advocates point to the potential reduction in medication errors as one critical advantage. There is also growing evidence that ICTs are essential for improving access to health services, particularly in rural and remote areas where resources and expertise are scarce or even nonexistent. This can help support the development of new, innovative models of care delivery over broadband networks (OECD, 2010).

Many e-health initiatives are emerging in Latin American and Caribbean (LAC) countries. The term e-health is understood here as the application of ICTs throughout the health system: educating and informing health care professionals, managers and consumers/patients; health promotion and prevention; improved care and innovation in health care delivery; and better performance in health systems, by informing programme, policy and funding decisions.

Despite their tremendous promise, incorporating ICTs into daily use has generally proven difficult. Taking advantage of the potential gains of ICTs requires careful planning, significant investment in infrastructure and collaboration between stakeholders. Understanding the challenges of adoption and effective use of ICTs across these various functions, and their broader economic effects, can help increase their penetration and realise the potential benefits. In order to encourage wide-spread adoption, a robust, balanced approach to privacy and security is essential to establish the high degree of public confidence and trust needed for health ICTs, and particularly electronic health records.

The main objective of this chapter is to contribute to a greater understanding of the role of telecommunication and broadband infrastructure in advancing e-health services. A particular focus is on compensating for physician shortages and closing the urban-rural gap in the LAC region. The availability of electronic health records over high-speed networks, for example, can reduce waste, improve patient outcomes and cut costs. Telemedicine

applications that make possible clinical care in real time, bringing together geographically distant patients and providers, can help deliver the highest quality care to even the most remote communities. Remote monitoring by broadband can facilitate post-operative care and chronic disease management without hospitalisation or institutionalisation. The aim of this chapter is also to contribute to the development and use of indicators to measure progress and identify good practices in e-health, within the broader digital agenda framework of LAC countries.

The following sections briefly review LAC countries' efforts and current perspectives on the state of health ICTs in the region, and the economic and social benefits that can be realised. While no study has yet estimated the total cost savings possible from broadband-enabled projects, the results of a variety of small programmes in the region make clear the potential. The chapter then highlights areas that can be useful for sharing information and developing indicators to monitor progress, presenting international comparisons. It analyses specific examples of e-health applications in a number of LAC countries, taking into account their main health needs and policy objectives. It outlines the challenges of implementation and how countries have managed to resolve bottlenecks. Concrete examples, taking into account local contextual issues, such as public health needs or the extent of broadband infrastructure development, can support decision-making on e-health initiatives and enhance health and living conditions in the region.

Key policy objectives for the LAC region

ICTs are used to enhance health care systems in numerous ways. The main high-level policy objectives include the following:

- **Efficiency gains and cost reduction.** The introduction of ICTs can improve the value created in the health sector (OECD, 2010), specifically, in efficiency gains and cost reduction. The most frequently cited advantage is the reduction of unnecessary health care services. For example, electronic health records (EHRs) can facilitate evaluation of health care interventions and their quality at practice level, and facilitate clinical research and public health planning. ICTs can also be used to provide the information for incentive programmes, such as pay for performance.
- **Improved access and health care delivery, supporting the goals of universal care coverage.** ICTs can improve the quality of care and make care more responsive by enabling timely access and supporting the goals of universal care coverage. Tele-health is increasingly seen as an important way of optimising continuity in care and improving access to health services, particularly in rural and remote areas where health care resources and expertise are scarce or even nonexistent.
- **Reduced medical errors and improved patient safety.** ICTs can prevent medication errors by making it easier for health care professionals to acquire and share information about patients. Electronic drug prescriptions (e-prescribing) can, for example, be integrated to check for patient information on any history of adverse drug reactions (ADRs).
- **Improved prevention and management of chronic diseases.** ICTs can also play an important role in increasing compliance with clinical care guidelines – or protocol-based care – which is particularly valuable in the management of chronic diseases such as asthma, diabetes and heart failure. It can also improve care co-ordination, which is essential for improving clinical outcomes in chronically ill patients.

- **Improved data sharing for infectious disease monitoring.** ICTs, especially mobile devices, can enhance health workers' ability to ensure that cases are diagnosed, reported and managed effectively. It can particularly help by facilitating adherence to treatment.

Progress in these policy objectives can help make health systems more responsive to the patients they serve, while increasing their efficiency and sustainability. With this in mind, the Pan American Health Organisation's (PAHO) 51st Directing Council passed a resolution adopting the "Strategy and Plan of Action on eHealth". The Council approved the resolution with the goal of ensuring the sustainable development of member states' health systems through the application of health care based ICTs and to achieve "substantial cost savings through effective and efficient health services delivery and epidemiological surveillance" (PAHO, 2011).

Tools for measurement and analysis in the LAC region

Complex challenges lie ahead in achieving widespread broadband adoption and leveraging ICTs to improve care. Many countries hope to learn from others' successes and failures to inform their own policy development. This requires a shared understanding of terms and harmonised approaches to measuring availability, adoption and effects. This section focuses on efforts to measure ICT availability and use.

Since 2008, the OECD has led an effort to gather reliable statistics to compare ICT development and policies in the health sector (Adler-Milstein et al., 2014). This can help governments understand the barriers and incentives to ICT use and to realise the far-reaching economic and social benefits of their application. A model questionnaire was completed and published in 2013 (OECD, 2013a). Part I of the survey is addressed to general/primary care/family practitioners in ambulatory settings, and Part II to chief information officers and administrators in acute care settings. Indicators are grouped into four broad domains in which measurement of availability and use are policy priorities for most countries:

- **Provider-centric electronic records.** Systems used by health care professionals to store and manage patient health information and data, including functions that support the care delivery process (e.g. electronic medical records, or EMRs, EHRs, or electronic patient records, or EPRs).
- **Patient-centric electronic records.** Systems typically used by patients and their families to access and manage their health information and organise their health care (e.g. personal health records (PHRs), patient portals and other patient-centric electronic records).
- **Health information exchanges.** The process of electronically transferring (or aggregating and enabling access to) patient health information and data across provider organisations (e.g. e-transfer of patient data between ambulatory care providers or e-transfer of data at the regional level).
- **Tele-health.** A broad set of technologies that support care between patients and providers, or among providers in different locations (e.g. video-mediated consultations between physicians and patients, remote home monitoring of patients, teleradiology).

Further guidance on implementation is available in the *Draft OECD Guide to Measuring ICTs in the Health Sector* (OECD, 2013a). Some of the experiences in implementing the model survey, including in LAC countries, are reviewed below (Box 11.1).

Box 11.1. **Implementing the OECD model survey on e-health**

Since 2013, several countries have begun piloting the OECD model survey and/or mapping information from existing surveys and administrative data sources to indicators that would be derived from the model survey. Related data for additional countries is available in surveys of primary care physicians conducted by the Commonwealth Fund and of primary care physicians and hospitals commissioned by the European Commission.

The OECD model survey was also used as input for the development of a framework for the collection of ICT statistics by LAC countries. In particular, **Brazil** has been co-operating with the OECD through the Regional Centre for Studies on the Development of the Information Society (CETIC.br) since January 2012. In 2013, Brazil became one of the first countries to pilot the draft model survey questionnaire. The survey was administered to a probabilistic sample of public and private health care facilities, as well as to health care professionals (physicians and nurses). The results have made it possible to map the ICT infrastructure, the use of ICT systems and applications, and activities, motivations and barriers preventing the use of ICT by health care professionals. The use of this Health Survey has institutional and methodological support from an expert group composed of representatives from the government, academia, organisations from civil society and international agencies.

In 2014, the Government of **Uruguay** also started to collect data on ICT in the health care sector, as part of the Salud.uy programme, its national e-health strategy. The methodology is aligned with the OECD model survey and the Brazilian pilot project. The questionnaires were sent out between March and June 2014. The overall objective was to establish a baseline for the extent and quality of access, use and appropriation of ICT in the management of health service providers in Uruguay, as well as gaining insights on the appropriation of these technologies by health care professionals.

Building on OECD, Brazilian and Uruguayan experience, the ICT Work Group of the Statistical Conference of the Americas (SCA) of the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) produced a model survey in 2014 for measuring ICT access and use in the Latin American health care sector.

Overview of the situation in the LAC region

In the last few decades, public spending in the social sectors in LAC has grown significantly. According to the United Nations Economic Commission for Latin America and the Caribbean (CEPAL, 2012), the region spent USD 461 per capita in 2005 on average around 1990, compared to USD 1 026 per capita by 2010. Public spending on health, education and social protection increased from 11.2% of GDP in 1990 to 18.6% of GDP in 2010. Growth of health spending and its long-term sustainability have, thus, become important issues on the political agenda of LAC countries, as growth in public spending puts pressure on budgets, provision of health care and household spending. This growth can be explained by several factors. Some are structural, such as the ageing of the population, urbanisation and the increasing availability of advanced medical technologies. Others are related to policy and the overall performance of health care systems.

Health care administrators and policy makers across the LAC face major questions regarding the allocation of scarce health care resources. LAC governments have a wide range of policy tools available to control the escalation of costs. “Command-and-control” policies, such as accepting a decline in the quality of services, a decline in the number of interventions or diseases covered, or a change in the balance between what is funded through the national budget and what people pay out of pocket can hold expenditures down

in the short term, but they often have unintended consequences in the long term. Many LAC countries already have high levels of out-of-pocket spending. In Brazil, for example, for the lowest 40% of the population, almost three-quarters of out-of-pocket spending is attributable to pharmaceutical spending. Such policies, moreover, do little or nothing to moderate the underlying pressures that continue to push health spending up. Other promising avenues are available for controlling health spending in the longer term. Improving the quality of health care, reducing duplication of services, increasing patient safety and co-ordinating care across health care settings can all help control costs. Shifting care out of expensive, acute care settings and into the community and the home has also gained greater acceptance as the prevalence of chronic diseases (and often multiple chronic diseases) increases in ageing populations. Recent evidence suggests that ICTs can play a critical role in achieving these goals.

In 2011, when the Directing Council of PAHO adopted Resolution CD51.R5 on eHealth, it urged the PAHO Secretariat and its member states to respond to public health challenges in the region by creating an environment that enables the use of innovative ICT tools and methodologies. Specifically, Resolution CD51.R5 called on member states to "promote internal dialogue within and co-ordination between ministries and other public sector institutions and encourage the forging of partnerships between government, the private sector, and civil society as a means of building national consensus and facilitating the sharing of experience on cost-effective models" (PAHO, 2011).

The general finding based on analysis of OECD/IDB questionnaires returned by LAC countries and the literature is that most of the LAC region is still at an early stage of health ICT adoption and use. One of the main obstacles to implementing e-health in the region is the lack of professionals with the skills and experience to develop and execute e-health projects (WHO, 2014d). Another important obstacle in the LAC region has been the deficiencies in the technology infrastructure due to instability of connections, limited spectrum, bandwidth and elevated costs of services (often with high upfront costs).

Health care systems in some LAC countries still face severe challenges that limit access to health, such as lack of information, lack of services, distance to services, or household budget constraints. The challenge in these countries is to expand the basic coverage and access to care to most of the population, particularly in rural areas, in a fiscally sustainable way. These countries face a dilemma: short-term and long-term policy priorities may point in different directions in relation to resource allocation. Without solid evidence on which to base decisions, spending on ICTs for health may become a matter of opinion – and often a political gamble. Policy makers therefore need a clear view of the "theory of the case": that is, better evidence why they should support widespread use of ICTs in health care and how best to do this in the face of other priorities. The collection of reliable statistics on quality of care as well as on availability and use of ICTs can be helpful in guiding resource allocation decisions.

Good practices in the LAC region

This section includes countries that already have or are in the process of implementing e-health strategies. In some aspects, they can be considered the most developed in the LAC region. However, it is recognised that many pilot or other initiatives are in place in other countries of the region and are probably not reported in the official literature.

The sections below provide examples of how e-health applications can achieve the four policy objectives noted in the previous section.

Improved mother and child care

LAC countries face a variety of obstacles to improved maternal health: cost-effective e-health interventions can dramatically reduce maternal mortality. In the past 20 years, the LAC region has made significant advances in improving maternal health, and mortality rates have fallen over 40%. Many LAC countries have reached or exceeded the Millennium Development Goal (MDG) to reduce the maternal and child mortality rate, and many have or will soon achieve the new global goal of ending preventable child deaths (defined as an under-5 mortality rate [U5MR] of 20 deaths per 1 000 live births).

Coverage of antenatal care in the LAC region is one of the highest among all developing regions. In 2014, as many as 97% of pregnant women received at least four antenatal care visits during their last pregnancy, a substantial increase from 75% in 1990. National averages often, however, mask local inequalities (UNICEF, 2011). The child mortality burden still varies considerably within countries and can be high in pockets, even when, on average, a nation is doing well (Belizán et al., 2007). In LAC countries, over 180 000 children under 5 years old and nearly 9 000 mothers still die annually, most of them among poor, indigenous and marginalised groups (PAHO, 2012). Maternal mortality in the Caribbean remains particularly high, with 190 maternal deaths per 100 000 live births in 2013. And although Latin America has a much lower maternal mortality ratio, with 77 maternal deaths per 100 000 live births in 2013 (UN, 2015), maternal mortality ratios are 10-44 times higher in the poorest provinces of several countries in Latin America. LAC countries have also made slow progress in reducing adolescent childbearing, with the adolescent birth rate remaining high, at 73 births per 1 000 girls in 2015 (Pérez-Lu et al., 2015).

Information technology can play an essential role in supporting strategies to reduce maternal and child mortality, **delivering information, facilitating access to care and enabling evaluation to better deliver timely resources**. Two initiatives in the LAC region, one based in Peru and the other in Guatemala, have been operating successfully for over five years to support maternal health (Box 11.2). These initiatives found momentum from the Every Woman Every Child global movement launched by the United Nations' Secretary-General Ban Ki-moon during the United Nations Millennium Development Goals Summit in September 2010, leading, in turn, to the creation of an accountability framework with three interconnected processes – monitoring, review and action, focused on countries that account for 98% of the world's maternal and child mortality.

In 2013, the World Health Organization (WHO) and the International Telecommunication Union (ITU) ran a joint survey that explored the use of eHealth for women's and children's health, including in Peru and Guatemala. The report highlights the gains that have been made and offers them as models that other countries can emulate. It also shows, however, that effects on outcomes from e-health initiatives are not immediate. Many difficulties, dilemmas and barriers stand in the way of further progress. In the case of TulaSalud, change was noticeable only two years after the start of the programme, which indicates the need for **sustained support and long-term political commitment** in health support via mobile phones (m-health) and telemedicine projects for obtaining significant returns on investment (WHO, 2014a, 2014b).

Box 11.2. **Examples of applications of tele-health and mobile phone health (m-health) to mother and child care**

Peru's *WawaRed Maternal*

The *WawaRed Maternal* is a project led by the *Universidad Peruana Cayetano Heredia*. It was launched in 2010 with the support of the Inter-American Development Bank (IDB) and the International Development Research Centre (IDRC-Canada). It consists of three fundamental components: electronic health records for prenatal care, text messaging (SMS) and an Interactive Voice Response (IVR) system. Messaging is personalised and tailored to the health profile and gestational age of the patient. SMS content includes information on the importance of vitamins, nutrition, motivational messages, warning signs and reminders about the date of an appointment and other important information during the gestation period. The interactive voice response system consists of a telephone exchange with pre-recorded voicemails with information about warning signs and instructions for when patients should seek health care. *WawaRed Maternal* has been implemented in the region of Ventanilla-Callao in Peru (population 300 000); the local health jurisdiction has 15 health centres and one hospital. The system has found great success and acceptance among users; the implication of messaging for the outcomes of pregnant women is currently being evaluated in a randomised trial.

Source: WawaRed (2016), "WawaRed Maternal", WawaRed, *http://wawared.org/en/en/wawared-maternal*.

Guatemala's *TulaSalud* for reducing maternal and infant mortality

With a Human Development Index (HDI) of 0.581, Guatemala is considered one of the least developed countries in Latin America. The country is divided into 22 administrative departments. Alta Verapaz is one of the largest, with 1.2 million inhabitants, 78% living in rural areas, 89% indigenous communities and 48% living in extreme poverty. In 2012, the maternal mortality rate in the department was 273 deaths per 100 000 live births. The main causes of death are hypertensive disease and postpartum haemorrhage. *TulaSalud* was established to address these high rates of maternal and child mortality. The initiative leverages the potential of m-health. It is based on the provision of a cell phone to community facilitators (CFs), volunteers in rural communities who perform health prevention, promotion and care. The programme also leverages the potential of mobile phone health for distance medical consultations and for community health promotion and prevention. With cell phones, the CFs are able to carry out consultations; send full epidemiological and clinical information related to the cases they attend to; receive continuous training; and help in prevention and promotion of community health through distance-learning sessions. Simple and actionable reports and maps are produced daily, aimed at improving the effectiveness and efficiency of clinical monitoring (e.g. making sure women are receiving timely and appropriate prenatal care and counselling) or at improving the effectiveness and efficiency of health worker monitoring (e.g. making sure CFs are interacting with local communities as expected and investigating any potential issues).

From 2008 to 2012, TulaSalud monitored 6 783 pregnant women and co-ordinated 2 014 emergency transfers, 298 of which were high risk pregnancies and 235 for children under the age of five. A control study showed that the populations involved in the m-health programme (TulaSalud) presented a significant reduction in maternal mortality ($p<0.05$) compared to the group served by community facilitators without ICT tools.

Source: Martínez-Fernández et al. (2015), "TulaSalud: An m-health system for maternal and infant mortality reduction in Guatemala", *http://dx.doi.org/10.1177/1357633X15575830*.

Empowering consumers/patients through health literacy

Information is a key factor for preventing diseases and improving health. Health literacy is still a challenging issue in both developed and developing countries. It can be defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (Bohlman, Panzer and Kindig, 2004). ICTs are a fundamental resource that can provide citizens health and wellness information. Given the recent developments in mobile health applications and social media, ICTs are now uniquely positioned to **deliver prevention and wellness messaging**, to help people change their lifestyle and behaviour to prevent diseases and to maximise well-being.

E-health promotion strategies today include a wide range of solutions, including the creation of websites, dedicated portals, social networks, SMS text messaging, etc. Recent studies and reviews indicate, for example, that SMS may be an effective low-cost method to promote sexual education and healthy behaviour among young people. Web 2.0 is particularly attractive to participants because of the potential of receiving individualised tailored feedback. Governments in LAC are also gradually using mobile health apps and online platforms to deliver medical information to consumers, promoting the healthy lifestyles and behavioural change often required to manage specific health conditions, particularly in vulnerable populations (Box 11.3).

E-health promotional initiatives hold much promise, but might suffer from the problem of a loss of users over time. Some users' motivation tends to drop off after their curiosity has been satisfied by using the app a few times. Systematic research to examine both the effectiveness and the level of public participation in such programmes should include **descriptive and predictive knowledge about active participation**. Developers and researchers need to move beyond a narrow focus on early adopters and produce a population perspective on recruitment and retention of participants.

Improving the management of chronic non-communicable diseases (CNCDs)

The burden of disease worldwide has shifted in the past 20 years from infectious conditions to chronic non-communicable diseases (CNCDs) that are often the result of unhealthy lifestyle choices and environments: heart disease, stroke, diabetes, chronic neck and back pain, cancer and depression (IHME, 2013). Populations are ageing and many people are living longer, with multiple morbidities and disabling conditions. Since 1970, the average age at death has risen by 35 years worldwide, with gains in life expectancy throughout the globe.

For most of the 20th century, LAC countries had youthful populations, and it was not until the 1980s that the proportion of the population under 15 years dropped below 40%. In 2010, less than 30% of the population was under 15 years old, while the percentage of those of 65 years and over was around 7%, having been at most 5% for most of the century. In the next 40 years, however, a dramatic rise is expected in the number and proportion of older people in the region. By 2050, 22.5% of Brazil's population and 22.1% of Mexico's will be 65 and over. By 2050, according to recent forecasts, only in Guatemala will that segment of the population account for less than 10%.

In 2014, PAHO reported that annually, almost 4 million people in the region of the Americas die from NCDs, comprising 76% of all deaths. More than one-third of these deaths are premature (occurring before age 70), and most are preventable. Important CNCD risk

factors in the region are hypertension (affecting 20%-40% of the population); obesity (affecting 26% of adults, more than any other region); diabetes (affecting 5%-10% of the population); and tobacco use (about 22% of the population) (WHO, 2013; PAHO 2013).

Box 11.3. **E-health promotion initiatives in LAC**

Colombia: From 2002-2005, the teenage pregnancy rate in Colombia was estimated at 90 births per 1 000 women (79 per 1 000 in urban communities and 128 per 1 000 in rural populations). This rate is one of the highest in Latin America. In 2006, the *Fundación Santa Fe* of Bogota started a web-based medical counselling programme called "Doctor Chat". It is a free-access online consulting service in Spanish that allows them to submit health-related inquiries and receive personalised, accurate responses from a group of well-known physicians after submitting a simple, Internet-based form. The programme allowed unrestricted open discussion on sensitive topics such as sexually transmitted diseases and sexual risk behaviours.

The pilot phase of this project uncovered a particular need for information on sexual and reproductive health. The *Fundación* concluded that the expansion of the service to new platforms could help to lower the rate of teenage pregnancy in Colombia and the spread of disease, through innovative educational services. The web-based, mobile teleconsultation platform for DoctorChat was designed and developed in partnership with a software development group from the *Universidad de los Andes*, a private university in Colombia. Although the rate of the use of the service is inconsistent, user-satisfaction surveys indicate that such strategies are well-accepted among young adults.

Sources: Lopez et al. (2014), *Sexual and reproductive health for young adults in Colombia: teleconsultation using mobile devices*, *http://dx.doi.org/10.2196/mhealth.2904*; Flórez et al. (2004), *Fecundidad Adolescente en Colombia: Incidencia, Tendencias y Determinantes*, *https://economia.uniandes.edu.co/assets/archivos/Documentos_CEDE/d2004-31.pdf*; Colombia (2010), *Encuesta Nacional de Demografía y Salud*, *http://profamilia.org.co/wp-content/uploads/2015/05/ends-2010.pdf*.

Mexico: Part of the mission of the e-Mexico National System is to bring health care closer to citizens through the e-Mexico Portal. This includes four pillars: eGovernment, eEconomy, e-Health and e-Learning. It was created in 2003 to raise public awareness of activities promoting healthy lifestyles, as well as to support government procedures and management of health care issues. By 2006, the e-Health Portal had become the official portal for the e-Mexico National System, with the highest number of page views, and the second most important portal in terms of overall contents. The Mexican Association for the Fight Against Cancer, a nonprofit organisation, has successfully used the portal to promote awareness of cancer symptoms and help reduce cancer mortality rates.

In the LAC region, more than 100 million adults are hypertensive, with rates among the highest in the world (Kearney et al., 2005). Most adults with hypertension and other CNCDs rely on primary care for disease management. However, many LAC countries still have weak primary care systems that lack capacity and resources to help patients effectively treat these conditions. This situation will become even more acute with the ageing of LAC populations.

The sustainability of LAC health care systems thus critically depends on **improving the quality and efficiency of care for chronically ill and ageing populations**. More productive interactions and better outcomes will require a major transformation of practice, combining redesign of delivery systems, better use of technology for real-time decision making and patient self-management support (Table 11.1).

Table 11.1. **Implications of demographic change and the increasing burden of chronic conditions**

Demographic change	Needs
An ageing population	The effect on overall demand will depend on trends in disability, but the nature of the care required will shift toward long-term patient-centred conditions and home-based support services.
Significant growth in the number of patients living with chronic conditions	New models are needed to manage care and prevent acute conditions, by pro-actively planning care in a primary/community-based setting and promoting patient self-management.
Increased incidence of multiple complex symptoms and comorbidities	Greater co-ordination across the continuum of care will be required.
Workforce availability	The ageing of the workforce and increased demand will affect workforce availability. It will also require the effective use of health practitioner skill sets, and investment in information technology and primary/community-based infrastructure.
Greater prevalence of chronic conditions and lifestyle choices	Need to make greater use of patients' personal resources and self-management.

Source: OECD (2013b), *ICTs and the Health Sector: Towards Smarter Health and Wellness Models*, *http://dx.doi.org/10.1787/9789264202863-en*.

In view of these resource constraints, innovative e-health care models to improve **patient monitoring and self-care support** are especially important (Box 11.4). Since m-health services have low marginal costs and high availability, they have the potential to reach large numbers of patients between in-person clinical encounters. The LAC region has 109 mobile phone subscriptions per 100 population (ITU, 2014), which highlights the potential for conducting health interventions using these devices.

Many studies have shown that m-health services, including short-message service (SMS or text messaging) and interactive voice response (IVR) calls, can improve NCD self-care support (McMellon and Schiffman, 2002). Text messaging, in particular, is a powerful tool for behavioural change because it is widely available, inexpensive and instantaneous. Its potential is growing as more features become available on smartphones.

The progression of chronic disease often involves unpredictable changes in symptoms and physiological risk factors. Patients, particularly those with diabetes and hypertension, may report very good health when visiting ambulatory care and suffer poor health a few weeks later. Regular in-between-visit follow-up via IVR or other m-health tools is useful to catch emerging problems before they become acute. **Local language content** is as essential as connectivity to offer meaningful opportunities for NCDs self-care. It must also be recognised that seniors are generally less at ease with ICTs.

Solutions for improved infectious and parasitic disease management and monitoring

Infectious diseases are the world's leading cause of death for children and adolescents. They are also the second leading overall cause of death, after heart disease. Continuous outbreaks of infectious diseases have been reported in the past decade in the LAC region. In particular, the disease burden from neglected tropical diseases (NTDs) is high in the region. Most NTDs are chronic and disabling parasitic infections such as the intestinal helminth infections, schistosomiasis, lymphatic filariasis, food-borne trematode infections and onchocerciasis, as well as selected bacterial and viral infections such as trachoma and dengue. In Brazil alone, NTDs affected approximately 20 million people in 2008 (Hotez, 2008, 2010).

Box 11.4. **Examples of e-health solutions for the management of non-communicable diseases**

The Plurinational State of Bolivia (hereafter "**Bolivia**") has a population of 10.5 million, 51% of whom live at or below the poverty line and 35% live in rural areas. Since the passage of national reforms in 2007, all Bolivians have a legal right to access health care. However, due to economic, geographical, cultural and social barriers, 77% of the population still reports limited access to basic health care. In 2013, the Institute of Applied Engineering at the *Universidad Católica Boliviana* in La Paz and the *Servicio Departamental de Salud* initiated a multi-year project to better understand how m-health interventions could help Bolivian health officials improve patient monitoring and self-care support. The aim was to adapt to the Bolivian context an m-health platform for non-communicable disease (NCD) self-management support, developed at the University of Michigan, and to test the efficacy of an IVR platform, an automated telephony system that gathers information and routes calls to the appropriate recipient.

A 2013 survey indicated that the IVR programme was associated with better medication adherence and overall outcomes, 95% of participants reporting that they would recommend the system to a friend. However, 37% of survey respondents with diabetes or hypertension reported that they speak a non-Spanish language in the home (an estimated 35% of people in Bolivia speak the indigenous languages of Aymara or Quechua). Translation of programmes into the language in which patients are most comfortable is necessary in order to not miss opportunities to have a meaningful effect on NCDs self-care. In addition, older adults tend to have greater difficulties understanding how to navigate IVR systems.

Source: Piette et al (2014), "Establishing an independent mobile health program for chronic disease self-management support in Bolivia", *http://dx.doi.org/10.3389/fpubh.2014.00095*.

Chile's COSMOS Project: System for Monitoring and Mobile Communication in Health (SCSM) was led by the *Pontificia Universidad Católica de Chile*'s Nursing School in Santiago. The goal of this year-long project, conducted in Puente Alto in 2011, was to design a mobile communication and monitoring model, to improve timely diagnosis and initiation of treatment for Type 2 diabetes. The system includes personalised communication, automated voice communication and automated written communication, using SMS. The study included 102 patients (73.5% women, of a mean age of 50.95 years, SD = 8) in Puente Alto for 13 months (from February 2011 to March 2012). Results indicated that 87.5% of the patients had undergone diagnostic testing within the past 45 days (primary outcome) and 96.1% within the timelines set for the project.

Source: Alcayaga et al. (2014), "Pilot plan for a mobile health communication and monitoring system for people with diabetes", *www.ncbi.nlm.nih.gov/pubmed/25211577*.

Colombia: SINCan Project (*Sistema de Información Nacional en Cáncer*). Established in 2012, Colombia's National Cancer Information System combines and processes data from different sources to provide the information needed both for planning health services and investigating the causes and determinants of cancer. The programme is consistent with the Ten-Year Plan for the Control of Cancer in Colombia 2012-2021. The SINCan programme aims to address not only the needs of patients, health workers and health system stakeholders but also of their families and caregivers. The SINCan system offers include alerts, information support for policy planning and support for other strategies to improve the quality, access, timing and outcomes of patient care.

Source: Rivillas et al. (2014), "Advances in eHealth in Colombia: Adoption of the National Cancer Information System", *www.ncbi.nlm.nih.gov/pubmed/25211575*.

Due to the diversity of diseases included in the grouping, NTDs have a wide array of symptoms, including blindness, growth delays, anaemia, organ damage, increased risk of complications during childbirth, increased risk of endangering the mother's health, loss of limb function, cardiac failure, arrhythmia and disfigurement (Lindoso and Lindoso, 2009). These symptoms greatly reduce quality of life, especially because those most affected belong to the lowest socio-economic class. Only with combined intervention, including early detection, prevention and measures to inform and promote education, can appropriate control be achieved (CDC, 2016; Shapiro et al., 2011; WHO, 2014c).

Infectious and parasitic disease control programmes require good information on local epidemiology, as well as on the organisations operating in the area and the services provided. Mobile phones have the potential to **support informal infectious disease surveillance networks in LAC countries**. One example is Alerta DISAMAR in Peru, directed to Navy personnel, which has collected information on more than 90 000 cases and 31 disease outbreaks since its inception in 2003.[2] While some e-health solutions to follow patients affected by NTDs are now available in the LAC region (Box 11.5), effective scale up still requires: open standards for data storage and exchange; increased interoperability between EMR systems, lab systems, pharmacy systems and mobile health systems; and a shift from vertical disease- specific designs. Finally, it is especially important that systems and strategies are **developed collaboratively** to encourage local development, innovation and support.

Improving access to care through telemedicine

Tele-health is increasingly viewed as an important tool for optimising continuity in care and improving access to health services, particularly in rural and remote areas where health care resources and expertise are scarce or nonexistent. Data exchange through telemedicine can be asynchronous or synchronous. Asynchronous data collection and transmission is less demanding and can be done on 3G mobile networks, because speed and latency are less relevant. Data-intensive real-time monitoring, on the other hand, demands high upload and download speeds.

The **role of reliable and affordable infrastructure** in advancing e-health is most evident when dealing with telemedicine practices, due to its bandwidth requirements. For telemedicine, the lack of high bandwidth broadband infrastructure is perhaps the most important obstacle to its widespread implementation. Policies to improve access to health care to ICTs should aim to overcome this barrier, such as by including telemedicine considerations, goals and indicators in their broader broadband plans, to realise the potential of e-health and telemedicine.

The lack of high-speed connections required for high-intensity services can often be circumvented by the store-forward method of delivery for services that do not require live communication. Teleradiology is an example of a high-intensity service that does not require synchronous communication and can often be conducted using the store-and-forward method.

Telemedicine services can be mapped into four quadrants based on the **intensity of the information exchanged** between participants of the telemedicine process (usually measured by the size of the files used, speed/resolution of the video required, etc.) and **duration of the service delivery** (Figure 11.1). Low-intensity services are typically delivered via low-speed connections. The typical teleconsultation encounter, involves usually a short, intensive session between a clinician and a patient. The consultation process however, often requires continuous and frequent monitoring of the patient's functionality to test the delivered therapy and/or adapt it to the patient's progress.

Box 11.5. **Improved infectious disease management and monitoring**

Peru: Electronic Medical Record System to support multidrug-resistant tuberculosis (MDR-TB) treatment

Tuberculosis (TB) is a leading cause of death and disability in developing countries and continues to be a public health threat worldwide. Multidrug-resistant TB (MDR-TB) is recognised as a major and growing threat to health worldwide, with a large incidence reported in the LAC region. Peru has the highest incidence of TB in Latin America and in the last decade, around 3% of patients were diagnosed with MDR-TB. MDR-TB is a complex disease that predisposes to chronicity. It generally requires two or more years of treatment, with complex and often toxic drug regimens. The scale-up of treatment requires a long-term relationship with the patient, accurate and accessible records of each patient's history, and methods to track patients from initial diagnosis and throughout their treatment. This can be best achieved with the implementation of based electronic medical record (EMR) systems.

For this purpose, supported by the Bill & Melinda Gates Foundation and subsequently the Global Fund for AIDS, TB and Malaria, the Partners in Health (PIH) developed a web-based EMR system in 2000. The system was set up and managed by *Socios en Salud* (the PIH sister organisation in Peru) and expanded to support the management of patients in the National TB programme (NTP), ultimately handed over to the Peruvian NTP in 2007. The goals of the PIH-EMR were to: support direct clinical care, teleconsultation and quality improvement, allow reporting to funders, the NTP and WHO, support clinical research, and improve medication management, including prescribing, dispensing and forecasting of requirements. Customised tools have since been developed for data quality control, clinical data access and data analysis.

