

# Telecommunication Sector Policies for the Development of Information and Communication Technologies in Panama

Part I

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Country Department for Central  
America, Haiti, Mexico, and the  
Dominican Republic

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# Telecommunication Sector Policies for the Development of Information and Communication Technologies in Panama Part I

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## Executive Summary

Information and Communication Technologies (ICT) are the foundational stone of progress. Information transmission is at the heart of activities such as education, governance, health, and commerce. In education, access to information makes all the difference; simply compare that time and effort required to learn about the French revolution by going to a library or using a smartphone at home. Commerce is similar, searching online for the best price and quality requires little time and effort. Without ICT finding the best price and quality requires costly investments, often leading to bad purchases. For example, consider acquiring a car. An online-informed buyer will have access to the best prices and information, including the likelihood and cost of repairs and depreciation. Without simple and cheap access to information, a bad purchase is more probable; leading to a costly ownership and faster replacement – an unfortunate outcome since a car is a sizable portion of a family's wealth in developing countries.

Having reliable and meaningful access to information is no little feat for a country. Infrastructure needs to be in place; from the big cables – the backbone – that carry data from state to state to the fiber or copper cable connecting a home and the spectrum used by mobile phones. Infrastructure needs to be everywhere, from the rich and dense urban areas to the sparse rural areas. Users require an affordable device and services to access information. Finally, content needs to be high-quality and comprehensive.

Public policy is fundamental. Most of the infrastructure involved in ICT displays economies of scale and scope, requiring careful economic regulation to guarantee competition and steady investments. In addition, public policy is also needed to achieve social goals like universal coverage and penetration.

This document is the first of a two-volume study that provides a policy guideline that draws from international experience and economic analysis to recommend some policies that are expected to foster the development of ICT in Panama.

This volume contains three chapters. The first chapter provides a comparative assessment of telecommunication policies that are linked to the development of ICT in Latin America and the world. The second chapter presents a comprehensive number of e-applications and services successfully launched in the region and the world. The third and final chapter identifies Panama's current gaps in regulation and infrastructure; additionally, it measures the potential benefits of adopting the best policies.

This volume finds gaps in policy, infrastructure, and e-applications. On the policy side, the biggest difference from comparable best-practice is the concessions model. In Panama, the government defines 20-year telecommunication concessions and interested parties bid on them. These concessions include spectrum and rights to future spectrum allocations. This model prevents free entry and reduces market innovation. The best practice involves allowing free entry and allocations of spectrum band on a competitive basis, an auction preferably. The Panama policy distorts prices and allocations as new allocations or spectrum are not open to competition or price discovery. A second gap in policy is related to dominance. Panama conducts yearly reviews of dominance but lacks clear measures and methods to deal with dominance.

On the infrastructure side, the biggest gap with respect to comparable best-practices is the lack of spectrum allocated to mobile services. In Panama, the total amount of spectrum is about half of comparable countries. This lack of spectrum leads to less quality of service. A related gap is the price of the allocated spectrum, Panama's spectrum is among the most expensive allocations in comparable countries; producing higher prices for services.

On e-applications, there is a considerable gap on e-government. Compared to other countries, Panama offers little information to the public and a minor level of engagement on e-consultations processes.

## Introduction

This volume identifies ICT policies that are expected to have the greatest impact if implemented in Panama; especially those related to e-applications. The analysis relies on evaluating the outcomes of ICT policies around the world and then compare those policies to Panama's greatest gaps. This study can provide a policy pipeline worth of further analysis, adaptation, and implementation.

Broadly speaking, ICTs are those technologies that allow us to communicate and exchange information. In this volume, ICTs will cover two technologies: telecommunications (fixed and wireless networks) and the internet. These technologies are vital for the development of society because information is vital. These technologies allow scientist to access the latest discoveries, help consumers acquire the best products at the best prices, and let families share moments through pictures, videos, and text.

On a global scale, ICT's have become a crucial input on economic growth and social development. On the one hand, investments in ICT infrastructure create jobs, increase returns to public and private investments and improve the value added to the economy. In 2014, ICT sector contributed 3.91% to total value added and 2.51% to employment in the Europe Union.<sup>1</sup> In Panama, the impact of digitalization on GDP growth was 4.74% between 2005 and 2013, higher than the Latin America value of 4.30%. Furthermore, the telecommunications sector represents 1.2% of all employment in Panama (Katz 2015).

There are many academic studies on the importance of ICT to economic growth. Jorgenson et al. (2016) estimate a possibility frontier model, which allows a decomposition of economic growth on labor services, quality of labor, total factor productivity, ICT capital and non-ICT capital, they find ICT capital investments produce 0.5% of world economic growth between 2005 and 2012. Using panel data from 49 countries from 2000 to 2013 Nath et al. (2017) estimates the impact of ICT on import and export of services. They find 1% increase of ICT explains exports 19% for the export of financial services, 24.3% for other business services and 14% for transportation services, on the same way 1% increase of ICT explains 24% for imports financial services, 34.6% for insurance services, 17.4% for other business services, 15.4% for royalty and license fees, 22.2% for telecommunication services, and 17.8% for travel services.

Equally significant articles have specifically studied the economic impact of broadband infrastructure. Czernich et al. (2009) find that a 10 percentage-point increase in broadband penetration raises annual per-capita growth by 0.9-1.5 percentage points. At the firm level, Fornefeld et al. (2008) find that companies adopting broadband-based processes improve their employees' labor productivity on average by 5% in the manufacturing sector and by 10% in the services sector. In pursuance of improving the economic impact of broadband the author highlights the importance of foster the use of online services, high education level, broadband infrastructure and support to innovation. However, the crucial point is that the specific intensity of innovation, education, infrastructure, and usage of e-services will depend on each country-specific characteristics.

Regarding the importance of ICT in a more comprehensive environment, Katz (2015) performs a detailed study of ICT impact on Latin America countries. It contains the impact of digitalization on economic growth and value-added, regional studies of ICT market structure, general recommendations to the public sector, the proliferation of Latino America digital industry and its main challenges. One of the main contributions is the description of why

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<sup>1</sup> ICTs contribution to GDP varies significantly across countries. For instance, in Ireland ICT's share is around 11.27% whereas it is around 1.11% in Russia. Data from <https://ec.europa.eu>.

Latin America is still underdeveloped, the article shows two reasons: inefficiency in public sector resource allocation, and scarce investment from the private sector.

About inefficiency in public sector resources allocation, Katz (2015) estimates Latin America public sector spends 19.1 billion dollars per year on ICT research and development distributed on 107 programs; The author argues there are too many entities and programs which highly fragment ICT investment, this is a source of inefficiency as there could be redundant entities on the economy. In relation to scarce investment from the private sector on Latin America, there is geographical and sectoral concentration, between 2010 and 2013 65% of all investment funds were concentrated on Brazil, and only 3% were allocated on start-ups investments (in contrast to later-stage investments) a fact that reduces ICT entrepreneurship.

Given their paramount importance, ICTs are actively fostered by governments around the world. In general, governments identify key objectives that are of national interest and pursue them by making policies through each branch of government. In principle, governments might have different objectives, different ways measuring progress with respect to those objectives, and different tools to foster progress.

This variety of objectives – metrics – policies provides a rich data set to select a list of ICT policies expected to have the greatest impact in Panama. The following section outlines the methodology. The first chapter contains the identification of the universe of policies pursued in the region. The second chapter presents a comprehensive number of e-applications and services successfully launched in the region and the world. The third and final chapter identifies Panama's current gaps in regulation and infrastructure and measures the potential benefits of adopting the best policies.

## Methodology

This study delivers an economic analysis that quantifies the potential benefit of adopting one or several policy recommendations that are expected to boost the ICT sector in Panama, specially e-applications. The methodology follows five steps:

1. Clear Identification of policy objectives
2. Definition of a set of metrics to measure each objective's progress
3. Selection of comparable countries
4. Identification of a set of policies used in comparable countries
5. Analysis of the policies efficacy

This study follows the set of objectives identified as fundamental in the Latin American and the Caribbean toolkit by OECD-IDB (2016) (the "toolkit"). This "[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." This study benefits greatly from the guidelines offered in the toolkit and identifies the policies that could have the greatest impact in Panama. The set of policies under consideration are listed in Table 1.

Table 2 identifies two sets of metrics to measure progress with respect to the objectives identified in the toolkit. The first set represents "core" metrics widely available and maintained by institutions like the International Telecommunication Unit and the World Bank; metrics like mobile broadband penetration and mobile population coverage belong to this group. The second set represents "complementary" metrics that required additional calculations to be useful in this analysis. Prices per GB and prices per Mbps belong to this second group.

In principle, the universe of policies that could be used by policymaker is vast and varies across regions and time. The intention of this study is not to define some arbitrary set of “optimal” policies but to look at the set of policies that similar countries have used to achieve their goals. To this end, six countries were selected based on their “similarity” to Panama based on the core set of telecommunication metrics and some macroeconomic variables. Appendix A details the methodology used to define similarity.

The universe of policies comprises three sectors and three branches of government. The sectors under consideration are fixed networks, wireless networks, and the internet. Since policies are executed at all levels of government, this study includes the legislative, the executive and the judicial powers. For the legislative power, the analysis considers the latest major legal reforms in the telecommunication sectors. For the executive power, the “digital agendas,” and the “national infrastructure plans” are analyzed. For the judicial power, the outcome and stakes of the latest major legal cases are considered.

The full analysis is developed over the next three chapters. The first chapter provides a comparative assessment of telecommunication policies in the comparable countries. This is a review of the main policies followed in the region and the status of each country with respect to the objectives contained in the toolkit.

The second chapter presents a comprehensive number of e-applications and services successfully launched in the region and the world. This chapter includes the latest government initiatives related to new technologies like the Internet of Things, Big Data and Machine Learning.

Based on the first two chapters, the third and final chapter identifies Panama’s current gaps in regulation and infrastructure and measures the potential benefits of adopting the best telecommunication and e-application policies.

The following tables summarize the telecommunication objectives, metrics, and policies considered in the analysis.

*Table 1 Objectives*

<b>Objectives</b>	
1. Maximize the social and economic utility of spectrum use	2. Lowering, and where appropriate, eliminating administrative entry barriers
3. Increase the availability, penetration, and use of telecommunications services	4. Facilitating efficient access to rights of way and passive infrastructure
5. Provide a level field for competition in allocating spectrum	6. Ensuring effective and efficient interconnection
7. Establishing an investment-friendly environment	8. Facilitating demand-side competition
9. Monitoring and assessing dominance	10. Encouraging private investment extending broadband access
11. Ensuring access to infrastructure controlled by dominant operators	12. Solving critical bottlenecks for infrastructure deployment and use

Table 2 ICT Metrics and Macroeconomic Indicators

Sector	Metric	Core
Spectrum	Assigned Spectrum	
	Prices per MHz/Pop/Year	
Mobile Networks	Coverage	*
	Penetration	*
	Unique Mobile Subscribers	*
	Broadband Penetration	*
	Average Mbps	
	Prepaid Cellular tariffs	*
	Prices per Mobile GB	
	Prices per Mobile Minute	
	Data per Subscription	
	Fixed Networks	Penetration
Broadband Penetration		*
Internet tariffs		*
Prices per Mbps		
Internet	Internet Bandwidth per user	*
	Households with Internet access	*
	Secure Internet Servers	*
	Individuals using Internet	*
Investment & Competition	Global Competitiveness Index	
	Network Readiness Index	*
	Investment in telecoms	
	Mobile Churn	
	Mobile Subs HHI	
	Mobile Dominant Market Share	
Fixed Subscribers HHI		

e-applications	Fixed Dominant Market Share	
	Spectrum HHI	
	Spectrum Dominant Market Share	
	ICT use for business-to-business transactions	*
	Business-to-consumer Internet use	*
	Importance of ICTs to gov't vision	*
	Government Online Service	*
	Gov't success in ICT promotion	*
	Impact of ICTs on business models	*
	Impact of ICTs on access to basic services	*
	Internet access in schools	*
	ICT use & gov't efficiency	*
	E-Participation Index	*
Macroeconomic Indicators	Population	
	Urban Population	
	Dense Population	
	Population density	
	Urban Population density	
	Land area	
	Urban land area	
	GDP per capita PPP	
	GINI coefficient	

Table 3 Universe of Policies in Comparable Countries

### Policies

a. Spectrum assignment process	b. Number portability and device ownership
c. Coverage requirements	d. Price policies
e. Directed provision of services	f. Dominance definitions and measures
g. Universal Funds Programs	h. Infrastructure sharing policies
i. Limitations to foreign investments	j. License length and flexibility

k. Regulators autonomy

l. Protection of personal data

### Information and Communication Technologies in Panama – A primer

Panama is the fastest growing country in Latin America; its Gross Domestic Product (GDP) has been growing annually between 4.9% and 6.6% between 2013 and 2016. In 2017, Panama's expected GDP growth rate is around 5.9% whereas the Latin American average is 1.3%.

The telecommunications sector is significantly important in Panama. ICT accounts for 8% (or \$4,415 million) of Panama's Gross Domestic Product (GDP) in 2016 and generates 3.7% of total tax collection. The telecommunication and information sector accounts for 1.4% (24,753 direct jobs) of the total employment in 2017 in the country. Access to the internet has grown steadily over the last years; Between 2009 and 2016 Fixed and Mobile Broadband Subscriptions have grown at a CAGR of 8.33% and 135%, respectively. The telecommunications sector is not only important in size but contributes around 10% of the economic growth.<sup>2</sup> The economic importance of the telecommunications sector is only expected to increase. Total revenues in the telecommunications industry grew at a 5.29% CAGR between 2010 and 2016 and represented 2.03% of the national GDP in 2016, down from 2.82% in 2010.<sup>3</sup>

ICT sector and telecommunication sector as stated below, it represents 8% and 2% of GDP respectively, this 6% non-explained by telecommunication sector is explained by other sectors that are digitalized or have been digitalizing their services and modernizing their production structure.<sup>4</sup> In Panama, these ICT intensive sectors are tourism, logistic, agriculture, environmental, health, security, and education. This application of technology across all Panama industry is motivated by the national strategy of science, technology, and innovation (PENCYY) developed by the national secretary of science and innovation (SENACYT) and the private union of innovation telecommunication and information technologies (CAPETEC).

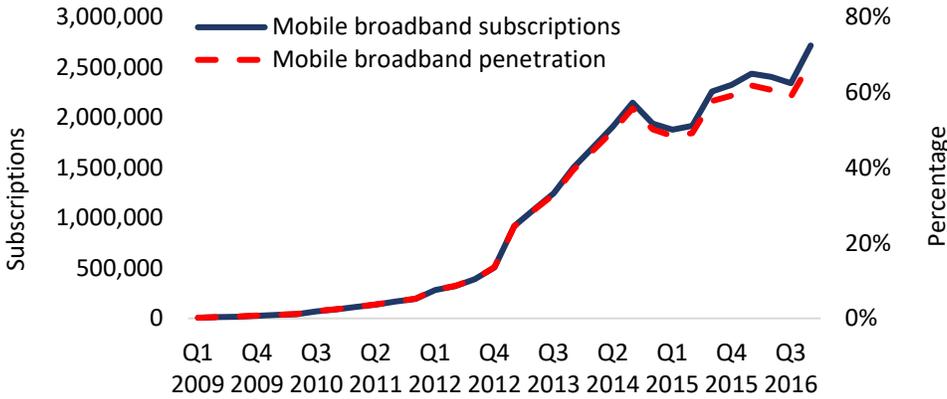
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<sup>2</sup> The Economic Impact of Broadband in Panama. Broadband Commission. The International Telecommunications Unit. 2012

<sup>3</sup> Data for ICT contribution to GDP from Panama digital Agenda 4.0, for tax collection from Katz (2012), for direct jobs from INEC, for broadband subscriptions OVUM and revenues of telecommunication sector from ASEP.

<sup>4</sup> It could be the case that sectors like education, health, security, among others be more intensive on ICT than telecommunication sectors.

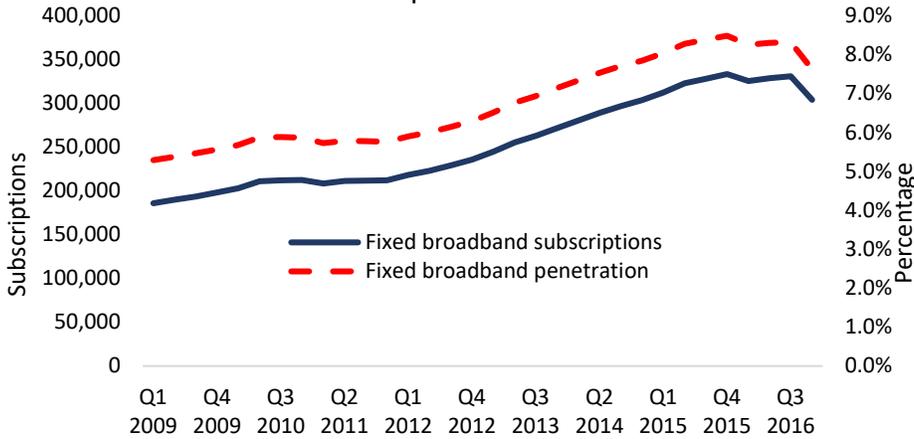
### Panama Mobile Broadband Subscriptions and Penetration



Source: OVUM

Figure 1 Panama Mobile Broadband Subscriptions and Penetration

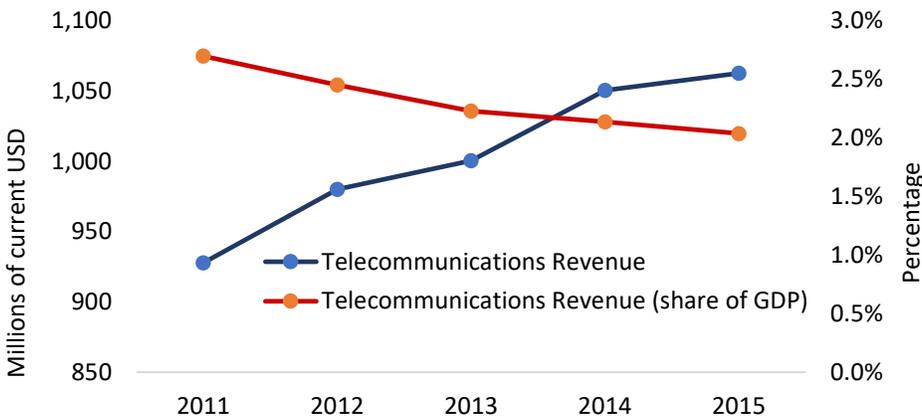
### Panama Fixed Broadband Subscriptions and Penetration



Source: OVUM

Figure 2 Panama fixed broadband subscriptions and penetration

### Panama telecommunication revenues



Source: revenue from ASEP, current GDP from World Bank.

Figure 3 Panama telecommunication revenues

## Comparative Assessment of Telecommunication Policy

The main objective of this chapter is to survey telecommunication policies in countries comparable to Panama. To define the set of countries that are considered “comparable,” the study gathers a core set of telecommunications metrics and macroeconomic indicators on 30 countries around the world and performs a similarity test.

The selected macroeconomic indicators are population, the percentage of urban population, dense population, population density, urban population density, land area, urban land area, and GDP per capita. These indicators have a strong influence on the performance of the ICT sector due to the economies of scale present on telecommunication networks. Dense urban populations usually provide complementary infrastructure, like electricity grids and paved roads, to efficiently deploy networks. Once deployed, the utilization of assets is directly proportional to the population density. Table 2 contains the macroeconomic indicators.

The core set of telecommunications metrics is organized around three categories: coverage, penetration, and affordability. Specifically, we focus on: mobile population coverage, households with Internet access, internet bandwidth per user, secure internet servers, unique mobile subs, mobile penetration, mobile broadband penetration, fixed penetration, fixed broadband penetration, individuals using the Internet, fixed broadband Internet tariffs, and prepaid mobile cellular tariffs. This core set of metrics is available for many countries and is kept up to date by industry leaders and international organizations. Table 4 contains the core telecommunication metrics.

Based on the entire dataset of macroeconomic indicators and the core ICT metrics, the set of comparable countries are Chile, Colombia, Costa Rica, Ecuador, Mexico, Spain.<sup>5</sup>

### Economic Indicators

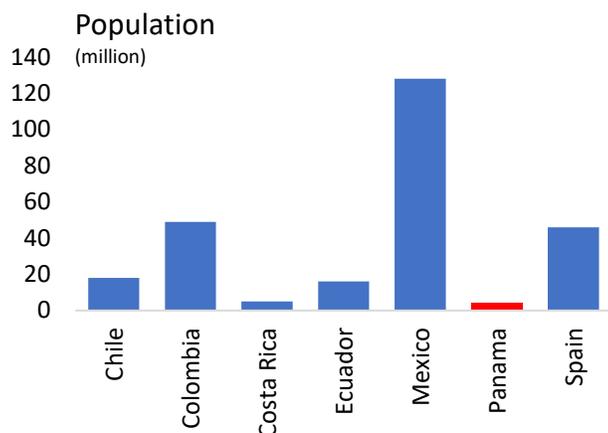


Figure 4 Economic indicators: Population

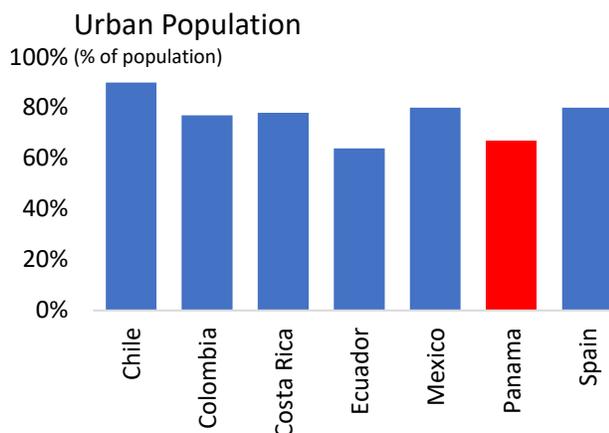


Figure 5 Economic indicators: Urban Population

<sup>5</sup> Mexico and Spain are included as reference countries. In the past, Panama has designed policies based on these countries. See, for example, the Panamanian digital agenda 2014-2019.