Source: Fraser et al. (2013), "E-Health systems for management of MDR-TB in resource-poor environments: A decade of experience and recommendations for future work", *www.ncbi.nlm.nih.gov/pubmed/23920632*.

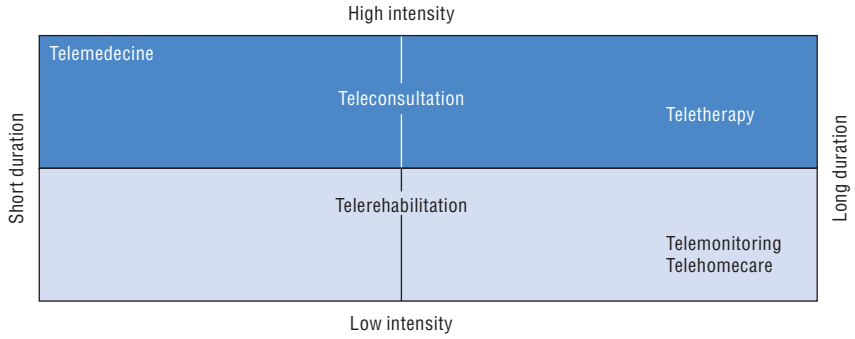
Colombia: Dengue eMocha

The electronic Mobile Open-source Comprehensive Health Application (eMocha) is a free, open-source application developed by the Johns Hopkins Center for Clinical Global Health Education, used on smartphones for the prevention of dengue fever. It provides real-time information on ecological, biological and social indicators to evaluate interventions and reduce dengue vectors. Field workers can conduct surveys, gather geographic data and collect water samples. The encrypted information is then sent to a server for review and analysis. As of May 2013, 4 419 households in Colombia had been visited and 10 913 water containers examined and sampled. Advantages of using eMocha include reducing the time needed to identify, act and implement preventive measures.

Source: eMocha application, available at *http://es.esacproject.net/project/emocha*.

Traditional telemedicine, such as teleradiology and telepathology, mostly falls into the high intensity/short duration quadrant. This type of service requires very reliable high-speed connections. It usually involves a short, one-time encounter that either does not repeat or only repeats a few times. At the other end of the spectrum, chronic disease management involves monitoring over long periods. The interaction and communication in chronic disease management is usually of low intensity. Chronic disease management using telemonitoring can thus be categorised in the low intensity/long duration quadrant. Telerehabilitation services also require continuous interaction over a long time span. The LAC region has seen a number of telemedicine initiatives of varying intensity and duration. (Box 11.6).

Figure 11.1. **Telemedicine service according to intensity of information exchanges and duration of the sessions**



Source: Adapted from Parmanto and Saptono (2009), "Telerehabilitation: State-of-the-art from an informatics perspective", *www.ncbi.nlm.nih.gov/pmc/articles/PMC4296781/*.

Box 11.6. **Improving access to care through telemedicine in LAC countries**

Brazil: TelessaúdeRS

The TelessaúdeRS is a research project conducted by the Graduate Programme in Epidemiology at the School of Medicine of the Federal University of Rio Grande do Sul. The main purpose of the project, established in 2007, is to support GPs through teleconsultations (clinical problem-solving and medical regulation), telediagnosis, tele-education, and the delivery of remote care. From 2007 to September 2015, 15 536 health care professionals from 1 241 primary care services in 497 municipalities in the state of Rio Grande do Sul were registered as users of TelessaúdeRS. During this period, 31% of the registered users, as well as 86% of the primary care units and 88% of the municipalities, had submitted at least one request, for a total 15 441 queries, of which 85% were asynchronous and 15% were synchronous (e.g. Voice over IP [VoIP]). The highest number of requests came from nurses (36%), community health agents (25%) and physicians (15%). Limitations for the expansion of TelessaúdeRS include infrastructure and uncertainty over the legal framework and regulations.

Sources: Ministério da Saúde (2011a), *Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil (2011-2022)*, *http://actbr.org.br/uploads/conteudo/918_cartilha_dcnt.pdf*; Ministério da Saúde (2011b), *Plano Nacional de Saúde – PNS: 2012-2015*, *http://conselho.saude.gov.br/biblioteca/Relatorios/plano_nacional_saude_2012_2015.pdf*; Mendes (2011) "As redes de atenção à saúde", *www.programa.telessaudebrasil.org.br/wpontent/uploads/2015/02/Manual_Telessaude.pdf*; TelessaúdeRS (2016), *TelessaúdeRS*, *www.ufrgs.br/telessauders*.

Peru's *Enlace Hispano-Americano de Salud* telestethoscopy project

Acute respiratory infections are the leading cause of childhood mortality. The lack of physicians in rural areas makes their correct diagnosis and treatment difficult. The main goal of the *Enlace Hispano-Americano de Salud* (EHAS) Foundation was the development of a telestethoscopy system that allows a physician to receive real-time cardio-respiratory sounds by remote auscultation, as well as video images showing where the technician is placing the stethoscope on the patient's body. The system was tested in Peru in 2013, between Santa Clotilde health center and Loreto Regional Hospital, over a 180-kilometre-long wireless network. The project has since been launched in the Napo River area to remotely monitor cases of acute respiratory infections and provide second opinions on cardiology patients. Several studies have documented the positive impacts for patients and health care personnel.

Sources: Foche-Perez et al. (2012), "An open real-time tele-stethoscopy system", *http://dx.doi.org/10.1186/1475-925X-11-57*.

Box 11.6. **Improving access to care through telemedicine in LAC countries** *(Cont.)*

Guatemala's Healthy Pregnancy Project

Another project demonstrating the uses of telemedicine is the EHAS Healthy Pregnancy project in Guatemala. This equips nurses with a portable ultrasound, a folding solar panel (for battery charging) and a system for blood testing. The goal is to detect early obstetric complications (foetal malposition, placenta praevia, infections and anemia) and delivery risks that cannot be carried out in rural centres without medical assistance. A study of 1 000 pregnant women was successfully completed in 2013, significantly reducing neonatal (65%) and maternal (100%) mortality.

Sources: Prieto-Egidio et al (2014), "Telemedicine networks of EHAS Foundations in Latin America", *http://dx.doi.org/10.3389/fpubh.2014.00188*; Foche-Perez et al. (2012), "An open real-time tele-stethoscopy system", *http://dx.doi.org/10.1186/1475-925X-11-57*.

Venezuela's SOS Telemedicine programme

Venezuela's SOS telemedicine programme at the School of Medicine of the Central University of Venezuela (UCV), funded through the Organic Law of Science, Technology and Innovation, is designed to provide expert support to health professionals and students working in primary care facilities. The aim is to improve access to medical services and offer consultations with specialists to patients who cannot easily visit specialists. The programme offers teleconsultations and telediagnosis free of charge, provided by qualified professors in various medical specialties. The service also helps health care personnel improve the quality of diagnosis and care.

Source: Vegas (2014), "El Programa 'SOS Telemedicina para Venezuela'", *http://vitae.ucv.ve/?module=articulo&rv=116&n=5054*.

Panama's Telemedicine Programme

Telemedicine in Panama dates back to 1998, when the Medical School of the University of Panama created the Medical Documentation and Information Centre (CDMI). Remote stations were created in Chiriquí, Santiago, Chitré, Aguadulce, Penonomé and El Valle, with support from the Ministry of Health and the *Fundación para el Apoyo al Diagnóstico* (FADDoM). Using a patient information record, the remote stations request assistance from CDMI, thus making it possible, through a computerised network, to obtain evaluations and diagnoses.

Costa Rica's National Telemedicine Programme

A national telemedicine programme was established in Costa Rica in 1997 by the Social Security Fund (CCSS) which provided all hospitals with the technological equipment to carry out remote consultations. The programme has been fully operational since 2004. According to data from the Directorate of Health Services Network, by 2013, the system had handled 10 864 teleconsultations. In the first quarter of 2014 alone, 1 914 were recorded. The system has been particularly useful in Costa Rica's Ngöbe region, which has scattered settlements of itinerant indigenous populations with low literacy rates.

Source: CCSS (2014), *Videocommunications Institutional Network Report*, Social Security Fund, *www.ccss.sa.cr/noticias/index/32-ccss/1147-ccss-identifica-a-2-5-millones-de-costarricenses-en-sistema-de-identificacion-agenda-y-citas*.

Asynchronous IT infrastructure is used by a significant number of health care service delivery sites across the LAC region. Asynchronous communication stores and forwards data to the physician; this allows data retention over long periods. In asynchronous communication mode, large data files can be transmitted in small chunks over low- to medium-bandwidth channels, which makes it possible to use common household connections.

Tele-education for capacity-building of the health workforce

Distance learning, specifically e-learning, has gained in popularity in the past decade, but its use is uneven in medical schools and it appears to be more common in basic medical science courses than in clinical education. Distance learning does not preclude traditional learning processes; frequently, it is used in conjunction with in-person classroom or professional training procedures and practices. Tele-education has mostly been used in biomedical education as a blended learning method, which combines tele-education technology with traditional instructor-led training, in which a lecture or demonstration is supplemented by an online tutorial (Box 11.7).

Box 11.7. **Examples of applications of distance learning in health care**

Brazil: Health Informatics Specialisation Degree Programme

The Open University of Brazil (*Universidade Aberta do Brasil* [UAB]) is an integrated system for public universities offering higher education courses through distance learning to populations that have difficulty accessing university education. The UAB System was established by ministry legislation in 2006, for "the development of education in the distance mode, in order to expand and internalise the offer of courses and higher education programmes in the country." The goal is to promote distance learning in public institutions of higher education and to support research on innovative learning methodologies. It also encourages collaboration between the Union and the federal entities and encourages the establishment of permanent training centres through classroom support in strategic locations. The UAB System provides development, interaction and execution of initiatives that stimulate the partnership of the three levels of government (federal, state and municipal) with public universities and other interested organisations, as viable alternative mechanisms to develop undergraduate and postgraduate consortia.

In recognition of the importance of capacity building in e-health, an online specialisation degree in Health Informatics was established recently by the *Universidade Federal de São Paulo* (UNIFESP).

Source: UNIFESP (2016), "Especialicação em Informática em Saúde", *www.unifesp.br/reitoria/uab/especializacao-em-informatica-em-saude*.

Guatemala: Course for Community Auxiliary Nurses by Tele-Education (CAEC)

In 2004, to improve primary health care, the Tula Foundation, through the TulaSalud Association, launched a three-year distance training course for nursing technicians and a one-year course for nursing assistants, using a multi-videoconference system. Training is carried out in collaboration with the Cobán School of Nursing and has involved more than 1 100 students in 29 remote locations across the country under the supervision of the Guatemalan Health Ministry's Human Resource Department. The aim was to deliver a bivalent Auxiliary Nurses programme (i.e. distance learning that would cover fundamentals both for hospital work and for prevention). The positive results have allowed the project to expand to the departments of San Marcos, Totonicapán, Baja Verapaz, Petén, Zacapa and Chiquimula, training professionals of health Services and organisations to practise in rural and neglected areas.

Source: TulaSalud (2016), "Course for Community Auxiliary Nurses by Tele-Education – CAEC", *https://sites.google.com/a/tulasalud.org/tulasalud_eng/Programas/tele-education/caec*.

Cuba's *Red Nacional de Enfermería Informática*

The *Red Nacional de Enfermería Informática* is a network for sharing experience in collaborative, creative and innovative ways to improve nursing skills. Good practices are disseminated to enhance nursing services that can improve the health and quality of life of the Cuban population. The objectives are: i) develop the Nursing Informatics Network Cuba (RedENFI-Cuba) using ICTs; ii) create groups or communities of practice on specific topics, enabling a fruitful exchange of information, lifelong learning and members' scientific development, and keeping them up to date with trends of computer science in nursing, helping to identify priorities; iii) facilitate co-ordination among network members and groups, with a user-friendly platform that allows the exchange and strengthening of nursing, continuing education and research; iv) linking the network to other specialised nursing or other health sciences and social networks in general; v) helping to co-ordinate the operation of other nursing networks in Cuba with international networks specialised in computer science in nursing.

Source: Infomed (2016), *Red Nacional de Enfermería Informatica*, *http://temas.sld.cu/redenfermeriainformatica/*.

Co-ordinating care and patient safety through electronic health records

Electronic health records (EHR) are a key component of e-health, providing a foundation for greater care co-ordination and improved clinical management. Rolling out EHR implementation, however, is a notoriously complex and expensive undertaking (Sittig and Singh, 2010). Setting up a hospital EHR system is more a continuous programme than a project with an end point (Boxes 11.8 and 11.9).

Box 11.8. **Functional characteristics of an electronic health record**

One the basis of advice from an expert panel, in 2008, DesRoches and colleagues defined the key functions that constitute an outpatient EHR system. Using a modified Delphi process, the panel reached consensus on the functions necessary to classify a system under one of two categories, a basic and a fully functional system. Fully functional systems include four domains: recording patients' clinical and demographic data, viewing and managing results of laboratory tests and imaging, managing order entry (including electronic prescriptions), and supporting clinical decisions (including warnings about drug interactions or contraindications). The four domains are associated with 16 unique functions. The distinction between the two types of EHRs is defined by the absence of certain order/entry capabilities and clinical-decision support in a basic system. A fully functional system has all 16 functions.

	Basic system	Fully functional system
Health information and data: five functions		
Patient demographics	x	x
Patient problem lists	x	x
Electronic lists of medications taken by patients	x	x
Clinical notes	x	x
Notes, including medical history and follow-up		x
Order-entry management: five functions		
Orders for prescriptions	x	x
Orders for laboratory tests		x
Orders for radiology tests		x
Prescriptions sent electronically		x
Orders sent electronically		x
Results management: three functions		
Viewing laboratory results	x	x
Viewing imaging results	x	x
Electronic images returned		x
Clinical decision support: three functions		
Warnings of drug interactions or contraindications		x
Out-of-range test levels highlighted		x
Reminders regarding guideline-based interventions or screening		x

Source: DesRoches et al. (2008), "Electronic Health Records in ambulatory care: A national survey of physicians", *http://dx.doi.org/10.1056/NEJMsa0802005*.

Given the upfront costs, the decision by a primary care establishment or a hospital to adopt an EHR system depends both on the financial returns expected and the potential collateral benefits. These might include improved patient safety, better health outcomes and patient retention. Robust evidence is now available to demonstrate that EHRs can help reduce medication error and promote co-ordination of care. The literature also shows that, in a hospital setting, value for money is achieved with high-level, fully functional

EHR systems (according to HIMSS Electronic Medical Record Adoption Model staging), but that satisfactory return on investment occurs only after five to ten years (Amarasingham et al., 2009). Successful deployment of EHRs requires long-term political commitment and leadership at the highest level of governance.

Box 11.9. **An example of EHRs in Argentina for improved co-ordination of care in the hospital setting**

Argentina's *Hospital Italiano de Buenos Aires* EHR

The *Hospital Italiano* de Buenos Aires is a private, nonprofit organisation with two hospitals (medium and high complexity), 25 primary care and ambulatory centres, 750 beds, 200 of which are for critical care and over 1 000 beds for home care. It treats both private patients and patients admitted under Argentina's social security system. Since 1998, the hospital has been using an in-house Health Information System with a unique, modular, problem-oriented and patient-centred web-based system, to collect all information generated in emergency, home care, in-patient and ambulatory settings. The EHR system, known as ITALICA, also offers access to the patient though the *Portal Personal de Salud* (PoPeS), which has provided health care information, medication lists, results on laboratory and complementary exams since 2007.

ITALICA allows users to order ancillary tests, prescribe medications and view results including imaging through an integrated picture archiving and communications system (PACS). The EHR has a relational database record and also a repository (based on Clinical Document Architecture R2), which is digitally signed by professionals responsible for health care delivery. This repository is used to interact with payers and other EHRs, and to make information portable for patients or other external health care providers.

Sources: Plazzotta F. et al. (2015), *Sistemas de información en salud: Integrando datos clínicos en diferentes escenarios y usuarios*, *www.redalyc.org/pdf/363/36341083020.pdf*; Campos et al. (2013), "Developing and implementing an interoperable document-based electronic health record", *www.ncbi.nlm.nih.gov/pubmed/23920943*.

Long-term sustainability and financing

For many ICT projects, once the initial funding runs out, the most significant challenge is developing a sustainable business model. Long-term sustainability and financing appear to be the most challenging and, in most cases, unpredictable aspects of e-health initiatives. The focus is often on adoption and the technical feasibility of the project, while the financial aspects of the approach often play a secondary role. Ultimately, however, it is the economics and the value to society that determine whether a system can survive.

There is no magic bullet for the options or strategies necessary for long-term financial sustainability. Many initiatives are still struggling to begin exchanging health information, whereas more mature initiatives need to confront how to expand their services in a financially sustainable way. Financial sustainability is a critical issue and stands out as a persistent concern, even for those initiatives that are relatively more mature and directly funded by government.

Health care organisations, public or private, need to project a positive return on investment (whether financial or otherwise), to win financial, institutional and political support for their efforts. Although health care organisations could (and in many cases do) improve care and address unmet public health needs by implementing e-health (the "social case"), they typically have difficulty demonstrating an economic benefit (the "economic case"), including whether their own financial performance improves.

It would seem that the return on investment (ROI) or value for money from implementation of ICTs should be relatively straightforward to assess, yet the evidence today is weak and difficult to interpret. One common problem is that while the costs of implementing health ICT solutions are incurred up front, the benefits (financial or otherwise) are not always immediately realised (see Box 11.10). Moreover, returns may go not to investors but to other parties who may not have been involved in the intervention at all. One health care entity's short-term ROI may be another's loss. For example, if an ICT can save money by reducing emergency department and inpatient care for congestive heart failure, the local hospital may well suffer a loss of revenue.

For these reasons, many health care organisations in LAC countries still question the value proposition of ICTs.

Box 11.10. **Delayed benefit realisation**

Studies suggest that the financial benefits of ICT implementation are often realised only many years after the investment was made or only when a level of functionality is reached that truly serves the needs of clinicians and system planners. In a report for Canada Health Infoway, Booz Allen Hamilton suggest that the national, systemic fiscal cost-benefit after ten years is actually negative, at CAD 1.5 billion, having reached a positive cash flow by Year 7 and breakeven only by Year 11. By Year 20, the systemic (national) savings is estimated at almost CAD 20 billion.

This is supported by a 2007 study by PricewaterhouseCoopers of nearly 2 000 hospitals in the United States, which found that productivity improvements and improved service efficiency followed on average two years behind initial health care ICT investment. The same study, however, concludes that the financial breakeven point will strictly depend on the levels of investment. Above a certain level of ICT investment – or tipping point – the cost impact levels off and is associated with cost reductions. The levelling off occurs despite the added costs of more ICT capital; that is, ICT capital at some point pays for itself by displacing costs elsewhere in the hospital.

The European Union's e-Health Impact Project, covering ten case studies in different countries and contexts, identified a 2:1 return on e-Health investment when benefits were given a euro value; the average breakeven point for the ten e-Health initiatives studied was five years.

Sources: PWC (2007), *The Economics of IT and Hospital Performance*, *https://www.pwc.com/us/en/technology-innovation-center/assets/healthindex_web-x.pdf*; Stroetmann et al. (2006), *e-Health Is Worth It: The Economic Benefits of Implemented e-Health Solutions at Ten European Sites*, *www.ehealth-impact.org/download/documents/ehealthimpactsept2006.pdf*; Booz Allen Hamilton (2005), *Pan-Canadian EHR: Projected Costs and Benefits*, *www.infoway-inforoute.ca/en/component/edocman/20-canada-health-infoway-s-10-year-investment-strategy-vol-3/view-document?Itemid=101*.

Conclusion

The cases discussed in this chapter point to a number of e-health practices or approaches that can be employed in efforts to address public health priorities in the region. In many LAC countries, primary care is the entry point into the health care system for an individual's health care needs and problems. It provides ongoing person-focused care, and co-ordinates or integrates care provided elsewhere or by others. The primary health care system also serves essential public health interests by providing an infrastructure for detecting outbreaks, and a vehicle for rapidly disseminating information and care during a national health emergency.

Not surprisingly, in the countries covered by the cases considered here, ICTs are central to efforts to renew primary care, generally by targeting three areas of considerable need: improvement of chronic care, better monitoring and care of infectious diseases, and better mother and child care. These objectives are not necessarily mutually exclusive, and are indeed closely linked. Choosing these targets has ensured that projects that could have otherwise drifted and become "technology for the sake of technology" in fact had a **discernible health focus** and have proven sustainable in the longer-term. These conditions require regular monitoring of patients to track trends in clinical parameters and rapidly identify any deviations. This task can be dramatically facilitated by ICT.

The adoption and use of health ICTs, however, typically imply trade-offs with competing goals. Policy makers must thus determine whether the expected benefits from these practices are likely to outweigh the costs in each particular situation. This highlights the importance of **independent, robust monitoring and evaluation of programmes and projects**. Most of the cases reported had included some sort of post-implementation evaluation to determine the actual payoff from the adoption and use of ICTs.

Measuring the effects of ICTs is, however, difficult for a number of reasons. ICT implementation may have effects that are multidimensional and often uncertain in their reach and scope, and difficult to control. In addition, the realisation of benefits from ICT implementation strongly depends on contextual conditions. For example, moving to an EHR in its fullest form is not just a technical innovation; it is a cultural transformation. Change management is vital for successful uptake, and failure to build in processes for effecting the necessary organisational transformations will reduce both uptake and effectiveness. The challenges described above place health ICT investments in a space that is quite different from other capital investments in the health sector, for example a hospital building or medical equipment. But health ICT projects are still often evaluated using traditional appraisal techniques, limiting evaluation to the objectives of sound financial management. However, providing decision makers with direct cost-analysis cash-flow projections, financial figures etc., is not enough, since the ultimate strategic objective is to improve the efficiency and quality of clinical care and patient outcomes through health ICTs.

Despite a plethora of anecdotal information, the hard evidence available today on the implications of e-health is, therefore, inconsistent, which makes it difficult to synthesise and interpret. Failure to collect the data necessary to evaluate the effects of ICTs is one of the core challenges to achieving widespread adoption of high-performing ICT initiatives.

Notwithstanding the difficulties entailed, the cases reported cast no doubt on the potential ability of LAC countries to make major progress toward key policy goals, such as improving access to care in remote areas or better care co-ordination for chronic diseases, through implementing ICTs. In particular, they prove that cost-effective solutions for remote and rural areas are possible.

One of the major challenges of introducing a new ICT platform is that the productivity of users may actually decrease in the initial months of the implementation. With complex clinical applications in particular, learning new ways of working can lead to high levels of user dissatisfaction, in addition to lowered productivity.

One shared characteristic of the programmes reviewed here is that they all required the **full support of all stakeholders** to achieve their goals. Notable facilitators included dedicated community caregivers and physician leaders who envisioned the specific changes needed, and were able to overcome organisational and cultural barriers and unforeseen technical

challenges at implementation. All initiatives had **dedicated funding**; many were launched as **pilots** through dedicated grants and against specific public health goals. Although there are limits to the generalisation of results, the case studies covered here illustrate the interdependence between various policy dimensions, which are difficult to disentangle, but must be addressed if countries are to achieve the intended efficiency gains from ICT implementation. The following points summarise the main findings:

- **Align incentives with health system priorities:** To achieve the intended benefits from ICT technology, governments and payers need to set targets associated with unambiguous public health gains, such as improved management of highly prevalent chronic diseases, which are strongly associated with preventable hospitalisations. They must also align resources, processes, and physician compensation formulae to match the nature of the gains to be achieved.
- **Ensure long-term political commitment:** Effective operation requires strong leadership at the national, regional and organisational level. The government's regulatory and supervisory role is imperative for successful implementation. There are three ways governments can intervene to promote the adoption and use of ICTs: direct regulation; economic instruments; and persuasive measures.
  - With direct regulatory measures, also known as "command and control instruments", the government prescribes a specific outcome or target and/or the process or procedure by which it is to be achieved, and enforces compliance by appropriate regulation.
  - Economic instruments may include both financial incentives and market stimuli to persuade users to change their behaviour. They also may involve using disincentives, such as withholding payments for noncompliance, to stimulate the desired behaviour. To be of any use, and to have an effect, economic incentives need to affect the cost-benefit structure of the economic activities of the target. The greatest advantage of economic instruments is that they allow individuals to respond to the instrument in the way that is most cost-effective for them.
  - Persuasive measures, which are often combined with economic instruments, include support, such as providing education and training, and the use of social or peer pressure and recognition. They are intended to change an individual's perceptions and priorities by increasing awareness and conferring ownership of decision-making. They help to address the information asymmetry often associated with technological innovation.
- **Support infrastructure development:** There is a dynamic interaction between information technology infrastructure and e-health development. The availability of infrastructure promotes the development of new services, and the need for services can stimulate new infrastructure. To take full advantage of e-health and particularly telemedicine, it is not only necessary that all regions be able to receive broadband, it is also necessary for everyone to get access to stable and high bandwidth connections. In most LAC countries, infrastructure is still a challenge due to the high cost of connectivity – both in telephony and broadband.
- **Establish robust security and privacy protection:** A robust, balanced approach to privacy and security is essential to establish the high degree of public confidence and trust needed to encourage widespread adoption of health ICTs, and particularly EHRs. As noted in Chapters 14 and 15 on security risks and privacy, the number of countries with privacy laws is growing in the LAC region, but implementation has been difficult.[3]

None of the countries in the LAC region have a comprehensive national privacy strategy or programme. This situation is not surprising considering that the concept of national privacy strategy is relatively new. Law enforcement continues to be a challenge in the LAC region. The proportion of countries with an independent national Data Protection Authority (DPA) is very low. Only two countries (Mexico and Uruguay) have a fully independent and autonomous DPA. In other countries, the DPA is part of a ministry, e.g. Colombia (Ministry of Economy), Costa Rica and Peru (Ministry of Justice) and Ecuador (Ministry of Telecommunications and Information Society).

- **Strengthen monitoring and evaluation:** High-quality evidence is a fundamental source for decision-making processes. Information systems need to be well designed and evaluated to ensure they are quick and easy to use by the often overloaded clinical staff and community facilitators. Governments have much to gain in supporting the development of reliable and internationally comparable indicators. Risk, delay and cost can be minimised by learning from good international practice.
- **Promote user-friendly solutions and capacity-building:** Information technologies must be user-friendly, at the right place and time; poor user interfaces or connectivity can doom adoption. Health care providers as well as consumers/patients need the skills, trust and confidence to use the new technologies. Ensuring that their privacy is respected and that they perceive the systems as secure, as well as creating opportunities for education and training, will be essential. Content and presentation for older people in online information and services is also an important issue, requiring further attention if older people are to embrace and benefit from these services.
- **Accelerate and guide interoperability efforts:** While health care organisations are increasingly equipped with ICT products and systems, linking them remains a serious problem. Information systems in separate health care business entities must be able to exchange clinical information on patients (i.e. be interoperable), if ICT to be of value in clinical settings. Consistent implementation of standards and appropriate organisational changes are necessary to facilitate this process. Resolving interoperability issues will require government leadership and the collaboration of the relevant stakeholders to establish standards and develop innovative solutions (Indarte, 2012).

Notes

1. See for example *www.barchester.com/news/virtual-reality-therapy-could-support-depression-treatment*.
2. *http://healthmarketinnovations.org/program/alerta-disamar*.
3. *www.bakerlaw.com/files/Uploads/Documents/Data%20Breach%20documents/International-Compendium-of-Data-Privacy-Laws.pdf*.

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Chapter 12

Digital government

This chapter provides guidance on how broadband-enabled central and sub-national governments can become more agile, efficient and effective in fulfilling their roles, while responding to citizen and business' demands for greater transparency and inclusiveness in public sector operations. It outlines the expected benefits of shifting from e-government to digital government, of increasing availability of open government data and of using data as a strategic asset for improved policy making. The chapter then introduces existing measurement and impact assessment tools and approaches for these policies, both for central/federal and city governments. It also provides an overview of existing efforts in the Latin America and Caribbean (LAC) region to advance digital government, open government data and smart cities, and describes current trends across the OECD in these areas. Finally, it provides a number of good practices from LAC and OECD countries. These can serve as examples of forward-looking initiatives addressing the most pressing issues for the development of digital government in the region.

A key goal of this Toolkit is to promote the use of information and communications technology (ICT) by both the private and public sectors in the Latin America and Caribbean (LAC) region. This chapter addresses the perspective of the public sector. Generally, the framework conditions for the provision of high-speed Internet access, through the development of broadband infrastructure, should help improve the efficiency and effectiveness of government operations, policy making and public service delivery. This will benefit governments, individuals and business in all their activities. This chapter presents a set of good practices to improve public sector use of broadband and encourage more innovative, participatory and open government.

The pace of technological change in the digital economy continues to challenge governments in the LAC region and beyond. More connected and informed citizens and businesses have rising expectations about public service quality and convenience, and demand more inclusive and transparent decision-making. Governments in the region need to build strategic capacities to plan, steer and implement the use of digital technologies. Innovative and more collaborative ways must be found to meet these expectations in the context of scarce budgetary resources.

Improving public sector use of broadband and ICTs can help make public services more effective and responsive, and enhance the interaction between citizens and businesses. However, incoherent and unco-ordinated use of technologies can lead to inefficient use of resources, duplication of efforts and platforms, lack of interoperability of government information systems and data, and consequently, poor public sector performance. The digital divide and a lack of suitability for users' needs, a lack of ICT skills in the public sector, or privacy and security measures may reduce citizens' ability to use online channels to interact with public authorities. Governments need to overcome such obstacles to capture the full benefits of broadband and digital government.

Digital technologies can improve information disclosure, access to public sector information and improved public engagement. Strategies to increase capacities to use data more proficiently and to cover the use of ICTs should not be treated separately. By supporting a more strategic use of public sector data and information, such as through Open Government Data (OGD) policies and initiatives, digital technologies can benefit policy making, service design and innovative delivery arrangements, and enhance participation, accountability and transparency at all levels of government, whether local, regional or national.

This chapter provides clear policy objectives for governments in the LAC region, describes tools for measuring progress in achieving these objectives and analyses the context of digital government in the region. Based on this overview, it offers specific policy recommendations illustrating good practices to address outstanding issues and help governments achieve new levels of maturity in their use of digital technologies.

From e-government to digital government

E-government refers to the use of ICTs, and particularly the Internet, to achieve better governance (OECD, 2014a). Governments have increasingly put services online. However, often this has not significantly changed structures and back-office processes designed at a time when the focus was on achieving better operational efficiencies within specific policy domains. Neither has it necessarily made services and operations digital by design, for a more synergetic, co-ordinated and coherent use of technologies across the public sector. New digital technologies (e.g. social media platforms, mobile telephones/smartphones) and new approaches to using technology (e.g. open government data and big data) offer more collaborative ways of working within and across administrations, and better ways to engage with the public. This can help governments become not only more efficient and effective, but also more open, transparent and accountable to their constituents.

This new stage of maturity of digital technologies and their increasing use by governments is marking a paradigm shift from e-government to **digital government**. According to the OECD *Recommendation of the Council on Digital Government Strategies*, digital government may be defined as "the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value. It relies on a digital government ecosystem comprised of government actors, non-governmental organisations, businesses, citizens' associations and individuals which supports the production of and access to data, services and content through interactions with the government" (OECD, 2014a).

The major result of this shift is that digital government is no longer only about putting services online and achieving operational efficiency. Governments are embracing a whole new conception of ICTs as a core element of public sector transformation. A key mechanism for strengthening public governance, they can help make governments more open, effective and efficient. Meanwhile, they can integrate service users' preferences into the design and delivery of public services. Digital government is about new ways of delivering public value and making services and government procedures digital by design. This requires integrating ICTs in the public sector reform agenda right from its conceptualisation.

Open Government Data

Within broader strategic frameworks for digital government, a growing number of governments have adopted policies and initiatives to design and implement OGD. This refers to the release of data collected and produced by public organisations while performing their tasks, or data commissioned with public funds. The goal is that OGD is released in open formats that allow their **free use, reuse and distribution**, subject only to the requirement that users attribute the data and make their work available to be shared (Ubaldi, 2013).

The amount of data produced by governments on issues of public interest has increased in recent years, and attention has been drawn to its potential not only for enhancing the transparency, accountability, integrity and performance of the public sector, but for **creating economic and social value**. OGD has the potential to improve the outcome of public policies, for example in education and public transport. In the education sector, for example, new programmes could be developed to increase the effectiveness of teaching by tailoring lessons to students' records. Schools' performance could be monitored directly by parents by providing open but anonymised data on students' performance. Public sector data offers opportunities for new products and services, and steps could be taken to increase its availability in open and interoperable formats.

The private sector now generates massive amounts of data in its daily operations on supply chain management, the social behaviour of its customers and government regulations (Herzberg, 2014). An open data ecosystem can help **bridge public, private and civil society sectors**, and allow them to collaborate and exploit data to capture available synergies. For instance, large Internet companies, such as Twitter, have opened part of the data created by its network in the form of APIs (Application Programming Interfaces), allowing data reusers to combine this data with open government data to develop services and create value. Similarly, governments can use this data to perform data analytics, helping them identify social trends and calibrate public services and policies as needed. Civil society organisations can use data available in open formats to raise awareness of issues of public interest. This chapter will also address OGD policies and initiatives for LAC.

Policy objectives in the LAC region

To reap the full benefits of broadband and digital technologies, clear policy objectives are needed to guide decisions and investments made across the administration and different levels of government. An overarching governance framework is needed to identify roles, responsibilities and co-ordination mechanisms that promote the coherent use of digital technologies in the public sector, while boosting innovation and establishing the conditions for managing risk. These policy objectives are:

- **Improving the supply, quality and uptake of digital government services**. Governments face increasing, multifaceted challenges both in maximising digital government policies and projects and delivering high quality public services efficiently and equitably to all segments of the population. Given the existing financial constraints, innovative responses and new schemes must be found to deliver high-quality services that improve social outcomes. Access to online broadband services, public sector information and data, and digital civic participation and engagement can help governments secure consensus and commitment in a cost-effective and transparent fashion. Paired with the appropriate institutional capacities and administrative culture, this can allow governments to take more inclusive and more informed decisions while protecting privacy and security. Broadband technologies provide an opportunity to deliver quality, inclusive and cost-effective digital services and to support evidence-based policy making, provided that key structural enablers are in place.
- **Clarifying governance and strengthening management of government information services**. As public institutions reach new levels of maturity and sophistication in their use of broadband-enabled technologies, they are confronting a need to overcome the silo approach, share processes and data, integrate and work together with other units, both within their own organisation and across the public sector. This increases the pressure for co-ordination to ensure coherent and rational use of digital technologies. Public institutions should aim to overcome specific risks arising from inappropriate co-ordination and governance frameworks. An inadequate flow of information and a lack of collaboration within and across levels of government can lead to low efficiency, public sector fragmentation, an uneven level of preparedness to use ICTs and missed opportunities for value creation. Better internal co-ordination and collaboration can improve sharing of resources and integration of processes, which in turn can help enhance public sector performance.

- **Connecting government institutions to enable digital transformation**. Digital government relies on key infrastructure, such as access to ICT by public institutions – and particularly broadband connectivity. The use of common authentication systems for service users can support the back-office re-engineering that makes it possible to integrate processes and share the resources required to deliver integrated digital public services. Connectivity of government institutions also provides the public sector with new and more flexible channels for interacting more directly and cost-effectively with society. Potential benefits include greater efficiency for public and private sector organisations, enhanced competitiveness, economic growth and job creation, as well as greater public sector transparency and accountability.
- **Open up government data and improve data and information reuse across the public sector**. Digital government, particularly when supporting more openness in government processes, allows for an improved exchange and use of data, information and ideas among public institutions, and facilitates innovations that translate into new and more efficient services. Making data and information available, easily accessible and reusable offers governments the opportunity to engage with citizens in innovative collaboration schemes that can help create public value. In turn, non-institutional actors – such as citizens, the private sector and civil society – can more effectively participate in the design and implementation of public policies, as well as in the design and delivery of public services. Optimising open government data requires developing a dynamic open data ecosystem, enabling data producers and re-users to maximise its impact and create public value.
- **Leverage technology and innovation to organise cities more efficiently**. With populations that are increasingly urban, city governments need to leverage technology and innovation to organise and govern cities in smarter ways, creating more efficient and sustainable cities and ultimately achieving a better quality of life for citizens. Smart cities focus on broad policy outcomes such as energy saving, public transport, health, safety, mobility, sustainable development and increasing the capacity to innovate in one territory, stimulating ventures and new partnerships. These efforts can be complemented by the development of digital cities, which focus on the use of digital technologies to improve service delivery, the relations between individuals and the public administration and to promote the creation of citizen networks that enable the sharing of data, information and knowledge (OECD, forthcoming).

Tools for measurement and analysis in the LAC region

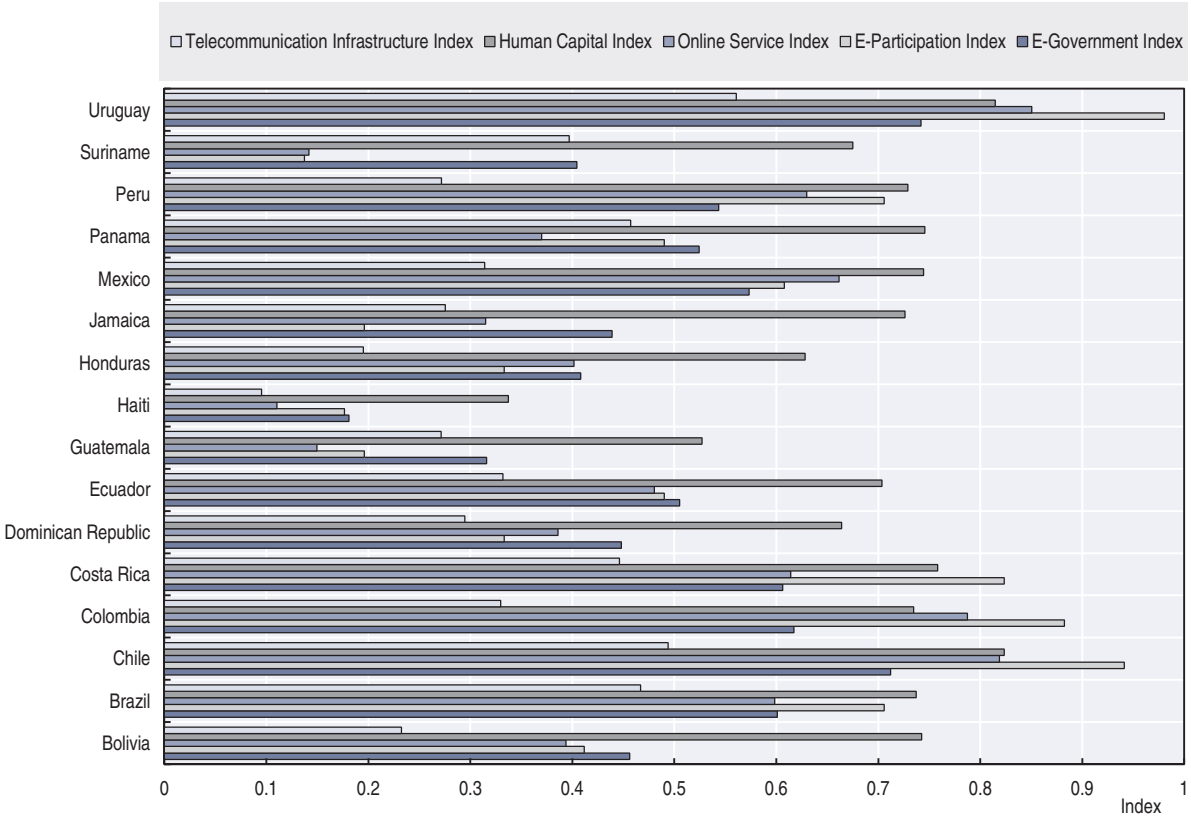
Digital government performance and public sector connectivity

The use of digital technologies is increasingly considered a precondition for the performance of public services. ICTs are essential for processes and services throughout the administrative back office, from national security to tax collection and issuance of public permits. Still, the efficiency and effectiveness of delivering, using and managing ICTs within the public sector is only measured sporadically, and performance indicators are one of the weaknesses of this area of work. Creating consensus around **standardised metrics or indicators and impact evaluation models** can enhance comparability of data across countries and support peer-learning exercises.

Most measurement efforts tend to focus on budget and time management rather than on **actual value creation**. Existing international measures focus on framework conditions, such as the World Economic Forum (WEF) competitiveness index, using data from entities such as

the International Telecommunication Union (ITU) and the World Bank, or on government supply, such as the United Nations' e-Government Survey (Figure 12.1) and the European Commission's revised e-government benchmark framework. The latter also includes some output- and outcome-related measures, such as uptake and user orientation.

Figure 12.1. **United Nations E-Government Index (2014)**



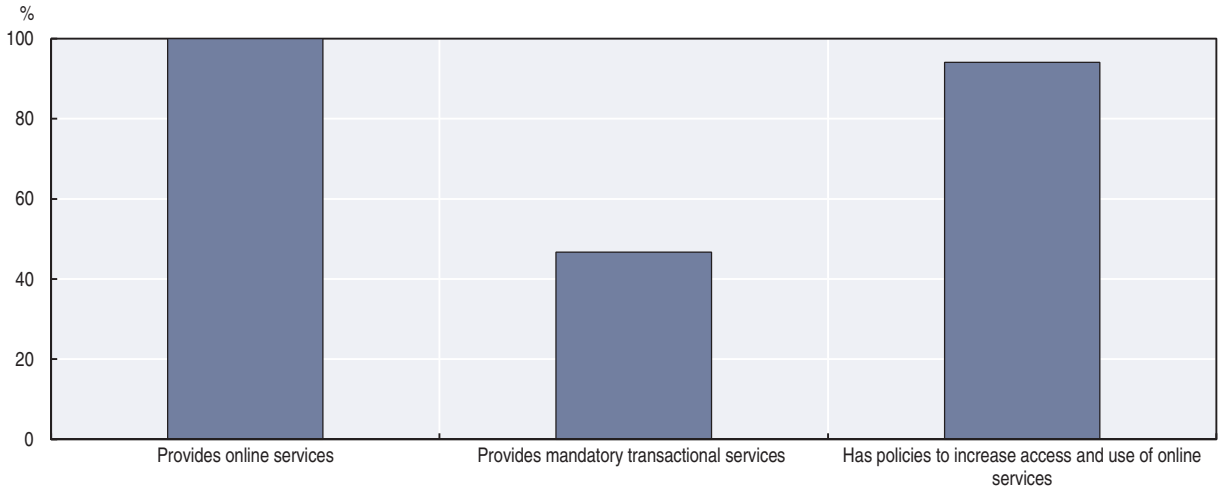
Source: UN (2014), *United Nations E-Government Survey 2014*, *https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2014*.

StatLink http://dx.doi.org/10.1787/888933354510

While making useful contributions to the understanding of the international development of e-government and digital government, these indicators need to be complemented by operational insights on governments' performance in digitising the public sector. These sets of new indicators can help measure impact not only in terms of inputs and outputs, but also in terms of outcomes.

In 2014, the OECD began to develop **performance indicators**, using the OECD Survey on Digital Government Performance, collecting data from OECD member countries. The survey focuses on 12 themes closely related to the OECD *Recommendation of the Council on Digital Government Strategies* (OECD, 2014a). It is currently in the data collection phase for the LAC region and will provide comparable data by 2016. This set of over 130 indicators includes data on service delivery, such as online service provision, mandatory use of online services, share of services available online, online public service transactions made compared to other channels, and use of user feedback in service design and delivery. An overview of online public service delivery in LAC is provided here (Figure 12.2).

Figure 12.2. **Online public service delivery in LAC countries**



StatLink http://dx.doi.org/10.1787/888933354527

Other performance indicators include the existence of co-ordinating units or functions, government investment in ICT infrastructure, services and human resources (HR), and measurement of direct financial benefits of ICT projects for government, citizens and businesses. However, digital technologies are diverse and cross-cutting, making it difficult to identify simple indicators of progress to capture the availability and quality of services, ICT governance and co-ordination in the public sector and overall public sector intelligence. It also presents challenges for the use of data to inform policy making, and innovation, which calls for a combination of tools.

The OECD *Recommendation of the Council on Digital Government Strategies* (OECD, 2014a) will be complemented by a Digital Government Policy Toolkit, of which a draft version is already available. The final version of the Toolkit will include a general overview of each principle of the Recommendation, key trends, good practices and a list of further reading. It will also include composite indicators linked to each of the principles, and a self-assessment exercise linked to each principle, to illustrate the type of policies and practices governments should use to make progress at different stages of development in the use of ICT.

At the national level, the design of performance indicators and impact assessment tools should align with digital government policy objectives. It is important to monitor and assess results at the aggregate level by key policy areas, to evaluate the results of the implementation of the digital government strategy, as well as at the micro level, to help identify the key drivers of success and failure of individual ICT projects or programmes. The methodology should clearly describe and assess inputs, activities, outputs and outcomes, so that the final impact can be determined. Outcome indicators can include time to complete procedures or access services, users' satisfaction with public services, number of citizens participating in public decisions through digital channels, and the economic benefits for citizens as well as the public and private sector.

The development of clear **business cases** (BC), or similar value-proposition methodologies, can help determine responsibilities of all relevant actors and focus on expected outcomes. The use of BC methodologies can help plan, monitor and follow up on ICT projects, making it easy to adjust as necessary during implementation. Adopting the same methodology across an administration can help develop a results-oriented culture geared towards strong project management.

Finally, efforts have been made to **connect government institutions**, to make possible the requisite levels of integration and sharing to boost digital government performance. All the countries responding to the OECD/Inter-American Development Bank (IDB) questionnaires reported that close to 100% of central government institutions are connected to broadband. However, in certain cases, the data does not exist for local governments. Extending the monitoring effort will be critical so that local governments can provide digital public services and participate in the digital transformation. This can also broaden the focus of analysis to gauge efforts to introduce additional common enablers (e.g. "service bus" infrastructure and authentication systems for service users).

Measuring OGD implementation and effects

It is also important to reach a degree of maturity and consensus around impact assessment methodologies for open government data policies. This can help guide governments as they implement their policies and programmes and maximise value creation. Few objective measures exist at the international level to help governments understand OGD efforts and effects. The OECD has developed the *OURdata Index*, in its publication *Government at a Glance 2015* (OECD, 2015b), which assesses governments' efforts on three fronts: increasing **data availability** on the national portal; increasing **data accessibility** on the national portal; and providing active support for the **reuse of data**.[1]

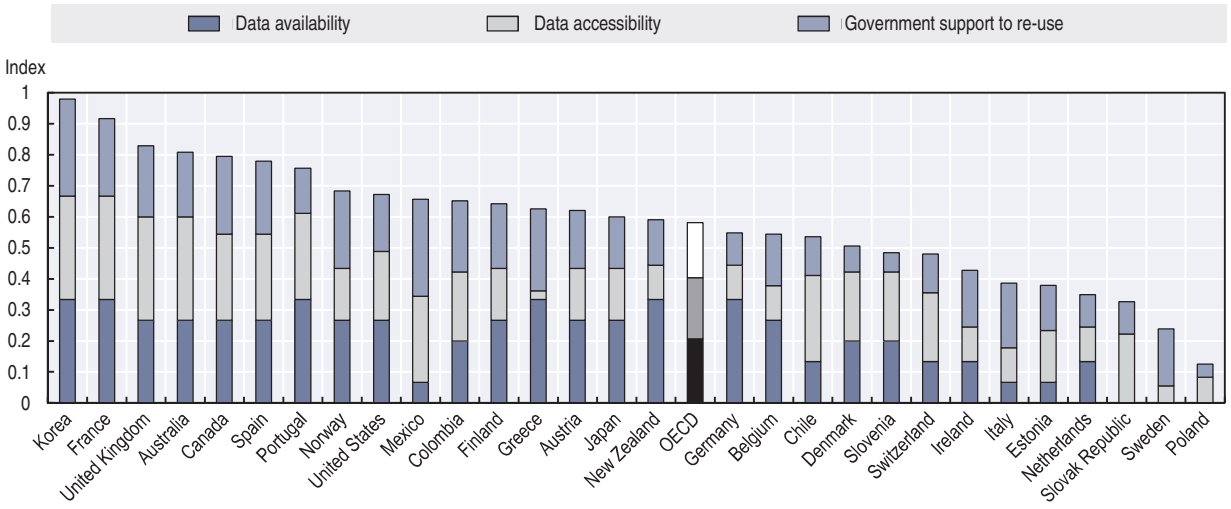
Data accessibility and availability are necessary, but if conditions are not in place to ensure reuse of data, OGD benefits, from social, economic and good governance perspectives (e.g. transparency, integrity, accountability) may be limited. Reuse of data by the public sector, by civil society organisations, by the private sector and a host of other actors is a *sine qua non* for optimising open data. The *OURdata* Index aims to help strengthen governments' focus on effective outcomes and to remember that the overall objective should not be increasing the availability of data, but encouraging stakeholders' engagement in data reuse (Figure 12.3). The *OURdata* Index is based on the OECD methodology for measuring Open Government Data (OECD, 2015b) and on the G8 International Open Data Charter, encapsulating the first set of internationally agreed-upon set of principles on Open Data.

The OECD methodology covers OGD strategies, effects and challenges, which allows the Index to focus on OGD implementation. The primary source of data used to calculate the Index is data collected through government sources. As international policy commitments progress (see for example the launching of the International Open Data Charter during the UN General Assembly in September 2015) the methodology underlying the *OURdata Index* will be expanded. This is essential, as the *OURdata Index* is also intended to help governments monitor their progress in implementing their international OGD commitments and commonly agreed-upon principles. Ultimately, the index aims to help governments design and implement OGD strategies that deliver value to the public. Additional international efforts to measure OGD include the Open Data Barometer, developed by the World Web Foundation, and the Open Data Index, developed by the Open Knowledge Foundation.

Smart cities

Different initiatives exist for measuring smart city performance. Applying its conceptual framework, the IDB has developed an assessment tool for Emerging and Sustainable Cities, gathering 140 indicators from a variety of sectors that help the IDB and local governments assess the sustainability of emerging cities. Emerging cities are defined as rapidly growing intermediate size cities of 100 000 to 2 million people. This tool is particularly valuable, as it consists of a set of indicators that was especially designed and developed to be implemented in the LAC region.[2]

Figure 12.3. **The Open-Useful-Reusable Government Data Index**



Source: OECD (2015b), *Government at a Glance 2015*, *http://dx.doi.org/10.1787/gov_glance-2015-en*.

StatLink http://dx.doi.org/10.1787/888933354534

Under its Emerging and Sustainable Cities Initiative (ESCI), which aims to foster smart and sustainable development of emerging Latin American cities, the IDB has developed a conceptual framework for analysing smart development. It is based on three pillars:

- **Environmental sustainability and climate change:** This includes indicators on efficiency and quality in water management and delivery, sanitation and drainage coverage and quality, waste collection coverage and quality of management, energy coverage, efficiency and sustainability, air quality, greenhouse gas emissions, noise control and vulnerability to natural disasters.
- **Comprehensive urban development:** This groups indicators on urban design and planning, fairness in distribution of urban services, urban transport network efficiency, economic competitiveness and public safety. It includes indicators on connectivity (broadband, mobile phones, smartphones), levels of educational attainment and quality of infrastructure.
- **Fiscal sustainability and good governance**, with a strong focus on transparency, fiscal effectiveness and sustainability: This includes indicators measuring participatory and modern public management (supported by the use of digital technologies), transparency, tax and financial autonomy, quality of public spending, contingent liabilities and sustainability of municipal debt.

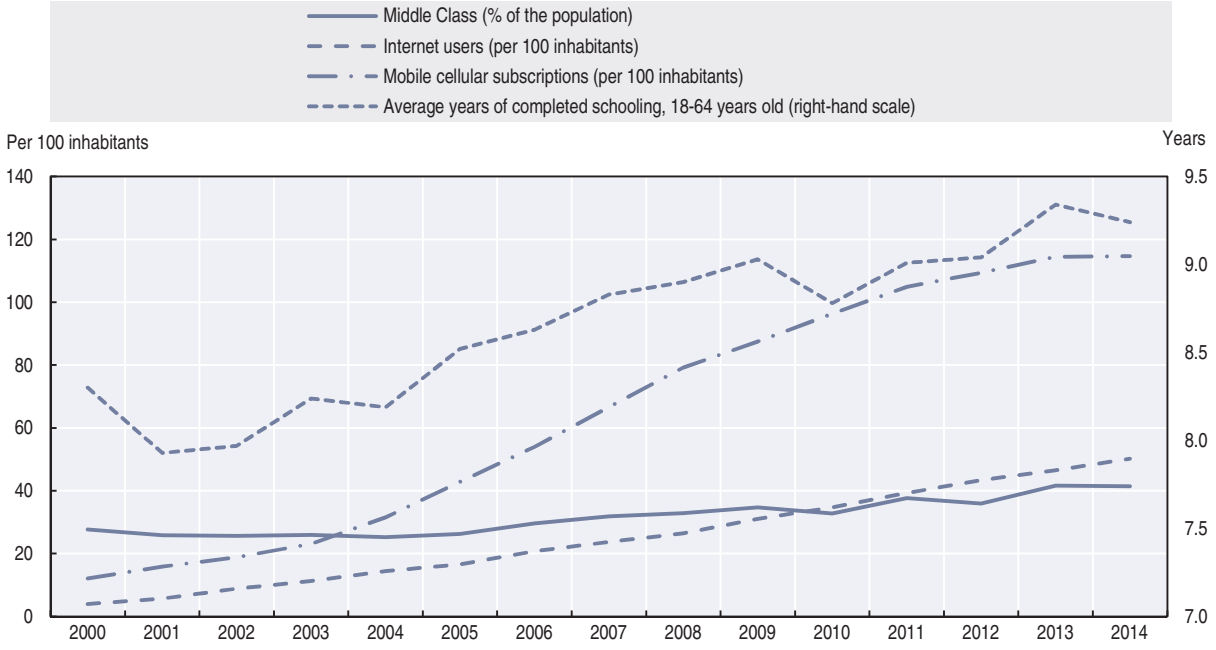
Overview of the situation in the LAC region

The LAC region has seen substantial change in the past two decades, including a growing middle class, rising levels of education, increased Internet usage and burgeoning mobile penetration (Figure 12.4).

Rising connectivity across the LAC region is changing how people interact in social, economic and civic spheres. Their **expectations for the delivery of public services** and in how they can interact with the delivery of these services are increasing. As a result, at a time of growing fiscal pressure on LAC governments, public authorities are expected to tackle increasingly complex issues for which they may not have sufficient information, adequate resources or capacities, and are expected to improve public sector productivity to deal with these growing demands. Governments thus need to use technology and data

more strategically. To achieve these goals, public sectors across the LAC region need to build a shared view of how digital government is supposed to work, improve collaboration and co-ordination across institutions, and enhance public engagement and participation mechanisms to leverage data, knowledge and talent from their communities.

Figure 12.4. **Middle-class use of ICT and average years of schooling in Latin America and the Caribbean**



Note: Middle class is represented as % of population with middle class income of USD10 to USD 50 PPP.

Source: OECD based on data by IDB (2015), *Sociometro-BID* (database), *www.iadb.org/en/research-and-data//sociometro-bid,6981.html*; World Bank (2015), *World Development Indicators* (database), *http://data.worldbank.org/data-catalog/world-development-indicators*.

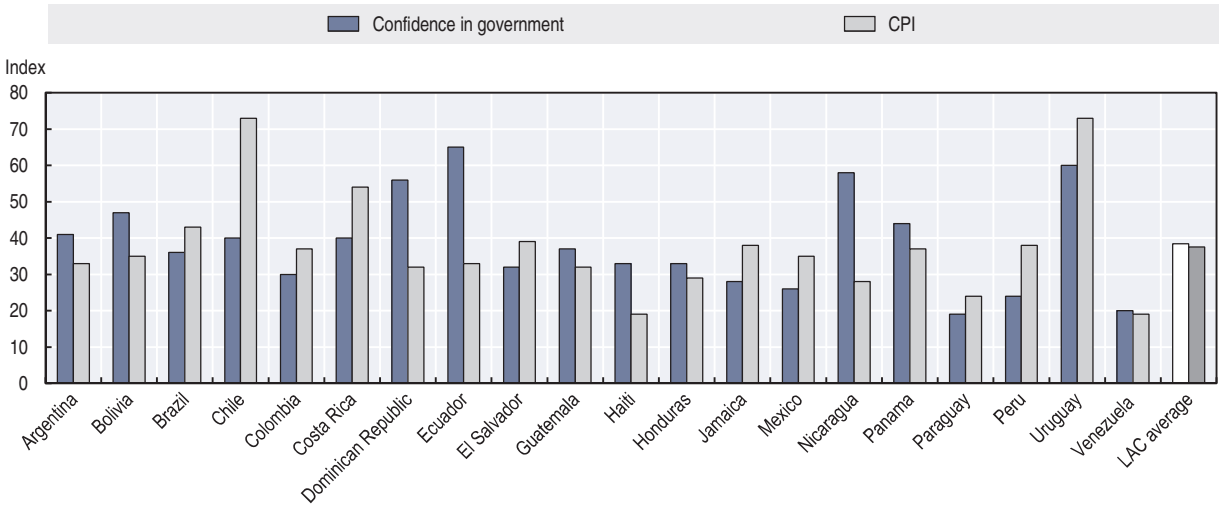
StatLink *http://dx.doi.org/10.1787/888933354549*

Given the need to digitise the delivery of public services, countries in the LAC region face relatively **low levels of trust in government institutions** (Figure 12.5). This is partly due to the perception of inadequate levels of transparency, accountability, performance and openness in government institutions. Digital technologies provide an opportunity for LAC governments to regain public trust and create public value. However, risks associated with their use, if not properly managed, could further erode confidence in public institutions. Security and privacy breaches and large ICT project failures could undermine government credibility and public trust (these issues are treated further in Chapters 14 and 15). Authorities cannot afford to appear unable to ensure safe and adequate use of digital technologies in the public sector, and must be able to plan investments and manage projects to drive results.

Digital government

Governments in the LAC region have begun to develop national agendas or strategies to increase **digitisation of government processes** and **develop digital public service delivery** and uptake. Most provide online services to their citizens and businesses. However, existing processes have often been transferred online without a substantial overhaul of back-office procedures. The design of these services can be driven by internal priorities. Development is frequently outsourced through traditional procurement arrangements that may not provide the required flexibility or adapt services to user demand.

Figure 12.5. **Confidence in government and perception of corruption**



Notes: Confidence is measured by the percentage of the population with confidence in government. CPI is the Corruption Perception Index (on a scale from 0 to 100, where 0 indicates high perception of corruption).

Sources: Gallup (2014), *World Poll 2014*, *www.gallup.com/*; Transparency International (2014), *2014 Corruption Perceptions Index*, *www.transparency.org/cpi2014*.

StatLink http://dx.doi.org/10.1787/888933354557

Traditional procurement rules may limit or prevent the public sector from leveraging the skills and potential of small and highly specialised start-ups in favour of large firms. Designing effective digital services demands appropriate governance frameworks as well as institutional capacity. This includes regulatory frameworks and ICT skills in the public sector. Delivering these services requires key enablers to be in place, for example, eID or digital signatures that can provide reliable authentication mechanisms and secure access to digital services. Many countries have developed legal frameworks to support digital signatures and eID, such as Peru and Uruguay. However, many have not yet implemented these frameworks.

Service delivery in the LAC region is often designed in a **silo approach**, as an isolated initiative focused on the internal priorities of the delivering organisation. This fragments the online user interface of the public sector, making it harder for citizens and businesses to access online services. To address this situation, a group of leading countries, including Brazil, Chile, Colombia, Costa Rica, Mexico, Peru and Uruguay, are developing one-stop shop portals offering citizens and businesses a single access point to all digital public services. This is paving the way for a user-centred approach (Box 12.1 and 12.2).

Box 12.1. **Peru's service portal for citizens and businesses**

As one of the leading countries in the field of digital government in the region, the government of Peru is quickly adapting to international trends in the field of service delivery. The *Oficina Nacional de Gobierno Electrónico e Informática* (ONGEI) has developed a service portal (*Servicios Ciudadanos*)[1] for citizens and businesses that serves as a one-stop-shop, facilitating access to and visibility of online public services. It provides citizens and businesses a catalogue including over 800 online services and 56 mobile applications that give users access to services on the move.

1. *www.serviciosalciudadano.gob.pe*.

In 2014, nearly all countries responding to the OECD/IDB Questionnaire reported having a strategy or policy in place to improve the access to and use of digital services. These strategies include infrastructure development plans and training programmes for citizens and businesses. Countries such as the Plurinational State of Bolivia, Brazil, the Dominican Republic, Guatemala, Mexico and Uruguay are opting to encourage the uptake of digital services, including by making the use of online channels mandatory. Mandatory online services mostly concern forward-looking agencies such as tax revenue administrations, which are seeking to improve their internal processing of tax declarations. The intent is to maximise efficiency and tackle cultural barriers through technology. However, mandatory online services remain an obstacle for digitally excluded populations, and additional effort is needed to support their access to these services.

Box 12.2. **Costa Rica's advances in digital government**

Since 2010, Costa Rica has designed goals, plans and projects to transform the state with information and communications technologies. The goal is innovation of services, to reduce bureaucratic processes and speed access to procedures and services for both citizens and businesses. Of the projects developed by the Technical Secretariat of Digital Government, the most notable are:

- Citizen Portal,[1] which aims to improve public services with a search engine designed to index all government sites. Featured services include: one-stop service, where services are provided for the processing of passports for the first time.
- Merk-Link,[2] a 100% electronic purchases integrated system designed to become the sole government procurement system, to improve transparency and efficiency in public procurement.

1. *www.gob.go.cr.*
2. *www.mer-link.go.cr.*

In certain LAC countries, a **lack of resources or geographical conditions** has slowed the development of infrastructure. To ensure a better distribution of digital opportunities across the country, different LAC countries have developed multi-channel strategies, while addressing structural factors that preserve existing divides. Given the high penetration of mobile telephones, a focus on "mobile government" has been considered one viable option, for example in Colombia (OECD, 2013b). However, little data is available on the effectiveness of these strategies, and few governments monitor progress with performance indicators. Public authorities should set up governance frameworks that allow for the digital transformation of the public sector. No one prescribed model for institutional and organisational frameworks can be recommended for public sector digitisation. Governance structures should establish clear roles and responsibilities based on a country's political realities, objectives and institutional capacity. The institutional development of LAC countries has progressively led most of them to establish ICT co-ordination units at the central government level (e.g. with a government chief information officer, or CIO). Regional leaders, such as Brazil, Colombia, Mexico and Uruguay, have made major efforts to improve co-ordination between the units responsible for ICT implementation. Room for improvement nevertheless remains in establishing formal co-ordination mechanisms between units within and across levels of government.

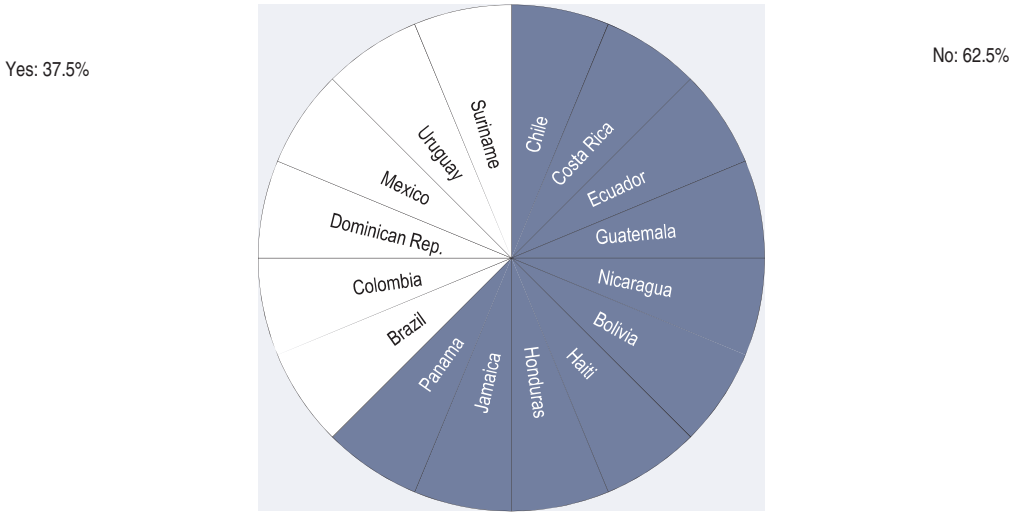
A major challenge for both OECD and LAC countries is to **win the support of top civil servants and the political leadership** for broadband strategies. Insufficient appreciation

of the benefits of digitisation limits the ability to break down resistance to change and to mobilise the necessary resources for this transformation. Government officials tasked with promoting digitisation have the challenging task of raising awareness both within the administration and in society at large. Experience from OECD countries shows that the process of developing a national broadband strategy is a key strategic moment to gain visibility and secure commitment from all stakeholders. Engaging with them in the development phase is necessary to ensure that the different views are reflected in the final document, facilitating a broad sense of ownership and political support for digital government initiatives.

Most LAC countries have yet to develop **comprehensive strategies** to improve their capacity to implement digital government initiatives and support broader public sector reform. In recent years, Brazil, Chile, Colombia, Costa Rica, Mexico and Uruguay have revised their procurement frameworks to support governments' use of cloud technologies, app and software development and the protection of data privacy when contracting digital services. Still, most legal and regulatory frameworks for ICT procurement in the region fall short of addressing many of today's most pressing challenges, including procuring and deploying digital technologies promptly, supporting innovation, sharing and the use of open-source software in the public sector. LAC countries often lack information about their existing assets, which undermines their capacity to identify their needs and make rational ICT investments.