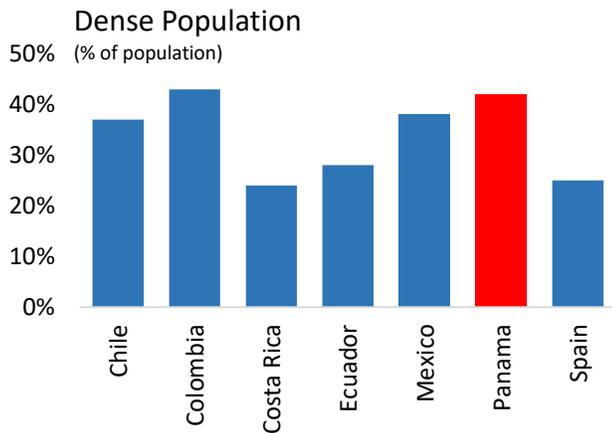


Figure 6 Economic indicators: Dense population

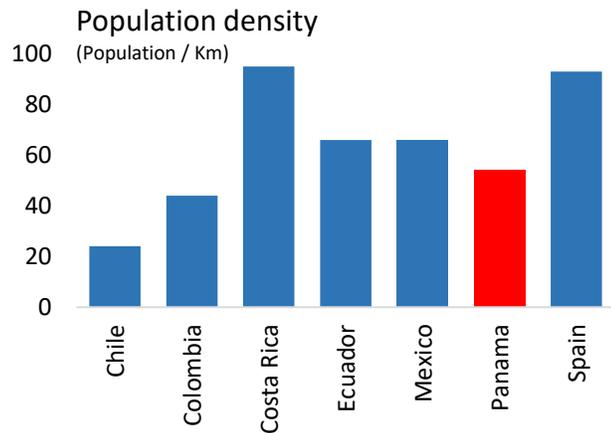


Figure 7 Economic indicators: Population density

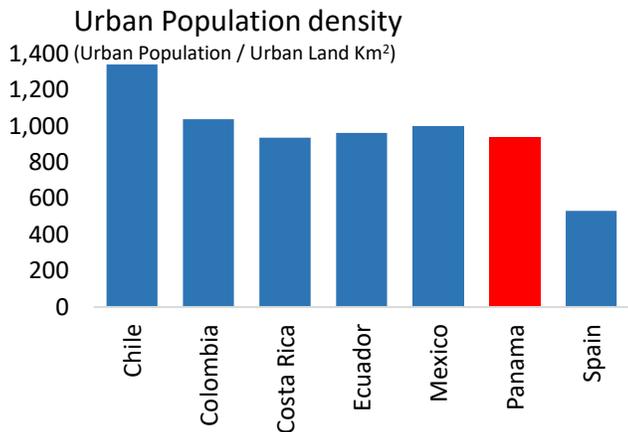


Figure 8 Economic indicators: Urban population density

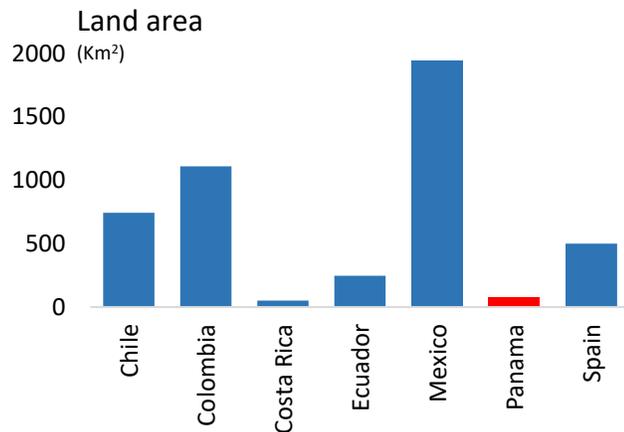


Figure 9 Economic indicators: Land area

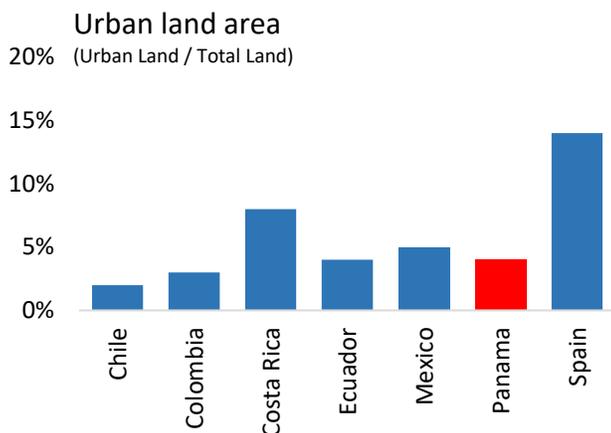


Figure 10 Economic indicators: Urban land area

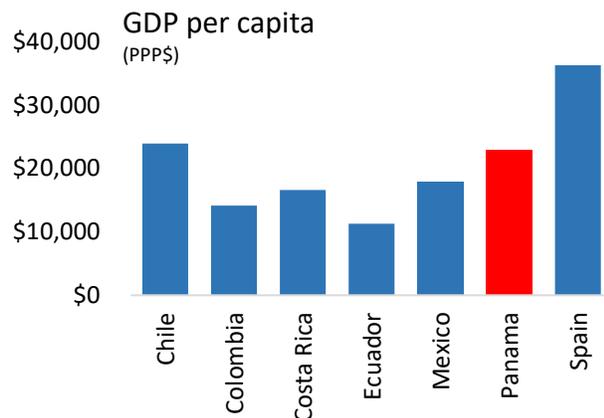


Figure 11 Economic indicators: GDP per capita

## ICT Metrics

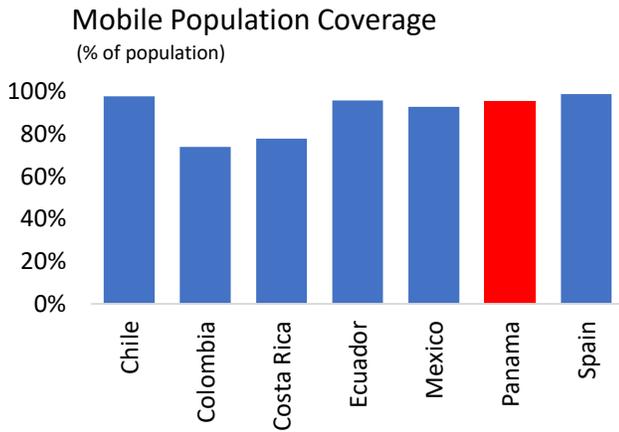


Figure 12 ICT Metrics: Mobile Population Coverage

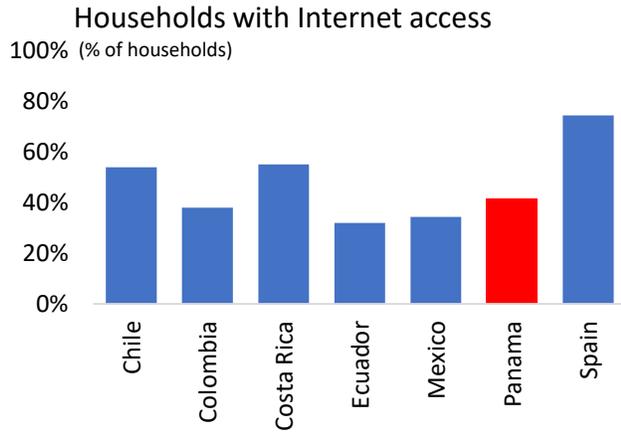


Figure 13 ICT Metrics: Households with Internet Access

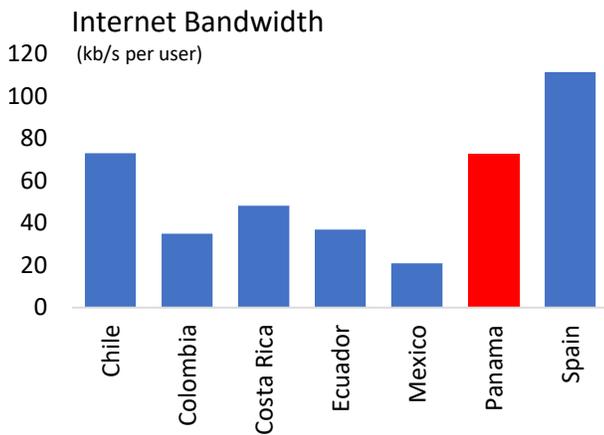


Figure 14 ICT Metrics: Internet Bandwidth

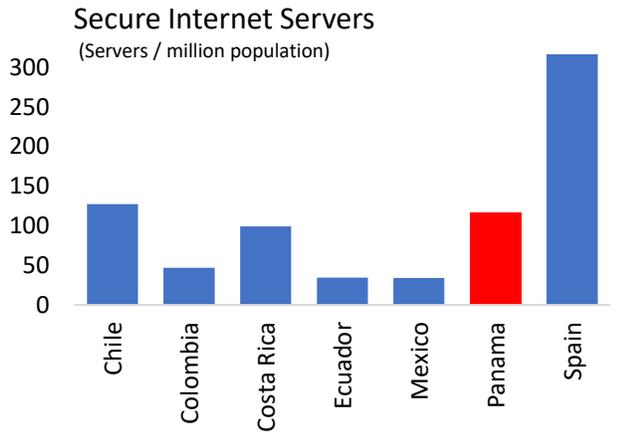


Figure 15 ICT Metrics: Secure Internet Servers

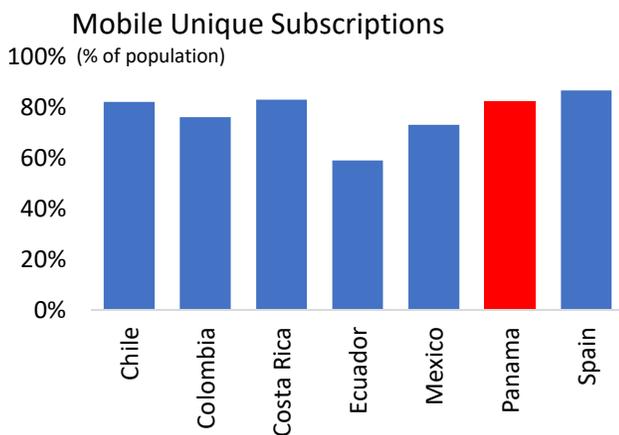


Figure 16 ICT Metrics: Mobile Unique Subscriptions

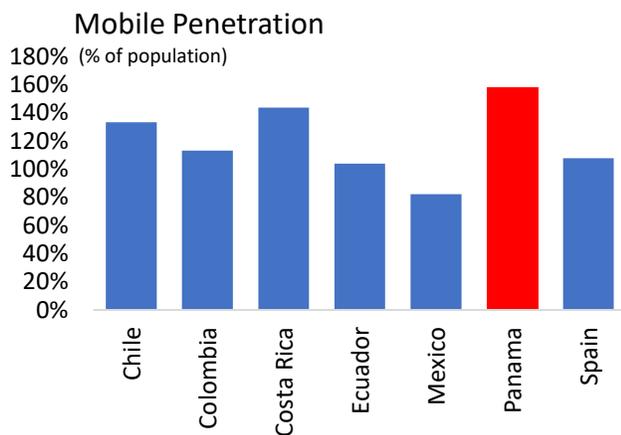


Figure 17 ICT Metrics: Mobile Penetration

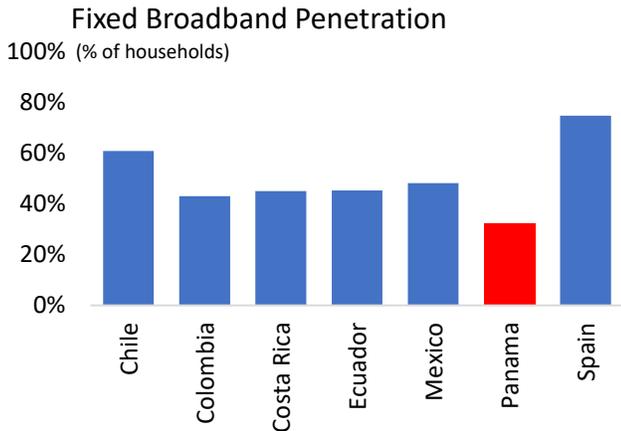


Figure 18 ICT Metrics: Fixed Broadband Penetration

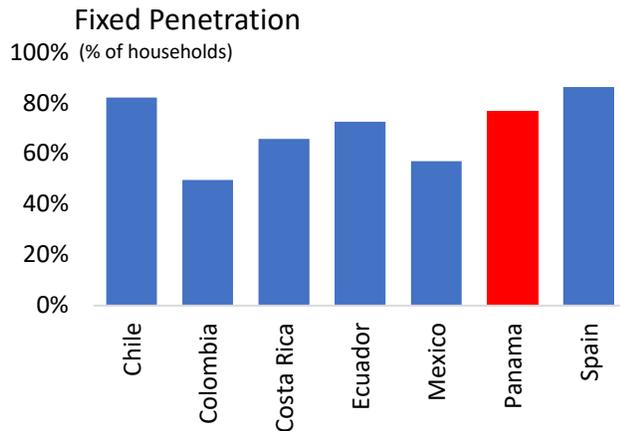


Figure 19 ICT Metrics: Fixed Penetration

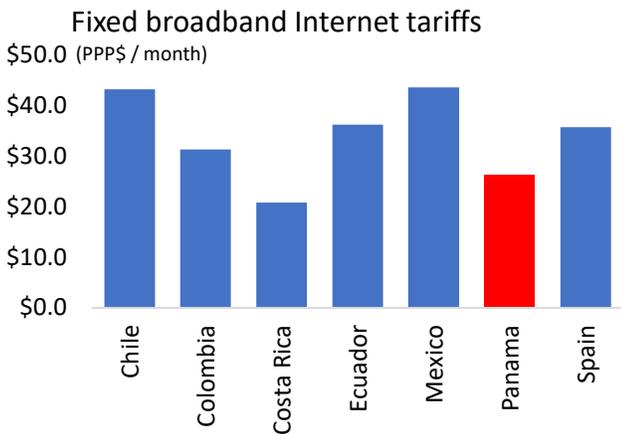


Figure 20 ICT Metrics: Fixed broadband Internet tariffs

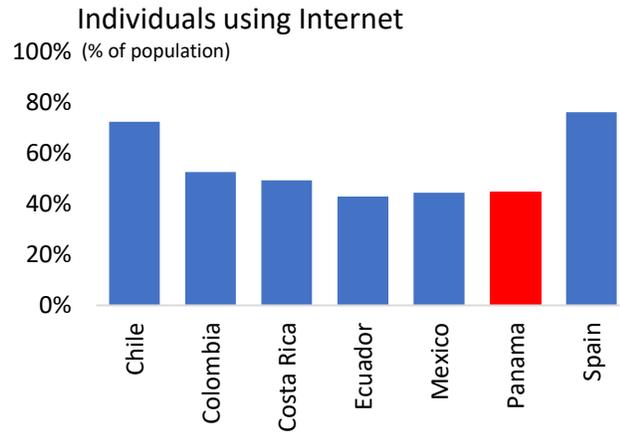


Figure 21 ICT Metrics: Individuals using Internet

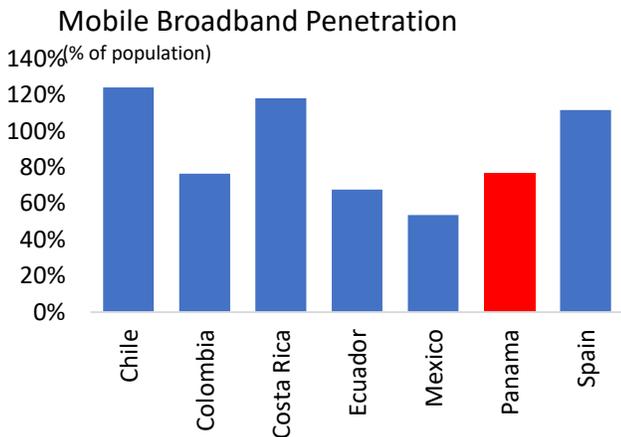


Figure 22 ICT Metrics: Mobile Broadband Penetration

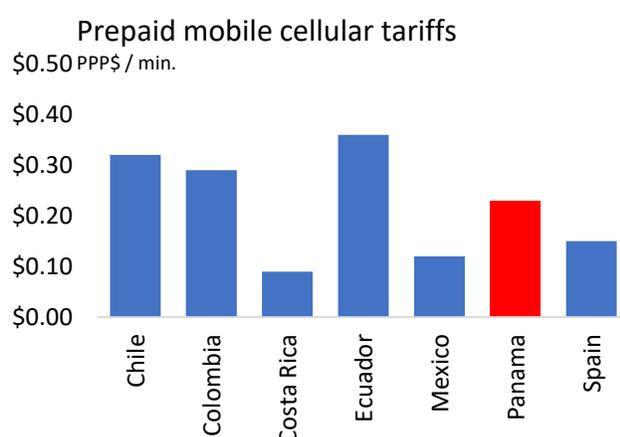


Figure 23 ICT Metrics: Prepaid mobile cellular tariffs

## Panamanian performance by international indexes

In the last ten years, the tremendous growth of the telecommunications sector and the unprecedented increase in broadband penetration has improved Panama's position in international ICT landscape. This is confirmed by an improvement of 9 positions in the Global Competitiveness Index and an increase of 9 in the Network Readiness Index; both designed and maintained by the World Economic Forum. Similarly, Panama advanced 14 positions in the World Bank's Doing Business Index.

These improvements, however, have not been uniform across all ICT industries and applications. One of the major areas of opportunity is the advancement of e-government initiatives. This lag is evidenced by a deteriorated performance with respect to the World Bank's Knowledge Economy Index and the United Nations e-government Index. In the last ten years, Panama has decreased its rank by 15 and 16 positions, respectively.

The Global Competitiveness Index (GCI) "assesses the factors and institutions identified by empirical and theoretical research as determining improvements in productivity, which in turn is the main determinant of long-term growth and an essential factor in economic growth and prosperity".<sup>6</sup> In the last 10 years, Panama improved its position from 59/134 in 2007-2008 to 50/137 in 2017-2018. This was driven by the relative improvement of the pillars of the macroeconomic environment (+41 positions), innovation (+32 positions) and market size (+14 positions).

### Global Competitiveness Index, 2017-2018

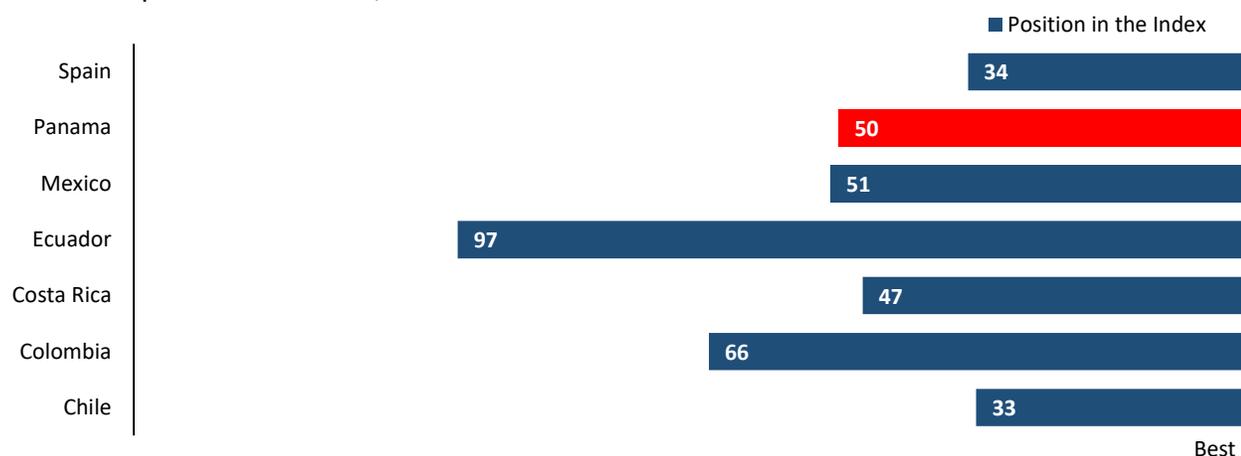


Figure 6 Global Competitiveness Index

<sup>6</sup> The Global Competitiveness Report 2017-2018. World Economic Forum.

The Networked Readiness Index (NRI) “measures the capacity of countries to leverage ICTs for increased competitiveness and well-being”.<sup>7</sup> Panama improved its position in the last 10 years from 64/127 in 2007 to 55/139 in 2016. The comparison with 2007 is not possible due to change in methodology in 2012. From 2012 Panama improved its position from 57/142 to 55/139. This was driven by the relative improvement of the pillars of economic impacts (+20 positions), business usage (+9 positions) and skills (+9 positions).

### Networked Readiness Index, 2016

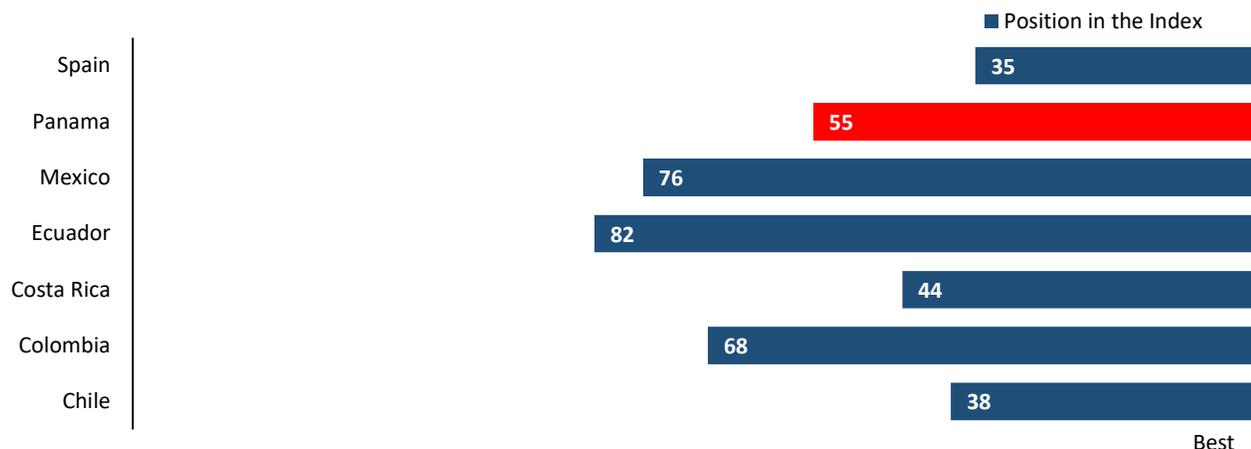


Figure 7 Network Readiness Index

The Doing Business Index “measures the aspect of business regulation and their implications for firm establishment and operations”.<sup>8</sup> In the last 10 years, Panama improved its position from 65/178 in 2008 to 79/190 in 2018.

### Doing Business, 2018

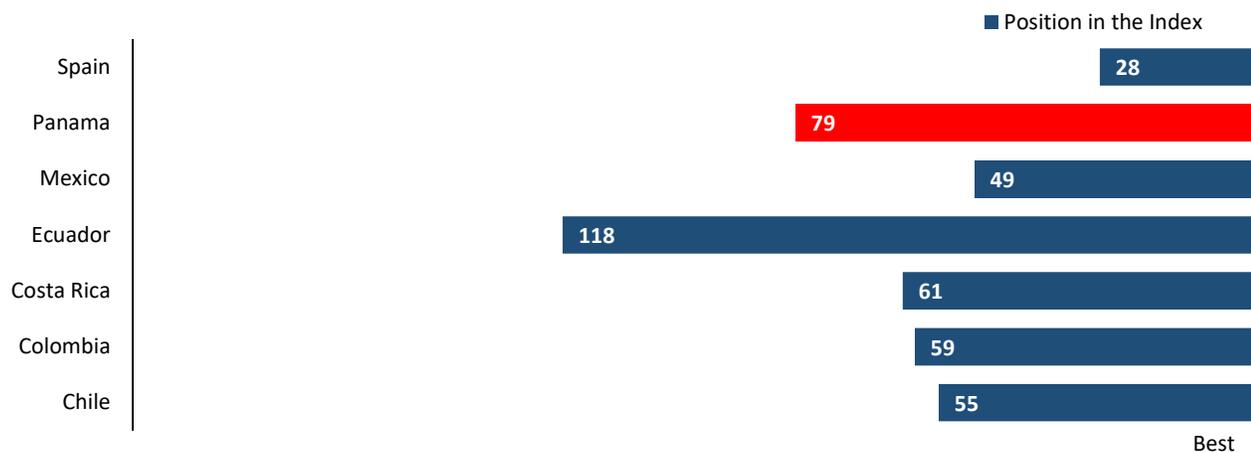


Figure 8 Doing Business

<sup>7</sup> The Global Information Technology Report, 2016. World Economic Forum.

<sup>8</sup> Doing Business 2018, a World Bank Group Flagship Report. World Bank.

The Knowledge Economy Index “measures the overall preparedness to compete in the Knowledge Economy is based on four pillars: 1) Economic Incentive and Institutional Regime (EIR); 2) Innovation and Technological Adoption; 3) Education and Training, and 4) Information and Communications Technologies (ICT) Infrastructure”.<sup>9</sup> From 2000 to 2012, Panama deteriorated its position from 50/147 to 65/147.

### Knowledge Economy Index, 2012

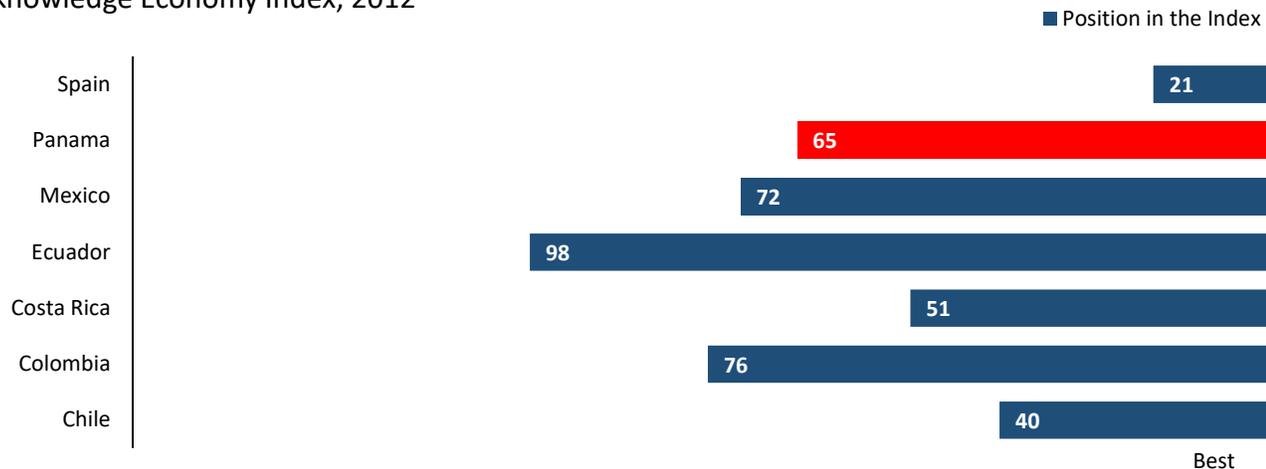


Figure 9 Knowledge Economy Index

The E-Government Development Index makes an assessment of the website development patterns in a country, incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people.<sup>10</sup> The EGDI is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity, and human capacity. From 2008 to 2016, Panama deteriorated its position from 83/179 to 99/193.

### E-Government Development Index, 2016

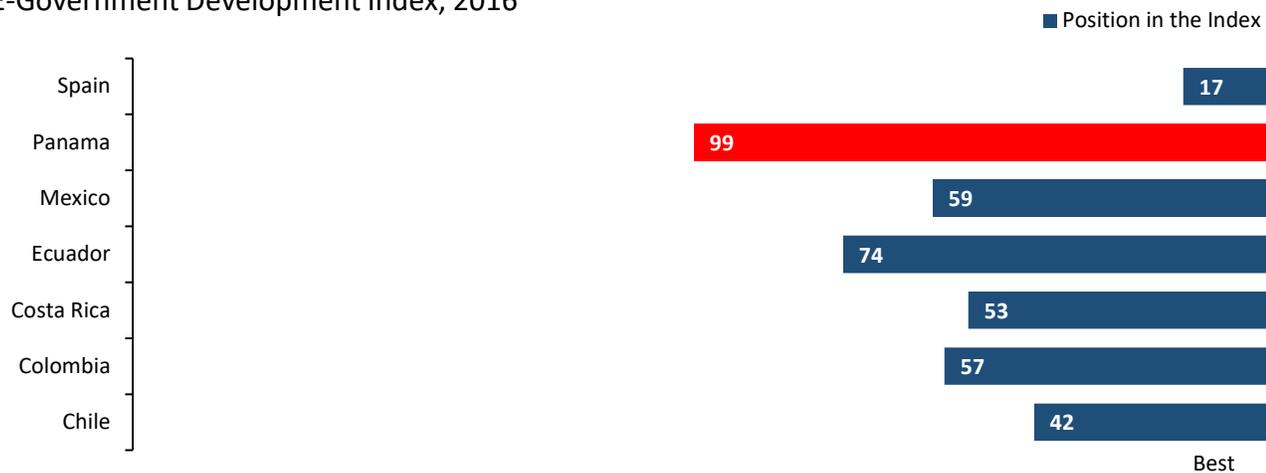


Figure 10 E-government Development Index

<sup>9</sup> Knowledge Economy Index, 2007 Rankings. World Bank.

<sup>10</sup> E-Government Development Index (EGDI), 2016. United Nations.

These indices represent a systematic effort to measure the evolution of ICT around the world. As such, they can be readily used to identify immediate areas of opportunity for Panama. The following tables represent such an identification exercise for the Global Competitiveness Index and the Networked Readiness Index. The process involves two steps:

- a) Identification of desirable ranks
- b) Identification of Panama gaps

For each index, two desirable ranks are identified: i) the rank of the best comparable country today, and ii) Panama's best rank in the last 10 years. In the case of the GCI, the comparison is based on the "B. ICT use" pillar.

Table 4 Panama's gaps with respect to the GCI

**Global Competitiveness Index 2017-2018**

a)	Index/Pillar (weight)	Panama	Best Comparable (Chile)	Best Historical (India)
	Global Competitiveness Index (100.0%)	50	47	50
	B. ICT use (4.2%)	79	46	79

b)	ICT Use Indicators	Value	Gap with respect to	
		Panama	i) Chile	ii) India
	Individuals using Internet, %	<b>54.0</b>	12	-
	Fixed broadband Internet subscriptions/100 pop.	<b>9.5</b>	6	-
	Int'l Internet bandwidth, kb/s per user.	<b>55.1</b>	120	-
	Mobile broadband subscriptions/100 pop.	<b>29.7</b>	39	-
	Mobile telephone subscriptions/100 pop.	<b>172.3</b>	-	-
	Fixed telephone lines/100 pop.	<b>15.8</b>	3	-

Source: Own calculations based on data from the Global Competitiveness Index 2017-2018.

**Networked Readiness Index 2016**

a)	Index/Pillar (weight)	Panama	Best Comparable (Spain)	Best Historical (Uruguay)
	<b>Networked Readiness Index (100%)</b>	<b>55</b>	<b>41</b>	<b>45</b>
	3rd pillar: Infrastructure (8.3%)	63	34	53
	4th pillar: Affordability (8.3%)	33	33	33
	6th pillar: Individual usage (8.3%)	72	33	44
	7th pillar: Business usage (8.3%)	39	39	39
	8th pillar: Government usage (8.3%)	60	32	27

b)	ICT Indicators	Value	Gap with respect to:	
		Panama	i) Spain	ii) Uruguay
	<b>3rd pillar: Infrastructure (8.3%)</b>	<b>4.4</b>	1.0	0.3
	Electricity production, kWh/capita (2.1%)	<b>2,353.8</b>	3,636.6	1,068.1
	Mobile network coverage, % pop. (2.1%)	<b>96.0</b>	3.8	4.0
	Int'l Internet bandwidth, kb/s per user (2.1%)	<b>72.7</b>	38.9	-
	Secure Internet servers/million pop. (2.1%)	<b>116.6</b>	200.1	-
	<b>4th pillar: Affordability (8.3%)</b>	<b>6.1</b>	-	-
	Prepaid mobile cellular tariffs, PPP \$/min. (2.8%)	<b>0.2</b>	-	0.2
	Fixed broadband Internet tariffs, PPP \$/month (2.8%)	<b>26.2</b>	9.4	-
	Internet & telephony competition, 0–2 (best) (2.8%)	<b>2.0</b>	-	-
	<b>6th pillar: Individual usage (8.3%)</b>	<b>4.0</b>	1.6	1.2
	Mobile phone subscriptions/100 pop. (1.2%)	<b>158.1</b>	-	2.7
	Individuals using Internet, % (1.2%)	<b>44.9</b>	31.3	16.5
	Households w/ personal computer, % (1.2%)	<b>38.2</b>	35.8	29.2
	Households w/ Internet access, % (1.2%)	<b>41.6</b>	32.8	15.9
	Fixed broadband Internet subs/100 pop. (1.2%)	<b>7.9</b>	19.4	16.7
	Mobile broadband subs/100 pop. (1.2%)	<b>29.5</b>	47.8	30.3
	Use of virtual social networks, 1-7 (best) (1.2%)	<b>5.9</b>	-	-
	<b>7th pillar: Business usage (8.3%)</b>	<b>4.0</b>	-	-
	Firm-level technology absorption, 1-7 (best) (1.2%)	<b>5.3</b>	-	-
	Capacity for innovation, 1-7 (best) (1.2%)	<b>4.2</b>	-	-
	PCT patents, applications/million pop. (1.2%)	<b>1.7</b>	35.7	1.3
	ICT use for business-to-business transactions, 1-7 (best) (1.2%)	<b>5.1</b>	-	-
	Business-to-consumer Internet use, 1-7 (best) (1.2%)	<b>4.9</b>	-	-
	Extent of staff training, 1-7 (best) (1.2%)	<b>4.2</b>	-	-
	<b>8th pillar: Government usage (8.3%)</b>	<b>4.1</b>	0.7	0.8
	Importance of ICTs to gov't vision, 1-7 (best) (2.8%)	<b>4.5</b>	-	-
	Government Online Service Index, 0–1 (best) (.9%)	<b>0.4</b>	0.6	0.5
	Gov't success in ICT promotion, 1-7 (best) (.3%)	<b>4.4</b>	-	-

Source: Own calculations based on data of the Networked Readiness Index 2016.