Finally, the institutional capacity of governments in Latin America also faces the challenge of **developing ICT skills in the public sector**. This is further complicated by the gap between private and public sector salaries, which tends to push talent toward the private sector. A substantial number of governments in the region do not yet have a strategy to attract, develop and retain human resources with the skills to support the digital transformation of the public sector (Figure 12.6). Even where such strategy is place, the focus is often on training civil servants and providing financial incentives. Meanwhile, non-financial incentives are critical, especially since it is unlikely that governments will be able to compete with private-sector wages in the near future.

Figure 12.6. **Countries with a strategy to attract develop and retain ICT-skilled civil servants**



StatLink http://dx.doi.org/10.1787/888933354561

Connecting the public sector for digital government services

Almost half the LAC population does not yet use the Internet, compared to only 20% in OECD countries. This shows that the digital divide remains a structural factor that can reduce the benefits of digital government and the use of new tools such as cloud computing and big data analytics. Even countries with considerable economic weight, such as Peru and Mexico, have user rates below the regional average and in Chile and Uruguay, the regional leaders, barely 50% of the population are yet online (ECLAC, 2013).

Despite the high levels of connectivity of central government institutions, the **availability and quality of access to the Internet and broadband** in the LAC region is spotty. This is due to in part to unsuitable legal and regulatory frameworks and the barriers to entry for new providers, the lack of demand and geographical challenges, which reduce competition and service quality.

The region has seen major efforts to connect public institutions at the local level. These have often concentrated on addressing regulatory constraints and investment. The expected returns on investment, at least in the short term, often fall short, since public officials frequently lack the **knowledge and skills** to take advantage of access to the Internet, which demonstrates how extensive the digital divide remains. Moreover, such programmes often lack continuity and/or sustainability, often as a result of changes in government (Mariscal and Bambrilla, 2012).

Open Government Data

Governments in the LAC region are progressively recognising the importance of developing overarching open government data (OGD) strategies. A majority of the LAC countries that responded to the OECD/IDB Questionnaire reported that they have an OGD strategy in place (Figure 12.7). However, in most of these countries, open data regulations are, at least conceptually, linked to Freedom of Information Acts (FOIs), many of which were enacted before the open data movement reached government. This might suggest that the **legal framework of open data needs** to be updated to include considerations such as the publication of government data in open formats by default. Generally, the adoption of these OGD strategies in the region have been driven by countries that participate in and have committed to the Open Government Partnership, and which have a strong focus on its transparency and anti-corruption aspects. Moreover, some LAC countries have developed national open data portals, to improve the accessibility of central governments' data. By December 2014, six LAC countries had national open data portals: Brazil, Chile, Colombia, Costa Rica, Mexico and Uruguay.

While the value of open data in promoting transparency and accountability in the decision-making process and handling of public resources is essential, some strategies tend to overlook the economic and social value of open government data in creating an innovation ecosystem that can provide new ways of delivering public services efficiently and effectively.

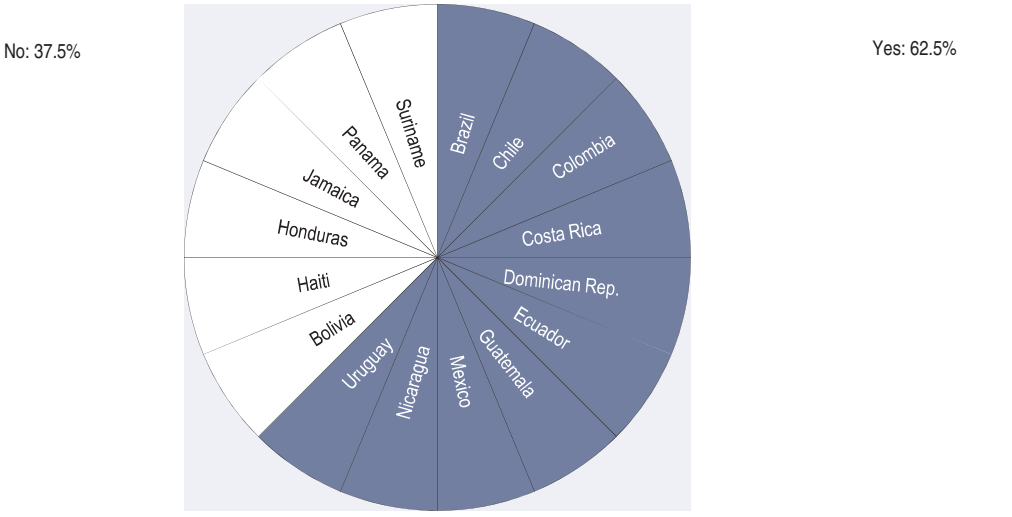
Smart cities

People in the LAC region are not only increasingly connected and mobile, but also increasingly urban, which translates into new opportunities and organisational challenges. The region is the second most urbanised on the planet, increasing from a 64% urbanisation rate in 1980 to 79% in 2010 (UN, 2015).

These demographic trends and pressures concentrate talent and resources, turning cities into dynamic hubs of innovation that can achieve important economies of scale and increased competitiveness (OECD, 2013a; Fujita, Krugman and Venables, 1999). However, this does require that city governments create adequate living conditions that maximise citizens' productivity and well-being, while managing risks. This will necessarily entail new

approaches to urban planning and the use and management of resources, attracting and developing new skill sets and reinventing city governance and transport systems.

Figure 12.7. **Central/federal governments with an OGD strategy or policy in place**



StatLink http://dx.doi.org/10.1787/888933354574

Cities in the LAC region, like others around the world, are still trying to assess what "smart" looks like. Thanks to increased awareness and concrete challenges, they are rapidly joining broader efforts to create smarter cities and developing initiatives to create sustainable and innovative urban areas. However, in general terms, major challenges remain in terms of traffic, gas emissions and ecological footprint, urban planning, government efficiency and transparency, by comparison with OECD standards.

Some cities have started to develop **plans and projects to become smarter**, with a view to positioning themselves as regional leaders. This is the case of Santiago, Mexico City (with its open-data initiative), Bogotá, Medellín (with its drive towards innovation), Buenos Aires, Rio de Janeiro and Montevideo (Box 12.3). The main challenges for smart cities initiatives are creating enabling conditions (setting up the appropriate ecosystem), including building trust across social sectors, creating institutional capacities, overcoming strong wage differentials between the public and private sectors and establishing formal mechanisms that support equal opportunity, talent and innovation.

Box 12.3. **Hacking insecurity in Mexico City**

Taxi service in Mexico City is an unpredictable proposition. Criminals often use vehicles camouflaged to look like licensed taxis to rob customers, with as many as 400 taxi robberies reported in 2013. Passengers have as a result preferred to opt for more expensive transport services. Mexico City's innovation lab, *Laboratorio para la Ciudad*, has developed an innovative app using open government data to help tackle taxi users' security concerns. This app allows users to enter the license number on the side of the car or snap a photo of the cab's license plate. The app will then cross-reference with city data to determine whether it is a registered taxi. The app also includes a button that automatically alerts the police department in case the user runs into trouble.

Source: Arana (2014), "In Mexico City, an 'experimental think tank' for a city and its government", *http://citiscope.org/story/2014/mexico-city-experimental-think-tank-city-and-its-government*.

Good practices for achieving objectives in the LAC region

The *Recommendation of the Council on Digital Government Strategies* (OECD, 2014a) is designed to promote digital government strategies that bring governments closer to citizens and businesses (Box 12.4). The Recommendation draws on over 15 years of experience in e-government in OECD member and non-member countries and recognises the potential of digital technologies to improve public sector efficiency. It also aims to support effective public policies and create more open, innovative and participatory forms of governance. The Recommendation includes 12 principles based on three pillars, and provides a conceptual framework for analysing digital government strategies and policies. It is intended to help governments design and implement better digital government strategies, and has been used as a frame of reference to formulate the specific policy recommendations in this chapter.

Box 12.4. **The OECD's *Recommendation of the Council on Digital Government Strategies***

Adopted on 15 July 2014, the OECD Recommendation is a structuring element for decision makers and stakeholders that need to navigate government objectives and resources in an increasingly complex policy-making environment. Digital technologies create both opportunities and challenges for successful government reforms in any policy domain, e.g. welfare, economic development and administrative services efficiency. A set of 12 principles, grouped under three pillars, guide decision makers:

I. Engage citizens and open up government to maintain public trust.

1. Ensure greater transparency, openness and inclusiveness of government processes and operations.
2. Encourage engagement and participation of public, private and civil society stakeholders in policy making and public service design and delivery.
3. Create a data-driven culture in the public sector.
4. Reflect a risk-management approach to addressing digital security and privacy issues, and include the adoption of effective and appropriate security measures.

II. Adopt cohesive approaches to deliver public value throughout government.

5. Secure leadership and political commitment to the strategy.
6. Ensure coherent use of digital technologies across policy areas and levels of government.
7. Establish effective organisational and governance frameworks to co-ordinate the implementation of the digital strategy within and across levels of government.
8. Strengthen international co-operation with other governments.

III. Strengthen government capabilities to ensure returns on IT investments.

9. Develop clear business cases to sustain the funding and focused implementation of digital technologies projects.
10. Reinforce institutional capacities to manage and monitor projects' implementation.
11. Procure digital technologies based on assessment of existing assets.
12. Ensure that general and sector-specific legal and regulatory frameworks allow digital opportunities to be seized.

Source: OECD (2014b), *Recommendation of the Council on Digital Government Strategies*, *www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf*.

Digital government

Governments across OECD countries are progressively **shifting their approach to digital public service delivery**: from government-centred (focused on increasing cost reduction, efficiency and productivity in service delivery), to user-centred (focused on anticipating users' needs to improve administrative and personal services), and finally towards user-driven approaches (focused on fostering the digital transformation to enable governments to create increased public value).

A **user-driven approach** can help enhance government service delivery. It builds on the value of digital technologies to modernise the public sector by integrating digital technologies in service design and delivery, which results in shaping public policy outcomes. Experience shows that allowing such new forms of partnerships and crowd-sourcing ideas from within an administration and the society at large leads to gains in efficiency and productivity in the public sector. Many governments, in reaction to citizens' rising expectations of public services, have moved towards increased openness, experimentation and collaboration. This has helped achieve better performance, and more efficient and simplified services. Champions of this approach in the OECD include the United Kingdom, the United States, France and Finland. Portugal and Chile offer good examples of one-stop shops to inform citizens and provide public services in an intuitive and interactive manner (Boxes 12.5 and 12.6).

Box 12.5. **Portugal's Citizen Portal**

The Citizen's Portal (Portal do Cidadão)[1] is the central channel of access to electronic public services in Portugal, facilitating the relationship between citizens, business and the public administration. It serves as a single point of contact for online services provided by both central and local government, and also presents services provided by private entities. It was developed by the Portuguese Agency for Administrative Modernisation (AMA), in close co-operation with Portuguese public entities that use the Portal. It involved an extensive process of functional and technological development, with the goal of creating an efficient, interactive interface that is easy for users to navigate.

The new Portal has a new layout and updated functions, combining the features and services of the previous Citizen's and Business Portals. It makes access to online services provided by public authorities simpler, faster and more intuitive. The portal conforms with the WCAG 2.0 AA level and is adapted for different kinds of mobile devices (e.g. smartphones, tablets, etc.) allowing access to the services at any time or place. It uses authentication with the Portuguese Digital Mobile Key (*Chave Móvel Digital*), which allows users to log in to the portal and access digital services with a secure and easy password.

The portal makes possible a high level of participation and collaboration, allowing users to publicly rate, comment and share their suggestions and evaluations of the services and information provided. This can be shared on social networks like Twitter or Facebook.

1. *https://www.portaldocidadao.pt/*.

Source: OECD (n.d. a), "Portugal: Citizen's Portal", *www.oecd.org/gov/portugal-citizens-portal.pdf*.

As noted earlier, however, governments in the LAC region still need to contend with challenges in delivering digital public services. The aim is to **scale up their efforts**, creating a critical mass of users for a citizen-driven approach to digital government. To optimise the potential of ICT for improving public services, Latin American governments should aim to expand access for all citizens to digital services, tackling any existing forms of

the digital divide while avoiding new forms of digital exclusion (see Principle 1 of the *Recommendation of the Council on Digital Government Strategies* [OECD, 2014a]). Including all citizens in this effort means removing cultural barriers to digital uptake, such as making sure local content is being produced, including for indigenous people (as discussed in Chapter 10). The design and accessibility of digital services should be enhanced by leveraging platforms and technologies already in use by much of the population, such as mobile phones and social media.

Box 12.6. **Improving access to public services with ChileAtiende**

Chile has combined efforts to reduce the digital divide while providing services through a multichannel strategy. ChileAtiende seeks to bring government closer to citizens by providing a multichannel and multiservice network for the delivery of public services ("one-stop shop"). The network includes the following channels:

- over 200 offices geographically distributed to cover most of the population of the country, offering 91 benefits and services from 28 institutions to the public
- Digital Channel, a website that provides information on more than 2 500 benefits and services in simple language, as well as Twitter and Facebook accounts for direct contact with citizens
- Call Center provides information and orientation on public services and benefits
- ChileAtiende vehicles are vans sent out to remote and rural areas to provide public services.

The project was launched in January 2012. It was inspired by the experience of Canada, Singapore and Australia, and took advantage of an opportunity to reuse previously installed capacities. The offices and Call Center are owned by the *Instituto de Previsión Social* (IPS, or Institute of Social Security), whose expertise is in delivering services to citizens. The website, in turn, is an evolution of ChileClic, a previous effort to concentrate information on public services online. A board was appointed to oversee the project and manage approvals.

Plans are also in place to develop infrastructure, improve access to ICT and hold regular training programmes to develop ICT skills among citizens and businesses. This experience illustrates a committed effort to address issues preventing digital service uptake in the regional context.

Source: OECD (n.d. b), "Chile: ChileAtiende", *www.oecd.org/gov/chile-chileatiende.pdf*.

The rapid uptake of mobile technology in the LAC region, with nearly 120 subscriptions per 100 people, has provided governments with an additional channel to deliver and improve their services (OECD and ITU, 2011). The use of different platforms and delivery systems that reach out to a broader public should be commended and encouraged. In Peru, a national mobile payments platform provides authorities and citizens with an efficient, fast, secure and transparent way of making cash transfers (Box 12.7). Beyond specific mobile platforms for providing public services, some governments have sought to implement **broader mobile government programmes** within their digital government strategies, as in the case of Singapore (Box 12.8).

Additionally, digital government strategies should clearly identify a unit, body or function responsible for co-ordinating the deployment of ICTs in the public sector, with a mandate to guide change and ensure strategic coherence. According to the OECD's draft

Digital Government Toolkit, these units or bodies should also be responsible for developing common policies and standards, drive the adoption of national interoperability frameworks for data exchange and interoperability between independently operated applications, and facilitate synergies and sharing of lessons (OECD, 2015a). **Co-ordination efforts** should address outstanding cross-jurisdictional challenges, while preserving clear accountability for each party's areas of responsibility (see Principles 6 and 7 of the *Recommendation of the Council on Digital Government Strategies* [OECD, 2014a]).

Box 12.7. **Peru's mobile payment platform, Bim**

Inspired by the M-Pesa experience in Kenya, Peru established Bim, a national mobile payment platform based on a "coo-petition" model. Peru's approach to financial inclusion consisted of first bringing together different stakeholders to create a national platform and then letting them compete with offers of digital financial services via mobile phones, often without the need of smartphones or data plans. The government acted as a facilitator by providing an enabling regulatory framework for this new platform. The scheme is backed by all the country's banks and can be used across mobile operators networks.

This joint effort is helping to drive down the costs of financial services and provide governments with efficient, faster and safer payment methods. This is especially important in Peru, which has one of the LAC's lowest levels of use of financial services. Only 29% of the population have bank accounts. Mobile telephones have become a substantial tool in Peru for bridging the differences between services available to rural and urban populations.

Sources: *https://www.bbvaresearch.com/publicaciones/la-nueva-banca-la-banca-para-todos-el-modelo-peru/*; *https://www.betterthancash.org/news/blogs-stories/modelo-peru-a-unique-approach-to-financial-inclusion*.

Box 12.8. **Singapore's Mobile Government Programme**

The Mobile Government Programme is part of Singapore's broader digital government strategy and has three key objectives for the 2011-2015 fiscal period:

- "support and guide agencies to deliver feature-rich government mobile services (m-Services) to enhance customer experience and satisfaction
- aggregate demand for mobile research, tools and services that help agencies in the efficient and consistent implementation of mobile services
- improve or maintain Singapore's standing in international rankings, through the delivery of high-quality services via the mobile channel.

Today, more than 300 mobile government information and services are available. "M-Gov" also established a whole-of-government (WOG) central short-messaging-service (SMS) platform, known as OneSMS, to facilitate the development of m-services by government agencies through demand aggregation. The programme was co-developed by the Ministry of Finance (MOF) and the Infocomm Development Authority of Singapore (IDA) as part of the Integrated Government 2010 ("iGov2010") e-government master plan for 2005-10, motivated by the increasing penetration rate of mobile phones, especially smartphones and the increasing number of transactions through mobile phones, either through mobile browsers or native mobile applications.

Sources: IDA (2016), "M-Government", *www.ida.gov.sg/Programmes-Partnership/Store/M-Government*; Singapore (2016), "Mobile Government", *eGov Programmes*, *www.egov.gov.sg/egov-programmes/programmes-by-citizens/mobile-government*.

In response to new challenges and requirements that governments are facing to complete the digital transformation, **new trends in governance and organisational frameworks** are starting to emerge, Three approaches presented below, often combined as hybrid models, are worth noting (OECD, 2015a, forthcoming):

- **Digital transformation office model:** This creates a new organisation, with the mandate to oversee and co-ordinate the use of technology to transform the operation of the administration and the delivery of services. The staff is usually recruited from the tech sector to compensate for the lack of highly technical skills in the public administration and are experts in digital technologies, tools and approaches. The aim of this approach is to improve the strategic use of data and technology within the administration, in an effort to bring "quick wins" on service quality improvement. In the long term, it may not be sustainable, since it often fails to effect deeper structural and cultural change across governments. Countries that have adopted this approach include Australia's Digital Transformation Office and the United Kingdom's Government Digital Service.
- **Central co-ordination model:** This model seeks to create strong government-wide leadership, such as by setting up a co-ordination unit with a clear mandate and/or establishing formal positions of CIOs. The goal is that this co-ordination authority can count on enforceable levers to set policy and control approval of funding for large ICT investments. This may also include the creation of shared service organisations and centralised procurement processes for ICT under the responsibility of this co-ordination body/authority. This approach has the advantage of creating common standards across government (e.g. making the use of Business Case approaches mandatory) and potentially leveraging economies of scale. However, a focus on big-ticket items can make public administrations slower to react and limit agility in initiating pilot projects aimed at exploring innovative technologies or approaches. Countries that have adopted this approach include Denmark (OECD, 2010), Mexico (OECD, 2011), Spain (OECD, 2012) and Colombia (Box 12.9).
- **Decentralised co-ordination model:** This provides greater flexibility for individual ministries to pursue projects and test different approaches in using ICT for modernisation. Often there is still a central co-ordination body and a national strategy to guide digital government activities. However, fewer mandated requirements are required of departments and no unifying senior official is designated with ultimate responsibility for the digital agenda. This approach allows greater ability for experimentation and customisation by departments, and more opportunities to engage with other levels of government, whether regional or local. However, adoption of this model runs the risk of leading to uneven implementation and may not ensure that lessons learned are effectively transmitted across all government organisations. Examples of this model include Finland (OECD, 2015c) and Chile (OECD, n.d. b).

The models presented above provide different degrees of centralised options for governance and management of information services. It is important to keep in mind that they all have strengths and weaknesses, and some may not be appropriate for certain situations. Probably as important as fixing on one model or another is to build an appreciation of the value of sound experimentation and ensuring that the models are periodically reviewed to confirm that they align with current conditions and public objectives. The United Kingdom's Government Digital Service appeared as an experimental model that achieved substantial progress in a relatively short period. This model is currently being replicated to some extent by other digital government leaders, such as Australia,[3] the Netherlands[4] and the United States.[5] Chile and Portugal are also pursuing interesting experiments in combining digital government and public sector innovation to improve service delivery.

Box 12.9. **Colombia's central co-ordination to achieve strategic goals**

Colombia's institutional framework for digital government has three strategic pillars: regulatory principles, policy guidelines and a monitoring and evaluation model. These three elements make it possible to enhance the understanding and implementation of electronic government.

The E-government Office of Colombia is a branch of the Vice Ministry of Information Technology of the Ministry of ICT, established under Decree 2618-2012. In defining policy and regulatory frameworks, the office has the following functions:

- development of guidelines regarding e-government that support policies, strategies, and practices for public administration
- defining policies for the rationalisation and automation of procedures, and promoting e-government service delivery in co-ordination with agencies working for administrative efficiency
- designing and implementing the strategic plan for e-government at all government levels
- promoting co-operation between national, regional and local authorities and relations with civil society organisations through e-government.

The e-Government office also monitors and evaluates the implementation of the strategy through a model composed of various tools, one of which is a unified report system of advances on all administrative policies in which e-government is evaluated as a transversal topic.

Source: OECD (n.d. c), "Colombia: Development of E-Government Institutional Framework", *www.oecd.org/gov/colombia-instituional-framework.pdf*.

A key objective of these governance frameworks and co-ordination mechanisms is to ensure **coherent use of digital technologies across levels of governments**, to maximise benefits for the population. Nonetheless, achieving cross-jurisdictional co-operation in ICT, particularly in federal systems, often proves a challenging task. In certain small countries and cultures, co-ordination may be facilitated through primary relations. Making co-ordination sustainable in larger countries requires institutional maturity and formal mechanisms for co-ordination. Denmark provides an example of a country with good practices in the implementation of joint governance for its digital government strategy (Box 12.10).

Some OECD countries have been focusing on the role of **data as a strategic asset** in promoting innovation and modernisation of the public sector. Some have appointed a Chief Data Officer (CDO) or other forms of data governance at the central government level. CDOs are usually charged with helping agencies improve organisational arrangements to better manage data resources. Ultimately, they are expected to make a quantifiable difference in how institutions create, store, manage, use and share data, with users both inside and outside the government, thereby improving evidence-based policy making. Examples include France, the United Kingdom and the United States.

Similarly, the introduction of "once-only principle" legislation, recognising the right of citizens and businesses to provide their information only one time, can be seen as an additional external means to **improve co-ordination and data-sharing mechanisms** between public authorities. Observing this principle requires a high level of systems integration, and the willingness to collaborate and cut across silos within the administration. It also calls for a level of public confidence in the institutions' capacity to manage potential risks of privacy, security and misuse when sharing citizens' personal data.

Box 12.10. **Denmark's joint-governance approach to digital government**

Denmark has an original and sustainable mechanism for co-ordination and commitment to the national strategy across the public sector. The Steering Committee for Cross-Government Co-operation (*Styregruppen for Tværoffentlige Samarbejder*, or STS) was set up in 2005 under an agreement between the government, regions and Local Government Denmark.

The STS is a cross-government co-ordinating body whose goal is to create common ground in developing digital government. The framework for collaboration is confirmed in the annual negotiations between the government and regional and municipal representatives on the budgets for the following year. The STS includes high-level representatives (at the level of permanent secretaries/managing directors) of the five most important ministries for e-government from the central government, and of the associations representing municipalities and the regions. It is responsible for determining the overarching principles and coherent framework conditions for digital government, co-ordinating initiatives across the public sector to enhance the use of resources, decide on resource allocation and determine models for digital government operations and maintenance of projects.

Source: OECD (2010), *Denmark: Efficient e-Government for Smarter Public Service Delivery*, *http://dx.doi.org/10.1787/9789264087118-en*.

Institutional capacities are also critical in the sound management of government information systems. They support the planning and implementation of ICT projects as they become increasingly complex. Project complexity is growing not only in terms of budget size but also in the number and diversity of actors involved and in the choice of technologies and delivery arrangements.[6] Given the increasing technological options, it is noteworthy that ICT projects have become even more challenging due to changes in the life cycles of digital technologies. This may entail the life cycle of a device or piece of equipment or, more likely, the software associated with it. ICT equipment may once have had a relatively short lifetime compared with other infrastructure provided by public authorities, and software is likely to require updates in areas such as security, for its entire working lifetime. Although the diversity of actors has increased, as public ICT projects become more complex, the more challenging it has become for some players to participate and offer their services (e.g. small bidders such as SMEs and start-ups).

To address these issues and ensure return on investments, governments need to develop **clear business case methodologies** linking ICT projects with overarching strategic objectives. They need also to provide sound, systematic evaluation of projects' costs, benefits, risks and outcomes (Box 12.11). This recurring exercise should provide them with the evidence to identify key drivers of ICT project failures and successes (see Principle 9 of the *Recommendation of the Council on Digital Government Strategies* [OECD, 2014a]). Meanwhile, the overarching strategic objectives and systematic evaluations should make it possible to **break down large projects** to a smaller and more manageable size.

In the effort to establish an overarching framework, governments are also responsible for ensuring the adoption and application of **standards, guidelines and codes for procurement**, as well as re-engineering, interoperability compliance and performance evaluation processes. Australia (OECD, 2015a) and Denmark (OECD, 2010) provide excellent examples of this.

These standards, however, must be flexible enough to adapt to rapidly changing digital technologies and be open to experimentation. To face the challenges of standardisation while maintaining flexibility, governments should ensure that evidence and data are collected as projects are launched and make greater use of existing data to monitor project performance.

Box 12.11. **The Danish ICT Project Model**

The Danish ICT project model offers a standardised system for managing ICT projects across a government administration. With explicit reference to the United Kingdom's ICT project model, Prince2, it provides guidelines for how to organise and manage ICT projects and delivers concrete templates for all generic products in the process. The overall phases covering all projects are shown below:



The Ministry of Finance has created a unit establishing good practices for digital government projects, including both mandatory and recommended elements. The model has helped establish a specific governance structure, for example requiring approvals of well-developed business cases, as well as ongoing approvals – so-called "stop-go" decisions – each time a project passes from one phase to the next.

Producing **data as an asset for decision-making**, not only at the technical level, but also in the highest levels of public administration, is crucial. Given the proliferation of ICT projects, governments need to adopt mechanisms to ensure that the centre of government has a comprehensive picture of its needs and assets, to avoid duplicating systems and datasets, support strategic procurement decisions and minimise project management risks.

To select the appropriate mix of technologies and skills, governments should have a good knowledge of their assets, including a skills inventory, **ICT inventory** and age of existing assets, to determine where they are in their life cycle. Also useful are a public services catalogue, current contracts, inter-agency agreements and a list of public sector registries. These tools can guide future investments, helping to prioritise strategic decisions on resource allocations and improve efficiency. This might include consolidation and re-engineering of processes and technologies on the back end, establishment of one-stop shops to deliver services, streamlining procurement and contracting of ICT services and enhancing products and skills development.

The use and development of applications in public ICT projects that leverage cloud computing, open government data and social media now require **new procurement models** that support more flexible software delivery and allow for innovative responses (see Principle 11 of the *Recommendation of the Council on Digital Government Strategies* [OECD, 2014a]).

To improve the procurement of digital technologies, some countries have moved towards shared IT service centres and cloud computing, and have given a single ministry or agency responsibility for certain types of data or process management (e.g. identification, authentication, registration, licensing). This has made possible more efficient sharing of resources, software, data and/or processing capacity. Belgium[7] and Denmark[8] provide excellent examples. Procurement rules should be adapted to improve the ways governments work with open-source software, and more specifically, with their licensing terms of use and intellectual property models.

Finally, the effective use of ICTs and appropriate management of ICT projects within governments require **new skills**, including the advanced use of new technologies in carrying out internal tasks, delivering services and engaging with outside actors. They also demand specific knowledge of ICT project management and use of data for policy modelling, evaluation, data analytics and data mining (Chapter 9 further discusses ICT skills).

Many countries, including those in the LAC region, have a deficit of civil servants with ICT skills. The scarcity of human capital is frequently exacerbated by the fact that government salaries can rarely compete with private-sector salaries, and by the persistent digital divide (see Principle 10 of the *Recommendation of the Council on Digital Government Strategies* [OECD, 2014a]). To make sure adequate skills are available in the short term, governments should **leverage partnerships** with the private sector, academia and non-governmental organisations. In the mid- to long term, they should put in place arrangements to develop an adequate public sector workforce, by recruiting and involving young professionals, providing professional and vocational training and setting up exchange programmes between the public sector and technology leaders in civil society or the private sector (including not only large corporations but start-ups). These initiatives should be aligned with other policies promoting workforce mobility and renewal in the public sector, to attract and retain top talent.

As the regional overview showed, experience in the LAC region suggests that improving market conditions is a necessary but insufficient condition for addressing structural limitations for digital government. Many public institutions in the region, especially local governments, are not yet connected (Mariscal and Bambrilla, 2012). One good practice is to **incorporate goals in national broadband plans** to connect public institutions in the country (Chapter 5 discusses broadband plans in detail). This can help improve regional connectivity, increasing demand and skills at the local level and encouraging better service delivery and policy making (Box 12.12).

Box 12.12. ***México Conectado***

México Conectado is a federal programme initiated by the Ministry of Communication and Transport that seeks to honour the constitutional right of Mexican citizens to Internet access. The programme is co-ordinated by the central and municipal governments and offers free Internet access in public places, such as public institutions, schools, hospitals, universities, research institutions and parks.

In 2014, the programme provided Internet access to more than 65 000 institutions and public spaces, averaging over 2 000 new connected spaces in each state. Over 30 000 of these newly connected spaces are located in rural areas. By focusing on public schools and universities (73.84% of the new connected spaces), Mexico's federal government aims to reduce the digital divide and ensure that upcoming generations acquire the skills to succeed in the digital economy.

OGD

To move the OGD agenda forward, beyond simply transparency and accountability, governments should **adapt their legal and regulatory systems** to the new context and focus on building an OGD ecosystem. This will help realise the full potential of OGD for promoting innovation and will help public authorities tackle persistent problems, such as reducing energy consumption and congestion and improving health assistance. If OGD is to be taken to the next level, data needs to be seen as a strategic asset, with implications for governance in the public sector. Institutional arrangements should support the whole data and information value chain. Recognising data as a strategic asset also carries responsibilities in terms of skill requirements and investments. **Coherent national strategies for OGD** are needed, with strong ownership across levels of government and a sense of collective commitment among civil servants. To cultivate data-driven innovation, governments need to engage with data

producers, providers and users to identify and release valuable datasets. Efforts are also needed to promote the reuse of data for value creation. Effective reuse of government data requires that open data be relevant, easily accessible and re-usable by all (Box 12.13).

Box 12.13. **France's Etalab, innovating through data reuse and engagement**

Etalab (*data.gouv.fr*), the task force of the *Secrétariat général pour la modernisation de l'action publique* in the office of France's prime minister, is responsible for overseeing the development of the Open Data policy and supervising the co-ordination of cross-government implementation.

Etalab engages with reusers on social media, has open forums on the national open data platform and holds regular meetings with various stakeholders and participates in promotional events (such as "barcamps", hackathons, etc.). France has launched a unique initiative to develop sustainable, innovative models of data reuse by entrepreneurs and civic innovators. The DataConnexions programme gathers key partners of the digital innovation ecosystem in France. These include French and international corporations, research and educational institutions, investors, business angels and digital media. The aim is to bring resources to key start-ups chosen in an ongoing series of contests. This type of event helps match data innovators with the resources they need to bring their projects to scale.

DataConnexions is considered the prime initiative for sustaining software development contests (e.g. for apps, widgets, etc.). Information sessions for companies and citizens are also organised to raise awareness. For instance the central government has co-sponsored an Open Data commission, run by the association of French software and online services enterprises. Etalab has organised open workshops on data journalism, with testimonies from top French and international journalists and editors on their work with and around public data.

Source: OECD (2015d), *Open Government Data Review of Poland: Unlocking the Value of Government Data*, *http://dx.doi.org/10.1787/9789264241787-en*.

Governments can use different tools to promote the use of OGD for value creation. Good practices include the development of **one-stop shop portals** for open government data, offering a single window where data users can access the available datasets in open formats. Ideally, such datasets should be subjected to a process of quality assurance and complemented with useful metadata. Strategic use of hackathons, awards, grants and other pro-active approaches to promoting **data reuse** can play a decisive role in boosting innovation and value creation.

Smart cities

A smart city is often described as using ICTs to achieve a competitive and innovative economy. It is characterised by highly skilled human capital, open and participatory governance, innovative and cleaner transport and infrastructure, sustainable resource management and a high quality of life for residents (OECD, 2014b).

Some of the key challenges for building smart cities in the region include the development of strong urban planning capacities and skills, overcoming financial constraints to support the acquisition of smart technologies and infrastructure, managing rapidly growing urban populations, raising awareness of environmental issues, promoting rational use of natural resources, and creating an open culture across society that can leverage native and international talent and support innovation.

In the LAC region until now, the use of technology in the public sector has been mainly driven by an effort to improve efficiency in internal operations and move toward more transparent and accountable governance. Public authorities now need to take the next step in the use of digital technologies if they are to capture the full benefits of the digital economy and meet the challenges of increased urbanisation.

As urban planning becomes increasingly complex and data-driven, new skill sets at the local level are required to perform **sophisticated urban analysis and modelling**. Smart cities are relying on that evidence-based analysis of their economic activity, transport, human behaviour and resource consumption to help city governments find solutions to persistent problems. Predictive analysis gives city governments the opportunity to identify trends and intervene early to prepare for future risks, such as preparing for disaster management.

To make smart cities a reality, local governments need to develop a **clear vision to improve public institutional capacities, governance models and partnerships**, with the aim of supporting innovative and sustainable public service delivery. As with national digital government strategies, local governments should aim to use new technologies and data to improve public services and create participatory channels where citizens can engage in cities' decision-making processes. Local governments need to create new governance architectures so that both new and existing knowledge and talent can be used for evidence-based policy making and better service design and delivery. Within these governance architectures, data governance models, and the corresponding skills, are crucial for supporting digital innovation ecosystems. Using open data and inclusive decision-making and governance models, for example, is considered as a key element for smart cities, since this provides citizens and entrepreneurs the input for developing new insights and finding better ways of delivering public value (Boxes 12.14 and 12.15).

Box 12.14. **Singapore's use of open data and data analytics for better urban transport**

Like other metropolitan hubs, Singapore has heavy congestion at peak hours. However, it has made significant improvements using data from its smart travel cards and GPS data. This has made it possible to develop detailed models of how bus users move through the city, helping government understand traffic patterns, how citizens use the urban transport system and identify key problems with the existing bus routes.

Using this information, developers based in California developed an analytical platform to identify traffic patterns that provides precise information for mapping active trains and buses with meters, letting them know how full each one is, as well as how many commuters are at each station and what the estimated waiting times are. Analysis of this information helps the authorities decide where more buses and trains are needed or how to provide incentives for users to take different routes. The system resulted in a 13% drop in peak time travel. This experience has since been replicated in Bangalore and São Paulo to improve public transport.

Source: Hickey (2014), "How GPS and smart card data is used to reduce city congestion", *www.theguardian.com/business/2014/dec/07/gps-smart-card-open-data-used-reduce-transport-congestion*.

The need for **innovative solutions to persistent urban challenges** has prompted local government to establish innovation units. These are usually responsible for solving complex problems through new, more collaborative approaches to service delivery and policy design and implementation. They aim to change how local governments work, and partner with

external actors to maximise the effectiveness of public sector modernisation initiatives. The city labs of Buenos Aires and Mexico City are good examples of this trend.

Box 12.15. **Ruta N for an innovating Medellín**

The City of Medellín has conducted an interesting experiment in cultivating innovation at the local level. Ruta N[1] is a joint venture of the city, the privately owned telecommunications company UNE, and *Empresas Publicas de Medellín* (EPM), a public enterprise owned by the city. Its objective is to promote the city's economic development through science, technology and innovation-intensive businesses. One of the initiative's main goals is to position Medellín as the leading innovative city in Latin America by 2021. Ruta N has developed an innovation complex that hosts, among other entities, the Global Services Centre of Hewlett-Packard. Ruta N develops different programmes and projects, including capacity building across social sectors and attracting investment in technological and innovative areas.

1. *http://rutanmedellin.org/*.

Source: Glickhouse (2014), "Ruta N and Transforming Medellin into an Innovation Center", *www.as-coa.org/articles/latam-minute-ruta-n-and-transforming-medellin-innovation-center*.

Conclusion

Governments in the LAC region should strive to move from e-government to broadband-enabled digital government. The digital transformation of government entails incorporating ICTs in broader public sector modernisation efforts and rethinking operations and processes to make them digital by design. It also requires new service design and delivery methods that, through increased user engagement, help public authorities better understand user needs and preferences and deploy digital services more flexibly. To ensure return on investment, governments in the region must take steps to reduce and eliminate the digital divide and improve access to ICTs and digital services, to create a critical mass of users.

Institutional frameworks should help governments use digital technology and data in strategic ways to maximise their impact on public sector performance. While there is no "one-size-fits-all" model, governance frameworks should create units or bodies responsible for digital government. Given the appropriate policy levers and co-ordination tools, they can guide digital transformation and break down silos and cultural barriers that block open and collaborative ways of working and making decisions. Organisational frameworks should also improve the management of data. Governments can use this information throughout the policy cycle and service development process to support evidence-based decisions. Public authorities should focus on developing management tools to give central government and project managers a clear view of their existing assets, to inform strategic decisions on ICT use and investment. Finally, governments must review the gaps in their existing ICT and project management skills, and develop strategies to attract, develop and retain those with the necessary skills.

Trends in the region show that LAC governments are making progress in their use of open data for transparency and accountability. However, public sectors in the different countries should not waste the opportunity to use broadband and data to cultivate innovation that creates social and economic value. Concrete action must be taken to create a dynamic ecosystem, through regular consultation with stakeholders such as data producers, providers and reusers. Encouraging the reuse of open data and data analytics is key, as open government data is only useful insofar as it can guide policy going forward.

Rapid urbanisation in the region has confronted city governments with considerable organisational challenges in ensuring high living standards. However, it also offers a chance to reap the benefits of economies of scale, higher productivity and innovation capacity. City governments should make decisive investments in building institutional capacities. Technology can be used to collect and process data to better understand human behaviour, find innovative transport arrangements, adequately plan infrastructure and waste management, build energy-efficient cities, deliver more tailored and better services and create more equitable societies. This, in turn, will allow cities to develop and attract skilled individuals to contribute to the city's productivity, leading to a virtuous circle. City governments in the region should move towards more open governance models and use technology strategically, to engage citizens and businesses, and share ideas, data and information that promotes innovation at the city level, where most public services are delivered.

Notes

1. For more details: *www.oecd.org/gov/public-innovation/open-government-data.htm*.
2. For more details: *www.iadb.org/en/topics/emerging-and-sustainable-cities/implementing-the-emerging-and-sustainable-cities-initiative-approach,7641.html*.
3. The new Digital Government Office. See *www.dto.gov.au/*.
4. The new Digi Commissaris. See *www.digicommissaris.nl/*.
5. The US Digital Service. See *https://www.whitehouse.gov/digital/united-states-digital-service* and "18F" *https://18f.gsa.gov/*.
6. OECD countries report a significant number of large ICT projects with budgets of over USD 10 million, implemented for over three years.
7. Fedict Shared Services. See *www.fedict.belgium.be/en/over_fedict/Mission_and_aims#shared*.
8. Through the Danish Agency for Digitisation. See *www.digst.dk/Servicemenu/English/About-the-Danish-Agency-for-Digitisation*.

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Chapter 13

Consumer protection and e-commerce

This chapter covers aspects of consumer policy related to communication services and e-commerce. It addresses how consumer protection measures can inform and empower consumers, stimulating the market to innovate, improve quality and compete in pricing. This chapter presents an over-arching set of policy principles for ensuring that consumer interests are adequately protected. It also explores the importance of promoting e-commerce as a tool to broaden the scope of products, increase competition in the marketplace and allow consumers to compare price more easily. Finally, it presents best practices on consumer policy from the region and suggests areas that policy makers might consider going forward.

Broadband communication and Internet-mediated services are playing an increasing role in the daily lives of people in the Latin America and Caribbean (LAC) region. In many ways, these services create opportunities for consumers, but measures to protect consumers are also needed if individuals, businesses and governments are to make the most of the benefits of broadband. This chapter examines key issues of consumer protection and examines e-commerce policy issues for the LAC region.

Historically, **consumer protection** in telecommunications markets has been linked to competition, with an emphasis on creating a vibrant marketplace through supply-side measures. In recent years, however, there has been growing recognition that informed and empowered consumers can, through demand-side choices, stimulate firms to innovate, improve quality and compete in pricing. By making well-informed choices between suppliers, consumers not only benefit from competition, but drive and sustain it.

As the use of communication services has increased and converged (as noted in Chapter 7), more emphasis is being placed on reviewing the policies governing communications services' relations with consumers. New measures have been devised to provide better protection, more flexibility in the market for consumers, and better access to information. In this context, OECD countries developed a set of policy principles to ensure that consumer interests in communication services are adequately protected (OECD, 2008).

Information and communication technologies (ICTs) and the Internet have also ushered in a structural change in how commercial transactions are carried out, bringing them online and making them more efficient. The OECD defines **e-commerce** as any transaction for the sale or purchase of goods and services, conducted over computer networks by methods specifically designed to receive or place of orders. Payment and the ultimate delivery of the goods or services do not have to be conducted online, while orders made by telephone calls, facsimile or manually typed e-mail are excluded (OECD, 2011).

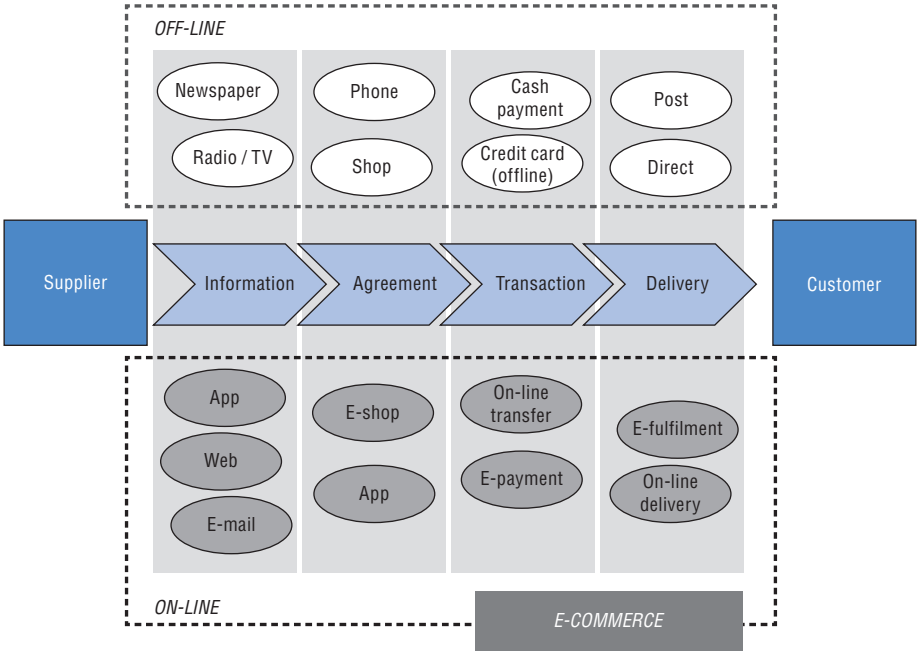
For businesses, e-commerce potentially improves efficiency in two key ways, by enlarging the scope of the market and reducing operating barriers and costs along the entire value chain. This is in large part because Internet-based channels can supplement or replace traditional channels at every step in the seller-to-buyer interaction (Figure 13.1). For consumers, e-commerce improves information collection on goods and services, locating sellers, making price comparisons, offering convenient delivery and allowing them to make purchases easily on a computer or mobile device wherever they are (OECD, 2013b). Overall, e-commerce has had broad positive effects throughout the economy:

- **Broader scope of products:** E-commerce increases the scope of products available to consumers.
- **Increased competition:** Competition is increased because users can search for products and compare prices online across a variety of sellers. They can visit the sites themselves, use product and price comparison websites, or rely on the product reviews and ratings

of other consumers. This allows them to quickly identify the least expensive supplier or choose between products with different features.

- **Easier price comparisons:** E-commerce facilitates price comparisons across firms, potentially lowering prices for consumers.
- **Lower entry barriers for new firms:** The Internet decreases market entry barriers and makes it easier for new firms to find customers online. Entry barriers merit special attention in the context of e-commerce, because of the opportunities they present to SMEs that were traditionally too small to compete in larger geographical markets.
- **Reduced search times:** E-commerce can lead to significant savings of time and effort for consumers. They save time by finding information quickly, avoiding lines and paying online.

Figure 13.1. **E-commerce solutions**



Source: OECD (2013b), "Electronic and Mobile Commerce", *http://dx.doi.org/10.1787/5k437p2gxw6g-en*.

Broadband networks (mobile and fixed) are a key part of the infrastructure supporting e-commerce. Markets without effective, secure and affordable networks cannot benefit from the economic growth and efficiencies offered by expanded e-commerce. Those that are lagging behind in logistical performance will find this to be a fundamental bottleneck that blocks the full potential of e-commerce.

The increased availability of goods and services online also brings new risks and vulnerabilities (digital security risk management and privacy protection are addressed in Chapters 14 and 15). New businesses, or even established online businesses, in rushing to establish an online presence or promote a new product, may neglect the fundamentals of customer service and fail to provide, for example, basic contact information, essential contract terms and information about how to resolve a complaint or seek redress. Because direct contact between online businesses and consumers is limited or non-existent, a predictable and trustworthy e-commerce marketplace is all the more important.

Key policy objectives for the LAC region

Consumer protection

The main policy objectives for consumer protection in communication services can be divided into three broad categories that correspond to different phases in the relationship between the operator and the user:

- **Improving customer acquisition:** Policy makers and/or regulators should aim to improve the first phase in the relationship between businesses and customers, which involves attracting customers through advertising and providing information about the services on offer. They should target actions towards the information provided about bundled services, advertising claims, and customer due diligence in researching offers.
- **Watching over contracts and engagement:** Policy makers and/or regulators should also monitor and take action when necessary in the second stage in the relationship between businesses and consumers, when contracts and agreements are in force. Actions in this area involve disclosure issues, billing practices, quality of service, accessibility and how complaints are handled.
- **Facilitating switching and termination:** The final stage of the relationship between businesses and customers, when they end the relationship, should also be monitored by policy makers and/or regulators. They should facilitate switching and termination by taking action to ensure number portability to new carriers and monitoring for SIM locking and termination charges.

E-commerce

The key policy objectives for e-commerce can be divided into three main groups:

- **Creating a framework for electronic settlements and payments:** Optimal payment systems provide a way of transferring value between different parties in the economy and facilitate transactions at minimal costs.
- **Reducing barriers to e-commerce:** This involves identifying the obstacles that inhibit the growth of businesses engaging in e-commerce or that prevent users from adopting services.
- **Promoting e-commerce adoption:** This entails developing initiatives to promote the use of e-commerce among administrations, businesses and consumers.

Tools for measurement and analysis for the LAC region

Consumer protection

To develop and implement sound policies for consumer protection, policy makers should be informed and guided by data whenever possible. Various sources of data support consumer protection policy making, including complaint information, surveys, market surveillance and in-depth market surveillance and consumer detriment assessments.

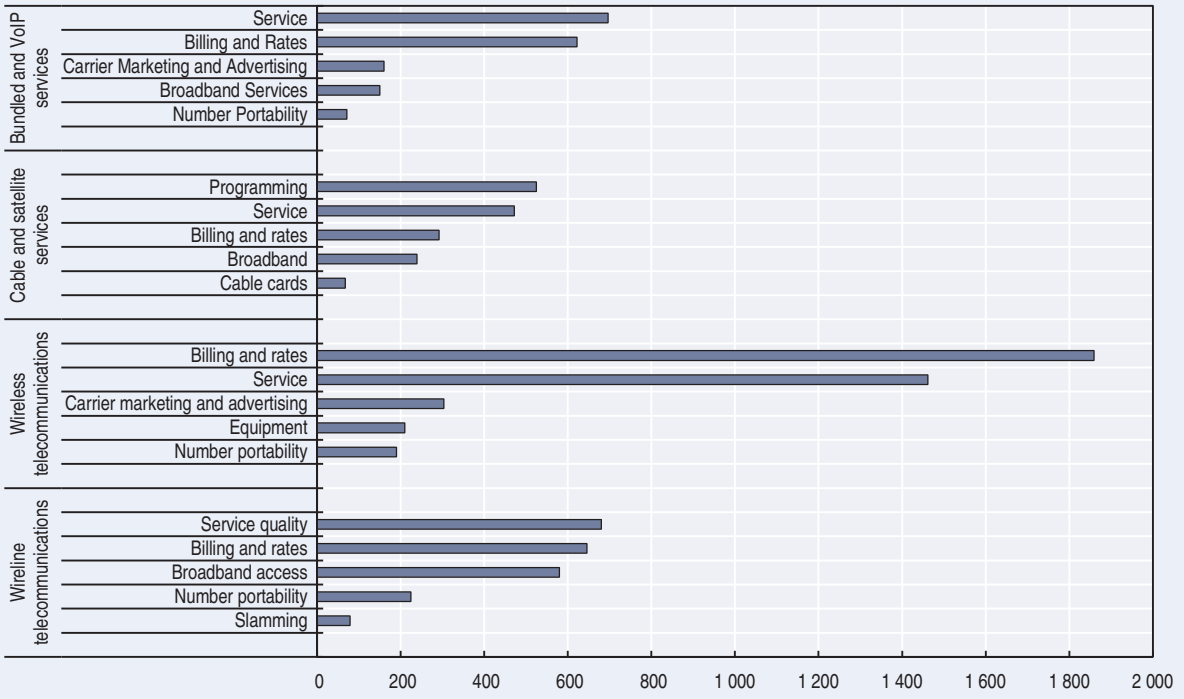
Consumer complaint information is the most commonly used tool to identify consumer issues, measure the magnitude and scope of consumer problems and evaluate the effectiveness of policy measures. It relies heavily on the information provided in consumer complaints. Complaint information can have an important role in policy making by providing a preliminary indication of problems, though it also has significant limitations. Complaints, for example, may be unfounded and/or reflect significant biases. Moreover, they tend only to

cover issues where consumers have noted a problem, and they are not suited for detecting hidden detriment to consumers (OECD, 2010). Complaint data can, however, help policy makers identify problem areas, as exemplified by the United States' Federal Communications Commission (FCC) (Box 13.1).

Box 13.1. **Visualising complaint data**

The FCC in the United States publishes quarterly a summary of the most frequent topics of complaint. Figure 13.2 represents the number of complaints in each of the areas related to telecommunications services. In the United States, wireless billing, rates and service are the dominant problems the agency handles (Figure 13.2).

Figure 13.2. **FCC summary of the most frequently cited complaints (Q4, 2014)**



Notes: An informal consumer complaint is defined as any correspondence or communication received at a Consumer and Governmental Affairs Bureau (CGB) Consumer Center via US mail, fax, e-mail, the Internet or telephone from or on behalf of an individual who i) identifies a particular entity under the FCC's jurisdiction; ii) alleges harm or injury; and iii) requests relief. The complaint figures in this summary reflect selected categories of complaints – specifically, the top complaint categories listed above – and do not include all complaints handled by the FCC.

Source: FCC (2014), *Complaints Report Q4 2014*, *https://www.fcc.gov/general/quarterly-reports-consumer-inquiries-and-complaints*.

StatLink http://dx.doi.org/10.1787/888933354589

Surveys are also carried out in some instances to collect information on the magnitude and scope of communication problems in markets. These have proved a highly effective way of analysing problems, using rich data. A survey by the National Consumers Council in the United Kingdom, for example, found data indicating that mobile telephony users commonly overestimate their own usage and then overpay, or underestimate their usage and pay significantly more by going over their allotment (OECD, 2007; NCC, 2006). Surveys can be useful for policy making, but the time and cost of developing, conducting and assessing their results limits their use (OECD, 2013a).

Market surveillance and consumer detriment assessments are an important source of data for policy makers. Consumer detriment arises when market outcomes fall short of their potential, resulting in losses to consumers. They involve identifying and measuring the nature and magnitude of consumer detriment: how consumers are being harmed and to what extent. This is a crucial component of evidence-based policy making. Elements of detriment include financial and non-financial impacts, such as direct financial losses, time loss, stress and physical injury. Although quantification is often difficult, it is essential that damages be assessed, even when this can only be done qualitatively (OECD, 2010). In some cases, regulators are pro-active in identifying issues and conducting in-depth surveillance of a situation, but this is relatively limited. Information on the approaches used to assess consumer detriment suggests that this is an area difficult for policy makers to address. Beyond complaints information, data are generally not readily available to permit a thorough analysis.

E-commerce

In the area of e-commerce, policy makers need statistics to evaluate key trends, such as the adoption of e-commerce by merchants and the willingness of businesses and consumers to engage in transactions online. Statistics are an important source of information about relative progress in urban and rural areas, but also for benchmarking exercises among countries in the region.

The *OECD Model Survey on ICT Use in Businesses* (discussed in the analysis and annex for Chapter 10) has a specific module on e-commerce (Module D) that sets out definitions and several indicators for assessing the **penetration of different e-commerce transactions**. They include:

- enterprises conducting e-commerce sales (as a percentage of all enterprises)
- e-sales value by platform and type of customer (as a percentage of total turnover)
- web sales percentage breakdown by type of customer and geographic area
- means of payment of accepted online sales (percentage of all enterprises, by means of payment)
- barriers to online sales (percentage relevance among enterprises)
- electronic data interchange (EDI) sales breakdown by geographic area (percentage of EDI sales)
- enterprises conducting e-purchases (as a percentage of all enterprises)
- e-purchase value by platform (as a percentage of total purchases).

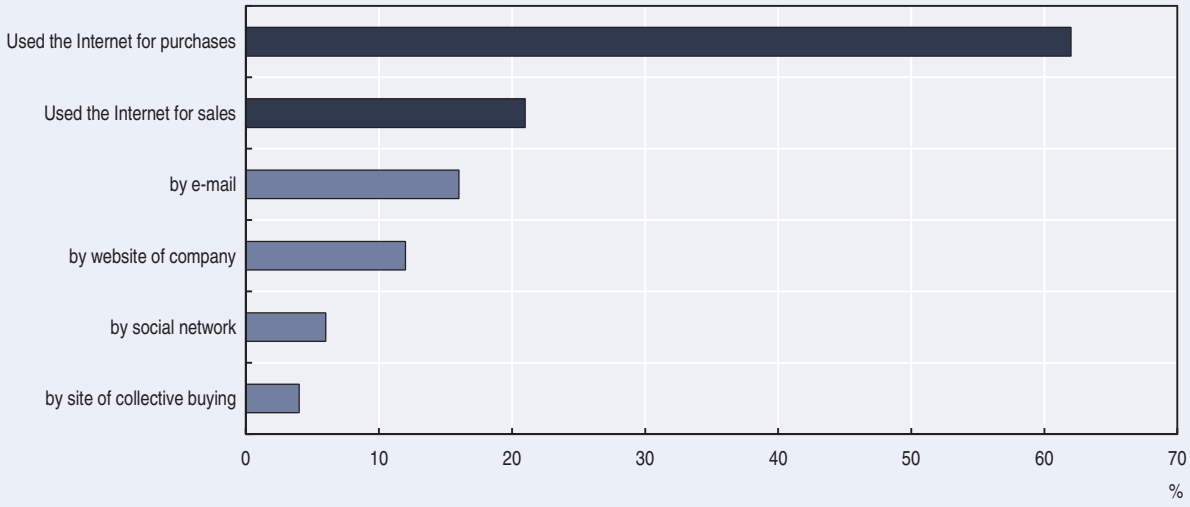
Data on e-commerce can also be collected by national **surveys on ICT use in households**, as in Brazil in the LAC region (Box 13.2). The e-commerce component of these surveys can include indicators such as:

- individuals who have researched prices of goods or services online (percentage of Internet users)
- individuals who have bought goods or services online (percentage of population)
- individuals who have not bought goods or services online (percentage of Internet users, classified by reason why they don't buy online)
- individuals who have publicised or sold goods or services online (percentage of Internet users.

Box 13.2. **Measuring e-commerce in Brazil**

The regional Centre for Studies on the Development of the Information Society (Cetic.br) has conducted surveys on the use of ICTs by households and businesses since 2005. Cetic.br's surveys are based on international reference models, such as the methodological references and data collection instruments defined by the United Nations' Partnership on Measuring ICT for Development, Eurostat documents, the OECD and the UnCETICited Nations Conference on Trade and Development (UNCTAD). Both Cetic.br's household and business survey include components for e-commerce. The figures below show results for 2014 for Brazil (Figures 13.3 and 13.4). The household and business surveys also include indicators on the barriers to the use of e-commerce for individuals and companies.

Figure 13.3. **Proportion of companies using e-commerce in Brazil (2014)**

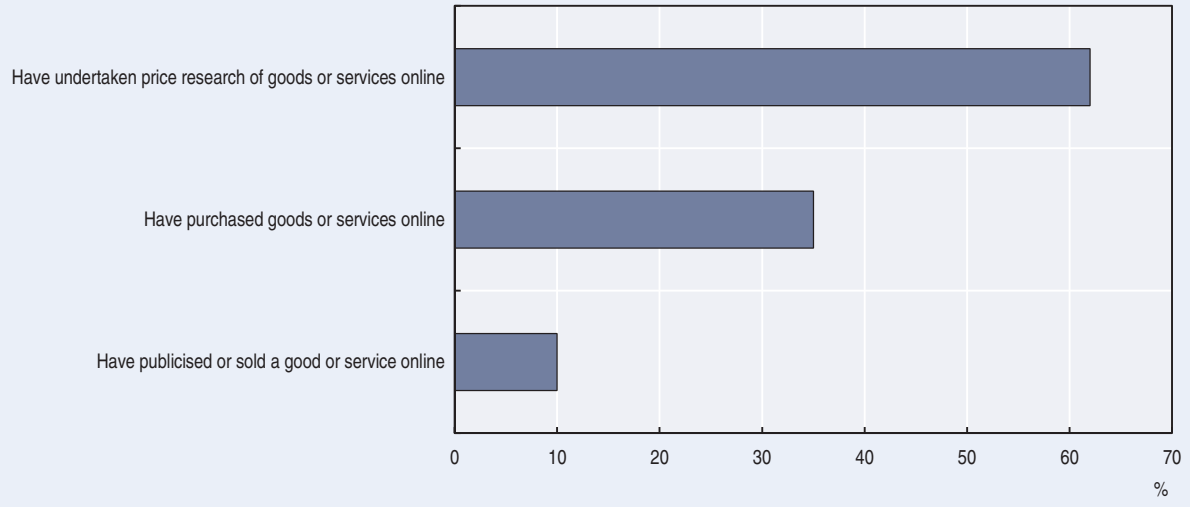


Note: The proportion of channels used for e-commerce (by email, by website of company, by social network and by site of collective buying) corresponds to the proportion of use by companies that have used the Internet for sales, and not all companies.

Source: Cetic.br (2015a), "Pesquisa sobre o uso das Tecnologias de Informação e Comunicação nas empresas brasileiras – TIC Empresas 2014", *http://cetic.br/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-nas-empresas-brasileiras*.

StatLink *http://dx.doi.org/10.1787/888933354592*

Figure 13.4. **Proportion of Internet users using e-commerce in Brazil (2014)**



Note: All indicators correspond to use in the past 12 months.

Source: Cetic.br (2015b), "Pesquisa sobre o uso das Tecnologias de Informação e Comunicação nos domicílios brasileiros – TIC Domicílios 2014", *http://cetic.br/publicacao/pesquisa-sobre-o-uso-das-tecnologias-de-informacao-e-comunicacao-nos-domicilios-brasileiros*.

StatLink *http://dx.doi.org/10.1787/888933354609*

The proportion of use of e-commerce may also be related to other indicators, and policy makers may wish to evaluate **e-commerce output indicators** in the light of possible bottlenecks, such as the quality of Internet infrastructure and the availability of payment and delivery solutions. The United Nations Conference on Trade and Development (UNCTAD) has developed a B2C E-commerce Index with four indicators: Internet use, secure servers, credit card penetration and postal delivery services (Box 13.3). The World Bank's *Ease of Doing Business Index* can also offer an interesting outlook on the prospects for e-commerce in LAC countries. Assessing e-commerce readiness and a business environment, to understand the needs, characteristics, strengths and weakness of these tools, is a crucial first step in formulating effective national e-commerce strategies and setting priorities. Comparable e-commerce statistics in the LAC region are in an early stage of development, but should be a priority for policy makers who need to understand the developments at home and among their neighbours.

Box 13.3. **UNCTAD B2C E-commerce Index**

The UNCTAD B2C E-commerce Index, first published in 2015, aims to assess readiness of countries for e-commerce, covering data for 130 countries and four indicators: on Internet use, secure servers, credit card penetration and postal delivery services. The Index was found to be strongly positively correlated with variations in the percentage of individuals shopping online. The Index shows highest e-commerce readiness in Luxembourg, Norway and Finland. It notes the need to improve e-commerce readiness, especially in the coverage of postal home delivery component, in the LAC region (Table 13.1).

Table 13.1. **UNCTAD B2C E-commerce Index and ranking (Top 4 and LAC countries, 2014)**

Country	% population having mail delivered at home (2012 or latest)	% of individuals with credit cards (age 15+, 2011)	% of individuals using the Internet (2013 or latest)	Secure servers per 1 million people (normalised, 2013)	UNCTAD E-commerce Index value	Rank
Luxembourg	100	72.4	95	99.3	91.7	1
Norway	100	60	96	97.4	88.3	2
Finland	100	63.9	92	96.5	88.1	3
Canada	100	72.3	83	93.3	87.1	4
Chile	94	22.8	61.4	73.9	63	39
Uruguay	93	27.1	58	72.1	62.5	40
Trinidad and Tobago	93	15.3	59.5	73.8	60.4	43
Brazil	81	29.2	58	69.9	59.5	47
Argentina	93	21.9	54.1	67.6	59.1	48
Costa Rica	98	12.2	47.5	72.5	57.6	52
Mexico	91	13	43.5	63.7	52.8	60
Venezuela	93	10.4	44.1	56.6	51	63
Colombia	60	10.2	51.7	65.6	46.9	71
El Salvador	95	5.3	25.5	60.9	46.7	72
Ecuador	68	10.2	35.1	63	44.1	76
Guatemala	95	6.9	16	58.1	44	77
Jamaica	50	6.9	46.5	67.9	42.8	80
Peru	56	10	38.2	61.9	41.5	82
Panama	25	10.7	45.2	73.5	38.6	84
Honduras	75	5.3	18.1	55.1	38.4	85
Nicaragua	44	2.5	13.5	54.4	28.6	98
Bolivia	19	4.1	34.2	54.9	28.1	99
Haiti	40	1.8	9.8	37.7	22.3	107

Source: Adapted from UNCTAD (2015), *Information Economy Report 2015: Unlocking the Potential of E-Commerce for Developing Countries*, *http://unctad.org/en/PublicationsLibrary/ier2015_en.pdf*.

Overview of the situation in the LAC region

Consumer protection

In the LAC region, some practices are more prevalent with regards to protecting consumers during the **customer acquisition** phase of the relationship with operators. Advertising regulation is strong across the countries in the LAC region responding to the questionnaire, 88% having regulations in place governing how communications services are sold to customers. Often these regulations are not specific to telecommunications, but to all goods and services.

One area that is less developed concerns the tools and information available to consumers at the time of choosing an operator, such as being able to gauge the actual speeds of existing Internet connections or viewing which operators have the highest download speeds. According to information provided by LAC countries, only 43% of governments provided speed test sites for citizens to test their connections (Box 13.4).

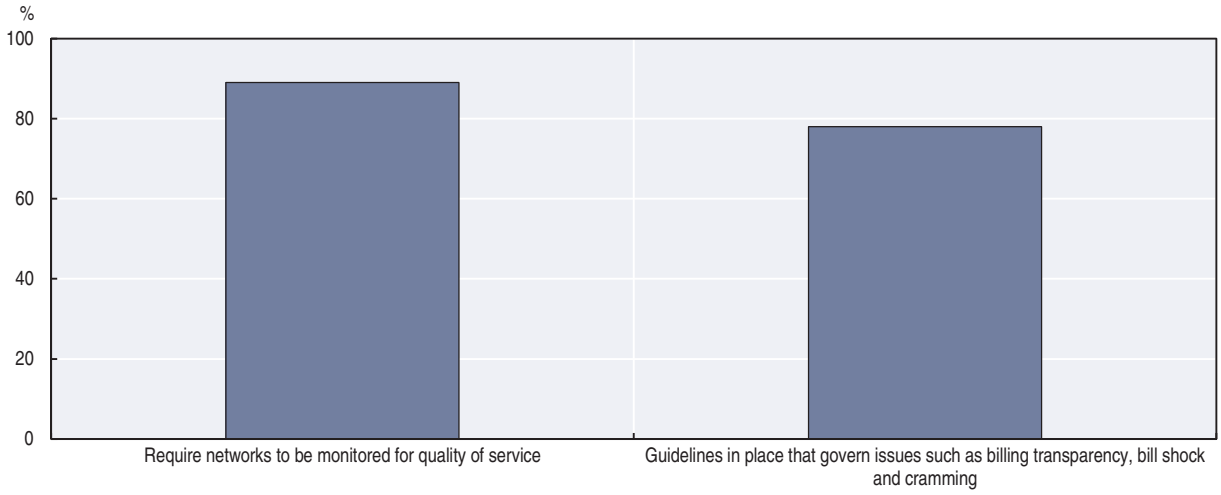
Box 13.4. **Speed test sites available from private or government sites in LAC countries**

- In **Brazil**, the regulator, ANATEL, has set up an entity in charge of measuring broadband speed for both fixed and mobile services (*Entidade Aferidora de Qualidade de Banda Larga* or EAQ), and consumers can volunteer to install specific software it provides to measure speeds and pass the data on to the regulator.
- In **Uruguay**, the government does not provide speed test information or tools, but private initiatives are available, such as *www.adsltest.com.uy*.
- In **Suriname**, users can test the speeds of their Internet connections, once subscribed, at private testing sites such as *www.speedtest.sr*.
- The regulator in **Peru** (OSIPTEL) attached conditions on the 1.7/2.1 gigahertz bands that the minimum effective speeds must be at least 1 megabit per second per user. Operators have been required to provide speed measurement software to users since 2005.
- **Colombia's** regulator (CRC) requires that operators place a free speed test conspicuously on their homepage, so that users can compare the effective rate they receive.[1]
- The regulator in **Mexico** (IFT) publishes data on the quality of mobile broadband for all operators, including average speeds. The information provided is based on a statistical sample including at least events (IFT, 2016).