## Major Information and Communication Technologies Legal Reforms

### Chile

In 1982 the Chilean government created a general telecommunications law called “Ley General de Telecomunicaciones” whereby the ICT sector has been regulated for many years. It includes consumer rights, public and private sector guidance, poverty reduction guidelines, environmental regulation, tax and tariffs, cyber-security practices, public digital purchasing, regulation on electronic payments, technology development and many other topics that are fundamental for the performance of telecommunications. In order to adapt Chile to the digital era, and to enforce achievement of the digital agenda targets many reforms have been made to the “Ley General de Telecomunicaciones.”

Apart from the general telecommunications law which constitutes a basis for the sector, there are specific laws that have become necessary as a result of the whole progress and development of ICT technologies. For example, government-issued law 19223 to protect civilians from criminal networks, it also issued law 19.628 that regulates personal data information and created a law to regulate electronic signatures. More recently, Chile has become a global benchmark on network neutrality by issuing law 20.453, which protects user privacy, intellectual property, and prevents child exploitation.

Concerning the digital agenda, Chile has proposed to modify and enhance existing laws that have become obsolete with modern technologies, and that must evolve to be compatible with the other items of the agenda such as e-applications or infrastructure development. Some of the legal goals in the agenda include a reform to law 19.628 of personal data information, create better norms on electronic payments, make a greater consolidation of electronic signatures, regulate digital tariffs, and create incentives for the development of ICT human capital.

A relevant law concerning physical infrastructure for ICT is decree 99 of 2012. It contains rules established to obtain, install and operate concessions of intermediate services of telecommunications that uniquely provide physical infrastructures such as conduits, ducts, towers, poles, cables and intelligence systems that increase coverage and penetration. An important regulation contained on Article 12 of decree 99 entails that given their respective physical restrictions, all of the intermediaries are obligated to supply services without discrimination or exclusive contracts, to all telecommunication companies that are physically constrained.

In addition, to promote telecommunication infrastructure deployment especially on rural and low-income urban zones that are unattractive for the national industry, decree 353 of 2001 approves regulation of the telecommunication fund (FDT), a financial instrument funded by the national government budget and administrated by a special communication counsel.<sup>11</sup> The council designs and adjudicates telecommunications projects through public contests aimed at private firms and institutions that fulfill certain conditions and requirements.

### Colombia

Colombia’s telecommunications sector has been one of the most regulated sector in the country over the last few years. The most important law is Law 1341 of 2009, it contains global principles and concepts on ICT, and establishes rights for the users, rules for the firms and guidance for the government. Furthermore Law 1341 creates *Agencia Nacional del Espectro (ANE)* and *Comisión de Regulación de Telecomunicaciones (CRC)*, the former is an agency in charge of conducting and planning national radio spectrum, the latter is an entity in charge of

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<sup>11</sup> The communication council is composed by Telecommunications minister, Economy minister, Social development minister, and a group of telecommunications experts.

promotion of free competition, fighting against market abuse and designing an appropriate regulation for the sector.

Law 1341 plays a key role in the configuration of telecommunications market on the country; it aims to ensure a favorable competitive environment on the sector without dismissing proper incentives for growth and investment. One critical framework to achieve the development of the sector is technology neutrality; described on Article 2, it is a regulation principle that supports the idea of applying the same rules to ICT providers without relying on specific technology regulation, which could create distortions and unfair treatment to some of the sector's participants. Technology neutrality also incentives adoption of modern technologies, a competitive sector, and more firm innovation.

In addition, a vital factor to achieve the development of telecommunications sector in Colombia is an efficient spectrum allocation. As a scarce resource, it is necessary to assign radioelectric spectrum to the most efficient ICT providers, that means obtaining the highest exploitation rents, achieving services differentiation, and guaranteeing a more competitive environment between operators. Law 1341 created *Agencia Nacional del Espectro (ANE)* an independent agency that gives technical support. Furthermore it designs and implements policy programs and plans involving monitoring and control of radio-electric spectrum. The rent captured by the spectrum allocation and all the other ICT contributions by providers are deposited on *Fondo de tecnologías de la información y las Comunicaciones (FONTIC)* a fund dedicated to financing programs and plans of ICT, especially concerning universal access.

Regarding the aim of a competitive environment, Law 1341 is designed to promote competition and control abusive practices by dominant providers. Article 50 contributes on this; it also obligates dominant providers to share essential infrastructure and network interconnection to any other telecommunication provider of the market which finally avoids discrimination on network access and promotes differentiation of ICT services to final consumers. In order to increase the quality of services of telecommunication sector and protect the user of abusive practices, CRC promulgated Resolution 3066 of 2011, a structured manual of telecommunications users' rights.

Resolution 3066 ensures practices that providers must empower consumers. It adjusts rules and conditions to international roaming services; it obligates providers to have a virtual office and virtual bills to improve customer support, it mandates clearer information on bundled services like the individual price of broadband internet, mobile and fixed telephony containing on the bundle. Also, the user must know the discount applied to the bundled service and have access to a well-organized SMS complaints mechanism.

Since Law 1341, it has been necessary for Colombian government tracking reforms that adapt the legal framework to the digital ecosystem. In this respect ministry of telecommunications and information created Decree 1078 of 2015 which gathers all legal reforms since 2009, turning itself into the most important and unique law of the sector that replaces Law 1341. One of the outstanding reform in recent years is Decree 1413 of 2017 that regulates the treatment of personal data, security of confidential information, electronic signature and imposes minimum requirements to online sites of public entities.

Another important reform is Decree 2434 of 2015, as in other countries like Chile, creates a national telecommunications emergency agency as a part of the national system of disaster risk management which aims to develop emergency telecommunication services (ETS) to prevent disasters. On another topic, Decree 2573 of 2014 and Decree 728 of 2017 consolidates the route map for the government, in order to advance on e-government practices, like online services or open procedures.

## Costa Rica

In 2007, Costa Rica approved the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR) and opened the door to foreign investment. As part of the conditions of CAFTA-DR, Costa Rica had to allow private participation in the telecommunications sector, which was controlled by a public company named ICE (Instituto Costarricense de Electrificación).

In 2008, the Legislative Assembly approved the liberalization of the telecommunications sector through The General Telecommunications Law (no. 8642) and The Strengthening and Modernization of Public Entities of the Telecommunications Sector Law (no. 8660).

The entry of new competitors to the telecommunications sector was done through a bidding process of three concessions for the use of the 1800MHz, 2100 MHz and 850 MHz frequency bands. Two concessions were given to the only two participants, Movistar and Claro. In 2011, two MVNOs, Tuyo Movil, and Full Movil, entered the market to offer mobile pre-payment mobile services through the incumbent's (ICE) network. In July 2017, SUTEL tendered 70MHz in the 1800MHz, 1900/2100 MHz bands, the winners were Movistar and Claro. The auction resulted in 43 million dollars.

Mobile Services and Satellite Providers require a concession to operate. Concessions are granted for 15 years extendable for a period of up to 25 years. Wireless, cable, and VoIP providers are subject to the same regulations and require an authorization to operate. Authorizations are granted for ten years extendable four times for five year periods. Resale of telecom services is permitted. It requires authorization from SUTEL, and the application process takes about 90 days.

Since the entry of new competitors, the users have the right to keep the same number when changing operators. The process is regulated by SUTEL and takes about three days to complete. For infrastructure sharing policies, authorities are working on it since 2015, but it has not been approved.

Since the liberalization, competition in Costa Rica's telecoms market has increased, quality has improved, and prices decreased. In 2016, SUTEL declared effective competition, ending fixed fees, in international telephony, fixed broadband, international roaming, and telecommunication transit. More recently, in September 2017, mobile telecommunication services were declared in effective competition, and set prices were eliminated.

International and regional roaming prices are subject to competition. However, Claro and Movistar do not charge roaming inside Costa Rica and from calls to/from Guatemala, Nicaragua, El Salvador, Panama, and Mexico. The interconnection between carriers is mandatory, and fees are regulated in case there is no agreement.

To establish if an operator has significant market power, SUTEL evaluates a) market share is higher than 25%; ii) entry barrier for other competitors; iii) competitors and market share of competitors; iv) chance of access to a source of inputs and v) recent behavior. A market research is done at least every three years.

Costa Rica's Universal Service fund (FONATEL) was created in 2008 through the Law No. 8542. FONATEL aims to ensure universal telecommunication services and reduce the technology gap. The beneficiaries of the fund are people that live in rural and disadvantaged zones where there is not the possibility to obtain basic telephone and internet services, low-income individuals and schools and other public institutions. FONATEL ensures access to fixed telephone and internet with a velocity of at least 2 Mbps for individuals and 4 Mbps for institutions. It is financed by 1.5%-3.0% of the operator's gross income.

## Mexico

Mexico is one of the most recent successful cases of regulatory reforms, which have had a great impact in boosting the telecommunications sector. After nearly four years of its implementation, the OECD evaluated the effects of the 2013 Mexican Reform in the telecommunications and broadcasting sectors, providing additional guidelines for continuing improving the development and inclusion of new technologies in Mexico.

Under the new regulatory framework, several changes were made for the competence and capacity of several public institutions in the Mexican telecom sector. For example, the creation in 2013 of the Federal Telecommunications Institute (Instituto Federal de Telecomunicaciones or IFT), as an autonomous body, for functional and budgetary purposes, endowed with ample powers to enforce the Law and the regulations related to the telecommunications and broadcasting sectors. The IFT is also the unique authority in competition and regulation in these sectors. Also, the Ministry of Communications and Transportation (Secretaria de Comunicaciones y Transportes or SCT) is a federal entity in charge of policy formulation in the telecommunications and broadcasting sectors, whereas the issuance and enforcement of sector-specific ex-ante regulation are vested upon the IFT. The Federal Economic Competition Commission (COFECE) was established as a fully autonomous competition agency with wide enforcement powers in several sectors, except telecommunications and broadcasting. Some of the attributions, like mergers and acquisitions, still need the participation of both regulatory bodies, IFT and COFECE. Other authorities and entities who participate in both sectors are the Mexican Ministry of Finance and Public Credit and the Office of the Federal Prosecutor for the Consumer (PROFECO).

The main laws that govern the regulation, policy and other procedures (i.e., administrative and court enforcement) in the telecom and broadcasting sectors are the Mexican Constitution (reformed in 2013) and the 2014 Federal Law on Telecommunications and Broadcasting (Ley Federal de Telecomunicaciones y Radiodifusión, LFTR). T

Regarding competition and effective regulation, the IFT, mandated by the Constitution and the LFTR, declared of 2 Preponderant Economic Agents, one per sector, and imposed asymmetric regulations in 2014, like the local loop unbundling. Recently, the impact of these measures was assessed. As a result, the IFT, in February of 2017, declared the functional separation for the predominant agent of fixed telecommunications (Telmex), who must create a company that will exclusively provide wholesale services related to local access. The preceding, to guarantee efficient access to fixed infrastructure and considering international best practices. The new company must have decision-making, administration, and corporate governance bodies or independent equivalents. In addition to the functional separation, other obligations were established in terms of equivalence of inputs, economic replicability, reference offers, among others. The objective of this regulation is to effectively guarantee access to essential inputs to fixed and mobile telecommunications service providers, which will result in the provision of these services in areas that do not have coverage and will improve the quality of current services.

In the same sense, the IFT must continue to determine the interconnection rates for fixed and mobile services, which are based on cost models.

Regarding entry and competition barriers, restrictions to foreign direct investment were eliminated completely for the telecommunications sector. The Constitutional Reform also introduced the convergent license, which allows providing all telecommunication and broadcasting services under a single title through any technology and means of transmission, which includes the possibility of extending the services, without the need to obtain another concession title. It is an enabling title to provide all services that are technically possible.

All this gives an account of the importance of the constitutional reform. This reform establishes a legal framework that grants legal certainty and certainty to investments, which strengthens institutions, which has as its axis on

economic competition, but above all to people. As a result, more people can access to more and better services in Mexico. For example:

- From June 2013 to December 2016, mobile broadband grew 165.2% (from 23 to 61 subscriptions for every 100 people). During the same period, Mexico was the country in the OECD with most penetration growth in mobile broadband services (+143%) and the third regarding fixed broadband growth (+23%).
- From June 2013 to December 2016, coverage expanded with cutting-edge technologies, since the number of connections with optical fiber almost tripled (from 5.3% to 15.7%) and connections with cable modem increased in 60% (from 21.9% to 35%).
- From June 2013 to December 2016, the percentage of households with download speed from 10 to 100 Mbps grew almost 13 times. Nowadays (December 2016) at least 79% of the households have download speeds superior to 10 Megabits per second.
- Telecommunications prices decreased 25% (from June 2013 to April 2017). In particular, mobile phone prices decreased 42% in the same period, making it one of the top five goods that decrease its prices most from 283 goods from the basic basket.
- Private investment grew more than 15% from 2013 to 2016 (from 60.8 to 70.2 billion pesos), and Foreign Direct Investment (FDI) grew 13 times from 2011 to 2015 and 2.5 times from 2012 to 2015 (from 1.2 to 2.8 billion dollars). During 2015, the telecommunications sector ranked third in terms of attraction of FDI to the country (8.5%).
- Since the Reform, the Telecom sector GDP grew at a 5.9% average annual growth rate, almost three times more than the economy as a whole (2.2%). Since 2015, its GDP has had eight consecutive quarters with positive growth rate. In particular, the Telecom sector's GDP grew around 11% during 2016, almost five times more than the economy's GDP, which grew 2.3%.

Additionally, through several auctions and other actions, the spectrum available to the market in Mexico increased almost three times, from 222 MHz to 449 MHz; measures like the Analog Shutdown and the Transition to Digital Terrestrial Television Transmissions, which allowed the use of the 700 MHz band for IMT services.

## Spain

In 2013, the Congress approved reforms to the General Law of Telecommunications to update the regulatory framework and bolster digital economy development. According to the Ministry of Industry, Energy, and Tourism of Spain, this law seeks to facilitate investments, eliminate entry barriers and promote competition and user protection. It simplifies the deployment of new networks, supports shared use of infrastructure and removes obstacles for new licenses. Also, ensures market unity and sets bases for investment in fixed and mobile ultrafast connections.<sup>12</sup>

The new Law principal objective is to facilitate the deployment of new generation networks and improve the supply of innovating services to citizens, with better quality and affordable prices. It is based on four main pillars: 1) Encouraging competition and services improvements to users; 2) Recovery of market unity; 3) Administrative simplification; and 4) Facilitate the deployment of the network. The Law set out a target for universal coverage of 10Mbps broadband by 2017, as well as entire population coverage of 30Mbps and 50% coverage of 100Mbps by 2020.

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<sup>12</sup> Digital Agenda for Spain. Ministry of Energy, Tourism and Digital Agenda, 2013.

In terms of prices and tariffs, retailer services are not regulated. Retailer services are offered in a free competition environment. The operator establishes rates and coverage areas. Wholesale services are regulated by the “Comision Nacional de los Mercados y Competencia,” which defines the conditions in which operators can use the network of another operator. Telefonica (the operator with significant market power) is forced to provide services of unbundled access to the subscriber loop, indirect access or wholesale broadband access and access to passive infrastructure.

Roaming prices in Spain are subject to European Union regulations. The new regulation (EU) of the European Parliament and the Council established the elimination of roaming surcharges from June 2017. Before that, the authority established maximum prices and gradually decreased them.

Number portability is regulated by the Customer Services of Telecommunications Office (Oficina de Atencion al Usuario de Telecomunicaciones) and takes about one day to complete the process. Also, the operator is obligated to unlock the device, if needed, to be used with other company.

Spain Universal Service program ensures access to basic telecommunication services to users that required it, independently of their location. The basic services include broadband of a velocity of at least 1 Mbps from a public place and access to a fixed telephone line. An operator is designed to provide the service by a bidding process. The operators finance the costs.

## Ecuador

Ecuador’s government launched in 2015 Ley general de Telecomunicaciones a law that regulates the whole ICT sector and replaces Ley general de Telecomunicaciones tracked in 1992. It fosters domestic, foreign and public investment for the development of ICT sector, it incentives industry of telecommunication services, and fosters networks and technology convergence. The law establishes the legal framework for the state, his duties and obligations on providing high quality and cheaper telecommunication services to the population, furthermore with Ley general de Telecomunicaciones Ecuador updates its normative framework to current global trends such as technology neutrality, network neutrality, spectrum allocation regulation, licensing, universal access, and personal data privacy.

Article 93 in Ley general de Telecomunicaciones places general objectives for spectrum regulation; the spectrum allocation must be efficient, it must be used by providers that guarantee the highest rent to the state, but also it must be fair and impartial to maintain a balance on the sector. The spectrum allocation has to be directed to the implementation of new technologies as long as the proliferation of universal access, considering that there cannot be interferences and environmental damages. Aside from spectrum allocation, regulation concerning infrastructure deployment is vital for ICT development, Article 113 obligates providers sharing infrastructure on telecommunication services. Likewise Arcotel 2017 resolution establishes that dominant companies can’t deny infrastructure sharing to any other company on the market without proper technical reasons. Arcotel allows providers to freely negotiate infrastructure sharing, as long as they fulfill the law.

ICT Infrastructure is built by private firms wherever is profitable for them to enter on some markets, for this reason, many rural zones and urban marginal zones don’t have access to ICT technologies, the lack of affordability makes these zones unattractive for the public sector. As a result, the government created FODETEL a public fund that aims to invest in ICT infrastructure at isolated zones of Ecuador. Resolution 394 of 2002 determines funding administration and operation of FODETEL; it is funding by taxes paid by private companies, donations and the National Council of telecommunications budget (CONATEL). FODETEL selects priority zones where penetration indexes are low and draw the respective public contest to each project once the budget has been approved.

Another important Law promulgated by the government is Law 162 of 2010 which regulates the treatment of personal data and the openness of government data. Article 4 obligates private, and public entities that administrate and register public data to respond on the authenticity, and veracity of the information provided, likewise Article 5 orders the government makes advertising on public data available in order to guarantee that nobody is excluded from using it.<sup>13</sup> Finally, in order to protect the privacy of the individual, Article 6 clearly defines confidential data, it appoints as confidential: ideology, political affiliation, ethnicity, health condition, sexual orientation, religion, migratory condition, among others.

### Digital Agendas and National Infrastructure Plans

This section focused on the executive branch of government. Specifically, on the digital agendas and national infrastructure plans. In general, national authorities use these tools to set pro-competitive and pro-investment conditions and/or to directly influence the provision of ICT services and/or infrastructure. For example, encouraging the expansion of telecommunication and ICT infrastructure and services, lowering barrier to investment and entry, foster the provision and adoption of e-government services (including open access to information), and encourage the provision and adoption of ICT applications in health, transport, and education.

Many times, policies are directly intertwined. For example, it is common in Latin America for spectrum regulators to require license awardees to expand mobile coverage to places without service and to provide a minimum level of open access to the internet by providing and maintaining free internet hotspots. When the spectrum assignment is competitive, this kind of policy is expected to improve overall competition, investment in telecommunications, mobile coverage, and penetration, and increase the number of people with access to the internet.

### Chile

Chile has been one of the main developers in ICT sector in the region; this sector contributes 3,9% to total national GDP. Chile has one of the higher levels of the region on Mobile-cellular telephone subscriptions, individuals using the internet, Fixed-telephone subscriptions, active mobile-broadband subscriptions and fixed-broadband subscriptions. To maintain these levels, and increase the country ICT penetration, Chile constituted a digital agenda planned until 2020, including 63 goals, 57 in progress and 6 already achieved.

Chile's digital agenda has as main axes *digital connectedness*: which aims for inclusive development of ICT across the country, *digital government*: which seeks to increase government transparency and efficiency of services provided, *digital entrepreneurship*: which promotes digitalization to small and large companies, and *digital education*: which aims to improve education through digitalization, and advance on digital technologies skills.

In order to achieve the goals of the digital agenda, Chile has made substantial efforts on ICT infrastructure that allows greater coverage, and higher quality on the internet and mobile phone services. One of the main infrastructure plans is called *Fibra Óptica Austral*; with an extension of 3000 km of submarine and ground optical-fiber cable, it aims to connect the south of the country, giving internet access to the most vulnerable population, passing from a 67 % of internet penetration on 2015 to a goal of 90% on 2020 (75% on rural zones) and passing from an average internet velocity of 4 Mbps on 2014 to 10 Mbps on 2020.

Besides fiber optic investment, Chile has deployed free Wi-Fi zones through the government program *Wifi Chilegob*, whose original goal was 1,233 Wi-Fi zones on fifteen regions of the country; as of 2017, the program is

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<sup>13</sup> The law contains an extensive classification of what is considered as public data available.

98% completed. Furthermore, the digital agenda contemplates satellite internet connection on the most isolated regions of the country in line with the development of a spatial sector.

The national infrastructure plan is expected to improve telecommunications services, the connectedness of hospitals, schools and state entities that would perform better with higher ICT infrastructure. Further, firms' productivity improves when the productive process gets digitalized, and ICT implementation allows entry into new markets, research, and innovation. Finally, digital connectedness will enhance the effectiveness of public policy in Chile, e-government applications, and other ICT services reach more citizens.

## Colombia

*Vive Digital 2014-2018* is the digital agenda of Colombia, the roadmap of the ICT ministry which aims to reduce poverty, create jobs, and produce solutions to different problems that Colombians face every day through a strategic use of technology. The digital agenda has two main goals, the first one increases government efficiency and transparency and the second one is to become a leading country on e-applications oriented to solve social problems especially the fight against poverty.

In order to become a leading country on social e-applications Colombia has implemented many direct policies to foster e-applications business, one of these is a free assistance and support service to early entrepreneurship that helps them to move from an idea to a successful business. Closing the supply-demand of ICT workers, another policy that the ministry has proposed is to motivate high school students to enroll on ICT studies (professional or technical), motivate engineers of different areas to get involved in ICT, and foster the engagement of ICT experts on public entities.

Connectedness and digitalization of all the citizens is a fundamental pre-requisite to achieve the main goal of becoming a leading country on e-applications if people cannot get internet access all the services that e-applications provides will never reach citizens. For this reason, the government had invested many resources on infrastructures such as broadband internet, Wi-Fi free zones, and ICT community centers with their respective programs *Plan Nacional de Fibra Óptica*, *Wi-Fi gratis* and *Kioskos Vive Digital*.

The goal of *Plan Nacional de Fibra Óptica* on *Vive digital 2014-2018* is to connect 1,123 municipalities (100% of the territory) to high-speed Internet connections and attain 27 million of broadband connections, the program *Wi-Fi gratis* aims to dispose 1000 Wi-Fi zones on 1,123 municipalities, and program *Kioskos Vive Digital* aims to increase the quality and guarantee sustainability of 7621 community centers. Furthermore, *Vive digital 2014-2018* pursues Mobile network goals such as the totality of users in 1,123 municipalities having access to 4G technology on their mobile devices and the Implementation of at least 245 MHz of radio spectrum.

## Costa Rica

After the market liberalization, the efforts of the government were focused on the creation of an environment to promote competition and expand telecommunication services coverage. In 2009, the government published the Telecommunications Development National plan 2009-2014 with the objective of ensuring universal access to telecommunication services. It had 4 action axes: 1) Telecommunications, which seeks to expand cellular and broadband coverage, transition to digital technologies (TV and Radio) and ensure interoperability and interconnection; 2) Economy, which seeks to ensure the use of ICT and promote competency and productivity; 3) Environment, which seeks to ensure a sustainable development of ICT; and 4) Social, which seeks to ensure the coverage and ICT services to vulnerable regions of the country.

After the first Telecommunications Development National Plan, the government published a second National Plan for the period from 2015 to 2021. The new National Plan focused on digital inclusion and consolidation of

competition-enhancing service quality. In this line, the authorities created a Digital Agenda and a Supportive Digital Agenda (Agenda Digital Solidaria) with the objective of promoting the development of telecommunications sector and ICTs usage in Costa Rica. The latter being focused on vulnerable communities. The main pillars are: 1) Digital Inclusion; with the main objective of increase the proportion of individuals using internet to reach the same level as average of OECD countries; 2) Digital Economy, with the main objective of achieve 100% of households with Digital TV in 2017, and 3) E-government and transparency, with the main objective of improve the quality of broadband connection and reach that 80% of population have access to broadband with the same velocity as the average of the OCDE.

## Mexico

In 2013, Mexico designed and started the implementation of the National Digital Strategy (EDN, Spanish abbreviation) 2013-2018, as a part of the National Development Plan, which is the mainstreaming strategy “Close, Modern Government.” The main objective was to build a digital Mexico in which technology and innovation will be key to boost Mexico’s economic and social growth. The program is managed by the Digital National Strategy Coordination Office, which depends directly on the Executive Branch of government.

This strategic project Digital has two main goals that can be measured with international digital indicators. First, that Mexico’s OECD digitization index reaches the average for OECD countries by 2018. Second, that Mexico’s index of citizens interacting with their government via Internet reaches at least the leading country in Latin American by 2018.

The EDN sets out five objectives to face the digital environment: 1) Government Transformation, 2) Digital Economy, 3) Quality Education, 4) Universal, Effective Health, and 5) Public Safety.

To achieve the adoption and use of ICTs, and each of the five objectives of the EDN, the Coordination Office, under Executive planning, proposed five tools: Connectivity, 2) Digital inclusion and skills, 3) Interoperability, 4) Legal framework and 5) Open data.

Some of the main results and programs of the EDN are the following:

- The number of users of the National One-Stop Shop gob.mx, which is a unique access to government services and information, grew 17 times from 2012 to 2015.
- The development of more than 40 apps (m-government) to bring services closer to citizens.
- As a part of the Digital Inclusion and Literacy Program, the Mexican government, during the 2013-2014 school year, delivered 240 thousand digital tools to students and educational authorities. It also, during the 2014-2015 school year, delivered close to 710 thousand tablets in six states.
- The project “Mexico Conectado”, has connected more than 100 thousand public spaces, such as universities, libraries, schools, hospitals and government offices, through internet access.
- The Puntos México Conectado program is a national network of training and digital education community centers that consists of 32 Points, one in each state of Mexico, in which anyone can learn and develop information technologies, as well as undertake innovative projects.

With respect to spectrum policies, the National Spectrum Plan 2017 2018 (NSP), established by law, and under the National Development Plan framework, was recently published in 2017 by the SCT (NSP). The plan follows three general objectives:

These objectives, published in the Official Journal of the Federation (Diario Oficial de la Federación or DOF in 2017) are:

- Objective 1 aims to increase and allocate spectrum by promoting greater competition, coverage, plurality and inclusion, connectivity and accessibility to telecommunications and broadcasting services, which will be achieved by identifying spectrum bands for IMT services and designing a methodology to value spectrum bands, among other actions;
- Objective 2 plans to make radio spectrum available for concessions of social use, and
- Objective 3 has the purpose to increase the efficiency in the use of spectrum, through the design of metrics and measurement methodologies and with the continuous disclosure of the National Chart of Frequencies Allocation, using the most recent information available.

In addition, the NSP must include: (a) a plan of action for the optimal use of the 700 MHz and 2.5 GHz spectrum bands, under the principles of universal access, no discrimination, and shared use, and (b) a plan of action to reorder the spectrum bands for broadband services, television and radio, which includes the liberalization of the 600 MHz band for IMT services.

In particular, for the 700 MHz band (also called the “second digital dividend”), it should be liberalized throughout the transition to the Terrestrial Digital Television (objective reached in 2015), the corresponding authority must define equitable mechanisms of spectrum sharing and operating parameters in the US-Mexico border, and it should be used to develop and deploy a wholesale shared network (Red Compartida).

In this regard, the Red Compartida will provide next-generation mobile communications services to at least 92% percent of the country's population, favoring universal access to information technologies, including broadband. It will also increase the coverage of telecommunications services by taking them to regions that lack them and will also enable the creation and access to technologies and applications that the population can take advantage of to generate entrepreneurial projects, new productive techniques, and innovative trade forms.

With respect to the 2.5 GHz band, it is required to perform an adequate segmentation of the band according to UIT’s standards and the IFT must execute and design an auction process under the principles of universal access and non-discrimination, as well as under a criteria that ensure effective competition and prevents concentration phenomena that are contrary to the public interest.

In addition to Red Compartida, Mexico’s infrastructure plan contemplates as a priority to increase access to spatial infrastructure, as well as to strengthen the capacities of existing facilities, which will allow, for example, to develop an Early Warning System for natural disasters.

Also, the Reform also established the deployment of a fiber optic network, “Red Troncal” that will be built from the equipment and fiber optic network of the Federal Electricity Commission (CFE). Its objective is to ensure the maximum coverage of services to the population. To facilitate its deployment, the law established the identification of the largest possible number of federal public sites that must be made available to telecommunications operators.

## Spain

Since 2006, three strategies were followed to improve the telecommunications sector in Spain. The first strategy, “Plan Avanza” (Plan 1) sought to convergence with the European Union, in access and usage of ICTS. The second strategy, Plan Avanza 2 and the Strategy 2011-2015 (Plan 2), sought to promote Spain as a leader position on the development and usage of ICTs products and services. The third strategy, The Digital Agenda, aims to meet the objectives of Europe’s Digital Agenda 2015-2020 (open up digital opportunities for people and enhance Europe’s position as a world leader in the digital economy).

In 2006, “Plan Avanza” (Plan 1) was launched by the Ministry of Industry Tourism and Trade (MITT), with the goal of advancing Spain’s Information Society and converging with European and OECD countries in access and usage of ICTs. One of the most important actions was the National Broadband Extension Plan, implemented between 2005 and 2008, which the main outcome was the increase of the percentage of the population that has broadband coverage from 80% in 2004 to 99% in 2009.

Plan 1 was focused on the supply side and aimed to increase ICT users, services and coverage, while its successor Plan 2, launched in 2009, was focused on the demand side. The Plan 2 focused on promoting the efficient utilization of ICT, through the development of ICT skill of citizen and SMEs, improvement of digital public services and improvement of cyber-security and e-confidence. The strategy of execution for the Plan 2 for the period 2011 to 2015, approved in 2010, identified 34 specific challenges and focused in achieving 10 objectives.

The Digital Agenda for Spain, approved in 2013, is the Government’s strategy to develop the digital economy and society. According to the Ministry of Energy, Tourism and Digital Agenda, the Digital Agenda "sets the ICT and e-Administration roadmap to achieve the goals of the Digital Agenda for Europe in 2015 and 2020..<sup>14</sup>

The Digital Agenda for Spain comprises six main objectives: 1) Foster the roll-out of networks and services to guarantee digital connectivity; 2) Develop the digital economy for the growth, competitiveness, and internationalization of Spanish companies; 3) Improve e-Administration and adopt digital solutions for an efficient rendering of public services; 4) Reinforce confidence in the digital ecosystem; 5) Boost R&D&i system in Information and Communications Technologies; and 6) Promote digital inclusion and literacy and the training of new ICT professionals.

The Agenda aims to cover 100% of the population with 30Mbps speeds and achieve 50% uptake of 100Mbps connections by 2020.

## Ecuador

In order to place the country as a regional landmark on connectedness, access, and reducing the digital bridge, Ecuador’s digital agenda 2016-2021 is mainly focused on these topics. The way in which the Agenda is written is a mirror of the government doctrine; there is an interest on ICT as an instrument for having an equal society and established an inclusive model of development. Furthermore, the digital agenda aims to promote research and development programs on ICT to impulse firms’ productivity and human capital formation. There are three major objectives displayed in the document: To complete and foster the deployment of telecommunications infrastructure, to increase the penetration of ICT services among the population, to assure the use of ICTs for the economic and social development of the country, and to establish the bases for the IT industry for the long run.

The first objective aims to increase the coverage in 4G technology from its current coverage percentage of merely 32% to 80% and focuses also on reducing the percentage of population without access to 2G and 3G services due to a current coverage of 96%, deployment of mobile internet coverage is important specially as it is difficult to supply fixed physical infrastructure on isolated regions. Ecuador had 33% of fixed broadband penetration on 2014 the aim of the government to 2021 is to increase penetration to 59%, the government argues that an extensive penetration of fixed broadband induces an increase of firms’ productivity and a significant rise on households’ real income.

The government has launched different programs to accomplish the goals proposed in the digital agenda. One of the most popular programs is the construction of Infocentros; these are communal spaces in isolated regions of

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<sup>14</sup> Digital Agenda for Spain. Ministry of Energy, Tourism and Digital Agenda, 2013.

the country where people could have free access to information technologies, which finally helps on reducing the digital gap. In addition to Infocentros, the government has been implementing e-government programs which seek to increase the number of public services that the citizens could access online.

The Digital Agenda aims to increase smartphones penetration from 18% in 2014 to 42% on 2021, larger use of smartphones by Ecuadorians will facilitate 4G coverage and will provide highest internet connection and data processing. One of the mechanisms to accomplish this goal is to deregulate importation of mobile cellphones. In addition, the digital agenda focuses on increase computer penetration on households from 37% on 2014 to 62% on 2021 one of the programs to achieve this is by reducing taxes on the cheapest pc's. It is not clear why the tax reduction is only on the cheapest computes, as long as it is necessary to foster penetration of high technology devices.

The digital agenda does not have many direct policies that foster e-applications development, even so, there is some specific training to SME's in ICT implementation. Although the programs are not highly concerned on e-applications developing, the government has made large infrastructure investments in internet access and mobile-phone coverage that will facilitate the propagation of e-applications once they have been developed.

## Major ICT Legal Cases

### Chile

Sub-secretary of telecommunications (SUBTEL) promotes equity in access to telecommunications, reducing the digital gap through the granting of licenses, subsidies, and state permissions. It protects the consumer from abusive practices in ICT sector, especially on unfair contract terms. In this section, we will mention some recent ICT legal cases in Chile involving SUBTEL and other regulatory agencies, such as the consumer protection agency SERNAC.

One of the most discussed legal cases was a millionaire fine to Claro on April 2017 because of offering a 4G mobile phone program on a zone that did not have the required coverage. The user bought the plan in November 2015, at that moment he was convinced to change his actual telephone company to Claro in favor of obtaining a better service and better technology, however all the multimedia services could not be used by the user because there wasn't coverage in his residential property E. Woo (2017).

Another case was a compensation imposed to Movistar on January 2017 for anti-competitive practices that affect OPS, an engineering company that used to buy minutes from Movistar and sell them at low prices compared to big telecom companies. OPS sued Movistar arguing that an arbitrary rise on fares, caused a huge loss on clients and reduced performance on sales compared to the period before the fares raised. Recently the court of appeals ordered Movistar to pay 14 million dollars compensation to OPS Solminihac (2017).

### Colombia

Law 1341 of 2009, was a beginning for a new regime of a stricter regulation (both ex-ante and ex-post) of telecommunications, and a fresh start with a clearer institutional setting. Because of this regime change, since 2009 there have been many legal cases of agents on the economy violating laws. Most of the legal cases in Colombia have been legal battles within broadband and telecommunications providers and legal battles of these companies with government or consumers. We discuss some of these cases below.

Even though regulation increased in 2009, achieving higher competition in the telecommunication sector has been a major task. The reason is that Comcel (Claro since 2012) was the first company that entered Colombian market, as an incumbent it has had a natural advantage over other companies, according to the ministry of ICT Claro has 62 % of mobile internet participation and 49,9 % of mobile phone subscriptions. On 2015 Claro was fined by the

superintendence of industry and commerce (the competition authority in Colombia) for violating the law (Resolution 1763 2007) that ordered Claro charging low prices to other companies for used their network's infrastructure, also in 2015 the OCDE called for a reduction on telecommunication market concentration in Colombia.

Apart from market competition regulation, there's been legal cases concerning government and individuals. The most sounded case over the last few years was an order to Claro and Movistar to pay \$1.6 billion dollars equivalent to assets that did not return to the nation because of the so-called reversal of telecommunications assets; this is the highest economic compensation to a State in the history of Latin America. The sanction was so large that foreign direct investment fell in the first quarter of 2017 because of the uncertainty and panic that it caused.

Furthermore, on March 2017 the Delegation for the Protection of the Consumer of the Superintendence of Industry and Commerce confirmed in the second instance the sanctions imposed on Claro, Tigo and Movistar for a total value of almost 3 million dollars for linking the benefit of cellphones equipment sales to mobile phone plan subscriptions, a practice that was abolished on 2014 by the telecommunication regulation commission in order to protect consumers.

#### Costa Rica

In October 2017, SUTEL confirmed the declaration of effective competition in the mobile telecommunications market. SUTEL rejected by the resolution RCS-259-2017 a legal appeal against the liberalization of the market.

#### Mexico

##### Interconnection

On August 16, 2017, the Mexican Supreme Court of Justice (SCJN) declared unconstitutional article 131 of the LFTR, which imposed the so-called "zero tariff" on Telcel or Radiomóvil Dipsa (the preponderant or dominant agent on mobile services) and determined that it corresponds to the IFT and not to Congress, the exclusive competence to set the asymmetric regime relative to interconnection rates for the termination of traffic in the mobile network of the preponderant.

In compliance with the provision of the SCJN, the IFT submitted to public consultation - during the last quarter of 2016 - a cost methodology to determine the interconnection rates, which it issued considering the natural asymmetries of Mexican mobile networks, to obtain a tariff which recovers the costs of an efficient operator similar to the preponderant and at the same time yields one of the lowest termination rates in the world. Under this design, one of the biggest asymmetries observed in the international market was established, to promote competitive markets. Thus, on November 2, 2017, the IFT Plenary resolved the interconnection fees that the concessionaires of the rest of the mobile industry and the preponderant will have to pay for call termination during 2018.

##### Mega fine

Between 2006 and 2011, Telcel charged rates for termination calls in its network that exceeded the commercial price of one minute in a call within the Telcel network. This behavior was denounced as a relative monopolistic practice by Axtel, Alestra, Megacable, Telefónica and Promtel, other main concessionaires in the mobile market. On April 7, 2011, the Plenary of the former Federal Competition Commission (CFC) sanctioned this practice with a fine of \$12,000 million pesos.

Telcel filed an appeal for reconsideration against the sanction. During the judiciary process, Telcel proposed commitments to make the practice ineffective and to restore competition in the mobile market. On April 30, 2012,

the CFC resolved that the commitments were suitable and economically viable to render the practice ineffective and to restore the competition process. On June 3, 2015, the IFT Plenary considered the commitments fulfilled.

## Spain

In 2017, the CNMC (National Commission on markets and competition) fined Telefonica, the operator with significant market power, for 5 million euros. This because Telefonica incurred in violations of the OBA Access Offer Agreement (agreement for the wholesale leasing services). The CNMC determined that Telefonica did not attend reported malfunctions in landlines operated by other companies. Instead, Telefonica reported these malfunctions as false. However, CNMC determined that between 53% and 78% of the false malfunctions have been mislabeled. This cost several million to the Telefonica competitors.

In 2012, the CNMC fined Telefonica, Vodafone and Orange for 120 million euros for charging too much for text messages. CNMC determined that from 2000 to 2009 those operators passed the services termination rates to consumers with high text messages costs. However, in 2017, the Spanish High Court annulled the fined, arguing that is not clear that they exploited a dominant position.

## Review of e-applications

The previous chapter dealt mostly with “access” policies and outcomes. However, access is only the first step when maximizing the benefits of Information and Communication Technologies. The specific applications being used are of paramount importance. Consider, for example, a country where both wired and wireless networks reach 100% of the population, and every single member of society is connected. In this hypothetical country, the government, every single citizen, and business are using the internet. However, there is a single application, e-mail. It is difficult to imagine that such a country would enjoy all the benefits associated with ICT. In this hypothetical country, learning about the French revolution would still require visiting the local library, purchasing a good or service would require visiting a store and filing taxes most likely would require a visit to a local government branch.

On a recent report,<sup>15</sup> ITU describes the importance of the social and economic impact of digital transformation on the economy; the report classifies digital technologies on two distinct waves, the first wave includes internet platforms, social networking, and cloud computing, the second wave includes IoT, Big data robotics, and machine learning. In the following, we present studies that reveal the importance of both waves of digitalization on the economy.

At the firm level, E-apps implementation increases demand to non-routine cognitive tasks and serve as complements to high skills workers, also e-apps implementation substitute work that is highly routine Gaggie et al. (2014). Furthermore, there is evidence that ICT usage boosts enterprises productivity. Bloom et al. (2012) show that ICT intensity complemented with skills workers and proper enterprises management induced a “productivity miracle” in The United States.

One example of a specific technology that increases firms’ productivity is Cloud computing. It allows ample data storage and data analytics, without incurring on significant capital expenses, it reduces sunk and fixed costs to entrant companies which lowers entry barriers on intensive IT markets. The OECD study reveals cloud computing causes 0.05-0.15% GDP growth in the short run, 1-3% impact in the long term and a reduction of the unemployment rate of 0.5 -0.6% in the short run and 0.2-0.3% in the long run. Also, cloud computing could reduce 4% of the current carbon footprint of the ICT sector in the European Union.

A survey among 4000 consumers in developing countries performed by OVUM daily aims to measure how consumers use digital services. It reveals digital services usage and spends are accelerating in emerging markets; 91% of respondents use social networking, 76% games, 73% both music and news, 63% video, and 51% educational services. This fact is a significant result as long as an increase in digital services penetration has many economic benefits Aker (2010), and distinct e-applications improves human life. Uber is an example of how a mobile application could enhance human being; it serves as a self-employment mechanism that could alleviate unemployment spells especially in developing countries that don’t have unemployment insurances. The aggregate consumer surplus for devices, applications services, and access is about 4.4% of GDP on G20 countries Dean et al. (2012).

This chapter extends the comparative analysis of the previous chapter to include ICT applications, i.e. the specific ways in which citizens, governments, and businesses use ICTs. Specifically, this chapter provides a comprehensive

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<sup>15</sup> <sup>15</sup> [https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2017/Soc\\_Eco\\_impact\\_Digital\\_transformation\\_finalGSR.pdf](https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2017/Soc_Eco_impact_Digital_transformation_finalGSR.pdf)

review of successful applications launched in the world and the comparable countries with respect to government (e-government), education (e-education), trade and business (e-commerce).

The Network Readiness Index provides a quick visualization of the state of e-application for comparable countries. In general, Panama is aligned with its peers. However, there is a significant gap in government online services and e-participation. The gaps are carefully analyzed in the next chapter.

**NRI 2016, E-application concepts**

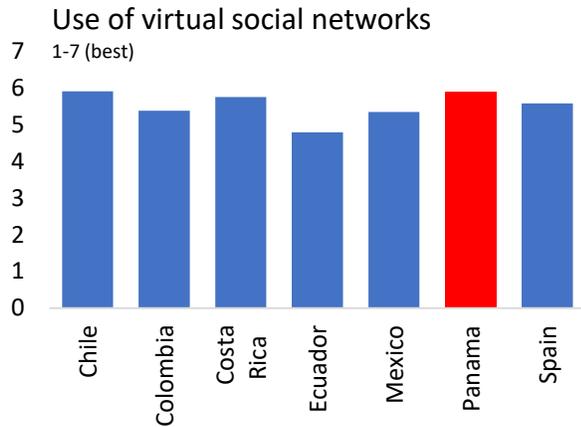


Figure 24 E-apps: Use of virtual social networks

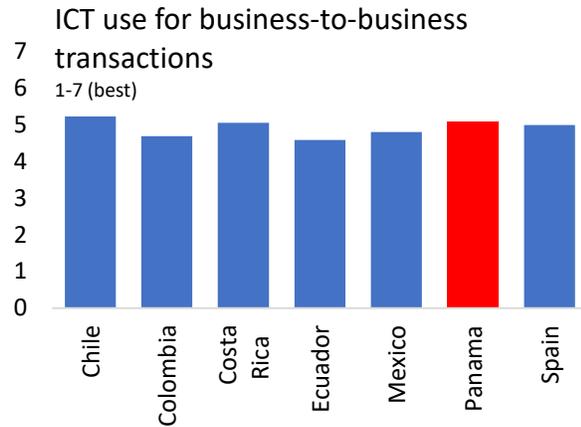


Figure 25 E-apps: ICT use for business-to-business transactions

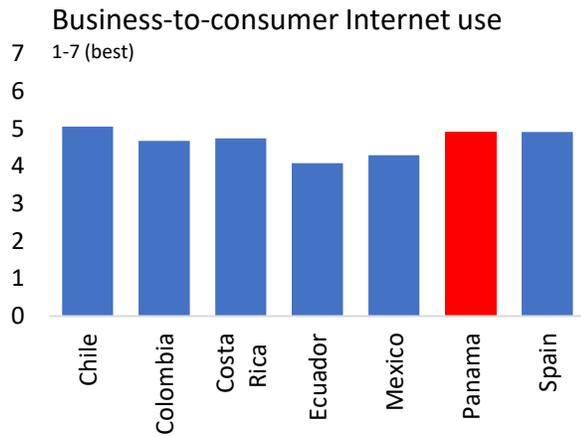


Figure 26 E-apps: Business-to-consumer Internet

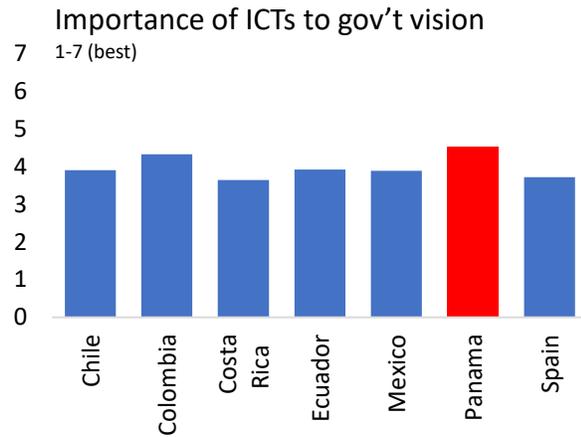


Figure 27 E-apps: Importance of ICTs to gov't vision

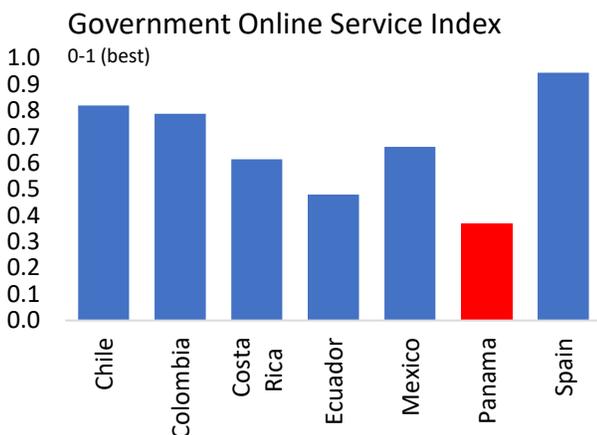


Figure 28 E-apps: Government Online Service

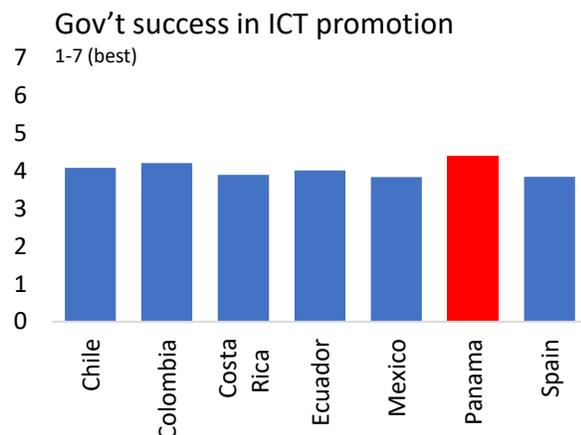


Figure 29 E-apps: Gov't success in ICT promotion

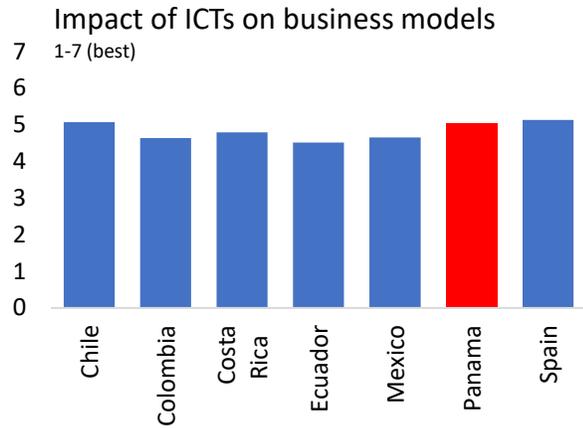


Figure 30 E-apps: Impact of ICTs on business

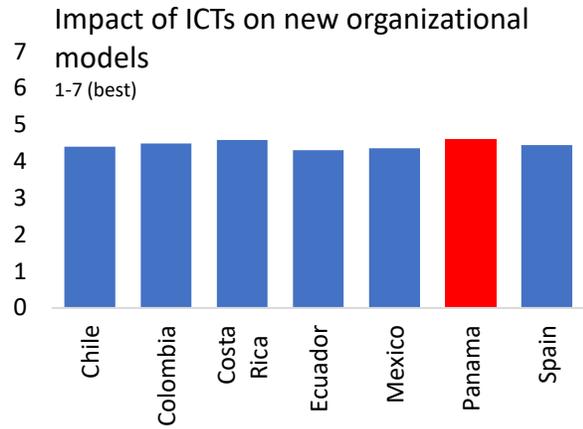


Figure 31 E-apps: Impact of ICTs on new organizational

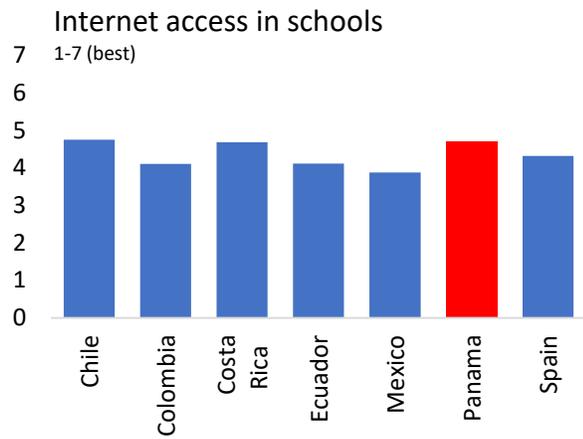


Figure 32 E-apps: Internet access in schools

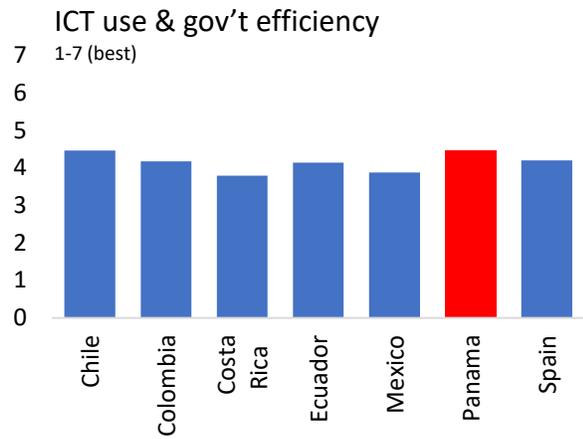


Figure 33 E-apps: ICT use & gov't efficiency

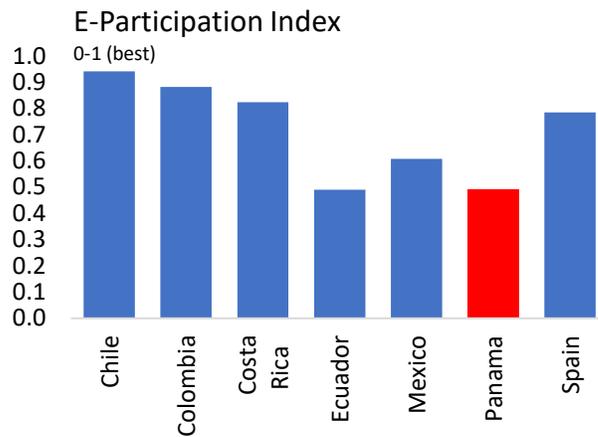


Figure 34 E-apps: E-Participation Index

## e-health

The use of Information and Communication Technologies in health applications is broad. It ranges from toll-free emergency call services to mobile applications that allow doctors to treat patients using telemedicine. These applications are expected to grow both in reach and scope. The ever-increasing penetration of broadband services allows health professionals to be always within reach of patients. At the same time, new technologies like always-connected wearable devices will keep accurate track of health indicators, especially for the treatment of chronic diseases.

There is a significant amount of literature on the positive effects health information technologies. Buntion (2011) shows that 92% of the recent articles have reached positive conclusions.<sup>16</sup> For example, Amarasingham, R. et al. (2009), find that an increase of 10 percentage points in the electronic automatic health records is associated with a 15% decrease in the odds of fatal hospitalizations.<sup>17</sup> The benefits that can result from ICT implementation can be divided into two main broad categories: 1) Increasing quality of care and efficiency, and 2) Reducing operating costs of clinical services.<sup>18</sup> There are other benefits as the opportunity of new methods of care or decrease in administrative costs.

Chaudhry B, et al (2006) analyzed 257 studies on the experience in implementing ICT technologies –such as decision support aimed at providers, electronic health records and computerized provider order entry systems– from 1995 to 2004 about the evidence on the effect of health information technology on quality, efficiency and cost of health care.<sup>19</sup> The study shows that an increase of adherence to guidelines was the principal effect of ICT on quality care. Especially, as a result of implementing decision support functions embedded in electronic health records. According to the study, improvements in processes of care delivery ranged from increases of 5 to 66 percentage points. Regarding Efficiency, the study finds that the implementation of ICT resulted in a decrease in the utilization of health care services (mainly laboratory and radiology services). Eight studies reported that order entry systems that provided decision support lead to decreases of 8.5 to 24 percentage points in the utilization of healthcare services.