1. CRC 3067 of 2011, modified by Resolution CRC 4000 of 2012. Examples of compliance with this obligation can be found at *www.claro.com.co/wps/portal/co/pc/personas/internet/test-de-Velocidad-internet-hogar*, *www.tigo.com.co/personas/planes/Paquetes/medidor-de-VELOCIDAD* and *www.movistar.co/cotizador-productos*.

As for the **monitoring of contracts and services**, LAC countries have relatively high adoption of protection for users who have subscribed to a service. Roughly 89% of responding countries require networks to be monitored for quality of service (QoS), with reporting done either to the regulator or published on the company's website. Slightly fewer countries (78%) have guidelines in place that protect users against unfair billing practices and require transparency in contracts and billing items (Figure 13.5).

Figure 13.5. **LAC regional protection on contracts and services**

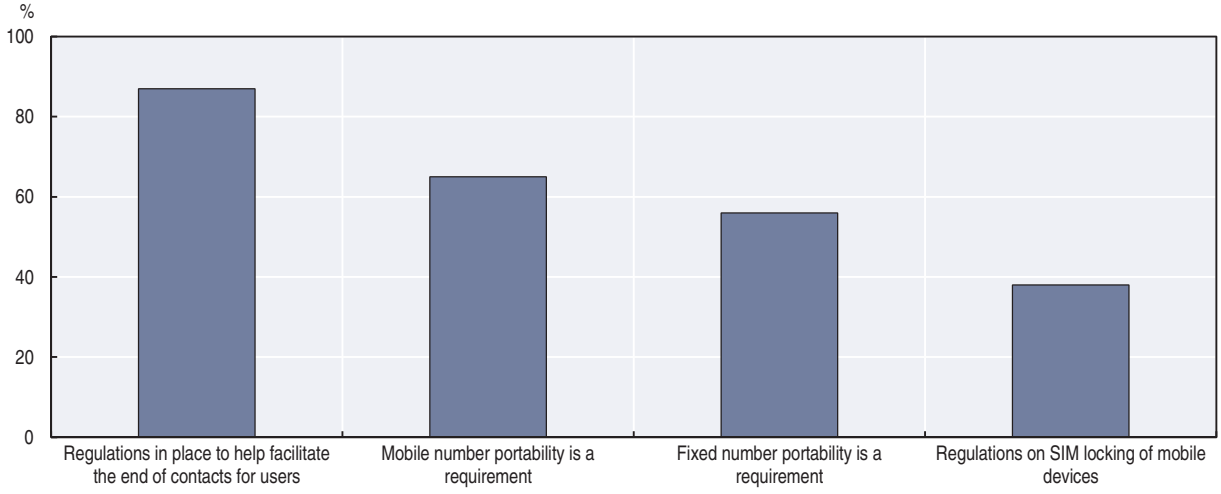


Source: OECD using data provided by countries in the region.

StatLink http://dx.doi.org/10.1787/888933354614

Once subscribers choose to pursue **contract termination and switching**, some protections are widely adopted, while others are relatively less common. Most countries in the region (87%) have regulations in place to help facilitate the end of contracts for users (Figure 13.6). These can include rules regarding minimum contract periods and early termination charges. Consumers typically need to be notified ahead of price increases or other contract changes and afforded the opportunity to leave the service without penalty if they do not agree to the new terms. Countries such as Chile and Colombia have taken steps to eliminate fees charged for early contract termination.

Figure 13.6. **LAC regional protection with regards to switching and termination**



Source: OECD using data provided by countries in the region.

StatLink http://dx.doi.org/10.1787/888933354628

Surprisingly, number portability is not universal across the region, despite its critical importance in keeping markets competitive and helping users switch to more attractive offers. Only 56% of countries have number portability for fixed operators, although this figure

is lower partially because some markets lack fixed-line competition. Only 65% of countries allow for portability of mobile numbers, a key challenge for competition. Some countries, such as Jamaica and Haiti, are in the process of implementing number portability, while others, such as Chile, introduced it in 2012. Number portability should be a high priority for LAC regulatory agencies. Finally, the SIM locking regulations that protect users when they want to use phones on another network are only available in 38% of countries.

E-commerce

The e-commerce market in the LAC region has experienced sustained growth for more than a decade, although from a relatively small base. Revenues generated by B2C e-commerce in this region doubled every two years in the period 2003-2013, by one estimate reaching USD 70 billion in 2013 (América Economía, 2012). In that period B2C revenue increased as a share of GDP in some of the major economies of the region (Brazil, Mexico and Chile).

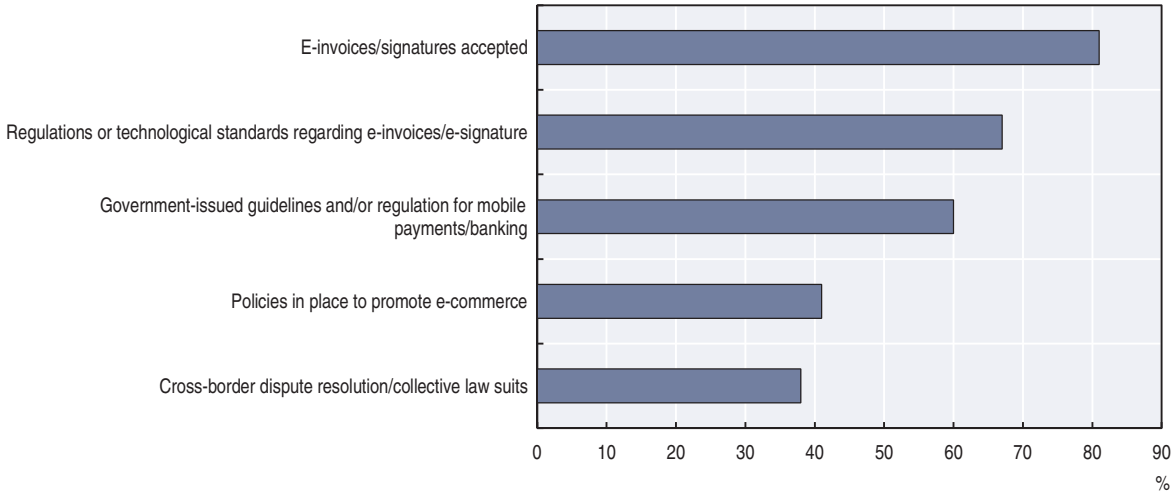
Although e-commerce has grown, its composition has remained nearly constant over recent years. According to OECD data, e-commerce is dominated by business-to-business (B2B) sales that are often handled via electronic data interchanges (EDI). Roughly 90% of the value of e-commerce transactions is from B2B. The remaining 10% of transactions are a combination of business-to-consumer (B2C), business-to-government (B2G) and consumer-to-consumer (C2C) activity (OECD, 2015b).

Brazil is the most mature and the largest e-commerce market in Latin America and the Caribbean. It accounts for 38% of the region's total B2C sales, followed by Mexico (19%) and Argentina (8%) (UNCTAD, 2015). Brazil has some of the largest Internet retailers in the region (B2W Digital, Nova Pontocom, Netshoes, *Máquina de Vendas* and Magazine Luiza) and in 2013, it reportedly became the first country in the region in which e-commerce accounted for 1% of total GDP. Chile and Mexico reportedly had e-commerce accounting for 0.61% and 0.57% of GDP respectively, while the region averaged 0.76%. Brazil, Argentina, Chile (with the third-biggest Internet retailer in the LAC region, S.A.C.I. Falabella) and Uruguay have the highest percentage of online shoppers among Internet users (near 70%) (UNCTAD, 2015).

The LAC region is more advanced in various aspects of e-commerce than other regions in the world. A number of factors have contributed to **growth in the adoption of e-commerce** in the region. First, the positive economic cycles of some of the largest economies had net effects on the adoption of e-commerce. Second, the increased level of consumers with bank accounts, among a growing middle class in the LAC region, facilitated the use of electronic transactions and payments, as did the increased connectedness of people through communication networks. Thirdly, countries have reformed several regulatory areas, for example by reducing taxes and consumer policies, adapting e-commerce to local consumer patterns and expectations. In some countries, legislation allowing refunds free of charge for products bought online helped build consumer confidence.

Despite these advances, many countries in the LAC region have not yet designed and implemented **e-commerce frameworks and legislation**. The UNCTAD (2015) reports that 81% of LAC countries have some type of e-transaction law. In the LAC countries surveyed in the OECD/Inter-American Development Bank (IDB) questionnaires, 60% reported having issued guidelines or regulations concerning mobile banking and m-commerce, 41% reported having policies in place to promote e-commerce and 38% implemented special measures to facilitate cross-border dispute resolution or allow for collection-action lawsuits (Figure 13.7). These responses shed light on the level of preparedness of LAC countries regarding their legal landscape and policy frameworks, where advances are still necessary.

Figure 13.7. **E-commerce progress by category**



Source: OECD, using data provided by countries in the region.

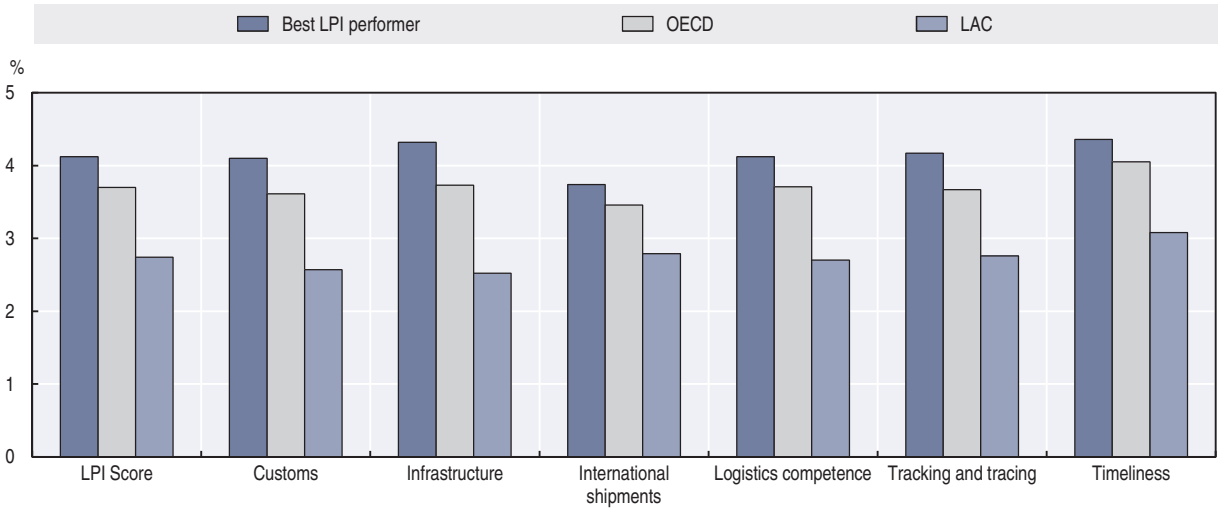
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In several respects, the potential for e-commerce in the LAC region is far from fully exploited. That is also the case in the OECD area, where although companies have largely adopted broadband, e-purchasing, enterprise resource planning, e-sales and supply-chain management adoption remain much lower. In 2013, 21% of companies in OECD countries sold their products and services online, a slight increase, of two percentage points, over 2009. Significant differences obtain among countries with regards to the size of the firm. Large firms, for example, are much more likely to adopt e-commerce, both for buying and selling online. Size can make a difference not only on the expenditure for growing an e-commerce business more quickly (promoting a website, keeping a website up to date and incorporating the newest features), but also on the capacity of firms to negotiate better transport rates and offer more delivery options to customers.

In the LAC region, a fundamental challenge for e-commerce is **logistics**. Logistics costs and performance are not only a bottleneck for competitiveness (OECD, 2014c), but a key hindrance for the delivery of e-commerce goods and the expansion of the digital economy. According to the World Bank's Logistics Performance Index (LPI), which aggregates indicators on infrastructure, customs, logistics quality, tracking and tracing, timeliness and international shipment, the LAC region lags some way behind other regions and OECD countries in this regard (Figure 13.8). While Uruguay, Colombia, the Plurinational State of Bolivia and Brazil have significantly improved their global rankings in the LPI, improvements between 2007 and 2012 in the LAC area have occurred at a slower rate than that recorded in East Asia and the Pacific region, for example (World Bank, 2014b).

Despite the geographical proximity of LAC countries, **freight costs** are almost as expensive for intra-regional exports as they are for extra-regional exports, and sometimes more expensive[1] (OECD, 2014c). World Bank data on *www.doingbusiness.org* indicates that there is still significant room for improvement in the overall business climate throughout the LAC region (World Bank, 2014a). Standardisation practices, infrastructure investment, logistics education and a coherent logistics strategy are needed to reduce logistics costs and promote e-commerce across borders in the LAC region.

Figure 13.8. **Comparison of best-performer LPI scores, OECD and LAC (2014)**



Note: The Logistics Performance Index (LPI) has a scale of 1 to 5, where 5 represents the best logistics performance. The best overall LPI performer for 2014 was Germany.

Source: World Bank (2014b), *Logistics Performance Index*, *http://lpi.worldbank.org/*.

StatLink http://dx.doi.org/10.1787/888933354647

The availability of the **latest technology and firm-level technology adoption** (addressed in Chapter 10) is moreover lower in LAC than in OECD countries (OECD, 2014c), which limits the full use of the existing infrastructure. ICTs can improve operational connectivity and connectivity among modes of transport, reducing cost and time by using systems that promote customs automation, are able to track the movement of goods, business-data security (telematics, traceability), information management and terminal operations.

Finally, **payment methods** can be a bottleneck for e-commerce expansion. Overall, the average credit card usage in the LAC region remains much lower than in OECD countries (see examples in Table 13.1). While credit cards are popular in some LAC countries, such as Brazil and Argentina, cash on delivery is also a common practice as a preferred payment method, as it is in Mexico (UNCTAD, 2015).

Good practices for the LAC region

Consumer protection

With sufficient data and information, the next step for policy makers is to examine the various issues that arise in practice and in sharing information. The first part of this section provides details on policy tools and examples of good practices across the three key phases of the customer relationship: customer acquisition, contracts/services and switching/termination. The second part focuses on good practices in e-commerce in general.

The first phase of consumer protection policy making refers to **customer acquisition**, that is, when consumers select between competing providers based on information provided by carriers. Factors that influence users' choices, in areas such as broadband mobile services, include advertising, bandwidth/speed claims and bundle options. However, consumers this stage may not be aware of the offers available or be sufficiently informed to understand them. Each of the issues raised below represents an area of potential focus for LAC policy makers.

- **Advertising (misleading/fine print)**. Advertisements regarding services can be misleading and create false expectations about cost and performance. Disclaimers and subsidiary charges are often buried in the terms and conditions in fine print that consumers may not initially see or understand. Roughly 88% of countries in the region report having legislation or regulations in place that govern advertisements for communication services. These regulations are often linked to general regulations regarding advertisements for other products, but communications services tend to have more complex contracts and are the subject of more complaints than other sectors (Box 13.5). This means that policy makers should take steps to ensure that advertising for communications services is clear and truthful. As regulations and laws are in place in most countries, and the next step is to ensure they are enforced.

Box 13.5. **Regulations for advertisements in the LAC area**

Governments should have regulations in place to ensure that advertisements for telecommunications services are clear and reliable. The approaches vary slightly across countries, but often cover the same ground. Examples include:

- In **Chile**, advertisements must be trustworthy, verifiable and not fraudulent. Advertisements are classified as any communications that service providers make to the public, regardless of the means of communication (Chile, 1997).
- **Colombia**'s regulations emphasise that communication operators must provide all relevant information to consumers. Providers are required to provide clear, transparent, trustworthy information that is precise, complete and free to the user (CRC, 2011).
- In **Costa Rica**, Article 14 of the User Protection Regulation establishes that "the operators and service providers, must provide clear, truthful, precise and sufficient information to consumers and users before entering into any contractual relationship". This information must include the specific conditions about the service provision, the quality of the services and their rates. This information must also be established and included in the contract.
- In **Mexico**, the law establishes the rules service providers must adhere to in advertising their products. Information and advertising related to the goods, services and products, regardless of the channel or way in which they are distributed, must be truthful, comparable and must not include any text, dialogues, sounds, images, brand names, designation of origin, or any description, that could be deceptive or abusive, or lead to errors.

- **Broadband speeds**. One area of concern for all stakeholders has been how best to advertise broadband offers. Broadband is typically advertised by the theoretical maximum speed that the technology can provide and not necessarily the speeds consumers will receive. Sometimes advertisements will preface the speed with "up to", but others do not. Consumers need to understand that Internet bandwidth is almost always shared with others and that actual bandwidth is likely to be significantly lower than the headline speeds provided in advertisements. As broadband speeds vary across households, neighbourhoods and operators, consumers often have little insight into the speeds that they can expect. Consumer groups, content providers and even governments have taken steps to support the measurement of actual bandwidth that is available to subscribers on a network. Speed tests can be an important additional piece of information for consumers selecting between broadband providers (this is also addressed in Chapter 5). Nearly 40% of countries in the region report having government sites that help consumers test the speeds of their connections, usually relying on tools developed by third parties. Both public and private

initiatives play an important role in providing more transparency about bandwidth. The main steps recommended for increasing transparency for consumers in the LAC region are:

- adopting the best currently available datasets, such as the ones provided by private entities, in the short term, which will enable robust like-for-like comparisons between countries and over time
- working towards a longer-term goal of achieving a dataset based on common methodologies of measuring actual broadband speeds, with the first step being to agree on principles of good practices in data collection.

- **Bundling**. Bundled services have both benefits and drawbacks for consumers. In general, they are less expensive when purchased together. Consumer surplus from one good in the bundle can potentially "subsidise" another less-valued element, and they also allow for the integration of products in a way that benefits consumers. However, bundles can make it much more difficult to compare offers across providers. Consumers may also be required to purchase a bundle including a product they value with others they do not. Bundling can also make it difficult for subscribers to switch providers. Bundled communication services can increase competition if they offer more choices, higher quality or lower prices. On the other hand, they may also result in increased consolidation between fixed and mobile network providers and less competition in wholesale and retail markets. Consumers need to be able to compare bundles easily across providers, and it is preferable if stand-alone offers are always available. Some governments, for example Ireland's, have created websites to facilitate comparisons across bundled offers (*www.callcosts.ie*) (OECD, 2015a).
- **Consumer diligence**. Another issue related to the consumer acquisition phase is lack of consumer diligence in reviewing material on service plans. Information about the plans is presented to the potential customer, but may either not be understood or be disregarded before the contract is signed. This presents problems later, as consumers encounter a term in the agreement they may not have realised was in force. To encourage customer diligence, the Brazilian government publishes a list of questions potential customers should ask of providers when signing up for new services (ANATEL, 2015). Such information sites are valuable if consumers are aware they are available. Policy makers can help promote knowledge of these sites and improve consumer education in broader ways. The Mexican regulator (IFT) provides consumers with a tariff comparison tool (*http://comparador.ift.org.mx/*) offering consumers information on services offered by the different providers in each geographical area, including prices.

The second phase of consumer protection policy making covers the **monitoring of contracts and services** after a consumer has entered into a contract with a communication provider. Issues that arise for consumers include inadequate disclosure of the terms of the contract, unfair billing practices (transparency, bill shock, cramming), quality of service issues, ineffective handling of complaints, and accessibility issues.

- **Inadequate disclosure**. This refers to a situation where consumers do not know or understand the full terms and conditions of their contracts, what the charges on their bills were for, and perhaps do not know how to have their questions or concerns addressed. Other issues include the complexity and length of contracts. Problems are exacerbated by consumers' limited capacity to understand the legal terms being used. Governments can take steps to ensure that contracts are provided in a concise format that typical users can understand.

- **Unfair billing practices**. Unfair billing practices include those that lack transparency in the billing or contract terms, "bill shock" resulting from charges consumers were not expecting, and fraudulent charges charged by third parties that may go unnoticed on a bill. Bills need to be simple for consumers to understand and identify any fraudulent charges. Roughly 78% of countries in the region have guidelines in place that govern issues such as billing transparency, bill shock and cramming (Box 13.6).[2]

Box 13.6. **Improving transparency in bills and contracts in LAC**

The government of **Argentina** has developed a website called *Conocé lo que pagás* ("Know what you are paying"). The site provides clear information on user rights, including details of what needs to be included in bills from providers.[1] This can help users identify legitimate charges.

In **Chile**, the telecommunications regulator, SUBTEL, has a dedicated site where citizens and consumers can file claims against telecommunications firms.[2]

The government of **Costa Rica** ensures that users have detailed bills available to them. Items on the bill must be broken down clearly, and users may request separate bills for items representing additional charges on a contract (Costa Rica, 2010).

In **Colombia**, customers can file their claims on a specific website and can use a mobile app (*Consumovil*) to find information on their rights as well as how to file claims. Additionally, the Superintendency of Industry and Commerce is setting up an alternative dispute resolution (ADR) model for the four largest operators to try to resolve customers' claims using a simplified model.

1. *http://quenosecorte.gob.ar/.*

2. *http://webapps.subtel.cl/PortalReclamosv2/Index.htmLink and www.subtel.gob.cl/images/stories/interoperabilidad/reglamento_sobre_tramitacion_y_resolucion_de_reclamos_12d_0194.pdf.*

- **QoS**. Users on a network may experience varying levels of service quality. These can include spots with low or without coverage, outages or significant congestion that makes services unreliable or unavailable. Most countries in the region (89%) require networks to be monitored for quality of service, and many different approaches can be used. Regulators commonly require that coverage maps be made available online (Box 13.7).

Box 13.7. **Examples of approaches in the region to ensure quality of service**

Countries in the LAC region have adopted a variety of approaches to ensure QoS. **Costa Rica**, for example, requires operators to provide coverage maps of their networks that are published online by the regulator, SUTEL.

In **Brazil**, the regulator, ANATEL, uses a public consultation process to determine the QoS indicators that operators are required to collect. If there are irregularities in the data collection or calculation, a special procedure is set in motion to verify noncompliance (ANATEL, 2011).

In **Colombia**, the government has initiated measures to compensate users for dropped calls. For post-paid users, the calls are credited back in the next billing period by the operator. In the case of prepaid use, the compensation is credited back within 30 calendar days after the end of each month.

The government in **Costa Rica** conducts periodic reviews of the quality of service parameters that are defined in regulations as a way to keep up with technological and market developments (SUTEL, 2011).

In **Peru**, fixed telephony, mobile, long-distance and Internet providers in urban areas are subject to QoS reporting requirements.

- **Handling of complaints**. A further important area for monitoring broadband contracts and services is how consumer complaints are handled. Complaints about communication providers that reach the regulatory authority can indicate that the operator's system for handling complaints is not optimal. Governments in OECD countries have made handling these complaints a top priority by:
  - **Pro-active development of responses to problems.** Industry self-regulation and co-regulation with regulatory authorities can be highly effective in some instances, provided that efforts do not undermine competition and openness.
  - **Co-operation and dialogue with regulators and civil society** to address current and emerging issues. Engagement of stakeholders has proven highly beneficial and has played an important role in helping improve customer service.
  - **Dispute resolution/redress mechanisms.** Governments have set up processes to resolve disputes and provide redress. Colombia, for example, has introduced a plan for consumers if they have an issue with their service and provides an incentive for operators to efficiently manage complaints and redress (Box 13.8).

Box 13.8. **Handling of consumer complaints in Colombia**

Telecommunications operators are required to provide the following channels for consumers to submit complaints to the company:

- offices consumers can go to
- a dedicated web page for complaints
- a social network channel
- a free telephone number for complaints available 24 hours a day and 7 days a week
- an SMS function where consumers can complain about mobile services using the code 85432.

In addition, users can go to the consumer landing page of the national regulator, CRC, and submit their complaint via the webpage (*www.crcom.gov.co/es/pagina/haz-una-petici-n-queja-o-recurso-pqr*). Operators are obliged to respond to consumer complaints within 15 working days. The onus is on the operator rather than the consumer to follow up. If the consumer receives no reply, this will be interpreted as "affirmative administrative silence", meaning that the operator has accepted the complaint. The operator has 72 hours to resolve the issue. If consumers are not satisfied with the reply provided by the operator, they may appeal, and the *Superintendencia de Industria y Comercio* will take over the case and resolve it.

Source: CRC (2016), "Conoce tus derechos como usuario", *www.crcom.gov.co/es/pagina/conoce-tus-derechos-como-usuario*.

- **Accessibility**. Another important area for policy makers is ensuring that services are widely accessible to everyone, and, in particular, disadvantaged and vulnerable consumers. These groups often have less of a voice in policy making, so regulatory authorities should take special care to ensure that rules are in place to provide access to all. Chapter 6 addresses some of the good practices related to ICT access and use for people with special needs.

The third phase of consumer policy relates to actions regarding **switching of providers or termination of contracts**. Many of the provisions in the contract come into force when a user wishes to leave the provider. Several important policy issues arise as a result. Key policy issues related to switching include number portability, SIM locking rules, the general state of competition, contract periods and termination charges. Each is discussed below:

- **Number portability**. Mobile and fixed-line number portability should be available because it eliminates an important barrier to switching carriers and results in more competitive markets. Number portability alone is not effective unless the process can offer a seamless transition between providers. Without a simple and effective porting process, many users will simply choose to stay with their existing providers even if better offers are available (Box 13.9).

> Box 13.9. **Time to port numbers in the LAC region**
>
> The length of time required to port a number varies across the region. The countries mandating the fastest porting times of 24 hours for mobile services are Chile, El Salvador, Costa Rica, Mexico, Panama, Paraguay and Peru. The process can take up to three days in Brazil, Colombia and the Dominican Republic.
>
> Even more important than the time required to port a number is whether the process can be done with minimal disruption. Ideally, a user should be able to swap a SIM in the phone once the service stops working for the previous subscription, and then immediately begin with the new SIM card using the same number.

- **SIM locking**. One way operators may limit users' ability to change their mobile networks is by locking SIM cards to a particular handset, usually because it has been subsidised by the carrier. In markets with greater competition, the trend is for operators to move away from subsidising handsets, which allows users to pay for their mobile telephones (SIM unlocked) over time. In 2015, nearly half of all LAC countries reported rules governing SIM locking of mobile devices. Mexico has a law in place stipulating that users can request that their phones be unlocked once the device is paid for or when the contract period has finished (Mexico, 2014). In Peru[3] and Colombia,[4] SIM locking of mobile handsets by operators is not allowed.
- **Contract periods**. Telecommunications markets move quickly, as a result of rapid technological change and competitive pressure. Consumers who lock into long-term contracts (e.g. two to three years) may end up paying the same rate for the duration of the contract even if prices drop for new subscribers. Shorter contract periods are better for consumers, making the market more competitive. An important policy issue is to remove auto-renewing contracts that restart a lock-in period after the first lock-in period ends. Renewing lock-in periods should not be justified as a way of recovering operators' fixed costs.
- **Termination charges**. Users may be charged a termination fee when they want to end a service. This can be the result of contracts that stipulate penalties for termination, or backloaded installation fees that need to be recovered when the user leaves. Both can create stickiness that locks in users and results in less than competitive markets. Policy makers can take steps to ensure that no excessive switching costs are incurred that could stop users taking a better offer elsewhere.
- **Lack of competition**. Strong competition among providers benefits consumers by improving users' bargaining position. By the same token, oligopolistic competition can lead to situations where service providers have more power to lock in customers for long contracts. It can also allow providers to limit the functionality of equipment and impose other requirements that favour the provider's interests. From a policy perspective, it is important for governments to encourage the development of services that provide consumers with a range of quality products at competitive prices. A staple

of consumer policy should be to ensure sufficient market competition to expand consumers' choices.

E-commerce

A key policy area for promoting e-commerce is building sound **frameworks for electronic settlements and payments**. The main roles of a payment system are to provide a way of transferring value between different parties in the economy and to facilitate transactions at minimal cost. Its design will be optimal if organised to allow quick and effective value transfers, while imposing a minimum of additional costs and risks. High costs for the payment process may seriously affect economic activity, rendering transactions too expensive. Conversely, the lower costs of efficient payment systems can have a positive effect on economic growth (OECD, 2006).

Policy makers can help promote economic activity by promoting a framework for electronic settlements and payments. The OECD's "Policy Guidance on Mobile and Online Payments" (OECD, 2014b) provides a wealth of information on policy actions to build a framework for e-commerce that can be tailored to the LAC region. The main pillars of the framework are:

- **Information** on the terms, conditions and costs of transactions. This includes issues such as accessibility and readability of payment-related information; complexity of payment terms and conditions and clarity and transparency of billing statements.
- **Privacy implications** related to mobile and online payment. This covers issues such as the collection and use of payment data.
- **Security implications** of mobile and online payment transactions. This includes the protection of the security of consumer payment.
- **Confirmation process**. This includes issues such as transaction uncertainty.
- **Children**. This includes issues such as charges incurred by children accessing goods and services.
- **Varying levels of protection among payment providers and payment vehicles**. This includes information on consumer protection and levels of payment protection.
- **Fraudulent, misleading, deceptive and other unfair commercial practices**. This includes inconsistent payment-related information; renewable contracts, renewable subscriptions and repeat purchases; unexpected charges and consumer confidence.
- **Dispute resolution and redress**. This includes issues such as roles and responsibilities of parties and the cost of seeking redress.

Once governments have a legal and regulatory foundation in place to support e-commerce, the next step is **removing barriers that inhibit the growth of businesses engaging in e-commerce** or that prevent users from adopting the services. Many of these barriers are well documented in the literature and can limit the growth of e-commerce and overall economic activity. Some of the most common barriers to foreign market access, including via e-commerce, are (OECD, 2015b):

- **high customs administration and shipping costs**, which in particular obstruct "long-tail" economic transactions, and thus SMEs
- **high tariffs**, such as excessive taxes applied to imported goods; arbitrary tariff classifications, or competitors with preferential tariffs via regional trade agreements, unfavourable quotas and embargos

- **inadequate property rights protection**, including copyrights, patents and trademarks
- **a shortage of working capital to finance exports**, information to locate and analyse markets, and managerial time, skills and knowledge
- **requirements for local establishment of businesses**, including mandating local bank accounts, local data storage or requirements that a percentage of the company's equity be held by domestic partners
- **high fees to register local country-code top-level domains**, whether for domestic or international firms
- **lack of trust** in e-commerce transactions
- **inadequate logistics to send goods to customers**, due to lack of infrastructure, integrated logistics policy frameworks, logistics education and/or less developed logistics sectors.

In an OECD survey of countries for this report, only 13% of countries identified regulatory barriers that could inhibit the development of mobile payments and banking in the country. Significant room for improvement remains in facilitating the overall business environment in the LAC region. Policy measures to reduce these barriers will especially benefit SMEs, which tend to have limited resources and skills to tackle obstacles. At present, SMEs rely increasingly on e-commerce intermediaries and marketplaces, such as Amazon or eBay. While these intermediaries make it easier for SMEs to access foreign markets and benefit from large network effects and economies of scale, the key role of online intermediaries in online and mobile markets may result in SMEs becoming dependent on such players.

When the foundational elements are in place and barriers for e-commerce are addressed, policy makers can focus on **promoting adoption of e-commerce both by businesses and customers**. Just under half of the countries in the LAC region (41%) report having public policies specifically to promote e-commerce. All OECD countries have adopted the OECD *Guidelines on Consumer Protection in the Context of Electronic Commerce* (OECD, 1999), which provides a policy framework for consumer protection in e-commerce.

Although many LAC countries still do not have strategies or public policy initiatives to promote e-commerce, several initiatives to promote it exist in the region. The Latin American Institute of e-Commerce (eInstituto), for example, is a regional organisation composed of e-commerce chambers or national associations that supports the development of the digital economy in the LAC region (Box 13.10). The region also has several national e-commerce chambers (Box 13.11).

The chambers of e-commerce play an important part in encouraging e-commerce among firms and consumers in the region. Several support the promotion of initiatives such as the Cyber Monday marketing campaign, an initiative to increase online sales by offering discounts on Mondays. In Uruguay, CEDU provides an online space (*www.ciberlunes.uy*) for firms to present their discounted products, acting as a catalyst for online sales. The major online retailers in the region (*Mercado Libre*, Arredo, Aerobic, *Toc Toc Viajes*, etc.) have participated in its earlier initiatives.

A regional initiative to generate trust among consumers in the LAC region is *eConfianza*, a label for e-commerce firms aligned with global best practices. Use of these labels has led to the adoption of best practices such as security, clarity of information, visibility of methods of payment and dispute-resolution mechanisms. Firms use the *eConfianza* label to differentiate themselves from other players, while providing consumers additional levels of trust. Other good practices related to trust in the area of privacy protection and digital security risk management are addressed in Chapters 14 and 15.