The use of ICTs can improve the way tasks are performed leading to a reduction in operating costs. However, in the clinical services, the evidence is mixed depending on the context and the technology used (OECD, 2010).<sup>20</sup> According to Garg AX, et al. (2005) the use of computerized clinical decision support systems (CDSSs) –such as diagnostic, reminding and drug-dosing systems– improved practitioner performance.<sup>21</sup> However, OECD (2010) shows that most practitioners reported improved efficiency but do not report a reduction in their workload as a result of using CDSSs, which indicates that the effects are likely to be different depending on the context.

The World Health Organization runs a Global Observatory for eHealth. Its mission is, among others, to “*provide relevant, timely, and high-quality evidence and information to support national governments and international*

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<sup>16</sup> Buntin MB, Burke MF, Hoaglin MC, et al. (2011) The benefits of health information technology: a review of the recent literature shows predominantly positive results. Health Aff 2011.

<sup>17</sup> Amarasingham, R. et al. (2009), “Clinical Information Technologies and Inpatient Outcomes”, Archives of Internal Medicine, Vol. 169, No. 2, pp. 108-14, American Medical Association, Chicago

<sup>18</sup> OECD (2010), “Improving the sector efficiency: The Role of Information and Communication Technologies”.

<sup>19</sup> Chaudhry B, Wang J, Wu S, Maglione M, Mojica W, Roth E, et al. Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care. Ann Intern Med. 2006.

<sup>20</sup> OECD (2010), “Improving the sector efficiency: The Role of Information and Communication Technologies”.

<sup>21</sup> Garg AX, Adhikari NKJ, McDonald H, et al. (2005). Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. JAMA 2005.

bodies in improving policy, practice, and management of eHealth.”<sup>22</sup> This observatory publishes periodically an “Atlas of eHealth” that keeps track of the progress made by different countries concerning the foundations of an e-health strategy and the development and adoption of e-health applications

The Atlas of eHealth comprises the country context (population, economic status, among others) and eight eHealth themes: 1) eHealth foundations, 2) Legal frameworks for eHealth, 3) Telehealth, 4) Electronic health records, 5) Use of eLearning in health sciences, 6) mHealth, 7) Social media, and 8) Big data. The Third Global Survey collects data on eHealth (2015). This study focuses on themes 1, 2, 3, 4, 6, and 7.

- 1) **eHealth foundations:** comprises twelve indicators on eHealth national policies, funding sources, multilingualism and capacity building. Data are reported by the country response (yes, no or don't know) and the global response is the average “yes” response.
- 2) **Legal frameworks for eHealth:** comprises thirteen indicators focused on the degree of protection and control of individual's own eHealth data.
- 3) **Telehealth:** reports on the health system level of the five telehealth programs. The Atlas of eHealth defines the health system level as:
  - a. **International Level:** health entities in other countries in the world
  - b. **Regional Level:** health entities in countries in the same geographic region
  - c. **National level:** referral hospitals, laboratories and health institutes (mainly public, but also private)
  - d. **Intermediate level, covering district or provincial facilities:** public, private for-profit and private not-for-profit (e.g. religious) hospitals and health centers
  - e. **Local or peripheral level:** health posts, health centers providing basic level of care

Table 5 Telehealth in Comparable countries

Telehealth Programmes	Health System Level						
	Panama	Chile	Colombia	Costa Rica	Mexico	Spain	Global
Teleradiology	*	National	Nat, Intm	Intermediate	National	All	Established
Teledermatology	*	National	Nat, Intm	Intermediate	National	Intl, Reg. Intm, Loc	Established
Telepathology	*	*	Nat, Intm	*	Intermediate	Reg, Intm, Locl	Pilot, Established
Telepsychiatry	*	National	Nat, Intm	Intermediate	National	Reg, Intm, Loc	Pilot, Established
Remote patient monitoring	*	Local	Nat, Intm	*	Local	Reg. Nat, Intm, Loc	Pilot, Established

Note: Ecuador was not included in the Survey. \* Unanswered. -- Don't know. Source: Atlas of eHealth 2015, World Health Organization.

<sup>22</sup> "World Health Organization, Global Observatory For Ehealth." <http://www.who.int/gho/en/>

- 4) **Electronic Health records:** identifies the introduction of an EHR national system and legislation, the facilities with EHR, the use of other electronic systems and ICT-assisted systems.

Table 6 EHR in Comparable countries

### Electronic Health Records

	Panama	Chile	Colombia	Costa Rica	Mexico	Spain	Global
<b>Country overview</b>							
National EHR system	Yes	Yes	No	Yes	Yes	Yes	
Legislation governing the use of the national EHR system	No	No	*	Yes	Yes	Yes	
<b>Health facilities with EHR %</b>							
Primary care facilities (e.g. clinics and health care centres)	25-50%	50-75%	*	25-50%	25-50%	>75%	
Secondary care facilities (e.g. hospitals, emergency care)	<25%	<25%	*	<25%	25-50%	50-75%	
Tertiary care facilities (e.g. specialized care, referral from primary/secondary care)	<25%	<25%	*	<25%	>75%	50-75%	
<b>Other electronic systems</b>							
Laboratory information systems	Yes	Yes	N/A	Yes	Yes	Yes	35%
Pathology information systems	No	No	N/A	No	No	Yes	18%
Pharmacy information systems	Yes	No	N/A	Yes	Yes	Yes	33%
PACS	Yes	Yes	N/A	Yes	Yes	No	26%
Automatic vaccination alerting system	Yes	No	N/A	No	No	No	10%
<b>ICT-assisted functions</b>							
Electronic medical billing systems	Yes	Yes	Yes	Yes	Yes	Yes	58%
Supply chain management information systems	No	Yes	Yes	Yes	Yes	Yes	58%
Human resources for health information systems	Yes	Yes	Yes	Yes	Yes	Yes	69%

Note: Ecuador was not included in the Survey. \* Unanswered. -- Don't know. Source: Atlas of eHealth 2015, World Health Organization.

5) **mHealth:** identifies the health system level of mHealth programmes.

Table 7 Mobile health in Comparable countries

<b>mHealth</b>							
	Panama	Chile	Colombia	Costa Rica	Mexico	Spain	Global
<b>Accessing/providing health services</b>							
Toll-free emergency	National	National	Nat, Intm, Loc	National	Intermediate	Intl, Reg, Nat, Loc	Established
Health call centres	National	National	Local	National	National	All	Informal, Established
Appointment reminders	National	Local	National	National	National	Regional	Established
Mobile telehealth	National	*	Intermediate	Intermediate	Local	Regional	Established
Management of disasters and emergencies	*	National	Nat, Intm, Loc	National	*	Regional	Pilot
Treatment adherence	Intermediate	Local	Intermediate	Intermediate	*	Reg, Loc	Pilot, Established
<b>Accessing/providing health information</b>							
Community mobilization	*	Local	Nat, Intm	National	*	Regional	Pilot
Access to information, databases and tools	National	National	National	National	*	National	Established
Patient records	*	*	Nat, Intm	Intermediate	*	Intl, Reg, Nat	Pilot, Established
mLearning	*	*	Nat, Intm	National	*	Local	Informal
Decision support systems	Intermediate	*	Nat, Intm	Intermediate	*	Regional	Established
<b>Collecting health information</b>							
Patient monitoring	*	*	Nat, Intm	*	Intermediate	Reg, Loc	Pilot
Health surveys	National	*	National	National	*	*	*
Disease surveillance	*	*	Nat, Intm, Loc	*	Intermediate	Regional	Pilot

Note: Ecuador was not included in the Survey. \* Unanswered. -- Don't know. Source: Atlas of eHealth 2015, World Health Organization.

6) **Social Media:** identifies the use of social media by healthcare organizations, individuals and communities.

Table 8 Social media in health e-applications in comparable countries

### Social media

	Panama	Chile	Colombia	Costa Rica	Mexico	Spain	Global
<b>Health care organizations – use of social media</b>							
Promote health messages as a part of health promotion campaigns	Yes	Yes	Yes	Yes	Yes	Yes	78%
Help manage patient appointments	No	No	Yes	Yes	No	Yes	24%
Seek feedback on services	Yes	Yes	Yes	Yes	Yes	Yes	56%
Make general health announcements	Yes	No	Yes	Yes	Yes	Yes	72%
Make emergency announcements	Yes	No	Yes	Yes	Yes	Yes	59%
<b>Individuals and communities – use of social media</b>							
Learn about health issues	Yes	--	Yes	Yes	Yes	Yes	79%
Help decide what health services to use	No	--	Yes	Yes	Yes	Yes	56%
Provide feedback to health facilities or health professionals	No	--	--	Yes	Yes	Yes	62%
Run community-based health campaigns	Yes	--	Yes	Yes	Yes	Yes	62%
Participate in community-based health forums	Yes	--	--	Yes	Yes	Yes	59%

Note: Ecuador was not included in the Survey. \* Unanswered. -- Don't know. Source: Atlas of eHealth 2015, World Health Organization.

The following paragraphs contain e-health applications in comparable countries.

**Sidra, Chile.** It is essential to have a central application that standardizes and distributes clinical information across the e-health ecosystem; this structure allows an efficient and secure information's transmission across the different stakeholders, SIDRA in Chile is an example of it is the primary program of the e-health strategy of the country; it aims to digitize all clinic and administrative processes within a healthcare center. Its objective is to be the source of clinical information for healthcare centers, healthcare districts, the Ministry of Health and other health-related Government agencies Castro (2016). Currently, the government aims to implement electronic health records (EHR) in all public health entities using SIDRA strategy and a standardized information format that comprises patient and entities information. [www.salud-e.cl/proyectos/sidra/](http://www.salud-e.cl/proyectos/sidra/)

**Mi Salud, Chile.** Self-care e-health applications encourage patients to keep constant monitoring of their health, which triggers early detection and incentives healthy practices. One of the more innovative e-health self-care applications is Mi Salud it is a Chilean website and mobile phone online platform that empowers patients. They can have access to their health records, medical appointments, medical examinations results, medical recommendations and drugs medication. Furthermore, it allows interaction between users, to share medical experiences and advises. [www.miportaldesalud.cl](http://www.miportaldesalud.cl)

**Telemedicine, Chile.** Telemedicine has been a significant service on e-health development; it allows Real-time diagnostics and higher feedback on quality care. Also, it enables higher healthcare access and penetration. In Chile, there's been a great effort on creating new telemedicine applications. Some of them are: DART is an e-health app that uses artificial intelligence to make early detection of ocular diseases; COSMOS project aims to detect type 2 diabetes using voice response calls; Telecardiology has proved to be useful on ST-elevation myocardial infarction detection Escobar (2017). Also, private companies are implementing telemedicine services; they provide public emergency services, ambulatory care, and critical care with e-advice.

**1DOC3, Colombia.** It's a platform to ask medical questions, with no cost. The developers ensure verified answers, by confirmable doctors. This app was the winner of the Startup Awards with the Greatest Social Impact 2015 awarded by the IDB. The user in iTunes App Store and Google Play, have rated this app with five stars. In 2016 they had answered more than 100,000 questions, today the number of orientations exceeds 14 million. (Google Play, 2018) The main economic impact of 1DOC3 is to democratize access to underlying medical issues. This feature becomes vital for vulnerable or isolated populations, where market failures inhibit the provision of medical support. [www.1doc3.com](http://www.1doc3.com)

**Teletropic, Colombia.** In developing countries, tropical diseases can be mortal in low-income separate zones where people can't have access to critical care and prevention mechanisms. Colombia's geographic conditions make it more prone to tropical diseases proliferation. Also, the limited healthcare coverage makes isolated zones more vulnerable to these diseases. Teletropic is a mobile phone application which provides online medical consultation, videoconferences, and online diagnostics oriented to tropical diseases.

**Primeros Auxilios, Colombia.** As a developing country, Colombian people living in isolated territories don't have easy access to medical care during emergencies. Some rural areas have very few health experts, and this is the reason why every year many avoidable deaths occur. In order to tackle this issue, taking into account the coverage smartphones have reached, the Colombian Red Cross developed an app where they teach the basics of first aid. With the help of animations, videos and case studies the app explains what to do in case of emergencies if you don't have immediate assistance nearby.

**Mi Veris, Ecuador.** As the world continues to reach into an even more digitalized era, companies related to the healthcare sector are aiming to facilitate the patients' process. Mi Veris is an app developed by Innovasystem Ecuador, in which patients from Veris medical centers are given easy access to all sorts of services. Some of these services include scheduling doctors' appointments, receiving lab results, prescriptions and images to directly to the phone, and finding the best doctors nearby. [www.veris.com.ec](http://www.veris.com.ec)

**Cognitival: Healthcare, Ecuador.** Implementing artificial intelligence and big data, a world of possibilities has opened in order to facilitate people's lives. It is the case of Cognitival: Healthcare, formerly called Cloud Therapy, a startup created by four Ecuadorians that is currently in the first stages of development which aims to provide patients with the insights of numerous researches done in the past in order to give an efficient diagnosis. Being partnered with IBM, Watson, the app is able to translate questions made by doctors or patients into an analysis that includes stashed away data from clinical studies and research and through the use of probabilistic reasoning, find the best solutions ranked in a confidence level scale. Cognitival: Healthcare is hoping to cut the diagnosis time for over 9000 rare diseases, providing the patients with valuable treatment time ranges.

**Blanco y Negro, Ecuador.** With technological developments, e-apps reach a higher potential to facilitate people with disabilities' lives. As an undergraduate dissertation project, the Ecuadorian Byron Llerena created the app, Blanco y Negro, by which visually impaired people can communicate and use as a tool for everyday life tasks. Blanco y Negro identifies numbers and digits drawn on the screen to send text messages and call different

contacts. The app also comes with the possibility of color detection and audio feedback as an aid in all of its features.

**EDUS, Costa Rica.** The Unique Health Digital Record app or EDUS (in Spanish) has introduced the use of HER and improve the automation of health care in 100% of the social security primary health care centers and identified 100% of the population. EDUS allows practitioners and patients to view clinical information, previous diagnoses, allergies, and medications. In addition, the patients can schedule appointments and validate their insurance status. <http://www.ccss.sa.cr/appedus/>, <http://gobierno.cr/ccss-completo-cobertura-de-expediente-digital-en-el-primer-nivel-de-atencion/>

**Denuncias Salud, Costa Rica.** The Health Complaints App improved the process to present a complaint before the Ministry of Health and empowered the users to demand better health services. The app allows the user to report actions or situations that affect their health and low-quality health services. <http://www.denunciasalud.com/> <https://www.ministeriodesalud.go.cr/index.php/tramites-ms/denuncias>

**OGES, Costa Rica.** The Geographic Health Observatory or OGES had generated information valuable to diminish premature mortality rates and works towards meeting the target of 25%. OGES generates a map with information about diseases and health conditions by zones. The information is available to everybody on the website. <http://geovision.uned.ac.cr/oges/index.html>

**IMSS Digital, Mexico.** IMSS digital aims to save patients time improving processes as schedule an appointment, registration, and change of health center. The app allows patients to administrate appointments and concentrates information regarding the health insurance. <http://www.imss.gob.mx/imssdigital>

**Previta, Mexico.** Prevista introduces the use of electronic clinic record to prevent diseases and hospitalizations. Previta offers health services to private insurance agencies, companies and individuals, using telemedicine and decisions support systems. <http://previta.com.mx/>

**Nimbo X, Mexico.** Nimbo X is an assistant that helps doctors provide better care for their patients. The app is a private service that improves the administrative process, such as billing and scheduling, saving time to the doctor. In addition, the app is capable of generating electronic health records. <https://www.nimbo-x.com/>

**Tarjeta Sanitaria Individual, Spain.** The Individual Health Card and its database contain clinic information of 77% of the population (2016). The card contains the clinic information of the patients, and the information is shared in all the network of public hospital and clinics. In addition, the card is the key to the implementation of electronic prescriptions. <https://www.msssi.gob.es/organizacion/sns/planCalidadSNS/tic01.htm>

**Social Diabetes, Spain.** Social Diabetes is an app that helps to control diabetes types 1 and 2. It allows patients to calculate the right doses of insulin and other medication in emergencies. In addition, the doctors can supervise the patient remotely. <https://www.socialdiabetes.com/>

**Telemedicina solidaria-Salud 2.9, Spain.** Solidarity-Health Telemedicine 2.0 has helped in the diagnoses of 694 complicated medical cases. The program connects health professionals from Africa (Cameroon, Ivory Coast, and Congo) with doctors in Spain. Doctors help in the diagnosis of complicated cases through telemedicine. <https://fundacionrecover.org/salud-2-0/>

## e-commerce

E-commerce allows buyers and sellers to engage using Information and Communication Technologies, typically the internet but also transactions for goods and services using the phone. The main benefits attributed to e-

commerce are related to the reduction of transaction costs and the increase of competition. Information technologies provide access to broader markets, reduced search time, better prices due to more competition, and lower barriers to entry for suppliers of goods and services.

The transformational nature that e-commerce has had cannot be understated. Today, seven of the ten most valuable companies worldwide are ICT companies, with most of their revenues, if not all, coming from e-commerce. A mere ten years ago, only one ICT company (Microsoft) belonged to the top 10 most valuable companies.

*Table 9 Market capitalization of internet companies*

**Market Capitalization of selected companies**

Company	Market cap*
Apple	905
Google	785
Microsoft	689
Amazon	634
Tencent	540
Facebook	525
Berkshire Hathaway	520
Alibaba	480
J&J	394
Exxon	369

\*Data as of January 15, 2018.

Source: Bloomberg.

E-commerce boosts firms' access to global markets, it reduces transactions costs, and allow businesses to be part of international value chains. In Europe, the increase in e-sales sales raises the rate of labor productivity by 0.3 percentage points over a two year period, with a more massive impact on service industries. Also, the increase in e-sales activities has accounted for 17 percent of the labor productivity growth during the period 2003–2010 Falk (2015). Furthermore, e-commerce increases consumers welfare; it enables diversification on consumption and online selling through C2C platforms.

In developing countries, e-commerce implementation has been slower; lagged ICT infrastructure deployment, culture barriers, lower internet penetration and usage rates have hampered e-commerce implementation Alyoubi A. (2015). In Latin America, B2C e-commerce amounted 51 billion dollars in 2013, among 4 percent of the world total. Brazil represents 39% of B2C Latin Americas' sales; it has the most developed electronic commerce of the region Rogers.J (2015).

A primary principle in economics entails that consumers get better off whenever they face lower prices, higher products differentiation and there is a perfect matching about their needs and affordability and the corresponding supply. Online retailing contributes to lowering prices and offering greater differentiated products; also consumers can select between many products for sale and make numerous comparisons that are harder to do on physicals stores. Brynjolfsson et al. (2003) found e-bookstores enhanced consumer welfare by 731 million to 1.03 billion in the year 2000. Regarding welfare improving by an application that matches consumer needs with a

provider, Uber is an application that fulfills that with the transport service. Levitt et al. (2016) estimate Uber X generated 2.9 billion in consumer surplus in 2015 on four main cities in the US, consistent with a daily consumer surplus estimate of 18 million dollars.

Table 10 Online Retail Sales

**Online Retail Sales / Total Retail Sales (%)**

Country	2017
Spain	4.0%
Colombia	3.6%
Chile	3.3%
Mexico	3.1%
Ecuador	2.9%
Costa Rica	1.3%
Panama	1.0%
<i>Developed Economies</i>	<i>7.70%</i>
<i>Developing Economies</i>	<i>3.00%</i>

Source: Own calculation with data from Euromonitor International.

The UNCTAD B2C E-Commerce Index “reflects the processes involved in an online shopping B2C transaction”. The Index comprises the four parts needed for an online shopping B2C transaction. First, Internet users, which is measured by the share of individuals using the internet in the country. Second, B2C web presence, which needs secure Internet servers to enable secure transactions. Third, Delivery; operational delivery efficiency is measured by the UPU postal reliability score. Fourth, Payment method, which is measured by the share of individuals with a bank account.

Panama’s is ranked in the 84 position in the 2017 edition of the ranking, 16 places from its best historical rank (68) and 51 from the position of the best comparable (33). According to this Index, Panama’s main obstacle for b2c e-commerce is the lack of delivery efficiency.

**B2C E-commerce Index, 2017**

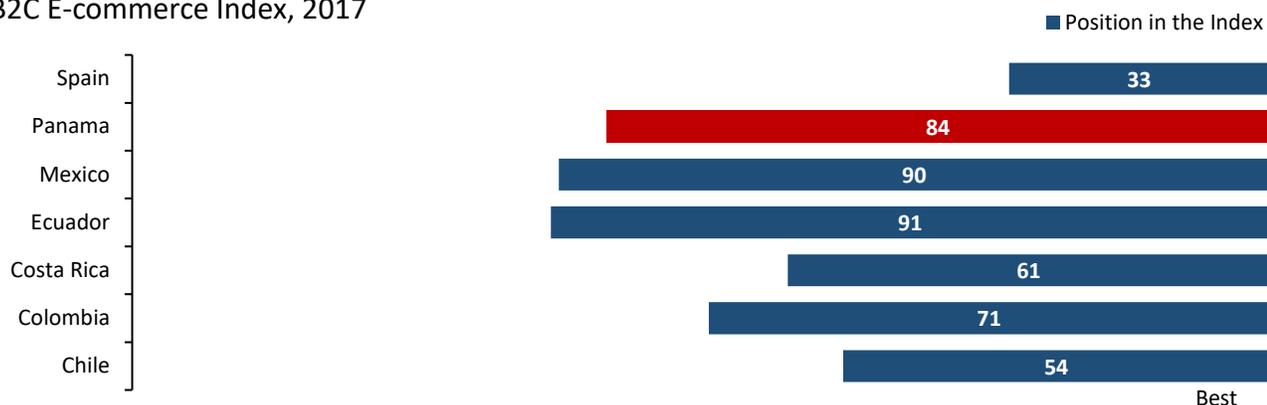


Figure 11 B2C e-commerce index

Table 11 UNCTAD B2C E-commerce Index, 2017

**UNCTAD B2C E-commerce Index, 2017**

a)	Index	Panama	Best Comparable (Spain)	Best Historical (Azerbaijan)
	B2C E-commerce	84	33	50

b) Indicator	Value	Gap with respect to	
	Panama	i) Spain	ii) Azerbaijan
Share of individuals using internet	54	27	24
Share of individuals with an account (15+)	44	54	--
Secure Internet servers per 1 million people (normalized 0-100)	67	13	--
UPU postal reliability (0-100)	8	54	67

Source: Own calculations based on data from UNCTAD B2C E-commerce Index, 2017.

**Cornershop, Chile.** “Time is money” is a commonly quoted attributed to Benjamin Franklyn it means that each moment of time has an opportunity cost (In economics usually measured as labor income or leisure), because of this, saving time has been a significant goal to apps developers. Cornershop is a mobile-app that saves time on groceries shopping, it contains thousands of products and hundreds of stores, that can be ordered on the app, and home delivered. [www.cornershopapp.com](http://www.cornershopapp.com)

**ComparaOnline, Chile.** Understanding financial products is a challenging task for people that are not familiar with economic or financial topics. It is even worse in developing economies where financial education has lower levels than in g8 economies. ComparaOnline is a mobile-app that empowers consumers on acquiring financial products; it shows all options available in the market, the type of service, the price and the interest rate. It contains market information on credit cards, mortgages, car insurance, life insurance, health insurance and travel insurance. It serves 1million users per month, and it is currently working on Colombia, Brazil, and Chile. [www.comparaonline.com](http://www.comparaonline.com)

**Viajes Falabella, Chile.** Planning a trip can be a challenging task; it implies having enough information on all flight tickets’ prices and qualities, and sufficient information about hotel prices and locations abroad. Viajes Falabella is a website application that enables users to observe a many tickets’ and hotels’ offers and to plan a trip that efficiently fits their preferences and budgets. The webpage also offers, tours, trip insurance, buses, and bundled services. Viajes Falabella won the eCommerce awards 2017 as the leading e-commerce enterprise in the Chilean tourism sector. [www.viajesfalabella.com](http://www.viajesfalabella.com)

**Sipsa, Colombia.** Sistema de Información de Precios y Abastecimiento del sector Agropecuario (SIPSA), is a Colombian’s national statistics office mobile application, that provides daily weekly and monthly information of Colombians’ commodity prices on many wholesale farmer’s markets across the country. Furthermore, SIPSA offers monthly supply information; it reveals the volume of distinct commodities that get into the cities. In addition to wholesale prices and quantities, SIPSA provides prices for agricultural inputs, like fertilizers,

herbicides, pesticides, animals, animal feed, land renting, among others. SIPSA has become a useful application to inform retailers and agricultural producers about market prices which finally allows them to take better and smarter decisions. [www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa](http://www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa)

**Nequi, Colombia.** It is an app that helps users to manage their money. It allows to separate income into “pockets,” which are categories of expenses; and to create savings goals, with dates and daily quotes. Given that this portal enables its subscribers to make money transfers between cell phones, cardless payments, and PSE movements, it could be classified into the mobile banking segment. This platform was launched in Colombia supported by Bancolombia bank, so their cash transactions are backed, which has generated trust among users (Nequi, 2018). It is noteworthy that the app has a mandatory face recognition security system, a significant innovation that gives trust even to the more skeptical user. Finally, the accounts can be opened at no cost, and their services can also be used for free up to a limit of money movement and total savings, which can be avoided by making a single payment of 15,000 pesos. The developers expect to reach 650,000 users by 2018. By the end of 2017, they had about 250,000. (El Espectador, 2017). [www.nequi.com](http://www.nequi.com)

**Rappi, Colombia.** Rappi is one of the most downloads mobile-app on Colombia, on January 2018 it receives 183 million dollars from foreign investors, which make it one of the most successful Colombian apps. It allows the user to buy food on closer restaurants or buy groceries on closer retailers. Apart from traditional delivery services like food and groceries, the option “Wishes” brings the user anything he wanted. Besides, Rappi offered a delivery service that enables to send or receive any package inside the city. Also, Rappi has nails service at home, carwash services, among others. [www.rappi.com](http://www.rappi.com)

**Shope2Home, Costa Rica.** In Shop2home users can find items from more than five different categories, with prices lower than those of physical stores. Shop2home is an online platform that connects buyers and sellers. It is based in Costa Rica and has presence in other countries of Latin-American. <https://www.shop2h.com/>

**Quiago, Costa Rica.** Quiago improved customer experience with real information that allow to make comparisons in order to choose the best. It is a mobile app that offers information and promotions of restaurants in Costa Rica. In addition, there is information about cultural and sports events. The app is growing and now has presence in other countries of America. <http://www.quiagohn.com/>

**Teletica.com, Costa Rica.** Teletica is an app that publish national and international news, sports, prices, weather and traffic. Information is updated every minute. In addition, it transmits online programs and videos. <https://www.teletica.com/>

**Simulador de Consumo de Datos, Mexico.** Data consumption simulation improved and made more transparent the selection of a mobile data plan, empowering users and improving competition. It is a website application developed by Mexico’s Ministry of telecommunications. It allows the user to simulate monthly data consumption according to previous profile customization which includes configuration options like social networks’ use (text, photos, video), SMS, streaming usage, movies, maps usage, e-mail, web navigation, among others. Once the simulation has an estimation of monthly data consumption, the platform shows all market plans (includes tariffs and telecom supplier) that are closer to user’s preferences. <http://simulador.ift.org.mx/simulador.php>

**OXXO Pay, Mexico.** OXXO Pay is an alternative payment method for online purchases for people that do not have a bank account. To make a payment, the user gets a code from the e-store and make the payment in cash in an OXXO store. The payment is processed immediately. OXXO has about 16,000 stores in the country and presence in every state. <https://www.conekta.com/es/oxxopay>

**Laudrive, Mexico.** Laudrive gives the opportunity to women to work as a private driver and offer transportation to other women. It is a service that connects those who offer a transport service to those who need it but can only be used by women. It only has presence in Mexico City. <https://www.laudrive.com>

**Wallapop, Spain.** Wallapop has more than 40 million users, and more than 100 million products have been commercialized. Wallapop is a virtual and mobile market. It allows to buy and sell second-hand products in a simple way, from a device or website. <https://es.wallapop.com/>

**Heygo, Spain.** Heygo connects hourly workers searching for a job to households looking for them. It has more than 200,000 members. The services offered range from teachers to carpenters. In Heygo the hourly workers advertised their skills and are rated by their previous services. Customers can select with more information. <https://www.heygo.com/es>

**Glovo!, Spain.** Glovo makes every business to have a delivery service without costs, helping to increase sales. With Glovo users can order or deliver what they want, and receive it in less than 60 minutes. It is an urban and collaborative home delivery service. <https://glovoapp.com/es/>

## e-education

Information and Communication Technologies are rapidly being integrated into every aspect of life. Education is no different. ICT applications can enhance the educational experience of young and adults by bringing together all sources of knowledge (digital books, online courses, educational videos, digital encyclopedias, etc.) and extending the times and places in which people can learn (from tele-education in distant communities to learning new skills while commuting).

Some evidence suggests the importance of ICT implementation on learning and teaching methods. Banerjee et al. (2007) obtain evidence of learning improvement on children that uses a computer-assisted-Learning program two hour per week. The program reinforces their math skills by 0.35 standard deviations the first year and 0.47 standard deviations the second year, both results show that ICT can efficiently increase education's quality when teaching methods adapt modern technologies. Regarding teaching quality, Allen et al. (2011) examined the usefulness of a web-portal that improves teacher-student interactions in the classroom, the intervention produced substantial gains in measured student achievement in the year following its completion, equivalent to moving the average student from the 50th to the 59th percentile in achievement test scores.

Open educational resources and massive open online courses (MOOCs), has been essential to deploy education coverage, lower education prices increase the quality of education and improve creativity. In some countries, there is a growing trend on online courses offering. In the UK 35% of higher education institutes provided at least one e-learning course, on Australia 48% of education activities are involved on e-learning practices OECD (2016), in the united stated 66% of higher education institutes offered distance education Prasad et al. (2008).

**Enlaces, Chile.** Enlaces is an education and technology center of the ministry of education. Since 1992 it has been fundamental on Chile's ICT implementation on education, and on promoting digital culture across the country. It works with all subsidized schools; it fosters e-learning strategies and digital infrastructure. Further, it capacitates teachers on e-teaching methods to complement technology implementation. Enlaces website includes many e-education apps, informative videos, educational software, and online documents that helps children and adults to improve their academic and cognitive skills. It is the principal e-education institution in the country, and a model to follow in Latin America. [www.enlaces.cl](http://www.enlaces.cl)

**Internet Segura, Chile.** In the digital era, it is essential to make responsible use of internet and the digital media. There are potential dangers like cyber-frauds, privacy violation, intimidation, hacking, where children are the most vulnerable and need to be more cautious. Further, the digital era has a set of rights and duties that most of the people do not even know they exist, it is essential to educate people on the laws that regulate digital content usage, to prevent damages and have conscious consumers. Internet Segura is a Chilean platform that aims to educate cybernauts on internet rights and duties and in potential damages that the internet has. Internet Segura has two main edges. The first edge aims to instruct parents on internet usage and give them appropriate tools and solutions for guide their children on digital content. It contains applications like a kid internet browser, tutorial videos, and educational software. The second edge consists on deliver pedagogical strategies to schools that help on improving internet's rules, right and duties and general regulatory framework. [www.internetsegura.cl](http://www.internetsegura.cl)

**Innovar para ser mejor, Chile.** Educators are the most critical players in the education system, on their ability to transfer knowledge and their pedagogical strategies lie the performance of students learning. Then, it is essential that educators improve their teaching skills, and update their class methodologies to modern pedagogical strategies, which frequently uses digital technologies. Innovar Para Ser Mejor is an education program directed to schools' professors that aims to provide pedagogical knowledge and to improve students learning. The program is 100% online, it promotes inclusion and is focalized on teachers that attend vulnerable zones of the country.

**Sena virtual, Colombia.** The web portal [senavirtual.edu.co](http://senavirtual.edu.co) agglomerates the online courses offered by the National Learning Service (SENA, by its initials in Spanish). It hosts vast options for short courses, classified in 43 categories. Additionally, it has an independent bilingual training platform called English Dot Works. This online strategy, supported by the national government, was launched in 2003 with the aim of fulfilling the specific needs of human resources in companies and improve the skills of workers in any area. Given the objectives of SENA, the courses offered in his platform are free and have technical support for inexperienced users. The organization established a goal for 2017 to open 3.052.064 places on its website, and reach at least 2.553.794 apprentices in virtual training, of which 683.043 are in bilingualism. (SENA, 2017). [www.oferta.senasofiaplus.edu.co](http://www.oferta.senasofiaplus.edu.co)

**Platzi, Colombia.** Platzi is an online education company, offering courses in marketing, programming, and web design. It was founded in 2013 and is now one of the most active competitors in the market. Its purpose is to democratize access to education and attend the professional segments that are left aside in professional careers through 27 careers and 150 (El Espectador, 2016). This initiative was supported by own funds and contributions of investors in Silicon Valley. Today, its income comes from annual or monthly subscription plans, which allows its users access to the full content of the web portal. (Platzi, 2018) According to the portal [enter.co](http://enter.co), today the platform has 310,000 students. (Enter.co, 2018). [www.platzi.com](http://www.platzi.com)

**UNAD, Colombia.** The National Open and Distance University (UNAD, by its initials in Spanish) is a virtual college, supported by the Colombian government, that offers undergraduate programs, mostly, but also postgraduate studies in seven areas. Despite being conceived as a district institution in 1981, ending the 90s, it obtains the national character. This platform has two main advantage over his relatives in this segment of virtual education. First, being endorsed by the National Education Ministry, so that his graduates can exercise with the UNAD certification. Second, low-cost fees. For 2018 the regular academic credit will cost 88.000 Colombian pesos, about 31 dollars. (UNAD, 2018). [www.unad.edu.co](http://www.unad.edu.co)

**Upe, Costa Rica.** Upe improves the learning process for teachers and students through the generation and free publication of updated academic material. The website offers 38 online courses and 12 discussion forums for relevant academic topics. <http://www.upe.ac.cr/>

**Recuper@, Costa Rica.** The program generates conditions to enable hospitalized students to continue learning as if they were in the classroom. Teachers use mobile devices and fixed technologies to deliver lectures to the hospitalized students in the Children National Hospital. Recupera is a model where teachers, and hospital staff cooperate to create an environment suitable to the education process. <http://www.ceaph.com>

**Estudia vale por dos, Costa Rica.** “Estudia, Vale por dos” has helped more than 1,300 mothers or pregnant teenagers to return to the formal education system. The program offers courses on the use of information technologies and social media to improve the learning process. The primary objective is to help mothers to return to the formal education system.

[http://www.fod.ac.cr/index.php?option=com\\_content&view=article&id=81&Itemid=160&area=8&proyecto=32](http://www.fod.ac.cr/index.php?option=com_content&view=article&id=81&Itemid=160&area=8&proyecto=32)

**Universidad Técnica Particular de Loja, Ecuador.** Distance education on higher institutes allows people to obtain a higher education with total flexibility of time and location. Some distance education courses charge tuition or a certificate pay, and others are free, the importance of both is that it facilitates education to people that are financial, geographical or time constraint. Universidad Tecnica Particular de Loja (UTPL) is the oldest higher education institute that offers 17 distance education programs in Ecuador. It currently has 35,000 students, more than 65,000 graduates, 160 Ph.D. professors, and 771 professors that have a master degree. UTPL has trained high skill workers capable of contributing to sector’s economic progress and has contributed to educating people according to future and current labor market trends. <https://inscripciones.utpl.edu.ec/>

**E-Learning, Ecuador.** The private sector contributes with many resources to ICT implementation in society; it plays a vital role in ICT innovation and research and its implementation to boost productivity. E-Learning Ecuador is one example of how the private sector could deploy e-learning practices in the productive sector; it is a firm that develops e-learning applications according to other firms’ specific needs. It has thriving cases that show how e-learning implementation on companies can increase efficiency on workers specific training and communication processes across the firm. Some of them are Cervceria Nacional e-learning app that teaches safety practices and procedures; Banco del Austro e-learning app that teaches workers how to identify operational risk; Banco General Romuñahui e-learning app that teaches workers how to track money laundering. [www.elearningecuador.ec](http://www.elearningecuador.ec)

**Escuela Politécnica Nacional, Ecuador.** Many people cannot afford tuition and fees of higher education institutes, and other people could have disabilities or some other physical restrictions (E.g. Prisoners) that impossibilities their access. In this sense, the developing of distance education is crucial as it enables people to access flexibility education programs compatible with their restrictions. Escuela Politécnica Nacional (EPN) is a higher education entity that offers online courses for all people in Ecuador; its programs include programming learning, pedagogical skills, and business management. EPN offers the possibility to obtain a certificate by paying a fee. <http://www.epn.edu.ec/>

**Aldea Digital, Mexico.** Aldea Digital offers a website with more than 30 online workshops, 92 conferences, and access to educational content. In addition, Aldea digital organizes an event where it provides equipment and internet to whoever wants to get access to the online content. The event is once a year with a duration of about 20 days. <http://aldeadigitalmx.com/>

**Televisión Educativa, Mexico.** EDUCATIONAL TV distributed education by television to 1.9 million of students and professors in Mexico, through programs like TELE middle and high school. In addition, EDUCATIONAL TV offers three channels with programs of science, technology, and general education to Mexico, South and Central America, and south of US, through EDUSAT. <http://www.televisioneducativa.gob.mx>

**Aprende.org, Mexico.** The website and app offer more than 80 free academic and technical courses. Aprende.org offers not only free educational content but also offers free data to access it, using the network of Telmex and Telcel. Also, the user can get official certification for the courses. <https://aprende.org/>

**Red Educa, Spain.** Almost five thousand students have graduated from the platform of Red Educa. The platform offers more than one hundred online courses at university level with official certifications. <https://www.rededuca.net/>

**Formacion Profesional a Distancia, Spain.** Distance professional formation has provided professional formation more than 800 thousand people. The programs aim to generate opportunities for people that cannot attend school because of their location or schedule. The program offers distance education to autonomous communities in Spain. <https://www.mecd.gob.es/fpadistancia/inicio.html>

**Escuela 20, Spain.** Escuela 20 contributes to the implementation of information technologies in the classrooms of the public schools. Also, it offers courses on the use of information technologies to professors, parents, and students. The project donates laptops and digital blackboards. <http://www.escuela20.com>

### e-government

The objective of e-government applications is to have better government. In practice, this means using ICT technologies, specially the internet, to achieve transparency, openness, and inclusiveness in all government processes and data. E-government initiatives pursuing these goals are public websites that provide access to statistical information regarding population, the economy and geography and well as digital applications that keep track of business invoices to facilitate tax collection and transparency.

There is an extensive amount of literature that validates the advantages of e-government. The list of advantages is long and includes improving public services to citizens, increasing efficiency of government agencies, reducing operational costs, and improving governance.<sup>23</sup> Online platforms can deliver public services to citizens quickly, easily and readily available.<sup>24</sup> Citizens save time and money by completing procedures online. According to Reynolds (2001), e-government also increases cooperation between departments and different public entities, leading to increases in productivity and efficiency. In 2012, the European Commission estimated that using online communication between citizens and government could reduce cost by 15% to 20%.<sup>25</sup>

In addition, according to Al-adawi (2005) E-government improves transparency of government activities, reduce systematic corruption and improve relationships between citizens and the state. E-government enables Citizens to have direct online access to information and public data regarding public activities, expenses, and projects. Northrup and Thorson (2003) argue that this requires an increase in transparency on public expending and reduces corruption.<sup>26</sup> The information available empowered the citizen to claim for better governments and supervises government activities.

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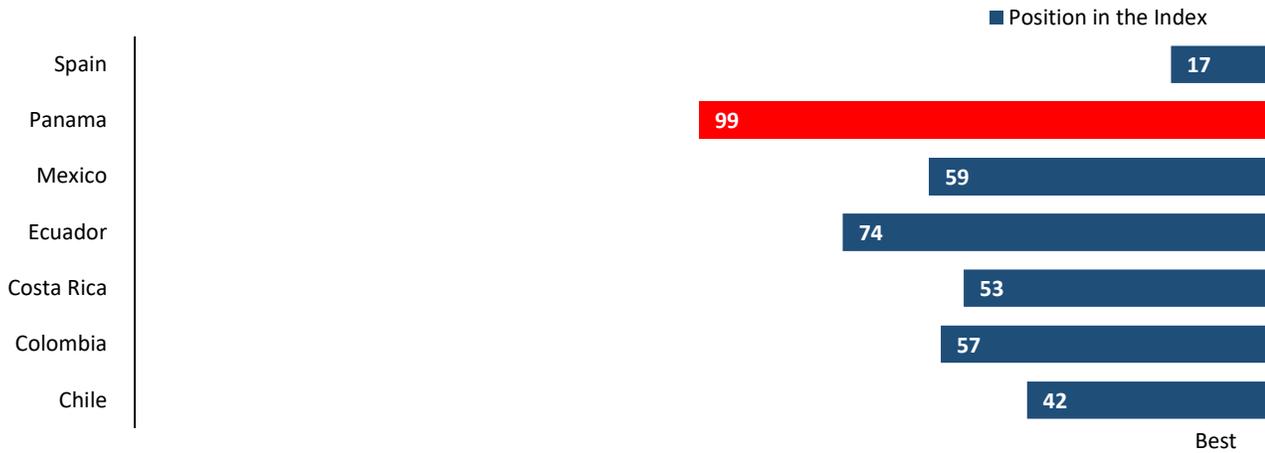
<sup>23</sup> Reynolds, M. & Regio, M. (2001). E-Government as a Catalyst in the Information Age.

<sup>24</sup> Al-adawi et al. 2005. "Conceptual model of citizen adoption of e-government"

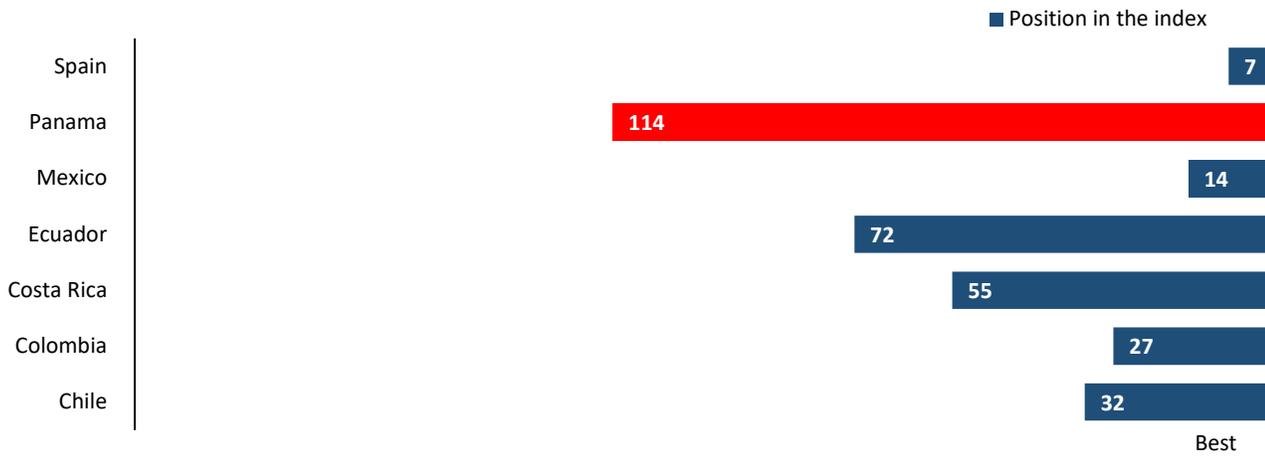
<sup>25</sup> European Commission (2012). Digital "to-do" list: new digital priorities for 2013-2014.

<sup>26</sup> Northrup, Terrell A. and Stuart J. Thorson. (2003). "The Web of Governance and Democratic Accountability."

### E-Government Development Index, 2016



### E-Participation Index, 2016



### Online Service Index, 2016



Figure 12 e-application indices

**Acceso a lo Nuestro. Chile.** By law, Beaches, rivers, lakes, and glaciers are national public goods, for this reason, every Chilean must enjoy this places without paying a fee, and no one can appropriate these sites and restrict their access. In 2014, Chile's government received 196 complaints about denied access to 114 country places, mainly beaches, rivers and lakes Martinez (2014). To enforce the law and empower citizens to access and enjoy nature national public goods, Chile's government launched a mobile phone application "Acceso a lo Nuestro" that enables citizens to make complaints efficiently and easily, about public sites that are being restricted by a private. "Acceso a lo Nuestro" is an excellent example of a mobile application that protects civilians' rights and facilitates communication between population and government authorities.

**Busca Justicia. Chile.** Article 2 of Chilean constitution establishes the private right to have fair and efficient access to justice and the right to have equal access to the legal system without geographic or socioeconomic discrimination. To foster universal access to the legal system, the government launched "Busca Justicia" a mobile phone application that allows the users to find each legal institutions and Ministry justices services that are close to the user. In a second stage "Busca Justicia" will allow more sophisticated services like online orientation and solutions to justice problems that the users could have.

**Trasantiago. Chile.** iTransantiago is an application that allows people to find the best route efficiently, it improves mobility on the city and empowers citizens by making better use of public transport (subway and buses). One of the critical features of iTransantiago is how the application was constructed. The app is feeding on open data uploaded by government institutions and coding by Chile's digital government agency. It highlights the importance of a digital ecosystem where data flow between institutes and fosters creation and implementation of digital products, like iTransantiago.

**Datos.gov.co, Colombia.** During the last years, there has been an increasing trend on fostering government transparency and empower citizens to have a more active role in supervising government performance. Open government is a practice that helps on reveal governments performance black box. It is a doctrine where citizens could have access to data and public institutions' documents. Colombia's open government platform Datos.gov.co is one of the most significant programs of the government; it is a web application that allows recollection and visualization of 6943 datasets of 937 distinct public entities like ministries, regional governments, government agencies, public universities, and companies.

**Nomasfilas.gov.co Colombia.** Time is a scarce resource. Each person has 24 hours on a day that must be efficiently used for different activities. The time it takes to comply taxes or obtain a certificate is a waste of time that implies less time for having leisure or less time for working. Therefore, every effort on reducing the time it takes to comply paperwork will be welfare enhancing as people have more time available. Colombia launched a website platform nomasfilas.gov.co which allows citizens to make online transactions and accessing online services; the website includes education, employment, taxes, justice, finance, health, and many other services.

**Urna Cristal. Colombia.** Fostering people participation in government decision-making process, and government practices that show that policy-makers care and listen to people needs is crucial for the developing of a modern democratic system. As long as government's relation with the people gets strong, public policy gets more accurate, and people get more control over country's development. Urna Cristal is a Colombian website platform that fosters civic participation and government transparency. It has multiple portals for posting ideas, asking questions and consulting different governments' topics. Urna Virtual has done numerous online participation exercises. It

received comments of how public services are fulfilling citizen needs; it promoted an online discussion about mining impact on water reserves; it launched an online pedagogic experiment to learn about the new policy code; it disclosed local government policy results; it launched online environmental campaigns that got strength by people participation.

**MuNet e-Government, Costa Rica.** MunNet has trained 1,128 municipal officers in 120 different municipalities. MuNet is present in Costa Rica, Guatemala, Panama, and Paraguay. The program supports the municipalities in their efforts to adopt ICTs in the design of public project and strategies. The program consists of 15 months of orientation for Mayors, diagnosis, training municipal officers, consultancy, and technology transfer. <http://portal.oas.org/Portal/Sector/SAP/DepartamentoparalaGesti%C3%B3nP%C3%ABlicaEfectiva/NPA/MuNeteGovernment/tabid/1169/Default.aspx>

**Oficina Virtual de la Caja Costarricense de Seguro Social (CCSS), Costa Rica.** This platform simplifies administrative process for the 1.7 millions of employees that are affiliated with the national social security system. In the platform, employees and employers can carry out procedures such as registration to the national security system, administrate their insurance, among others. <http://www.ccss.sa.cr>

**Aya, Costa Rica.** Aya app allows citizens to report inadequate services in the Water and Sewer system, increasing quality and transparency of public services. Citizens can check their consumption, pay their invoice, report leaks and be informed about maintenance of the network. <https://www.aya.go.cr/>

**Ventanilla Unica, Ecuador.** Tax submissions, tariffs payments, and other certificates could slow international trade, as it gets cumbersome to comply with a burden set of obligations at the moment of doing an export or an import of goods. To arrange the inefficiency of trade paperwork, the government implemented Ventanilla Unica, an online platform that allows the user to make tax submissions and obtain exports and imports certificates online. It has reduced transaction times 70% and has processed 1.2 million of transactions

**Tramiton, Ecuador.** To improve government efficiency and incentive civic participation, Ecuadorian government launched Tramiton. It is an online portal that allows citizens to propose solutions that can improve government efficiency and simplify cumbersome procedures. Furthermore, Tramiton has a platform that enables government officials to participate and collaborate to strengthen the institutional process and impulse quality and efficiency on public policy. Currently, it has 1405 government officials registered, 4238 civilians' users, 403 proposed solutions, and 87 applied solutions in progress

**Quipux, Ecuador.** Every day, public entities receive and send thousands of e-mails between them, and citizens receive and send other thousands of e-mail to public bodies primary for red tape motives. In this complex network of e-mails Quipux is an Ecuadorian web platform, that facilities public entities the management of all their e-mails and allow citizens to track their sent e-mails to specific public institutions. It is used by 340 public organizations like central public administration, independent, decentralized governments, business registers, universities, fire department and the citizenship. In 2015 1.7 million of citizens and 177000 government officials generated 110000 daily documents Barragan et al. (2015).

**ComprasNet, Mexico.** ComprasNet increases the transparency of public expenditure and generates opportunities for small and medium enterprises to sell products and service to the government. It is an electronic information system about acquisitions, leases, and services. The platform allows the user to get access to public tenders and contracts. <https://compranet.funcionpublica.gob.mx/web/login.html>

**DeclaraSat, Mexico.** DeclaraSat allowed more than 596,000 companies and 1.9 million people to present their annual tax declaration. DeclaraSat is an online platform where the taxpayers can pay the corresponding taxes. The

platform contains information about the income and expenses that the taxpayers did in the previous year, and the taxpayers only have to confirm them, making the process simple and fast. <https://tramitesdigitales.sat.gob.mx/Declarasat.EnLinea/Login.aspx?ReturnUrl=%2fdeclarasat.enlinea%2fDefault.aspx>

**Policia Federal 2.0, Mexico.** The app of the Federal Police represents a constant channel of communication between the citizens and the federal police, improving security and preventing crimes. With the app, the user can report crimes, get access information, and report information incidents on federal highways. Also, the user can pay fines and penalties. <https://www.gob.mx/policiafederal/articulos/aplicacion-pf-movil?idiom=es>

**E-Government Portal, Spain.** The unique website improves the telecommunication of all public administration with citizens. The eGovernment portal unifies and centralizes information about all government dependencies. It offers the possibility of doing procedures at any time and access to information, analysis, initiatives, and status of all activities of the government. [https://administracionelectronica.gob.es/pae\\_Home](https://administracionelectronica.gob.es/pae_Home)

**“Red Sara,” Spain.** Red Sara connects more than 3,708 local entities, representing more than 90% of the population, increasing collaboration within all government levels. Red Sara is Spain’s Government Intranet. It aims to save costs and time, and facilitate the integration of systems and exchange of data. <https://administracionelectronica.gob.es/ctt/redsara#.WmmxJKigLIU>

**Circe, Spain.** The Information Centre and Business Creation Network reduced the registration process of new business to just 24-72 hours and the numbers of forms to be filled from 23 to just 1. Circe is a website that enables the online completion of procedures related to the creation of new businesses. <http://portal.circe.es/>

Latest developments in e-government: big data, machine learning, artificial intelligence, blockchain and the internet of things

**Predicting High School Dropouts, Chile.** Nowadays, one of the major entities’ challenges is making use of a significant amount of administrative data that historically has been unutilized. Modern data science comprises predictive and classification methods that permits extensive data analysis, making administrative data and other data a valuable input. One example is the work by The Ministry of Education in association with Universidad de Chile; they detect which socioeconomic factors and school geographic locations better explain school dropouts and school performance on Santiago de Chile, using machine learning explanatory and predictive models Shakil Ahmed (2016) with Azure Machine Learning and Microsoft Power BI.

**Predicting The risk of Intracranial Aneurysm. Chile.** The quality of machine learning methods as predictive algorithms has let them as prominent tools for distinct fields of knowledge. On healthcare, machine learning techniques can help to predict the risk of specific diseases, given a set of past information. In Chile Universidad de Valparaiso and Hospital Carlos Van Buren developed a 2017-2020 health project that consists on identify relevant variables that may help in the process of predicting the risk of intracranial aneurysm rupture using machine learning and image processing techniques based on structured and non-structured data from multiple sources Chabert S et al. (2017). The project will improve the existing knowledge on brain mysteries and could reduce mortality rate due to subarachnoid hemorrhages.

**CEINE, Chile.** One of the leading Chilean institutions that contribute to big data machine learning and data mining is Centro De Investigacion En Inteligencia De Negocios (CEINE). Some of its projects include: market basket analysis using graph mining techniques; profiling clients using high-frequency individual mobility data, targeting clients using social media analysis and data mining; optimizing SERNAC claims to process through text mining analysis; detecting Sleep-Disordered Breathing through machine learning and data mining techniques; taxi

services optimization through route algorithms. The examples showed above are some of the current advances in Chile on big data and machine learning applications.

**Labor vacancies, Colombia.** Colombia's national statistics office (DANE, with its initials in Spanish) performs many surveys that grandly contains different households' characteristics. To perform labor market analysis, survey data collected by DANE allows an extensive description and analysis of labor supply, as long as surveys comprise household behavior and description. However, there is no information on how labor demand is determined. Therefore, it is essential to develop methods that allow a better understanding of how firms demand labor. In 2014 researchers from Ministry of Labor and Rosario University implemented a new methodological for analyzing labor demand using web-scraping of labor vacancies on Colombian internet pages Guataqui et al. (2014). One of the significant outcomes of the study is a database that contains labor demand patterns in Colombia.

**Inequality measuring using big data, Colombia.** Traditionally measures of inequality have been constructed through census and survey data. One of the significant pitfalls of traditional methods consists of data unavailability on separate zones where it is costly and operationally difficult to perform surveys. Mobile phones' call detailed records (CDR) can be used to approximated people socio-economic status, therefore using national CDRs is an innovative way to recollect information in places where traditional methods cannot do. In Colombia Tariq Afzal presents methodologies and findings of using CDR-based techniques for measuring poverty and inequality, the study allows a broader scope of inequality in the country and complements the studies performed by the national statistics office.

**Health insurance and risk predictor, Colombia.** Intensive Care Unit (ICU) services are amongst the costlier services provided by hospitals. Early detection of risk factors associated with readmissions, death, and infections in the ICU, can improve patient care quality and reduce costs in the long-run. Serna et al. (2017) adjusted alternative risk adjustment measures of health insurers using four machine learning methods (Random Forests, Artificial Neural Networks and Boosted Trees), which improves existing prediction methods and contributes to a significant cost reduction for the health system and serves as a toolkit to doctors in order to take better and smarter decisions with the available data.