Box 13.10. **A regional initiative for e-commerce in LAC**

The **Latin-American Institute of e-Commerce (eInstituto)** is a regional organisation that supports the development of the digital economy in Latin America with initiatives to consolidate and encourage online business. One of its main goals is to cultivate a regional network of local organisations that can learn from each other and promote each other's' interests. The network includes chambers or national associations of e-commerce from Argentina, Brazil, Colombia, Chile, Ecuador, Mexico, the Dominican Republic, Venezuela, Paraguay, Peru and Uruguay. Activities organised by the eInstituto in each country are run by a local chapter, an organising committee and promoters. Its four main regional activities include a promotion programme, a capacity-building programme, the regional eTrust programme and the regional eCommerce+ programme.

In 2016, the eInstituto planned to extend the regional *eConfianza* (eTrust) programme, to increase the quantity and quality of products and services that comply with best practices. It also planned to develop a Regional Cross-Border e-Commerce Programme. This pilot project aims to promote cross-border e-commerce in the region, working with the logistics sector and local suppliers in each country to expand their operations to neighbouring countries. Other initiatives include sharing statistics, indicators, definitions and studies to help measure the development of the digital economy and e-commerce.

The eInstituto also represents Latin American interests in several international and multilateral organisations working to promote e-commerce, and is a permanent member at the Universal Postal Union, the Internet Corporation for Assigned Names and Numbers (ICANN) and the United Nations Commission on International Trade Law (UNCITRAL).

Source: eInstituto (2016), *eInstituto Website*, *www.einstituto.org*.

Creating national platforms such as forums or chambers for e-commerce is a good practice for identifying bottlenecks and developing solutions based on a multi-stakeholder approach. It is critical that customers and suppliers of e-commerce-based services help set priorities in national e-commerce strategies. Attention should also be paid to measures to facilitate the effective participation of SMEs.

Strategies for promoting e-commerce should be designed and implemented in conjunction with initiatives to improve logistics, trade and broadband infrastructure (addressed in Chapter 5), as well as to streamline regulations, ensure legal certainty and ICT literacy and skills development.

Box 13.11. **Promoting E-commerce in LAC**

Argentina: The *Cámara Argentina de Comercio Electrónico* (CACE) was created in 1999 to bring together companies that use and provide electronic commerce. Its mission is capacity building and development of electronic commerce. CACE also provides juridical and business assistance, contributions to legislations, international partnerships, certification, conflict resolution, electronic documentation and e-signatures, among other services (*www.cace.org.ar/*).

Brazil: The Camara-e.net (*Câmara Brasileira de Comércio Eletrônico*) brings together e-commerce stakeholders in a neutral arena to discuss the launch of e-commerce regulations in Brazil. The multi-stakeholder forum was created in 2010 and includes consumer groups, companies, Internet governance authorities (CGI.br) and academic representatives. Camara-e.net has been fundamental in promoting security in electronic transactions, formulating public policies for the sector and improving regulatory frameworks to promote the development of e-commerce in Brazil. It focuses on disseminating good practices and assisting capacity building in SMEs on issues related to digital identity, online payment, accessibility, security, insurance, online commerce and sustainability (*www.camara-e.net/*).

Chile: One of the main challenges for e-commerce in Chile is its adoption among SMEs. The *Cámara Chilena de Comercio Electrónico* (CCCE) and its members have developed a toolkit of best practices to highlight the critical areas for providing a good e-commerce experience. The CCCE facilitates a dialogue with the Chilean governmental consumer protection agency, SERNAC, and helps formulate Chile's digital strategy. It has also organised capacity- building activities and events, such as Cyber Monday and Cyber Day, and will be launching an undergraduate degree on e-commerce to support professional development in this sector (*www.camaradecomercioelectronico.cl*).

Colombia: The *Cámara Colombiana de Comercio Electrónico* (CCCE) was set up in 2008, and by 2011 involved 26 companies promoting the development of online trade. Today, the chamber has 280 members and 8 committees covering: education and capacity building; promotion; documentation and electronic billing; statistics; government and regulation; logistics; m-commerce and payments/fraud. The chamber is permanently involved in activities to promote e-commerce in Colombia, such as trainings, outreach and branding. Some of its activities are exclusively for members, whereas others are open to non-members (*www.ccce.org.co*).

Mexico has several governmental agencies working to promote electronic commerce. Its areas of interest include protection of consumer rights, promoting the adoption of ICT in supply chains, promoting and consolidating cybersecurity plans and creating a culture of security for e-commerce users. The Mexican Association of the Internet (AMIPCI) was created in 1999 to promote the responsible and productive use of the Internet by organisations, private and public sectors and users (*www.amipci.org.mx*). AMIPCI has 200 members from a broad spectrum of sectors and works through several committees: e-commerce, security, infrastructure, professional services, mobility and emerging technologies, legal, education and culture, financial services, government affairs and market research. AMIPCI publishes yearly results of studies on the state of electronic commerce in Mexico, and organises events and studies to promote the Internet industry as a whole. The recently created (2014) Association of Online Sales of Mexico (AMVO) promotes e-commerce in Mexico through policy frameworks promoting safe social and economic development. Its objectives include ensuring transparency of the e-commerce laws; incentivising companies to operate online; promoting mechanisms to generate trust among businesses and consumers in e-commerce; improving the relationships with banks, to increase access and ease of payments (e.g. increasing the acceptance and use of credit cards); and organising capacity-building fora (*www.amvo.org.mx*).

Uruguay: The Chamber of the Digital Economy of Uruguay (CEDU) includes the main players in the domestic digital economy from the public and private sectors, such as regulators, e-government institutions, providers of ICT services, payment and finance, logistics, commerce and industry. Its main goal is to create a platform where companies can share common challenges and promote their interests collaboratively. It helps share best practices and technologies to develop the domestic digital economy (*http://www.cedu.org.uy*).

Conclusion

This chapter stresses the importance of informed and empowered consumers in driving and sustaining competition, which is critical if the region is to meet its broadband policy goals. Demand-side policies, once mainly linked to competition, have recently received greater recognition for encouraging firms to innovate, improve quality and compete in pricing. As communications services increase, more emphasis should be placed on consumer policy, to extend the range of consumer measures and provide better protection and access to information. OECD countries have developed a set of policy principles to ensure that consumer interests in communication services are adequately protected. This can be used as a source of guidance for the LAC region.

The main policy objectives for consumer protection in communications services broadly correspond to different phases in the relationship between the operator and the user. The consumer acquisition phase involves attracting customers through advertising and information on the services offered. Next, the contracts and engagement phase deals with disclosure issues, billing practices, quality of service and complaint handling. Finally, switching and termination of the relationship between the client and the service provider covers number portability, SIM locking and termination charges.

The introduction of e-commerce responds to a structural change in how commercial transactions take place over broadband networks, bringing them online and making them more efficient. Businesses benefit by enlarging the scope of the market and lowering operating barriers and costs. Consumers also benefit from information on goods and services, being able to locate sellers more easily, price comparisons, convenient delivery, and ease of purchase via a computer or mobile device.

The key policy objectives for e-commerce can be grouped into three main areas: creating a framework for electronic settlements, identifying the barriers for e-commerce (growth of businesses engaging in e-commerce or barriers preventing users from adopting it) and developing initiatives promoting the adoption of e-commerce among business and users.

Notes

1. Indeed, 20% of the total costs incurred in the transport of Paraguayan soy beans to Brazil and beef into Chile are the result of inefficiencies in the regional logistics chain (Schwartz et al., 2009). In some Central American countries, such as Costa Rica, Guatemala, Nicaragua and Panama, regional trade is hindered by poor-co-ordination and information problems, resulting in lorries returning empty (OECD, 2014c).
2. Cramming refers to the fraudulent practice of including unauthorised charges on a phone bill, often in a way that makes them look like standard or regulatory fees.
3. Defined in Article 23 of the OSIPTEL Resolution N° 138-2012-CD (OSIPTEL, 2016), *https://www.osiptel.gob.pe/categoria/condiciones-de-uso-y-su-modificatoria*.
4. Defined in Article 105 of the CRC Resolution 3066 of 2011 (CRC, 2011).

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Chapter 14

Digital security risk management

This chapter focuses on public policies to manage digital security. It first distinguishes digital security risk management from other aspects of cybersecurity related to technology, law enforcement, national security and defence. Next, it introduces the key elements of national strategies that can create framework conditions to increase trust for all stakeholders using ICTs, and for the digital environment for economic and social prosperity. The chapter surveys existing measurement and impact assessment tools and provides an overview of public policy efforts in the LAC region. Finally, it introduces selected good practices.

Broadband and information and communication technologies (ICTs) in general have become essential to the development and functioning of the economy in many areas in the Latin American and Caribbean (LAC) countries, in particular for critical infrastructure such as energy, transport, water, finance and key government services. However, the economic and social benefits of broadband policies can only be realised if stakeholders manage digital security risk, that is, the security risk associated with the use of the digital environment.

Many LAC countries have developed policies that address some aspects of digital security. However, they generally do not address this issue from a strategic perspective, with a clear vision for the future. Most importantly, they generally do not approach cybersecurity policy as a means of increasing economic and social prosperity, focusing instead on the technical and criminal aspects of the issue, or on national security. The policies in place often lack the appropriate level of co-ordination between the governmental and stakeholders. This undermines public policy efforts to encourage the use of ICTs, as a result of a limited understanding of the economic and social dimensions of cyber security.

This section presents a set of policy concepts and instruments to help develop policies for managing digital security risk for economic and social prosperity. It provides an overview of the situation in the LAC region, points to good practices in these countries and establishes recommendations based on the OECD 2015 *Recommendation on Digital Security Risk Management for Economic and Social Prosperity* (OECD, 2015a), as well as the work of other international and regional organisations, such as the Inter-American Development Bank (IDB) and the Organization of American States (OAS).

Key policy objectives in the LAC region

The main high-level policy objective for the adoption of a national strategy for managing digital security risk is to create framework conditions for all stakeholders to use ICTs and the digital environment for economic and social prosperity. This general policy involves certain key objectives:

- **Understanding digital security and stakeholders' responsibility for managing it**. All stakeholders should be aware that digital security risk can affect their economic and social welfare and that their management of digital security can affect others. Stakeholders should be equipped with the education and skills to understand risk and to manage it. In particular, they should understand that digital security risk management is an economic and social challenge, not simply a technical or national security issue.
- **Developing a national strategy for the management of digital security risks**. National strategies for the management of digital security risk should aim to promote economic and social prosperity. They should be co-ordinated broadly within the government to ensure consistency with other strategies for economic and social prosperity, and coherence with policies intended to protect critical infrastructure and ensure the provision of essential services. The aim is to combat criminality, protect national security and preserve international stability. These strategies should be supported at the highest level

of government, to ensure that the various interests at stake are appropriately balanced. They should be flexible and technologically neutral, and meanwhile, preserve and protect human rights and fundamental values.

- **Engaging with other stakeholders**. Policy makers should encourage the active participation of all stakeholders, from business, civil society, the Internet technical community and academia, in developing and implementing strategy and policy.
- **Cultivating international co-operation and mutual assistance**. Policy makers should establish multilateral and bilateral relationships to share experiences and good practices and promote an approach to digital security risk management that does not increase risk to other countries.

Tools for measurement and analysis in the LAC region

There are a limited number of references on key performance indicators and measurements for policy makers in the area of digital security risk management. These include the ITU *Global Cybersecurity Index* (ITU, 2014), the *Cybersecurity Capability Maturity Model* of the Oxford-based Global Cybersecurity Capacity Centre (2014), the Business Software Alliance (BSA) *Cybersecurity Dashboard* (BSA, 2015), and, in the area of energy, the US Department of Energy's Cybersecurity Capability Maturity Model (C2M2) Program (US Department of Energy, 2015). However, these generally approach cybersecurity as a technical issue rather than an economic and social challenge. Work is currently under way at the national level in some countries and in international forums to improve the evidence base for public policy in this area. OECD recommendations and examples of good practices on specific areas, measurement of security and privacy issues in the context of children's online access, and on Computer Security Incident Response Teams (CSIRTs) are available in the documents referenced below (Box 14.1).

Box 14.1. **OECD references on measurement in the area of digital security**

OECD (2012a): "Improving the Evidence Base for Information Security and Privacy Policies: Understanding the Opportunities and Challenges Related to Measuring Information Security, Privacy and the Protection of Children Online"

This report provides an overview of the existing data and statistics in the fields of information security, privacy and the protection of children online. It highlights the potential for developing better indicators in these fields, showing that a wealth of empirical data exists that, if mined and made comparable, will enrich the current evidence base for policy making. Such indicators would help identify areas where policy interventions are most clearly warranted, and can provide guidance on designing policy interventions and determining their effectiveness.

Starting from a broad scope covering all aspects of security and privacy, the report identifies the "low-hanging fruit", or areas where better indicators could be immediately developed with minimal resources. They include:

- improving the relevance of the OECD model surveys on ICT use by businesses and households/individuals for policy makers in the areas of information security, privacy and in particular the protection of children online
- improving the cross-country comparability of statistics provided by national/government CSIRTs in the area of information security, and privacy enforcement authorities (privacy authorities) in the area of privacy.

Box 14.1. **OECD references on measurement in the area of digital security** *(Cont.)*

OECD (2015b): "Guidance for improving the comparability of statistics produced by computer security incident response teams (CSIRTs)"

CSIRTs generate statistics based on their daily activities: issuing alerts and warnings, handling incidents, etc. However, such statistics are generally not internationally comparable. Between 2013 and 2015, the OECD worked with the CSIRT community to explore how to improve the international comparability of the statistics they produce. The outcome is a guidance document they can use to develop more generally comparable statistics. It should be considered as a first step in this area.

This document presents guidance for improving the international comparability of statistics produced by CSIRTs. The document explores a broad range of areas for cybersecurity statistics before focusing on two elements that could help policy making with better measurement and standardised statistics: i) CSIRT capacity and resourcing to mitigate security incidents effectively; and ii) the security incidents that CSIRTs handle. It develops policy and operational guidance for improving statistics related to both components.

Statistical indicators are specifically developed for CSIRT capacity: CSIRT budget, skills, personnel and formal co-operation. All incident response teams, no matter what their size or maturity, will possess data required for these statistics, thus making them more suitable for international comparison.

The guidance explains a number of conceptual, methodological, practical and technological challenges facing CSIRTs in the creation of comparable statistics on incidents, and suggests how to address these challenges. This area will require ongoing co-operation among CSIRTs, as well as among the incident response, statistical and policy communities.

The document also discusses various ways of normalising incident-related statistics to account for differences in network size, before concluding with final reflections regarding the dissemination and adoption of the guidance.

Sources: OECD (2015b); OECD (2012a).

Overview of the situation in the LAC region

National digital security strategies

Only six countries (Colombia, Mexico, Panama, Paraguay, Trinidad and Tobago and Uruguay) have a national digital security strategy, two of which (Mexico and Uruguay) address a national government strategy but not a digital security strategy *per se*.

Although 75% of countries in the LAC region still do not have a digital security strategy, a large number of countries, including Argentina, Brazil, Chile, Mexico and Paraguay, have government and public sector entities responsible for the co-ordination and protection of national security and critical infrastructure (OAS and Symantec, 2014).

The OAS has provided support and technical assistance to Costa Rica, Jamaica (OAS, 2015b), Paraguay and Peru in the implementation and improvement of their respective national digital security strategies (OAS, 2015a, 2015b, 2015c and 2015d).

A recent cybersecurity study (IDB and OAS, 2016) analysed the state of preparedness of 32 countries in the region based on 49 indicators in five areas: policy and strategy, education, culture and society, legal framework, and technology. Uruguay, Brazil, México, Argentina, Chile, Colombia and Trinidad and Tobago have achieved an intermediate level of preparedness, but lag advanced countries like the United States, Israel, Estonia and Korea.

The proportion of LAC countries with both substantive and procedural legislation to investigate and prosecute Internet and computer-related crime is still low (nearly 44%). Only 11 countries (Chile, Colombia, Costa Rica, the Dominican Republic, Jamaica, Mexico, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela) have substantive and procedural criminal legislation to counter cybercrime. However, some countries have reported problems not only with the enforcement of laws and concerns on how to keep cybercrime legislation up to date, but the need for training prosecutors and the judiciary to build capacity for law enforcement, given the knowledge gap among experts, as well as budget constraints (IDB and OAS, 2014).

Most government agencies of countries in the region tend to view digital security exclusively from one dimension (i.e. political, technical, industry-specific) rather based on a multidimensional perspective (IDB and OAS, 2014). Few place emphasis on the economic and social dimensions. As a result, governments do not sufficiently use public-private partnerships and co-operation to advance public policy objectives in this area.

Intra-governmental co-ordination

The proportion of LAC countries with government co-ordination mechanisms is very low (around 30%). Only eight countries (Brazil, Colombia, the Dominican Republic, Jamaica, Mexico, Peru Trinidad and Tobago and Uruguay) address some aspects of governmental co-ordination for developing their national digital security strategy. However, the information provided suggests that intra-governmental co-ordination is limited in practice and that most LAC countries do not yet have a whole-of-government approach to digital security risk.

OAS member countries have reported problems of co-ordination and alignment of digital security policies throughout government agencies. It is reported "a general lack of collaborative culture, which combined with budget constraints, makes the co-ordination of digital security policies a great challenge within government". Other OAS members reported a fragmented approach on digital security matters within their governments, with independent institutions working in an isolated rather than in a co-ordinated fashion (IDB and OAS, 2014).

Computer Security Incident Response Teams (CSIRTs)

The proportion of LAC countries with a computer security incident response team (CSIRT) fully endorsed by the government is relatively high (more than 50%). Twelve countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Guatemala, Jamaica, Mexico, Paraguay, Peru, Trinidad and Tobago and Uruguay) have a CSIRT fully endorsed or supported by its national government.

The Inter-American Committee Against Terrorism of the OAS (CICTE) has been working closely with all countries in the Americas on establishing and improving their incident response capabilities under OAS' *Programme for Developing a National Computer Security Incident Response Team*. Under this programme, the number of national CSIRTs in the Americas has increased from 5 to 18. However, according to reports, "the lack of financial resources and of personal training are the major challenges for implementing a national CERT and improving countries' response capacity to cyber threats in the Americas" (IDB and OAS, 2014).

Awareness and development of a skilled workforce that can manage digital security risk

Many countries in the LAC area have increased and improved their awareness-raising activities to enhance digital security and counter cybercrime (Box 14.2). "Stop. Think. Connect", a multi-stakeholder partnership initially launched in October 2010 to help digital citizens stay safer and more secure online, continues to expand, and now includes four LAC

government authorities (the Dominican Republic, Jamaica, Panama, Paraguay and Uruguay), CICTE and other private and public organisations in the region.[1]

The OAS recently launched an Awareness Campaign Toolkit on Cybersecurity, designed to provide governments and organisations guidance and resources in developing a cybersecurity awareness campaign (OAS, 2015e). However, capacity and training in countries in the region is often limited to the technical perspective. Training and capacity does not yet include skills to manage digital security from a broader perspective.

Box 14.2. **Digital security awareness programmes**

Mexico: National programme on public security

Mexico has implemented a National Programme on Public Security (*Programa Nacional de Seguridad Pública 2014-2018*). Section 4.2.9 establishes as a policy objective: "To encourage a culture of cybersecurity, particularly among children and teenagers, to prevent them from falling prey to Internet crime".

Source: Programa Nacional de Seguridad Pública 2014-2018, http://dof.gob.mx/nota_detalle.php?codigo=5343081&fecha=30/04/2014.

Mexico: National Cyber Security Week

In October 2015, as part of public awareness activities on digital security, Mexico's Ministry of the Interior (SEGOB), the National Security Commission of the Federal Police (PF) and the OAS organised the National Cyber Security Week, holding a series of conferences, seminars and training activities on information security to counter cybercrime at the national level.

Source: Protección Datos México (ProtDataMx), http://protecciondatos.mx/2015/10/essemana-nacional-de-la-ciberseguridad-2015ennational-cybersecurity-week-2015/.

Peru's campaign to improve security of government information

Peru's national CERT (Pe-CERT) disseminates information to increase and improve security levels of national information systems and networks and provides regular training and capacity on ICTs.

Source: PeCERT, *www.pecert.gob.pe/pecert-acerca-de.html.*

Uruguay: *Seguro te conectas* national campaign

Uruguay's national CERT (CERT-Uy) organises conferences and information-security training simulations and has promoted national awareness campaigns like "*Seguro te conectas*". This promotes responsible use of the Internet with a number of audiovisual recommendations and good practices to raise public awareness of the risks of misuse of ICTs.

Source: CERT-Uy and information on the "*Seguro te conectas*" campaign, *www.cert.uy/Seguro-te-conectas/.*

Building a comprehensive legal framework to mitigate cybercrime

The Dominican Republic and Panama are the only LAC countries that have ratified the 2001 Budapest Convention on Cybercrime (CoE, 2016), although the Council of Europe has officially invited seven other LAC countries (Argentina, Chile, Colombia, Costa Rica, Mexico, Paraguay and Peru) to sign (CoE, 2014).

Nevertheless, the proportion of LAC countries that have adopted substantive and procedural legislation in line with the Budapest Convention keeps growing (nearly 43%). Eleven countries (Chile, Colombia, Costa Rica, the Dominican Republic, Jamaica, Mexico, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela) have passed legislation to counter cybercrime. The cases of the Dominican Republic and Panama are noteworthy (Box 14.3).

Box 14.3. **Selected countries that have ratified the Budapest Convention**

Dominican Republic

The Dominican Republic was one of the first LAC countries to pass an independent law to investigate, prosecute and punish cybercrime under the substantive, procedural and international co-operation provisions of the Budapest Convention (Law No. 53-07 on Crimes and High-Tech Crime) in force since 18 January 2007. The Dominican Republic was the first LAC country to ratify the Budapest Convention, on 7 February 2013.

Source: Dominican Republic (2007), *Ley No. 53-07 sobre Crímenes y Delitos de Alta Tecnología*, *www.oas.org/juridico/PDFs/repdom_ley5307.pdf*.

Panama

Panama was the second LAC country to ratify the convention, on 1 July 2014. It does not yet have an independent law to investigate, prosecute and punish cybercrime, but a draft bill to reform the Criminal Code is pending approval by the National Assembly. The draft bill includes the criminalisation of conducts and crimes committed through information technologies, in line with the Budapest Convention's provisions.

Allocation of budget and resources to set up a digital security strategy

As addressed in Chapter 2 on regulatory frameworks and digital strategies, the great majority of LAC countries have an annual budget allocation for a national digital strategy, although the budget varies significantly from one country to another. Mexico's National Digital Strategy has an annual budget of USD 1.740 million (MXN 29 million), while Colombia allocated nearly USD 2.6 million for the first three years of its National Digital Strategy (*Vive Digital*). Chile budgeted USD 850 million for its National Digital Strategy. Nevertheless, the percentages dedicated to digital security are unclear.

Besides the general annual budget for national digital strategies, specific ministries can also allocate their own budgets for the digital security strategy. This is not common, however, in most LAC countries. In 2014, only Colombia allocated an annual budget to the National Defence Ministry equivalent to USD 1.5 million (COP 4.6 million) for colCERT, the Cybercrime Police Centre (CCP) and the Cyber Task Force of the Armed Forces.

Most recently, Mexico's Ministry of National Defence requested an annual budget of USD 100 million to create a Cyberspace Operation Centre in 2016. Its main purpose would be to build strategic capacity and training to counter cybercrime, threats to information security and the protection of critical national infrastructure (Stettin, 2015).

International co-operation and mutual assistance

The proportion of LAC countries implementing international co-operation and mutual legal assistance is low. Only five (Brazil, Chile, Mexico, Peru and the Dominican Republic) are part of the G8 24x7 Contact Network, designed to help national law enforcement authorities in other countries obtain and exchange information related to cross-border criminal investigations, including crime committed through the use of ICTs (Velasco, 2016).

The proportion of LAC countries with mutual legal assistance treaties in the field of extradition and regional judicial co-operation is relatively high. Fifteen countries (Brazil, the Plurinational State of Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela) have extradition treaties and bilateral agreements on international judicial co-operation in criminal matters in force.

Overall situation

Several LAC countries have adopted national digital strategies or are in the process of implementing one. Unfortunately, the great majority of national digital strategies in place lack a clear long-term vision on digital security risk and face a number of challenges, such as:

- creating and improving legal frameworks on digital security
- creating operational security risk management capabilities
- a clear distribution of responsibilities among government institutions
- international and multi-stakeholder co-operation (OAS, 2014).

All indications are that the majority of LAC countries are not approaching digital security risk from the economic and social perspective, as called for by the OECD. At the time of writing, this approach is still relatively new, and it is thus not surprising that it is not yet reflected in current policy frameworks. It should also be acknowledged that some LAC countries face various additional challenges that limit their ability to adopt this approach (OAS and Symantec, 2014).

The implementation of co-ordination mechanisms within governments to formulate and carry out national digital security strategies is a key challenge in LAC countries. Instead of distinguishing clearly the various facets of what is often known as "cybersecurity", and addressing them through an overarching strategy that ensures government co-ordination and coherence, governments often view this issue from a single perspective, such as national security, international security or cybercrime. As a result, the economic aspects are set aside and the issue addressed in isolation from non-governmental stakeholders, in a public policy silo. Budgetary concerns have constrained the adoption of co-ordination mechanisms among government agencies of the region. Only a few countries have allocated annual budgets for national digital strategies by the respective ministries and competent authorities.

Stakeholder engagement in most national digital security strategies has improved, but it is not yet mature in most LAC countries. Many still lack flexible mechanisms and medium and long-term plans to support stakeholders in developing policies and legal frameworks on digital security (OAS and Symantec, 2014). By contrast, a significant number of countries, including Colombia, Mexico, Panama and Peru have established national CSIRTs fully endorsed by their respective national governments, which have been very active in facilitating the exchange of information on security and computer incidents and threats and providing training on information security to their staff and the general public.

The number of LAC countries that have adopted legislation to counter cybercrime pursuant to the Council of Europe's Budapest Convention keeps growing. Many in the region are interested in formally requesting access to the convention and its Additional Protocol. This, however, will involve a complex and long-term political process.

Good practices for the LAC region

Awareness and understanding of digital security risk management

Over the years, awareness of digital threats and incidents has increased globally. However, there is still a limited understanding of some aspects and in particular, confusion over its economic and social dimension. The 2015 OECD *Recommendation on Digital Security Risk Management for Economic and Social Prosperity* and its companion document provide key concepts, principles and guidance to develop public policies in this area, as well as policies

to manage risk in public and private organisations (OECD, 2015a). The OECD approach is based on the recognition that:

- Digital security risk is an **economic and social issue** rather than solely a technical challenge.
- It is impossible to create a **fully safe and secure digital environment** where risk is entirely avoided, other than by eliminating digital openness, interconnectedness and dynamism, and thus renouncing any of the associated economic and social benefits.
- Risk can nevertheless be **managed and reduced to an acceptable level**, determined by the economic and social objectives and benefits at stake, as well as the context.
- Digital security risk management can drive the selection of **appropriate digital security measures** that do not undermine the activity they aim to protect, take into account the interests of others, and preserve human rights and fundamental values.
- **Leaders and decision makers** are best placed to steer the changes needed to reduce risk to an acceptable level.
- Digital security risk management should be **integrated with economic decision making** and the **broader risk management framework**, to facilitate strategic, agile and effective leadership.

National Strategy for the Management of Digital Security risk

Many countries worldwide are adopting what they often call national "cybersecurity strategies". Their content, however, varies extensively. Regardless of what they are called and the type of document or documents in which they are reflected, it is essential that governments adopt strategies to create the conditions for all stakeholders to manage digital security risk and to increase trust and confidence in the digital environment. Such a strategy may be part of an **over-arching policy** that addresses the national and international security dimension of cybersecurity, as well as the fight against cybercrime. It can also be included in a national digital strategy to promote the use of ICTs for economic and social prosperity.

Such a strategy should clearly state that it aims to:

- **take advantage of the open digital environment** for economic and social prosperity, by reducing the overall level of digital security risk within and across borders, without unnecessarily restricting the flow of technologies, communications and data
- **ensure the provision of essential services** and the operation of **critical infrastructure**, **protecting individuals** from digital security threats while taking into account the need to safeguard national and international security and to preserve human rights and fundamental values.

The strategy should be **directed at all stakeholders**, tailored as appropriate to small and medium enterprises and to individuals, and articulate stakeholders' responsibility and accountability according to their roles, ability to act and the context in which they operate.

Finally, it should result from a **co-ordinated intra-governmental approach** and an open and transparent process involving all stakeholders. It should also be regularly reviewed and improved based on experience and best practices, using internationally comparable metrics where available.

The OECD *Recommendation on Digital Security Risk Management for Economic and Social Prosperity* (OECD, 2015a) includes guidance for measures that the strategy can include, such as how the government can lead by example, measures to strengthen international co-operation and mutual assistance, how to engage with other stakeholders and how to

create the conditions for all stakeholders to collaborate in the management of digital security risk. Such measures include, for example:

- ensuring that the national digital strategy is conducted and managed in a manner conducive to **innovation and prosperity**, keeping the environment open, maximising the potential of ICTs for growth and development and facilitating international and regional co-operation
- improving and updating training programmes and ensuring the development of national **awareness-raising campaigns**
- creating a comprehensive national programme to **measure digital security risk** and facilitating **co-ordination mechanisms** and sharing of responsibility among government agencies
- encouraging **mutual assistance** in the identification of Internet crime and prosecution of perpetrators between law enforcement authorities in the region
- establishing **national points of contact to address cross-border requests** related to digital security risk management issues and improving responses to domestic and cross-border incidents and threats, including through co-operation with CSIRTs, co-ordinated exercises and other tools for collaboration
- encouraging **national partnerships between ICT companies and government** agencies on digital security and the creation of flexible cross-border co-operation mechanisms.

International Cooperation and Mutual Assistance

International co-operation and mutual assistance is a good policy practice. It can help detect cross-border crime and the development of international and regional co-operation mechanisms to enforce national laws against criminals located in different jurisdictions.

Colombia, Mexico, Peru, Paraguay and Uruguay actively participate in the OAS Cybersecurity Programme and the various activities organised by the Inter-American Committee Against Terrorism (CICTE)[2] to counter cybercrime with the participation of various stakeholders from the public and private sector.

Engagement with other stakeholders

Promoting the active participation of stakeholders, through national consultations on digital security, encouraging the management of digital security among different stakeholders, and sharing responsibilities is a good policy practice (Box 14.4).

Computer Security Incident Response Teams (CSIRTs)

Computer Security Incident Response Teams (hereinafter CSIRTs) play a key role in in identifying threats to information security systems and networks, and crime committed through the use of information technologies. There is consensus that a CSIRT is a "team of experts that responds to computer incidents, coordinates their resolution, notifies its constituents, exchanges information with others and assists constituents with the mitigation of the incident" (Box 14.5). CSIRTs also serve as reliable points of contact for reporting security incidents, disseminating relevant information on computer incidents, mitigating security risks and co-ordinating their response efforts with other similar institutions. Establishing a national CSIRT is a good policy practice to facilitate international and regional co-operation on information security. Private-sector CSIRTs (e.g. business, academia) can also be encouraged.

Box 14.4. **Selected cases of national stakeholder participation**

Colombia

Colombia expressly considers stakeholder participation in the document "*Cybersecurity and Cyberdefense Policy Guidelines*".

Document CONPES 3701, of July 2011, states that the national CSIRT (colCERT) and the CCP will articulate initiatives with the private sector and civil society to manage security incidents for the national critical infrastructure.

Source: Lineamientos de Política para Ciberseguridad y Ciberdefensa, www.mintic.gov.co/portal/604/articles-3510_documento.pdf.

Brazil

Brazil's Internet Steering Committee (*Comitê Gestor da Internet no Brasil CGI.br*) is a good practice example of multi-stakeholder co-operation that involves the technical community, academia and civil society. In this instance, all share the responsibility for reporting, reviewing and responding to computer security incidents. Responding to threats to networks and systems in the public and private sector and drafting national policies on information security are also part of the task.

Source: Comitê Gestor da Internet *no Brasil, www.cgi.br/.*

Jamaica

In 2013, Jamaica established a Cybersecurity Taskforce with stakeholders from the public and private sectors that together help to propose, draft and advance national policies on digital security, including Jamaica's National Cyber Security Strategy.

Source: Government of Jamaica (2015), *Jamaica's National Cyber Security Strategy, http://mstem.gov.jm/?q=national-cyber-security-strategy.*

Box 14.5. **Recommendations for the CSIRT community**

The Internet Government Forum selected the CSIRTs as one of the topics to be addressed in the Best Practice Forums in 2014. A selection of the recommendations are shown below:

- There is a need for policymakers to discuss the role of CSIRTs with the CSIRT community to avoid misconceptions around the role of CSIRTs.
- CSIRTs are recommended to be actively involved in relevant policy discussion at both the national and international level. In order to engage with other stakeholders it is important to be where they are. The provided examples show that it brings influence and understanding.
- Every government has the right to create the CSIRT it needs. It is recommended though that governments make an informed decision, taking in to consideration the potential consequences of their choice.
- Where CSIRTs are concerned privacy and security have to stand together in order for a CSIRT to be truly successful.
- Data protection is a term that is better understood in a general sense than privacy. Hence it is advised to use this term in a CSIRT context more as it is far more concrete.
- Data protection has to be at the core of the work of a CSIRT.
- It is recommended to involve Data Protection Commissioners more in the work of CSIRTs.
- To ensure transparency and accountability where data protection is concerned, it is advised to make a study whether a standard protocol can assist attaining transparency, as well as more conscious decisions about limits to data sharing, anonymisation of data where possible and the handling of data by CSIRTs.

Box 14.5. **Recommendations for the CSIRT community** *(Cont.)*

- CSIRTs should minimise data collection and processing, while also focusing on their constituency and anonymizing relevant information.
- A well-run CSIRT is an essential part in the protection of data and security within a society.
- Further study is recommended into the expanding role of CSIRTs. This could e.g. include whether there are sensible limits to tasks given and what role a CSIRT can play in enhancing cooperation in the security chain between other stakeholders, e.g. manufacturers of ICT products and providers of ICT services and does the current definition of a CSIRT match the reality of work asked and tasked.
- Further study is recommended into the ways CSIRTs and law enforcement can enhance their cooperation in meaningful ways, each from within its respective mission.
- Further study is recommended into responsible disclosure and how to create conditions that ethical hackers can contribute to a safer Internet experience for all.
- CSIRTs have a role in handling effects of cybercrimes and providing technical support for investigations, but cybercrime is overall crime and as such should be dealt by law enforcement entities, like the police. Containing too much of this work within a CSIRT, or making a CSIRT part of a law enforcement agency is likely to have significant impact on its ability to work with the private sector.

Source: (IGF, 2015), CSIRT Best Practice Forum, *www.intgovforum.org/cms/documents/best-practice-forums/establishing-and-supporting-computer-emergency-response-teams-certs-for-internet-security/627-bpf-csirt-2015-report-final-v2/file*

As noted above, 12 countries in the LAC region have a CSIRT fully endorsed or supported by the national government. The cases of Brazil, Costa Rica and Mexico are described here (Box 14.6).

Box 14.6. **Selected national CSIRTs**

Brazil

Brazil has two national CSIRTs in active collaboration. The Center for Security and Incident Computer Networks of the Federal Public Administration (CTIR Gov) is co-ordinated by the Department of Information Security and Communications of the Presidency of Brazil's Cabinet of Institutional Security. Its main purpose is to monitor and follow-up incidents and threats to computer systems and networks belonging to the Federal Public Administration.[1] Cert.Br is maintained, co-ordinated and sponsored by the Internet Steering Committee (*Comitê Gestor da Internet no Brasil CGI.br*) and is mainly responsible for the security of information systems and networks of the private and academic sectors, respectively.

1. CTIR Gov is available at *www.ctir.gov.br/*.

Source: www.cert.br/.

Costa Rica

Costa Rica created a national CERT (CSIRT-CR) in 2012 as part of the publication of Executive Decree No. 37052-MICIT of 9 March 2012. It is composed of the heads of the principal national ministries and is responsible for supporting and co-operating with administrative and judicial authorities to investigate and prosecute cybercrime and co-ordinate activities with Interpol and the OAS' Inter-American Committee Against Terrorism (CICTE).

Source: www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=72316&nValor3=88167&strTipM=TC.

Box 14.6. **Selected national CSIRTs** *(Cont.)*

Mexico

The Scientific Division of Mexico's Federal Police operates a national CSIRT (CERT-MX), currently the official national government CERT. CERT-MX serves as the main point of contact with Interpol and the US Department of Justice. Its activities include the identification and follow-up of computer security incidents, protection of industrial and critical infrastructure and launching national public awareness campaigns on information security.

Source: www.cns.gob.mx/portalWebApp/wlp.c?__c=fdd.

Conclusion

This chapter focused on public policies to increase the management of digital security risk for economic and social prosperity, as distinct from aspects of cybersecurity related to technology, law enforcement, national security and defence. It introduced the key elements of national strategies that can create framework conditions to increase trust for all stakeholders, so that ICTs and the digital environment can be used for economic and social prosperity. These elements include the understanding of risk management as an approach that is focused on the activities that rely on the digital environment, rather than only on the digital environment itself.

The chapter also indicated existing measurement and impact assessment tools and provided an overview of public policy efforts carried out in the LAC region. The general situation in the LAC region is that several countries have adopted national digital strategies or are in the process of implementing one. Unfortunately, the great majority of national digital strategies already adopted lack a clear, overarching long-term vision in relation to digital security risk and face a number of challenges, such as the creation and improvement of legal frameworks on digital security, the creation of operational security risk management capabilities, the clear distribution of responsibilities among government institutions; and international and multi-stakeholder co-operation. All indications are that the majority of LAC countries are not approaching digital security risk from the economic and social perspective as called for by the OECD. However, at the time of writing, this approach is still relatively new, and it is therefore not surprising that it is not yet reflected in current policy frameworks.

Finally, the chapter introduced a number of good practices to encourage digital security risk management policies and strategies, based on the 2015 OECD *Recommendation on Digital Security Risk Management for Economic and Social Prosperity* and its companion document (OECD, 2015a). In particular, policy makers should recognise that digital security risk is an economic and social issue rather than solely a technical challenge. They should also note that it is impossible to create a fully safe and secure digital environment where risk is entirely avoided. As a consequence, they should encourage an approach where leaders and decision makers take responsibility to manage the risk. That means to reduce it to an acceptable level, depending on the context and the economic and social objectives and benefits at stake. All measures in national cybersecurity strategies should reflect this approach, whether they relate to critical information infrastructure, international co-operation or CSIRTs.

Notes

1. Stop.Think.Connect is available at: *www.stopthinkconnect.org/*.
2. OAS Cyber Security program is available at: *www.sites.oas.org/cyber/en/pages/default.aspx*.

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ANNEX 14.A1

References to national digital security strategies and national legislation in the LAC region

Country	National digital security strategies and national legislation
Argentina	**Decree 3/2013 Model on Information Security Policy for the National Public Administration** published by the National Director of the Office of Information Technologies on 27 August 2013: *www.infoleg.gob.ar/infolegInternet/anexos/215000-219999/219163/norma.htm*
Brazil	***Comitê Gestor da Internet no Brasil* (CGI.br)**: *www.cgi.br/* **Center for Security and Incident Computer Networks of the Federal Public Administration of Brazil** (CTIR Gov): *www.ctir.gov.br/* **Cert.br:** *www.cert.br/*
Chile	**Supreme Decree No. 1299 Programme for Improving Management and Information Security** *www.csirt.gob.cl/decreto_1299.html* **Computer Security and Incident Response Team (CSIRT-CL):** *www.csirt.gob.cl*
Colombia	**National Cyber Security and Cyber Defence Policy:** *www.oas.org/cyber/presentations/Presentaci%C3%B3n%20Ottawa%20Colombia.pdf* *Documento Conpes 3701* ***"Lineamientos de Politica para Ciberseguridad y Ciberdefensa"*** 14 July 2011: *www.mintic.gov.co/portal/604/articles-3510_documento.pdf* **Emergency Security Response Team of Colombia (Colcert):** *www.colcert.gov.co/*
Costa Rica	**National Cyber Security Strategy:** *www.oas.org/en/media_center/press_release.asp?sCodigo=E-063/15* **Executive Decree Nº 37052-MICIT that creates the national C-SIRT of Costa Rica:** *www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=72316&nValor3=88167&strTipM=TC*
Dominican Rep.	***Ley No. 53-07 sobre Crímenes y Delitos de Alta Tecnología de la República Dominicana:*** www.oas.org/juridico/PDFs/repdom_ley5307.pdf
Mexico	**National Digital Strategy and National Strategy for Information Security:** *www.presidencia.gob.mx/edn/* ***Programa Nacional de Seguridad Pública 2014-2018,*** published in the Federal Official Gazette on 30 April 2014: *http://dof.gob.mx/nota_detalle.php?codigo=5343081&fecha=30/04/2014* **Computer and Emergency Response Team (CERT-MX)** of the Scientific Division of Mexico's Federal Police (*División Científica de la Policía Federal*): *www.cns.gob.mx/portalWebApp/wlp.c?__c=fdd*
Panama	**National Strategy on Cyber Security and Critical Infrastructure Protection:** *www.oas.org/cyber/events/Panama%20National%20Strategy.pdf* **Executive Decree No. 709 of 26 September 2011** establishing the **National Computer Security and Incident Response Team of Panama (CSIRT-Panama):** *www.gacetaoficial.gob.pa/pdfTemp/26880/34793.pdf*
Peru	**National Cyber Security Strategy:** *www.oas.org/en/media_center/press_release.asp?sCodigo=E-125/15* **Computer Security Incident Response Team (PeCERT):** *www.pecert.gob.pe/pecert-acerca-de.html*
Uruguay	**Computer and Security Emergency Response Center (CERTUy):** *www.cert.uy* ***"Seguro te conectas"* campaign:** *www.cert.uy/Seguro-te-conectas/*

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Chapter 15

Privacy protection

This chapter focuses on policy measures to protect privacy. It introduces the main elements of a government policy framework to protect privacy and provides an overview of the situation in the LAC region. Finally, it provides a set of good practices, with a focus on the need to promote privacy risk management as a useful and relevant methodology for all data controllers to protect privacy.

The increased collection and processing of personal data for economic and social activities that rely on the digital environment raises a number of privacy challenges. These must be addressed both to protect fundamental values and individual liberties, and to ensure a digital environment that inspires confidence and in which individuals can fully participate. Privacy protection frameworks, also known as "data protection" frameworks, aim to create the conditions for public and private organisations to process personal data to pursue economic and social objectives while protecting privacy. In general, they set the requirements that organisations must respect when they collect, process and share personal data, as well as the rights granted to individuals. Although privacy protection frameworks are generally developed at the national level, flows of personal data often cross borders, raising the issue of the interoperability of these frameworks. In addressing this, policy makers face a double challenge: i) developing a framework that protects privacy while promoting economic development; and ii) ensuring a sufficient level of international interoperability to prevent the privacy protection framework from hindering blocking or inhibiting international trade.

The *OECD Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data* (hereinafter OECD Privacy Guidelines) aim to assist policy makers in the development of privacy frameworks (OECD, 2013). They were initially adopted in 1980 and revised in 2013. They define key concepts used in this area ("personal data", "data controller" and so on) and include principles that can be used as a basis for privacy protection frameworks worldwide. The OECD Privacy Guidelines are high-level policy recommendations that can be used as a basis to develop a privacy protection framework with the flexibility to accommodate regional and local variations. Meanwhile, they should facilitate international interoperability for transborder flows of personal data. Most regional conventions, recommendations and standards for privacy and data protection are in line with the Privacy Guidelines, including the Council of Europe *Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data* (hereinafter Convention 108) (CoE, 1981),[1] the United Nations *Guidelines concerning Computerized Personal Data Files* (UN, 1990), the Asia-Pacific Economic Co-operation (APEC) *Privacy Framework* (APEC, 2005), the *International Standards on Privacy and Data Protection* (hereinafter the Madrid Resolution)[2] (AEPD and PFPDT, 2009) and more recently, the Organization of American States' (OAS) *Model Law on Data Protection* (OAS, 2014).

It is important to underline that privacy protection frameworks generally intersect with other frameworks, for example those governing digital security risk management (OECD, 2015), broadband policy and consumer protection, as well as with policies related to specific economic sectors such as health or finance.

This section presents a set of policy objectives, tools and measures for assessment in meeting key objectives to advance policies on privacy, data protection and e-identity. It provides an overview of the situation in the region based on national and regional indicators, points to good practices in the Latin America and Caribbean (LAC) region and establishes recommendations based on the work of international and regional organisations like the OECD and OAS.

Key policy objectives in the LAC region

Privacy protection is regulated in relevant instruments on international public law, such as the Universal Declaration of Human Rights (UN, 1948),[3] the International Covenant on Civil and Political Rights (UN, 1966a),[4] the International Covenant on Economic, Social and Cultural Rights (UN, 1966b)[5] and the Inter-American Convention on Human Rights (OAS, 1969).[6] It is therefore essential to ensure the continuity of privacy protection from the offline to the digital environment. However, the main policy objective is to develop and implement a policy framework that protects privacy while i) encouraging the use of the digital environment for economic and social prosperity; and ii) enabling transborder flows of personal data through appropriate international policy and legal interoperability. This general policy goal can be met through policy tools, such as:

Developing a national privacy strategy

A national privacy strategy that reflects a co-ordinated approach across governmental bodies is one of the key measures of national implementation included in the OECD Privacy Guidelines. Elements of the national strategy can include:

- the adoption of **laws protecting privacy**
- the establishment of **privacy enforcement authorities** with the governance, resources and technical expertise to exercise their powers effectively and to make decisions on an objective, impartial and consistent basis
- the encouragement and support of **self-regulation**
- the provision for **adequate sanctions and remedies** in case of failure to comply with laws protecting privacy
- the adoption of **complementary measures**, including education and awareness campaigns, skills development and the promotion of technical measures, that help to protect privacy.[7]

Implementing accountability

Accountability is one of the key principles of the OECD Privacy Guidelines. Data controllers[8] should be accountable for complying with measures that enshrine the other OECD privacy principles. A privacy protection framework can encourage data controllers to implement accountability by:

- setting up a **privacy management programme**
- being prepared to **demonstrate the propriety of its privacy management programme**, in particular at the request of a competent privacy enforcement authority or other entity responsible for promoting adherence to a code of conduct or similar arrangement that gives binding effect to the Guidelines
- providing notice, as appropriate, to privacy enforcement authorities or other relevant authorities where there has been a significant **security breach affecting personal data**. Where the breach is likely to adversely affect data subjects, a data controller should notify affected data subjects.[9]

Free flow and legitimate restrictions

Recognising that a data controller remains accountable for personal data under its control without regard to the location of the data, the OECD Privacy Guidelines call on countries to refrain from restricting transborder flows of personal data (TBDF) between

themselves and another country and for any restrictions to TBDF to be proportionate to the risks presented, taking into account the sensitivity of the data, and the purpose and context of the processing.[10]

International co-operation and interoperability

LAC countries should co-operate in the enforcement of privacy laws and facilitate international interoperability of privacy frameworks. This implies, for example:

- taking appropriate measures to **facilitate cross-border privacy law enforcement** co-operation, in particular by enhancing information sharing among privacy enforcement authorities
- encouraging and supporting the **development of international arrangements that promote interoperability among privacy frameworks** that give practical effect to the OECD Privacy Guidelines
- encouraging the development of **internationally comparable metrics** to inform the policy making process related to privacy and transborder flows of personal data
- making public the details of their observance of the **international or national privacy guidelines.**

Tools for measurement and analysis for the LAC region

There is no general agreement on indicators to measure the various aspects of privacy protection policy frameworks. However, in the context of their reporting and transparency obligation, privacy enforcement authorities generally publish an annual report reflecting their activities. This includes statistics on, for example:

- number of complaints received
- number of requests for information from individuals and data controllers
- number of fines, etc.

Unfortunately, the methodologies to collect and aggregate data are generally not comparable, and there is no systematic comparative analysis of these statistics, whether at the regional or international level.

Overview of the situation in the LAC region

National privacy strategies

None of the countries in the LAC region have a comprehensive national privacy strategy or programme. This is not surprising considering that the concept of national privacy strategy is relatively new. However, the proportion of LAC countries with privacy and data protection legal frameworks in place is relatively high (around 40%), and the number is growing.

Nine countries (Colombia, Costa Rica, Chile, the Dominican Republic, Ecuador, Mexico, Nicaragua, Peru and Uruguay) have privacy and data protection laws, including supervisory or regulatory authorities (Box 15.1). Brazil, Chile, Jamaica and Paraguay are in the process of consultation and drafting new laws in this area.

The great majority of countries in the LAC region, for example Brazil, Panama and El Salvador, have sectoral laws with scattered provisions on privacy and data protection, but no independent laws and regulations so far on data protection and national data protection authorities (OAS, 2015).

Box 15.1. **Selected national laws and regulations on privacy and data protection (2010-15)**

Colombia

- Statutory Law No. 1581 containing General Provisions for the Protection of Personal Data (17 October 2012)
- Decree No. 1377 that Partially Regulates Statutory Law No. 1581 of 2012 (27 June 2013)
- Decree No. 866 that Regulates the National Registry of Databases pursuant to Article 25 of Statutory Law No. 1581 (13 May 2014).

Costa Rica

- Law No. 8968 of Protection of the Individual for the Processing of his Personal Data (5 September 2011)
- Regulation of Law No. 8968 contained in Executive Decree No. 37554-JP (30 October 2012).

Dominican Republic

- Law No. 172-13 on Protection of Personal Data (26 November 2013).

Mexico

- Federal Law on Data Protection in the Possession of Private Parties (5 July 2010)
- Regulation of the Federal Law on Data Protection in the Possession of Private Parties (19 December 2011)
- Self-Regulation Standards on Protection of Personal Data (29 May 2014).

Nicaragua

- Law No. 787 on Protection of Personal Data (29 March 2012).

Peru

- Regulation of Law No. 29733 of Protection of Personal Data (22 March 2013)
- Law No. 29733 of Protection of Personal Data (3 July 2011).

Law enforcement continues to be a challenge in the LAC region. The proportion of countries with an independent national Data Protection Authority (hereinafter DPA) is very low. Only two countries (Mexico and Uruguay) have a fully independent and autonomous DPA. In other countries, the DPA is part of a ministry, as in Colombia (Ministry of Economy), Costa Rica and Peru (Ministry of Justice) and Ecuador (Ministry of Telecommunications and Information Society).

Policy makers in the LAC region tend to view privacy and data protection as a legislative and regulatory issue, rather than from the economic and social public policy perspective.

Implementing accountability

The concept of accountability has not yet gained wide acceptance in the LAC region. Only Mexico[11] incorporates this concept in its national data protection legislation and regulation. Colombia recently published a guide for the implementation of accountability in organisations as part of the implementation of Articles 26 and 27 of Decree No. 1377 of 27 June 2013 (SIC, 2014). However, the extent of the use of this principle by data controllers is not entirely clear. The implementation of a privacy management programme is not compulsory under most data protection laws of LAC countries.

Free flow of data and legitimate restrictions

There are remarkable differences of approach to the regulation of transborder data flows and restrictions on the transfer of personal data from LAC countries to third countries. The proportion of countries with restrictions and regulations on the free flow of information is quite high. Six countries (Argentina, Colombia, Costa Rica, Mexico, Peru and Uruguay) have provisions that stipulate special conditions for national and international transfers of personal data, as well as the use of mechanisms to export information to third countries, which includes model contractual agreements and clauses and binding corporate rules (Velasco, 2015).

International co-operation and interoperability

The proportion of countries with international co-operation agreements and other mechanisms for the exchange of information for the enforcement of cross-border privacy is very low. Only three LAC countries (Argentina, Colombia and Mexico) are part of the OECD's Global Privacy Enforcement Network (GPEN).[12]

The concept of privacy interoperability has not yet gained wide acceptance in LAC countries. The proportion of LAC countries promoting interoperability with other privacy frameworks is very low. Only Mexico participates in the APEC's Cross-Border Privacy Rules (CBPR) System (Box 15.2).[13] This country is seeking the interoperability of its national framework on data protection – in particular the implementation of self-regulation schemes through certification agents – with APEC economies. Other LAC countries, such as Chile and Peru, are also members of the APEC.

Box 15.2. **Countries on interoperability with other data protection frameworks**

Mexico

Mexico, through the *Instituto Nacional de Transparencia, Acceso a la Información y Protección de Datos Personales* (INAI), participates in APEC's Cross-Border Privacy Enforcement Arrangement (CPEA). This is a vehicle for regional co-operation in enforcing privacy laws among APEC member economies. Mexico is the only LAC country promoting interoperability with other data protection frameworks. Mexico's Ministry of Economy has participated in APEC's Cross-Border Privacy Rules (CBPR) System since February 2013.

Source: APEC (2009), *APEC Cross-Border Privacy Enforcement Arrangement (CPEA)*, *www.apec.org/Groups/Committee-on-Trade-and-Investment/Electronic-Commerce-Steering-Group/Cross-border-Privacy-Enforcement-Arrangement.aspx*.

Notification of data breaches and enforcement of data protection laws

Data security breaches are on the rise in LAC countries. Only three countries (Colombia, Costa Rica and Mexico) have established in their data protection legal framework obligations to notify affected data subjects and imprisonment sanctions for data controllers in case of a data breach (Box 15.3).

Box 15.3. **Selected laws and regulation with data breach notification obligations**

Colombia

Article 17(n) of Statutory Law No. 1581 establishes the obligation for data controllers to inform data protection authorities when security breaches occur and present risks in the administration of information of data subjects. Article 18(k) establishes an obligation to inform the *Superintendencia de Industria y Comercio* (DPA) when security breaches occur and to present risks in the administration of information of data subjects. The law provides fines for the equivalent of 2 000 days of minimum wage and the suspension of activities for six months.

Source: Colombia (2012), *Ley Estatuaria No. 1581 – Disposiciones Generales para la Protección de Datos Personales*, *www.sic.gov.co/drupal/sites/default/files/normatividad/Ley_1581_2012.pdf*.

Costa Rica

Articles 38 and 39 of Regulation of Law No. 8968 of Protection of the Individual for the Processing of his Personal Data establish an obligation for data controllers to inform data subjects on any irregularity in the processing and storage of their personal data as a result of a security vulnerability within five working days from the day the vulnerability occurred, to initiate a comprehensive review to determine the magnitude of the breach and the corrective and preventive measures to be taken and to inform both data subjects and the DPA (PRODHAB).

Source: Prohab (2011), "Marco Jurídico", *www.prodhab.go.cr//conozcanos/?marco-juridico*.

Mexico

Article 20 of the Federal Law on Data Protection in Possession of Private Entities (FLDPPPP) establishes obligations for data controllers to immediately inform data subjects in case of a data breach. Articles 67 and 69 of the FLDPPPP set forth imprisonment sanctions from three months to three years. The punishment may be doubled when sensitive information is involved. The former IFAI (now INAI) used the data breach notification provision of the FLDPPPP to request from Sony Mexico a report of the affected users located in national territory when the data breach scandal of Sony's Play Station Network and Qriocity occurred between 17 and 19 April 2011.

INAI enforced the data breach notification provisions of the FLDPPPP to request the national retailer *Puerto de Liverpool* S.A.B. information regarding the status of its databases containing personal information of employees and customers as a result of a data breach that occurred in December 2014.

Source: Mexico (2010), *Ley Federal de Protección de Datos Personales en Posesión de los Particulares*, *http://inicio.ifai.org.mx/LFPDPPP/LFPDPPP.pdf*.

Although enforcement of data protection laws still needs to be improved in LAC countries, some DPAs have started to levy fines and sanctions for noncompliance against data processors and data controllers (Box 15.4).

Summary of the overall situation

In recent years, many LAC countries have passed laws, regulations and policies to protect privacy and personal data as a fundamental human right, in line with various international and regional instruments on data protection. Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, Mexico, Nicaragua, Peru and Uruguay are among the LAC countries with data protection legislation and regulation in force.

Box 15.4. **Selected NDPAs levying sanctions for noncompliance with data protection laws**

Mexico

Mexico's DPA (INAI) is perhaps one of the leading enforcement authorities in the region. INAI reports a total of 21 sanction procedures for an estimate amount of USD 6.6 million (MXP 108.3 million) from January 2012 to 22 May 2015, divided into the following segments:

- insurance and financial services: USD 3.17 million (14 sanction procedures)
- massive media and information sector: USD 1.86 million (4 sanction procedures)
- education services sector: USD 612 394 (3 sanction procedures).

Source: INAI (2015), "Autoridades de Protección de datos de la Región – Retos Mundiales de Supervisión", *3er Congreso de Protección de Datos: Privacidad en la Práctica*, *www.sic.gov.co/recursos_user/memorias_3congreso_proteccion_datos/GUSTAVO_PARRA.pdf*.

Peru

Despite the recent enactment of the Regulation of Law No. 29733 of Protection of Personal Data, the DPA in Peru reports five procedures resulting in economic sanctions and fines against data controllers.

Source: MINJUS (2016), *Procedimientos administrativos sancionadores*, *www.minjus.gob.pe/procedimientos-administrativos-sancionadores/*.

Only one country (Mexico) has moved to a pro-active co-regulatory approach that includes the use and implementation of binding self-regulation on data protection. It has minimal regulatory restrictions on cross-border data flows, to facilitate trade and the exchange of data with third countries while encouraging technology innovation. However, the majority of countries of LAC still face numerous challenges, including:

- pro-active enforcement of data protection laws and regulations by the DPA
- encouragement of privacy management programmes that include obligations to respond, notify and provide redress to data subjects in case of a security breach affecting personal information
- harmonised cross-border privacy co-operation with other DPAs and law enforcement authorities, and encouragement of interoperability with other regional and national frameworks on privacy and data protection (e.g. APEC's Privacy Framework).

The majority of LAC countries have not developed national privacy strategies that take into consideration the recommendations in the OECD Privacy Guidelines. In addition, DPAs in LAC countries have not been conducting ongoing national campaigns for the protection of personal data that help to comply with the laws and regulations on privacy and data protection and to inform users about the mechanisms available to help them exercise their data protection rights.

Implementation of cross-border co-operation agreements to enforce privacy laws in LAC countries is limited. Only Argentina, Colombia and Mexico are members of the GPEN through their respective DPAs. National budget constraints are likely to be among the reasons for this, given that few countries have allocated annual budgets in this area.

In the field of cross-border data transfers, the legal frameworks of Peru and Colombia establish conditions to conduct international data transfers to third countries based on the adequacy level of protection contained in the European Union Data Protection Directive of 1995[14] and the draft European Union General Data Protection Regulation.[15] Paradoxically, neither Colombia nor Peru has yet met the adequacy level of protection standard of

the European Commission.[16] Only the data protection laws and regulations of Argentina[17] and Uruguay[18] have met the European Union adequacy decision standard. However, after the decision handed down by the Court of Justice of European Union (CJEU) in October 2015 (CJEU, 2015), some uncertainty remains over the status of the adequacy decisions related to Argentina and Uruguay.

The data protection laws of Colombia, Peru and Mexico contain provisions for the use of standard contractual clauses, binding corporate rules and other legal instruments to conduct international transfers of data to third countries. However, such mechanisms have not yet been fully implemented at a practical level, and the DPAs of LAC countries have not yet made official statements on the validity of such instruments.

Good practices for the LAC region.

Good regulatory practice in the area of privacy protection includes the promotion of privacy risk management[19] by the policy makers of LAC countries, as a useful methodology for data controllers to protect privacy.[20] This is perhaps one of the greatest challenges in the region, since it is a novel concept and the consensus is that "work is needed to understand practical applications and implications" of privacy risk management.

National privacy strategies should incorporate each of the policies contained in Part Five of Principle 19 of the OECD Revised Privacy Guidelines (Box 15.5).

Box 15.5. **Policy recommendations for national Implementation of the OECD privacy framework**

- Develop national privacy strategies that reflect a co-ordinated approach across governmental bodies
- adopt laws protecting privacy
- establish and maintain privacy enforcement authorities with the governance, resources and technical expertise necessary to exercise their powers effectively and to make decisions on an objective, impartial and consistent basis
- encourage and support self-regulation, whether in the form of codes of conduct or otherwise
- provide for reasonable means for individuals to exercise their rights
- provide for adequate sanctions and remedies in case of failures to comply with laws protecting privacy
- consider the adoption of complementary measures, including education and awareness raising, skills development, and the promotion of technical measures that help to protect privacy
- consider the role of actors other than data controllers, in a manner appropriate to their individual role
- ensure that there is no unfair discrimination against data subjects.

Source: OECD (2013), *OECD Privacy Framework*, *www.oecd.org/internet/ieconomy/privacy-guidelines.htm*.

The broad implementation of the accountability principle is also relevant. The actions contained in Principle 15 of the OECD Revised Privacy Guidelines need to be implemented by both data controllers and data processors (Box 15.6).

Box 15.6. **OECD Principles for Implementing Accountability**

A data controller should:

- Have in place a privacy management programme that:
  - gives effect to these Guidelines for all personal data under its control
  - is tailored to the structure, scale, volume and sensitivity of its operations
  - provides for appropriate safeguards based on privacy risk assessment
  - is integrated into its governance structure and establishes internal oversight mechanisms
  - includes plans for responding to inquiries and incidents
  - is updated in light of ongoing monitoring and periodic assessment.
- Be prepared to demonstrate its privacy management programme as appropriate, in particular at the request of a competent privacy enforcement authority or another entity responsible for promoting adherence to a code of conduct or similar arrangement giving binding effect to these Guidelines.
- Provide notice, as appropriate, to privacy enforcement authorities or other relevant authorities where there has been a significant security breach affecting personal data. Where the breach is likely to adversely affect data subjects, a data controller should notify affected data subjects.

Source: OECD (2013), *OECD Privacy Framework*, *www.oecd.org/internet/ieconomy/privacy-guidelines.htm*.

Policy makers should encourage balanced policies on TBDF and legal instruments, such as for example model contractual clauses and agreements and binding corporate rules for the transfer and process of personal data across different regions.

To encourage policies on privacy, active participation in international and regional enforcement networks on cross-border privacy networks is also important. These would include the GPEN and APEC's Cross-Border Privacy Enforcement Arrangement (CPE) and national data protection laws' interoperability with other regional data protection frameworks to reinforce the protection of personal information of data subjects across borders.

Conclusion

This chapter focused on policy measures to develop and implement a policy framework that protects privacy while encouraging the use of the digital environment for economic and social prosperity and enabling transborder flows of personal data through appropriate international policy and legal interoperability. It introduced the main elements of a privacy policy framework: a national privacy strategy including relevant legislation and a privacy enforcement authority, measures to encourage self-regulation and the adoption of privacy management programmes to increase accountability by data controllers, as well as mechanisms to facilitate interoperability of privacy frameworks across borders.

In addition, after underlining the lack of indicators to measure the various aspects of privacy protection, this chapter provided an overview of the situation in the LAC region. While no LAC country has yet developed a national privacy strategy, a relatively new concept, several have associated legislation and a privacy enforcement authority and others are currently developing their framework. Only a few countries in the region are part of an international co-operation agreement, and the concept of accountability has not yet gained wide acceptance in the region.

Notes

1. This convention, like most European legal instruments on data protection, is currently going through a reform and modernisation process.
2. The Madrid Resolution was adopted on the 5 November 2009 at the annual meeting of the International Conference of Data Protection and Privacy Commissioners (ICDPPC), a global forum of field experts and the highest authorities and institutions guaranteeing data protection and privacy (AEPD and PFPDT, 2009).
3. See Article 12.
4. See Article 17.
5. See Article 5.
6. See Article 11.
7. See Part Five, principle 19 of the OECD Revised Privacy Guidelines (OECD, 2013).
8. According to the OECD Privacy Guidelines (OECD, 2013), a data controller is the "party who, according to national law, is competent to decide about the contents and use of personal data regardless of whether or not such data are collected, stored, processed or disseminated by that party or by an agent on its behalf".
9. See Part Three, principle 15 of the OECD Revised Privacy Guidelines (OECD, 2013).
10. See Part Four, principles 16, 17, 18 of the OECD Revised Privacy Guidelines (OECD, 2013).
11. See Articles 6 and 14 of the Federal Law on Data Protection in Possession of Private Entities (FLDPPPP) and Articles 47 and 48 of the Regulation of the FLPPDPP.
12. GPEN was established as part of the implementation of the 2007 OECD *Recommendation of the Council on Cross-border Co-operation in the Enforcement of Laws Protecting Privacy* (OECD, 2007). GPEN's website is available at *www.privacyenforcement.net*.
13. APEC's Cross-Border Privacy Rules (CBPR) System is available at *www.cbprs.org/default.aspx*.
14. See Chapter IV (Articles 25 and 26) of Directive 95/46/EC of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data (European Parliament and Council of EU, 1996).
15. For information about the adoption of the draft Regulation, see *http://ec.europa.eu/justice/newsroom/data-protection/news/index_en.htm*.
16. *Ibid*., note 45, p. 895.
17. As stated in the Commission Decision of 30 June 2003 pursuant to Directive 95/46 of the European Parliament and of the Council on the adequate protection of personal data in Argentina (EC, 2003).
18. As stated in the Commission Executive Decision C (2012) 5704 of 21 August 2012 pursuant to Directive 95/46 of the European Parliament and of the Council on the adequate protection of personal data in the Republic of Uruguay (EC, 2012).
19. In the opinion of the Centre for Information and Policy Leadership at Hunton & Williams, "the role of risk management is a valuable tool for calibrating the implementation of and compliance with privacy requirements, prioritizing action, raising and informing awareness about risks, identifying appropriate mitigation measures and, in the words of the Article 29 Working Party, providing a 'scalable and proportionate approach to compliance'". See pp. 1-3 of Centre for Information Policy Leadership (2014).
20. Paragraph Six and Principle 15(a)(iii)(vi)(c) of the OECD Revised Privacy Guidelines takes into consideration the role of "risk assessment approach" in the development of policies and safeguards to protect privacy.

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