**Modelo Predictivo, Costa Rica.** The program found 3 thousand false providers registered as tax payers to evade taxation. In the las 5 years, the amount of tax evasion was estimated near 32 million dollars. The ministry of finance is using big data to trends and patrons to identify suspicious transactions that may lead to tax evasion or money laundry. <http://www.hacienda.go.cr/noticias/13734-hacienda-con-novedosa-estrategia-para-encontrar-evasores>

**Big Data for Tourism, Costa Rica.** The Costa Rican Tourism board made available four tools for big data management, aiming to improve the information available to businesses. The project includes access to essential software and programs internationally approved such as Review Pro, OAG, information through GPS and STR. These allow the user to generate analyses using big data. For example, using them, businesses can generate a more accurate estimation of tourism expenses and trends. <http://www.ict.go.cr/es/>

**Dinamica initiative, Costa Rica.** The program positively impacts 2-3 thousand people per year, using an artificial intelligence platform that provides support to entrepreneurs. The platform will answer the most common doubts and offer live webinars in order to promote virtual training. Dinamica Initiative is a project that is present in Latin America. <https://www.bcie.org/en/news/news/article/costa-rican-entrepreneurs-will-have-an-artificial-intelligence-platform/>

**Index of happiness, Ecuador.** Measure citizens happiness is essential for a government to get informed about people reaction to public policy, and in general to government performance and the overall country situation. Instituto Nacional de Estadísticas y Censos (INEC) Ecuador's national institute of statistics is developing an index of happiness using sentimental analysis and Hadoop clusters from twitter data. Sentimental analysis allows real-time emotion data of a significant part of the population, which can be used to perform distinct analysis (geographical analysis, characterization, and network analysis).

**Traffic improvement in Quito, Ecuador.** In a world where cities are growing faster, migration follow complex patterns and the population exponentially grow, mobility in the city gets more difficult to administrate. A congestion system raises transportation times, increases gas emission, damages health and overall productivity. Hence it is crucial to develop an efficient traffic system that improves mobility times. Armas et al. (2017) propose a traffic solution for Quito, they apply an evolutionary computation and machine learning methods to study the transportation system from a design optimization perspective; they find an efficient combination of traffic signals that improve the sustainability of the transport system.

**Crop insurance, Ecuador.** Low-income farmers are one of the most vulnerable people in developing countries, the incompleteness of the market and the lack of an insurance market make their income risky and volatile. Hence it is vital to develop different ideas that can improve farmer's life. Castillo (2016) proposes a methodology to build an efficient and transparent insurance scheme for small farmers supported by big data techniques that captures weather changes and allows constant crop monitoring. The authors propose satellite or drones monitoring that could take high definition pictures of all the harvest season.

**DataTur3, Mexico.** DataTur generates information about tourism activity in the country using bank transactions, improving the process of decision making and planning for tourist businesses. The project generated information that can be used to estimate future tourism activities. It analyzed information about 86 million national and international bank cards during a year, much more than the amount that a traditional survey can collect. <http://www.datatur.sectur.gob.mx/SitePages/BigData.aspx>

**Trato, Mexico.** Trato is a software that allows companies to create contracts easily. The app enables to create contracts using suggestions of most common clauses, allows management of electronic contracts and eSignatures. Also, the platform offers guidance to organize legal agendas. Trato uses Big Data from Federal Laws to create contracts and Blockchain Technology that enable the contract to be time-stamped. <https://trato.io/>

**Konfio, Mexico.** Konfio is an online lending platform for small businesses in Mexico that uses transactional data for rapid credit assessment. Konfio uses machine learning technology to assess the credit profile of small and medium enterprises and authorize an online credit. The process to get access to an online credit is 10 minutes. <https://konfio.mx/>

**Big Data for the estimation of origin-destination mobility matrices, Spain.** The project has a potential to generate information from near 100% of the population using mobile phone data. This project aims at the construction of origin-estimation mobility matrices using mobile phone data. The project has very recently begun by contacting an operator company to have access to data and jointly with them to set up an adequate methodology. However, no analysis has been conducted yet, since access to data has not been yet granted. <https://unstats.un.org/bigdata/inventory/?selectID=2015084>

**SIT, Spain.** Tourism Intelligence System improved the strategic planning process for tourist businesses, generating new important information. It is an instrument based on the analysis of different sources of information through technologies as Big Data and Business Intelligence. The main results are estimations for

trends in consumption, expenses, prices, and mobility of tourists.

<http://www.segittur.es/es/proyectos/proyecto-detalle/Sistema-de-Inteligencia-Turstica-/#.WmnM96igLIU>

**Intelligent parking, Spain.** Estimations are intelligent parking can reduce 30% traffic and 20% of CO2 emissions in the center of cities. Intelligent parking uses sensors to generate information about parking spots and traffic. The sensor transmits data about the availability of parking spots to users in real time Using the application users can save time in the process of looking for parking and pay for it if need it. <http://www.urbiotica.com/ejemplos-smart-cities/guiado-del-estacionamiento-urbano-en-castellon/>

## Identification of policy and infrastructure gaps

This chapter identifies major gaps in regulation, public policy, and infrastructure in Panama. Closing these gaps will accelerate the development of e-applications and foster access to reliable ICT services at affordable prices for the greatest number Panama citizens.

Both ICT laws regulations cover the most significant regulatory issues that comparable countries address. In this terms, Panama performs on par with its comparable countries. However, policies around spectrum assignment and pricing, concession definition and flexibility, and dominance measures require some attention.

On the non-policy side, the greatest gaps in the Panamanian ICT sector are clustered around three topics: spectrum, fixed broadband penetration, and the current state of e-government services. In summary, there is too little spectrum allocated to mobile services, a weak fixed broadband penetration, and there are is significant room to improve e-government services.

### ICT Policy review

The following list of policies represent the most significant contention issues in ICT law and regulation in the comparable countries, as defined by the review of the law, the digital agendas and the most significant judicial cases analyzed in the first chapter.

#### a. Spectrum assignment process

In the past, Panama has used a comparative selection process to assign mobile communications concessions. These concessions bundle the rights to i) operate as a mobile company, ii) use certain segments of spectrum, iii) access future segments of spectrum and iv) renewal. In addition, these concessions establish inflexible pricing rules that cannot possibly take into account the fast-paced innovation in the ICT sector.

These practices deviate from the best practices found in comparative countries. In terms of the right to operate as a telecommunications company, the best practice is to allow frictionless entry into the market. Any company willing to risk their on capital would be allowed to compete in the market. This reduction of effective barriers to entry provide a constant accountability mechanism for existing operators. The actual or potential entry of a new entrant provides incentives to increase the quality of services, reduce prices and increase coverage. In Colombia, for example, such is the case. Any company is authorized to participate in the market.

The second deviation from best practices is to bundle the right to operate as a mobile company and the right to use certain segments of spectrum. Spectrum is a scarce resource. On the contrary, in a competitive economy, entry rights should not be scarce. Furthermore, technology moves fast on the

ICT sector and it is common for spectrum to find better uses and use-cases. This unlimited innovation requires the ability to allocate spectrum on a more flexible way. Companies should be able to obtain and release spectrum that matches their business needs. The best practice is to allocate spectrum in competitive auctions. This practice is well-established not only among comparable countries but around the world.

The right to receive additional spectrum as it becomes available is a significant deviation from best practice. Regardless of the method of assignment, auctions preferably or comparative processes, spectrum should be allocated to the use and entity that the government, as a representative of society, deems the best. Such a decision is impossible when the spectrum was allocated 20 years in advance. It is very likely that the best use and the best entity to deploy and operate some spectrum does not retain its title after twenty years. Furthermore, the value of such an allocation is impossible to predict 20 years in advance. The best practice is to use auctions to both allocate and price spectrum rights.

The right of renewal is problematic too. On the one hand, every successful company should be allowed to continue operations without requiring re-authorization. On the other hand, as the best use of spectrum changes with technology, spectrum rights should be flexible enough to completely reallocate segments to other use-cases and entities. The best practice is no let successful companies operate continuously and to open the possibility of spectrum reassignment every 10 to 20 years.

b. Number portability and device ownership

Number portability is allowed for mobile and fixed operators. The maximum days to port the number is one on mobile services and is not defined for fixed services. Mobile number portability has encouraged access through more competition in the mobile sector, which doubled from 2012 to 2017.<sup>27</sup> This policy is in line with best practices.

c. Coverage requirements

Concessions include coverage requirements in the form of requirements to install infrastructure to serve at least a pre-defined number of users per geographic unit. This policy deviates from best practices because it cannot be updated and fine-tuned as the technology and the country needs change. Since these type of coverage requirements are part of the concession, they remain fixed for 20 years. On the other hand, the best practice is to include coverage requirements in the spectrum assignments, which happen every 3 or 4 years.

d. Price policies

There are many pricing policies subject to the interest of regulators. This section briefly summarizes the three: retail pricing, interconnection and roaming.

Concessions allow companies to choose their retail pricing. However, Article 31 of law 31 establishes the right for the authority to intervene in pricing in three circumstances: i) there exists only one supplier in the market in all the country or a specific zone, ii) services are subsidized by other services, and iii) the regulator determines that there exist antitrust practices. On retail prices, Panama follows best practices.

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<sup>27</sup> <http://portabilidad.gob.pa/>

According to the Executive Decree 21 of 1996, telecommunication operators can negotiate interconnection fees and rates based on the principles of equal access, neutral treatment or nondiscrimination between carriers. Interconnection rates must be just and reasonable, and must provide for a reasonable return rate. If the parties are unable to reach an agreement, ASEP may set the fees using as reference fees already agreed by the requested carrier with other carriers and/or applying efficiency criteria. On interconnection prices, it is reasonable for the authority to establish rules that allow operators to cover costs but not make interconnections unnecessarily expensive. Both Mexico and Colombia have developed costs models to establish such rules.

Roaming prices are freely determined by companies. For the same reasons that apply to interconnection prices, it is best practice to regulate roaming charges.

e. Direct provision of services

The National Internet Network or "Internet Para Todos" – the internet for everyone – project it's a national WiFi network that provides 1,320 access points across Panama and covers around 80% of the total population. It is managed by the Autoridad Nacional para la Innovación Gubernamental.

This practice is in line with comparables, however, there is a significant difference with respect to best practice. In Colombia, for example, the provision of WiFi is part of the obligations on spectrum licenses; because mobile operators have large networks and run operations continuously, it is easier, faster and cheaper to rely on existing operations to provide this service.

f. Dominance definitions and measures

Resolution 1334 of 1999 determines whether a telecom provider has a dominant position in the market. It dictates that a firm has a dominant position if it has temporal exclusivity, participation that exceeds on 15% that of the competition, or it has a participation on the HHI that exceed 20%. The regulator determines every year what operators are dominant. The dominance remedies, however, are not well-established. For example, in resolution JD-1228 of 1999, Cable and Wireless is found dominant and is required to justify its prices i.e. Cable and Wireless only needs to produce an explanation of the prices to continue its practices.<sup>28</sup> Dominance measures do not follow best practice and require a careful revision.

g. Universal Funds Programs

Panama created a Universal Access Fund under Law No. 29 of August 11, 2008 (modified by Law No. 62 of 2012) to provide technology solutions for access to the internet, mobile, and fixed telephony to areas of difficult access or where economic conditions would make it difficult for the residents to acquire such services. To contribute to the fund, providers are obliged to contribute 1% of their taxable income. The fund provides financing of research and development activities, and it should be transferred to the National Science and Technology Innovation Fund (Fondo Nacional de Ciencia Tecnología e Innovación or FONACITI). This practice is in line with comparable practices.

h. Infrastructure sharing policies

Decree 138 of 1998 dictates the regulatory framework for telecommunication's infrastructure usage. It prescribes functions to the regulator to guarantee equal, efficient and non-discriminatory

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<sup>28</sup> <http://www.asep.gob.pa/openhtml.php?idresol=JD-1228&idsector=1>

infrastructure usage, and it dictates norms that obligates infrastructure owners to facilitate access and usage to telecommunication's providers according to neutrality principles and technical conditions. This is in line with best practices.

i. Limitations to foreign investments

The legal framework that regulates foreign direct investment in Panama, including the telecommunications sector, has one of its central elements in Law No. 54 of July 22, 1998, on Legal Stability of Investments.<sup>29</sup> This regulation grants national treatment to foreign companies and capitals, although it requires that the operations that benefit from it have a minimum volume of two million dollars. The telecommunications law specifically authorizes majority equity participation for foreign private investors. Nonetheless, the direct or indirect participation of foreign governments is expressly forbidden.<sup>30</sup> Both measures are in line with best practices.

j. License length and flexibility

As explained in section i., "licenses" for operation and for spectrum usage lack flexibility. This is a substantial gap that prevents effective competition.

k. Regulators autonomy

The National Public Services Authority (Autoridad Nacional de los Servicios Públicos or ASEP) is an autonomous state agency, managing its funds separately from the Central Government, possessing its patrimony.<sup>31</sup> However, the Panamanian government owns 49% of Cable and Wireless, which introduces conflicts of interest in regulation. ASEP's autonomy is in line with best practices but the partition ownership of C&W represents a substantial conflict of interest that prevents impartial regulation.

l. Protection of personal data

Operators cannot use personal data without the consent of the users. The operator has to protect the information according to regulations applicable.<sup>32</sup> This practice is in line with best practices.

## Spectrum

"Spectrum" typically defines the part of the electromagnetic spectrum being used to operate telecommunication services over the air. Information can be transmitted using several frequencies but two (or more) messages transmitted on the same frequencies, in the same place, at the same time, interfere with each other. Hence, from an economic point of view, spectrum is scarce and its use needs to be coordinated to be useful to society.

In telecommunications, there are many ways to coordinate the use of spectrum. The most widely used forms of coordination are exclusive rights and technical standards. For example, it is common that mobile telecommunication companies are granted the right to use certain frequencies exclusively over well-defined regions for a period of time. Similarly, technologies like WiFi define standards that allow many people to use the same set of frequencies (but never at the same time and place) on relatively small areas – like a private dwell.

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<sup>29</sup> [http://www.innovacion.gob.pa/descargas/acceso\\_universal\\_Resolucion\\_No\\_6.pdf](http://www.innovacion.gob.pa/descargas/acceso_universal_Resolucion_No_6.pdf)

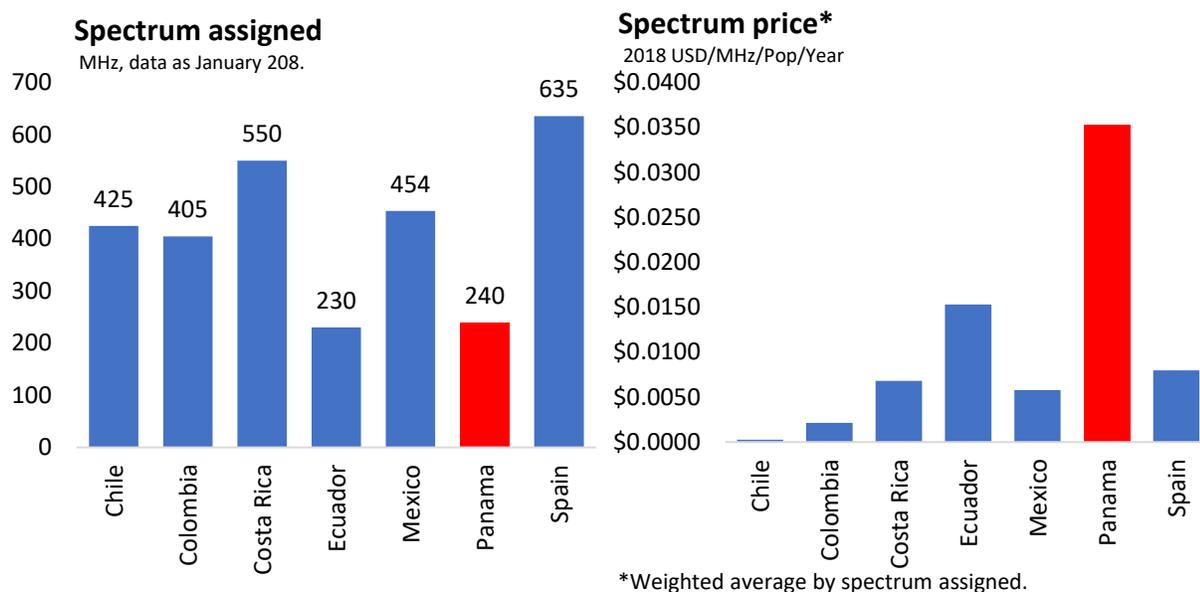
<sup>30</sup> [http://www.mef.gob.pa/es/Documents/Ley\\_54\\_Inversionistas.pdf](http://www.mef.gob.pa/es/Documents/Ley_54_Inversionistas.pdf)

<sup>31</sup> <http://www.asep.gob.pa/>

<sup>32</sup> <http://www.asep.gob.pa/telecom/Contratos/CLARO.pdf> (no. 15)

Nowadays, mobile communication is usually considered to be the most valuable use of spectrum in the ICT sector. The International Telecommunications Unit recommends allocations between 1,340 MHz and 1,960 MHz to be used for mobile communications (ITU M.2290) by the year 2020. The amount of spectrum allocated to mobile services in Latin America and the Caribbean is far from the recommended. The following table shows the allocation in Panama and its comparable countries. See the tables appendix for data on individual bands.

Table 12: Spectrum assigned and prices in comparable countries



Source: National Authorities, OVUM, authors calculations.

Panama has the most limited supply of spectrum and it's, maybe not surprisingly, the most expensive among comparable countries. Panama has allocated 240 MHz of spectrum whereas the average for its comparable countries in the region is 437 MHz. The most notable gap with respect to the comparable countries is the lack of spectrum in the 2.5 GHz frequency band, which is allocated to restricted television in Panama.

Table 13 Spectrum bands in Panama

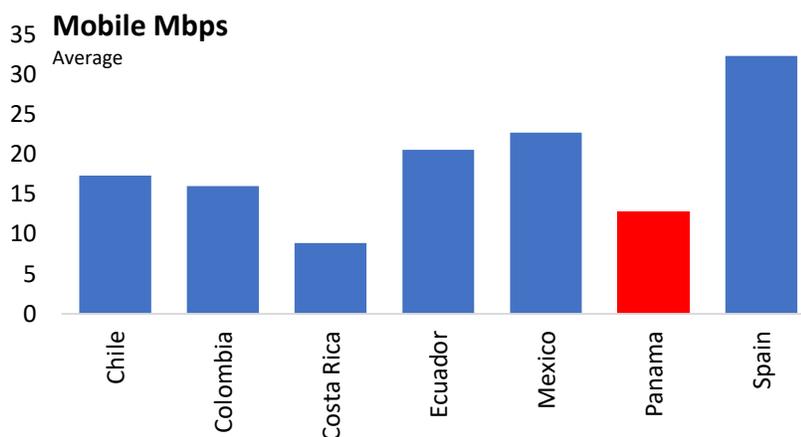
Band	Panama A	Avg. Comparables B	B – A
700 MHz	80	33	-
800 MHz	50	54	4
900 MHz	0	12	12
1800 MHz	0	53	53
1900 MHz	110	69	-
2100 MHz	0	105	105
2600 MHz	0	111	111
<b>Total</b>	<b>240</b>	<b>437</b>	<b>197</b>

Source: National Authorities, OVUM, authors calculations.

This spectrum gap has sizable consequences on many aspects of the industry. First, the quantity and quality of mobile services that telecommunication companies can provide are reduced; second, this reduction of output has direct consequences on prices, and the affordability of telecommunications; finally, the reduced output and higher prices reduce the economic welfare (consumer and producer surplus) of the Panamanian society.

In terms of mobile speed, Panama is the second worst in the set of comparable countries. This reduced speed limits the use of certain mobile applications. For example, video streaming and video calling on mobile phones require consistent speeds around 7 Mbps.<sup>33</sup> The average speed in Panama makes this kind of applications unreliable since the speeds will be much slower in moments of high demand.

Table 14 Mobile speed in comparable countries



Source: SpeedTest.

To measure the effects on quality and quantity of available mobile services, especially data, it is instructive to understand the basics of network planning and the production of mobile data. Networks use radio stations on cell towers to provide data and voice services on specific spectrum frequencies, the more spectrum deploys in each tower the more data is available; similarly, the more stations used to deploy a spectrum band, the more data is available.

In particular, the maximum amount of data (or voice services) that a network can provide per unit of time is given by the following equation:

$$q = A(Base\_stations)(Spectrum)$$

Where  $q$  is given in Gigabytes per unit of time (e.g. GB / hour),  $Base\_stations$  is the number of base stations in service,  $Spectrum$  is the amount of deployed spectrum (measured in MHz), and  $A$  is an efficiency constant. This equation describes what is typically known as average busy hour throughput. It follows from this equation that the user experience (measured in Mbps) is defined by the following equation:

$$s = qc$$

Where  $c$  is a concurrence constant that measures the average number of simultaneous users per unit of time. It follows directly from these equations that, on average, for a given network or set of networks, doubling the

<sup>33</sup> <https://help.directvnow.com/hc/en-us/articles/211978106-Internet-speed-recommendations-for-optimal-streaming>

amount of spectrum would double the average speed experienced by users and the total amount of data available for consumption.

As an illustrative exercise, consider the speed that mobile users could experience if Panama allocates more spectrum. The following graph compares simple benchmarks based on the previously presented equations and actual speed measurements of countries with similar spectrum allocations.

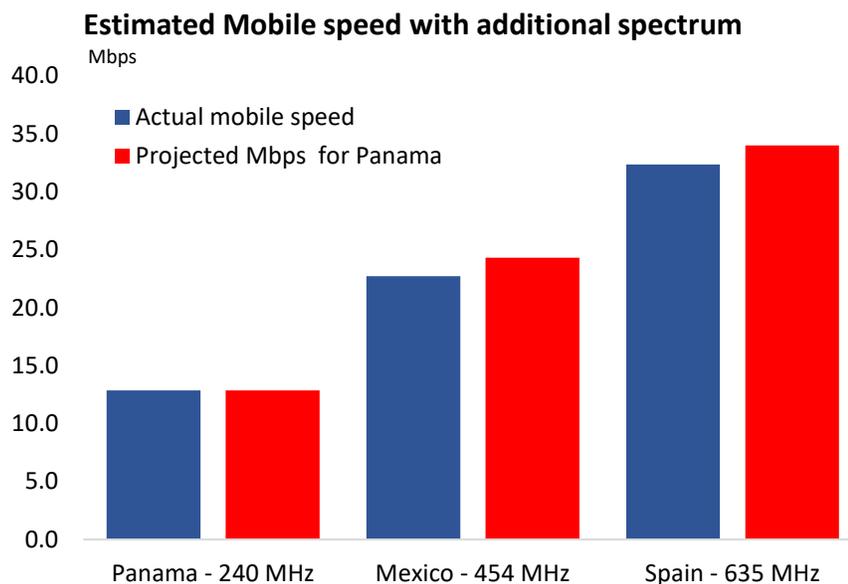


Figure 13 Estimated speed with additional spectrum

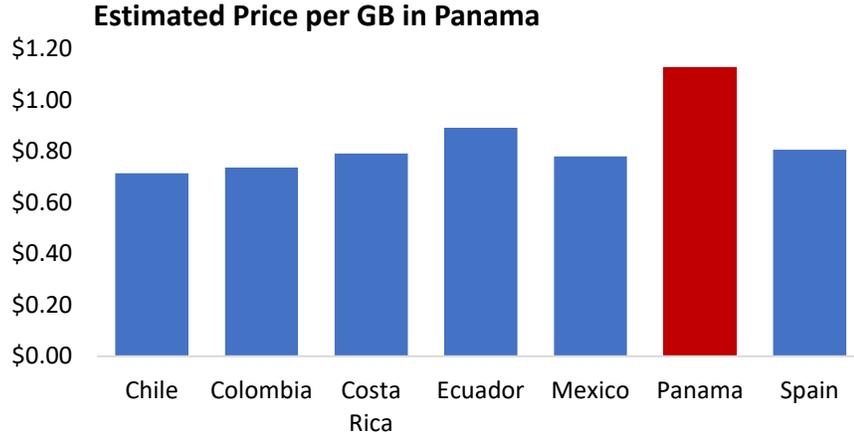
Source: National Authorities , authors calculations.

Regression analysis shows that, in the sample of 29 countries, the elasticity of the observed speed with respect to the amount of spectrum is 1.47. This means that that effects of adding more spectrum are likely to be greater than the simple graph shows. The results of the regression are in Appendix C.

In addition to the limited amount of spectrum, the allocated spectrum in Panama is expensive. For example, the 700 MHz band was allocated in Panama at a price that is 44 times the price in Chile and 20 times the price in México. These two countries in particular have adopted policies that favor coverage and deployment speed instead of raising funds from auctions. It is still early to evaluate the results of these policies but it is certain that some portion of the lower cost of the spectrum will be transmitted to consumers in the form of better service, greater coverage and a reduction in price.

Marsden et al. (2017) estimate that the elasticity of the price per GB with respect to the spectrum cost is 0.37. Applying this elasticity, the following graph shows the hypothetical prices that would be observed in Panama if the cost of the spectrum were in line with the cost in comparable countries.

Figure 14 Estimated price per GB in Panama



Source: Author's calculations.

### Fixed Broadband Penetration

Broadband penetration is low in Panama; it lags 42% behind Spain, 28% behind Chile and 11% behind Colombia. This low penetration seems unusually low, especially when compared to its main alternative: mobile 4G technologies. On the mobile side, Panama seems to perform on par with respect to the comparable countries.

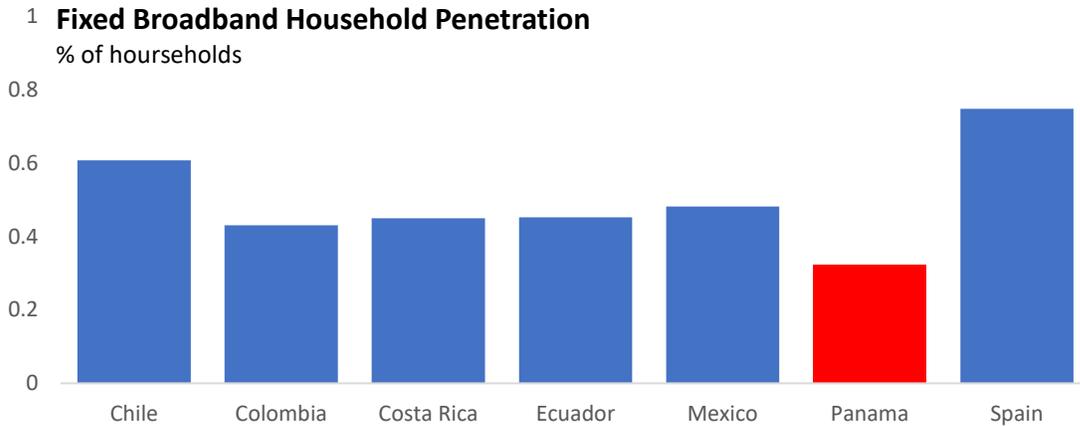


Figure 15 Fixed Broadband Household Penetration.

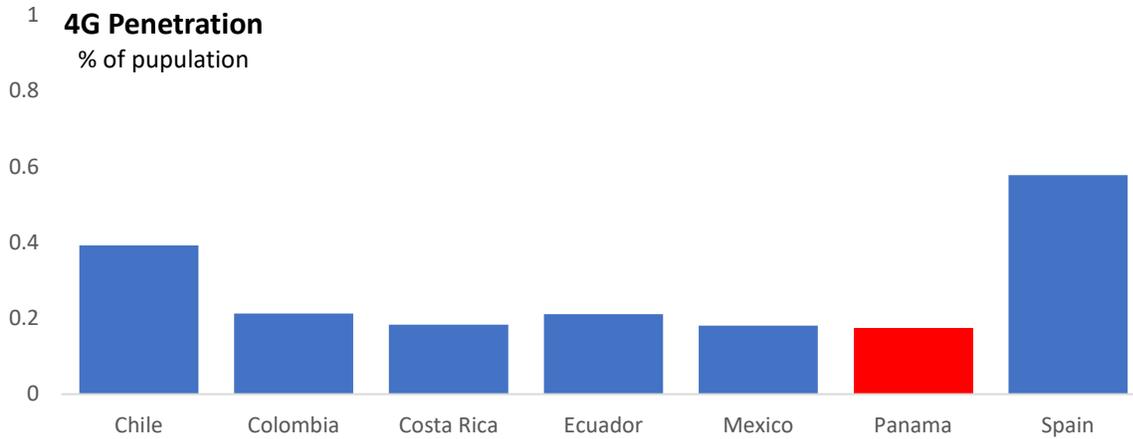
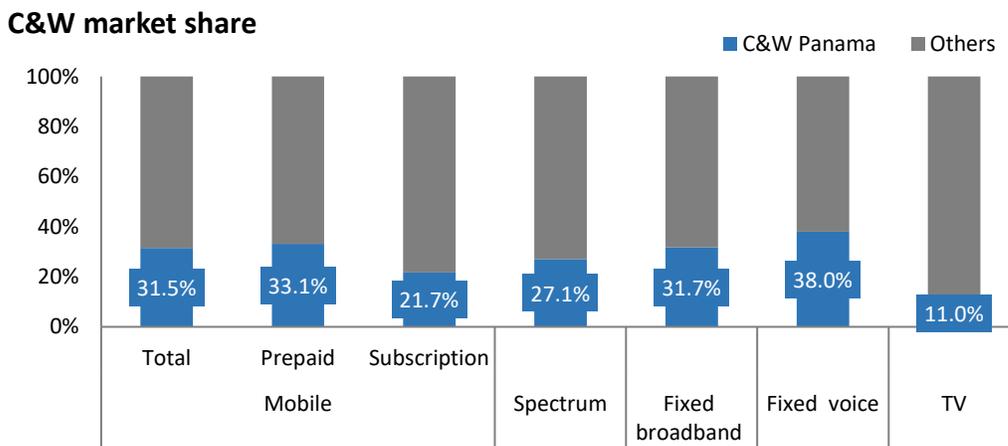


Figure 16 4G Penetration

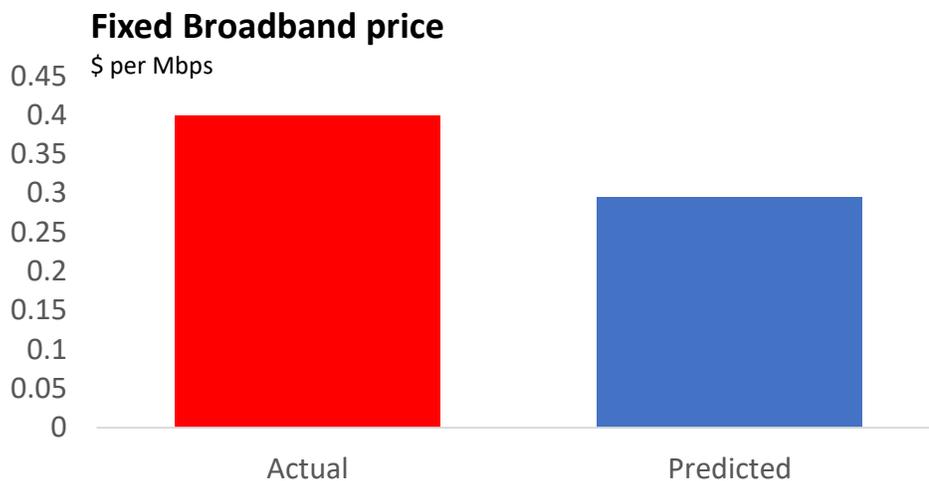
There could be several explanations for this low broadband explanations. First, there could be a systematic lack of infrastructure. It is possible that the coverage and capillarity of fixed broadband networks are such that a significant portion of the population is simply out of coverage. Unfortunately, due to a lack of detailed data with respect to the coverage and capillarity of fixed infrastructure, this study could not analyze this hypothesis. A second explanation could be related to the market dynamics after the relatively recent liberalization. Before 2013, Cable & Wireless Panamá S.A. (C&W) had the exclusivity of fixed services in Panama. However, the liberalization opened the markets and brought competition to the ICT sector; see the graph below. This study did not find evidence that the market position of C&W has been a significant contributor to the lack of penetration. A third explanation is related to price, it could be that fixed broadband is expensive compared to other countries. It seems to be the case.

Table 15 C&W market share



Source: ASEP, OVUM, GSMA, author's calculations.

The actual price per Mbps in Panama seems to be higher than what it would be based on country characteristics. Based on the regression analysis in Appendix E, the price per Mbps in Panama, based on country characteristics, would be \$0.32 dollars, a 20% discount on the actual price.



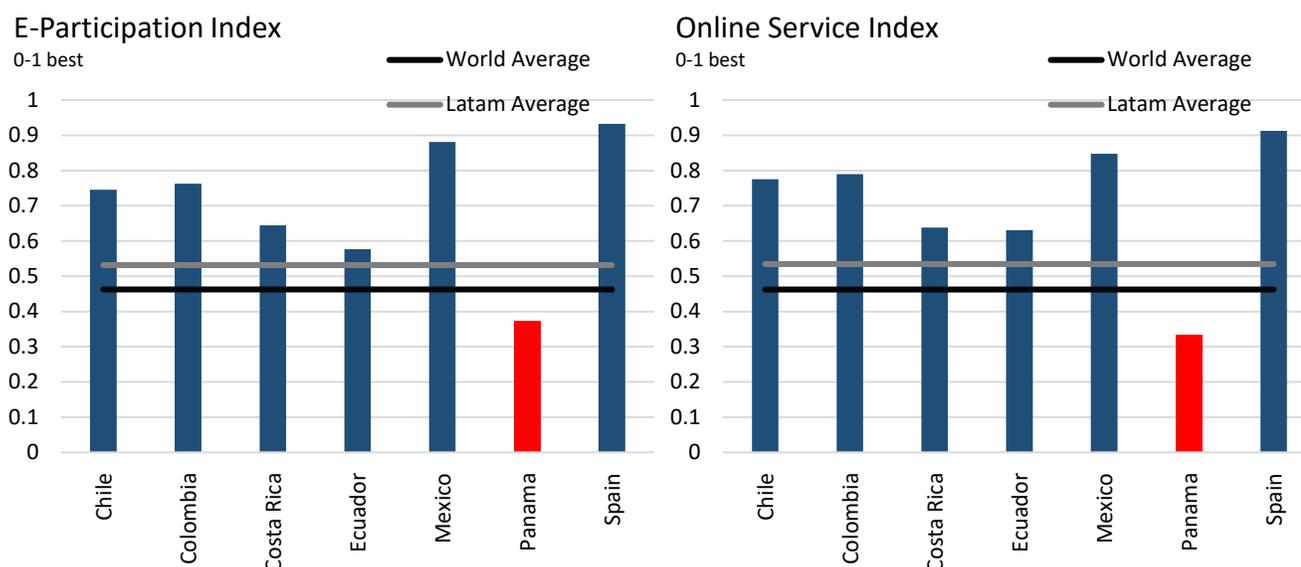
*Figure 17 Actual vs Predicted Fixed Broadband Price*

While the price per Mbps seems to be higher than in other countries, a deeper analysis is required to discover the factors for this price discrepancy. Reasonable hypothesis could be the lack of definitive measures against dominant operators or the relatively recent liberalization of the market.

#### E-government policy: e-participation and Online Services Index

Panama actively participates with a number of organizations that keep track of country performance on a number of measures .e.g. the World Economic Forum's Global Competitiveness Index. In general, Panama performs relatively close to its comparables. However, there are two international indices in which Panama performs significantly worse: The E-Participation Index and the Online Service Index.

Table 16: E-Participation and Online Service Index



Source United Nations

This section analyses in more detail each of these indices and provides selected examples from the comparable countries with respect to best-in-class (among comparable) executions.

Both indices are continuously developed, refined and maintained by the United Nations. Both indices are the results of survey data collected by the United Nation Department of Economic and Social Affairs (DESA) as part of their E-Government Survey. According to the UN, *the E-Government Survey provides new evidence and new analysis to reflect on the potential of e-government to support the implementation of the Agenda and the 17 Sustainable Development Goals (SDGs) that are at its core and measures e-government effectiveness in the delivery of basic economic and social services to people in five sectors, namely education, health, labour and employment, finance and social welfare.* The Survey is the only global report that assesses the e-government development status of all Member States of the United Nations.

### The E-participation index

The e-participation index is a survey focusing on the use of online services to facilitate the provision of information by governments. It contains three stages:

- **e-information sharing.** Enabling participation by providing citizens with public information and access to information without or upon demand
- **e-consultation.** Engaging citizens in contributions to and deliberation on public policies and services
- **e-decision-making.** Empowering citizens through co-design of policy options and coproduction of service components and delivery modalities.

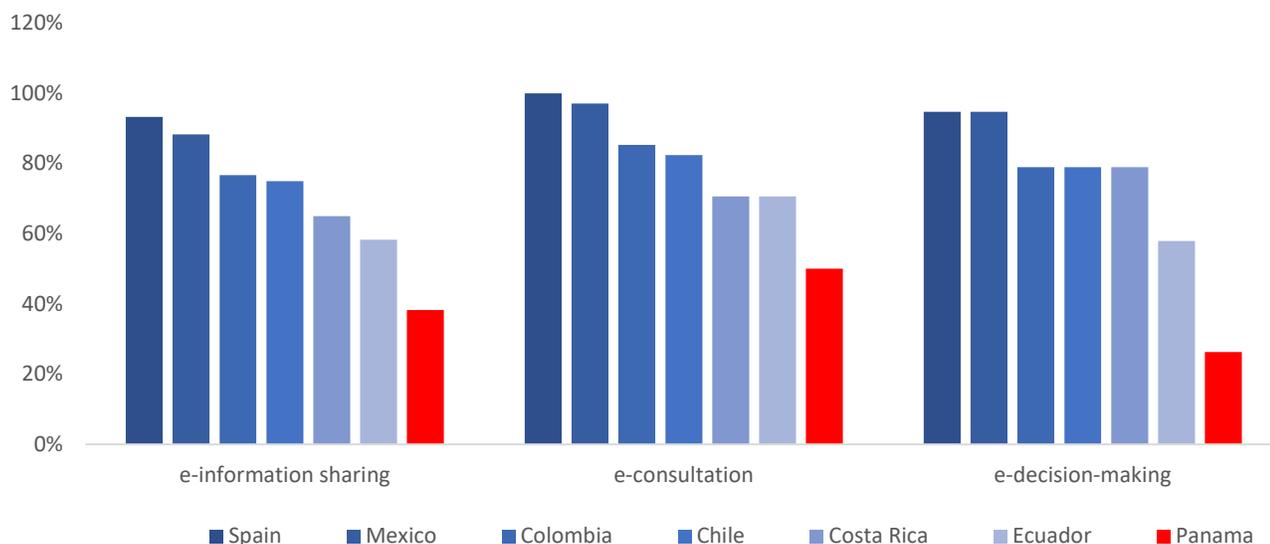
The first stage, e-information sharing, measures the governments' initiatives to provide people with information via ICT channels in order to help them make informed choices. This stage is critical because without access to publicly held information, participation cannot be evidence-based, fully relevant, or significant.

The second stage, e-consultation, measures how people are consulted on a particular policy, service or project. In general, the consultation does not imply that the government has an obligation to use the inputs received in its policies or services. Rather, it can leverage the information received in order to better respond to the public’s sentiments on a particular subject.

The third stage, e-participation, tracks the processes in which people provide their own inputs into decisionmaking processes. Two examples are: (i) direct e-voting via secure systems and (ii) identifying preferred (popular) options and proposals by rating them through social media’s “Like/Dislike” or “plus/minus” functions.

The following figure shows Panama’s performance against the comparable countries. In all three cases, Panama has the lowest score of the group, however the lag against the leader and the next best widens as the stage evolves. The gap versus Spain, the best in all stages, evolves as follows: 55%, 50% and 68%. The gap versus the next best, Ecuador, evolves as follows: 20%, 21% 32%.

Table 17: E-Participation Index Stages (0-1 best)



Source United Nations

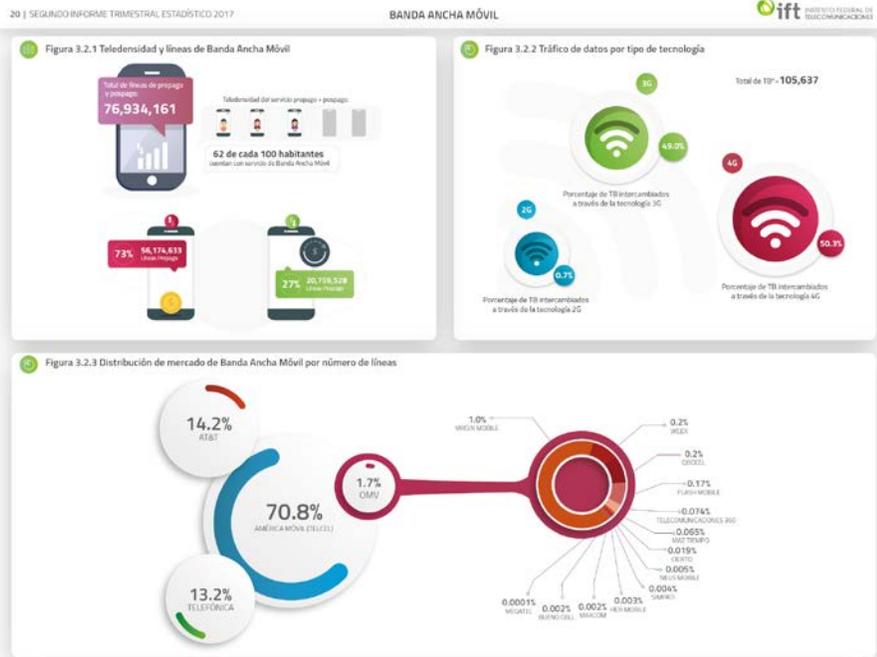
*Best-in-class e-information sharing: The case of ICT information in Mexico, Colombia and Panama.*

The United Nations E-Government survey doesn’t track specific policies or implementations, however, it might be useful to policymakers in Panama to have concrete examples that show the difference in performance between Panama and comparable countries.

A landmark information service in the ICT sector provided by governments is a continuous report of the ICT industry. Members of the industry, potential investors, policymakers, think tanks, research institutions and virtually any member of society interested in the outcomes and evaluation of the sector benefits from this service.

Colombia and Mexico issue quarterly reports on ICT industry with useful visualizations and access to the underlying rich data. The following boxes show pictures of the latest issues. In both cases, the countries have specialized websites to make the data and research available to the public.

Table 18 Mexico's quarterly telecommunication report

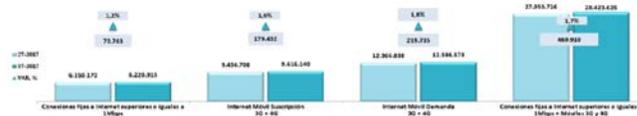


Source Mexico's 2Q17 report: Banco de Información de Telecomunicaciones. <https://bit.ift.org.mx/BitWebApp/>

Table 19: Colombia's quarterly telecommunication report

Al término del tercer trimestre del 2017, las conexiones a Internet de Banda Ancha presentaron un crecimiento absoluto de 469.910 accesos y una variación porcentual del 1,7%, cifras con referencia al segundo trimestre del 2017. Por su parte, las conexiones a Internet móvil por suscripción soportadas sobre redes 3G y 4G presentaron un crecimiento absoluto de 179.432 y un crecimiento porcentual de 1,9% para el mismo periodo de análisis. Gráfico 6<sup>1</sup>.

Gráfico 6. VARIACIÓN PORCENTUAL Y ABSOLUTA DE CONEXIONES A INTERNET DE BANDA ANCHA



Fuente: Datos reportados por los Proveedores de Redes y Servicios a Colombia TIC.  
Fecha de consulta: 27 de diciembre del 2017.

Los estratos socioeconómicos de la base de la pirámide presentaron variaciones porcentuales positivas de conexiones fijas a Internet de Banda Ancha entre el tercer trimestre del 2016 y el mismo periodo del 2017, siendo las conexiones en el estrato 1 las de mayor aumento en términos porcentuales, con un 11,7%; el estrato 2 con un 5,4% y, en el estrato 3 con un 5,6%. Gráfico 7.

Gráfico 7. ACCESOS A INTERNET FIJO DE BANDA ANCHA POR ESTRATOS SOCIOECONÓMICOS



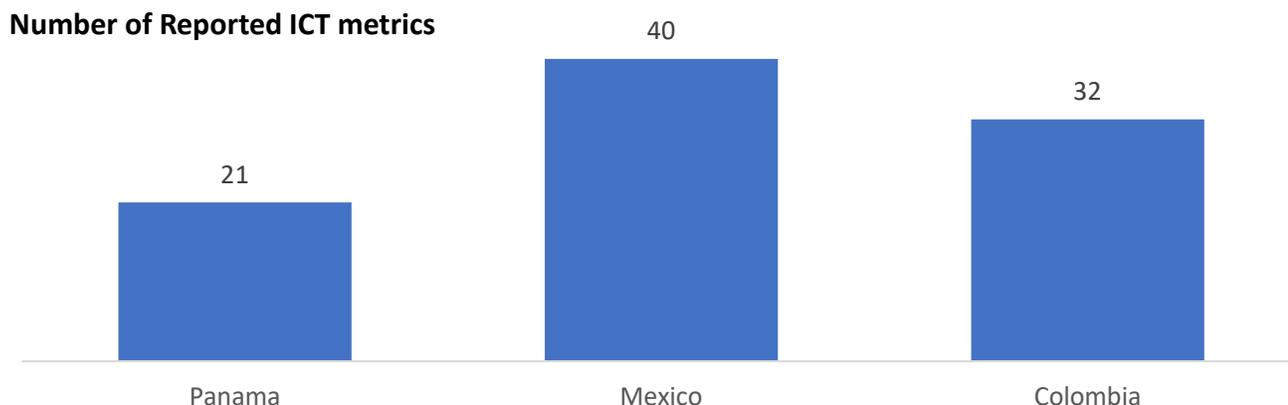
Fuente: Datos reportados por los Proveedores de Redes y Servicios a Colombia TIC.  
Fecha de consulta: 27 de diciembre del 2017.

<sup>1</sup>El número de accesos a Internet fijo de Banda Ancha residenciales sin estratificar para el tercer trimestre del 2017 fue de 17.652 accesos.

Source Colombia's 2Q17 report. Colombia TIC. <http://colombiatic.mintic.gov.co/602/w3-propertyvalue-715.html>

Panama has a similar service<sup>34</sup> but there is a significant gap in the quantity of data and the frequency of the reports. The following graph shows the number of ICT metrics reported by each country. As shown, Panama tracks about half of the metrics that other countries. The full list of ICT in the tables appendix; it contains an extensive (but not comprehensive) list of data items that are presented in Mexican, Colombian and Panamanian reports.

Table 20 Number of reported ICT metrics



Source: author's calculations.

*Best-in-class e-consultation: The case of ICT policy in Mexico, Colombia and Panama.*

It is fundamental to have an efficient system of communion between members of the ICT sector and policymakers. The sector is very complex and effective policymaking required balancing the needs and objectives of all participant members, from shareholders to consumers of services.

Implementing a e-consultation process is desirable. Policymakers can release consultations accessible to the public and all members of society can send comments to policymakers; establishing their situations and preferred outcomes. Information that is required by policymakers to fully understand the tradeoffs involved in every decision.

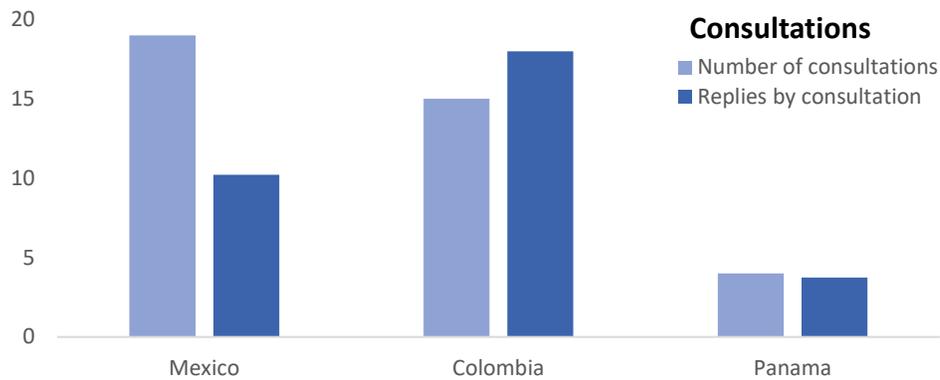
Having an open channel of communication, however, is not sufficient to have a meaningful conversation. It is fundamental for governments to provide access to information and analysis to the public. The complexities embedded in the ICT sector and the lack of information make it very expensive for each private entity to collect their own information and produce high-quality analysis on public policy issues.

Mexico, Colombia and Panama have well-established e-consultation processes in the ICT sector. However, the number of consultations, the quantity and quality of data and analysis provided by the government, and the number of responses varies significantly. Panama e-consultation process lags behind its comparable countries.

In 2017, the number of consultations was as follows: Mexico 19, Colombia 15, and Panama 4. The number of replies per consultation was as follows: Mexico 10.2, Colombia 18, and Panama 3.4. The reduced number of issues that Panama consulted with the public is a sign of a weak e-consultation process. The ICT sector is complex and requires a careful analysis of tradeoffs that is only achievable with open communication with the public.

<sup>34</sup> [http://www.asep.gob.pa/index.php?option=com\\_content&view=article&id=173&Itemid=224](http://www.asep.gob.pa/index.php?option=com_content&view=article&id=173&Itemid=224)

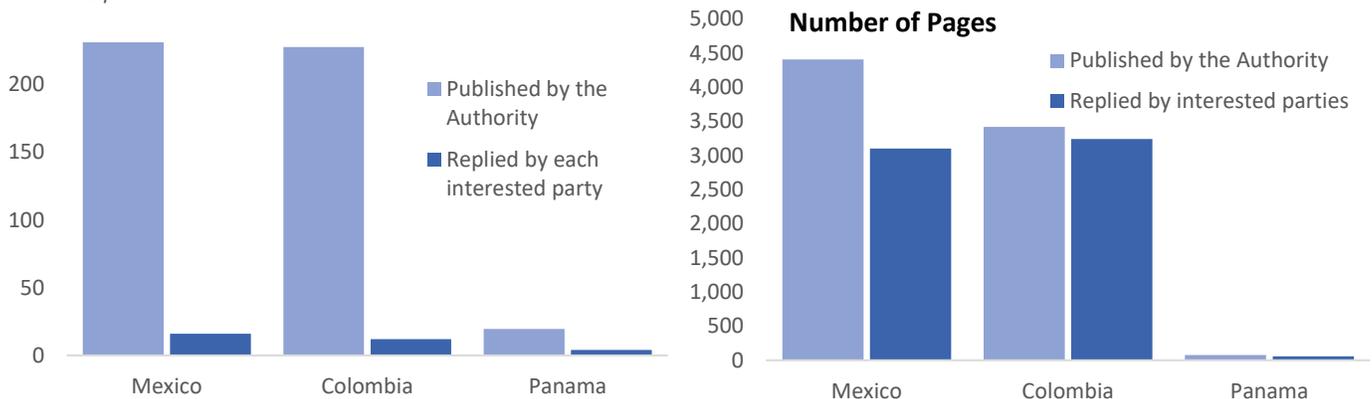
Figure 18: Telecommunication consultations



Source CRC, ASEP, IFT

As a measure of quality, the number of pages per consultation illustrates that not only Panama consults the public on a limited basis, the depth of analysis is shallow when compared to comparable countries. The following two graphs show the average and total number of pages published and replied in consultations.

Figure 19: Number of pages published by the authority and the interested parties



Source CRC, ASEP, IFT

## The Online Service Index

According to the United Nations, the Online Service Index attempts to evaluate the quality, scope and utility of online aspects of e-government based on a single internationally-comparable value using a four-stage model of online service maturity. The index assumes four stages of online services:

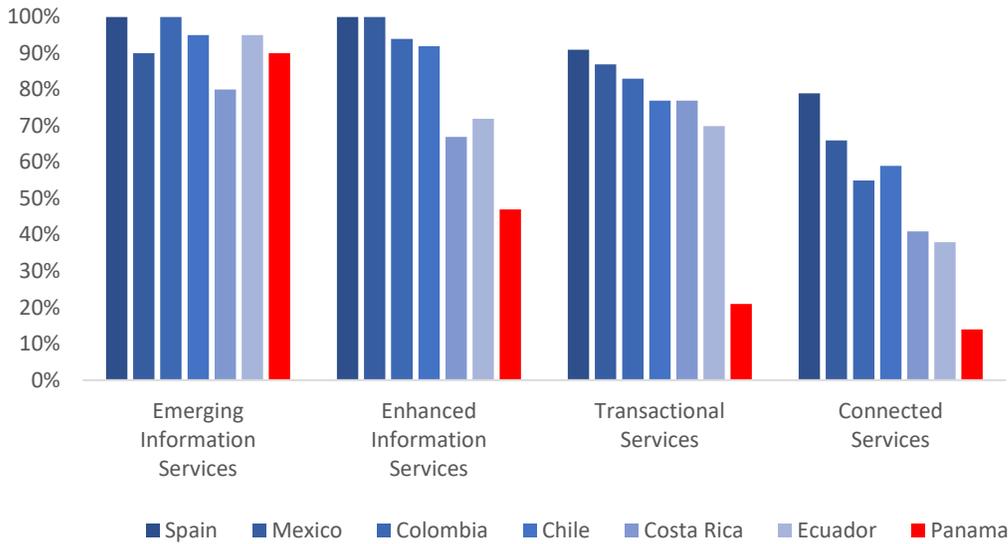
- **Emerging information services.** Government websites provide information on public policy, governance, laws, regulations, relevant documentation and types of government services provided. They have links

to ministries, departments and other branches of government. Citizens are able to obtain updated information in the national government and ministries and can follow links to archived information.

- **Enhanced information services** Government websites deliver enhanced one-way or simple two-way e-communication between government and citizen, such as downloadable forms for government services and applications. The sites have audio and video capabilities and are multi-lingual. Some limited e-services enable citizens to submit requests for non-electronic forms or personal information.
- **Transactional services.** Government websites engage in two-way communication with their citizens, including requesting and receiving inputs on government policies, programmes, regulations, etc. Some form of electronic authentication of the citizen's identity is required to successfully complete the exchange. Government websites process non-financial transactions, e.g. filing taxes online or applying for certificates, licenses and permits. They also handle financial transactions, i.e. where money is transferred on a secure network.
- **Connected services.** Government websites have changed the way governments communicate with their citizens. They are proactive in requesting information and opinions from the citizens using Web 2.0 and other interactive tools. E-services and e-solutions cut across the departments and ministries in a seamless manner, information, data and knowledge is transferred from government agencies through integrated applications. Governments have moved from a government-centric to a citizen-centric approach, where e-services are targeted to citizens through life cycle events and segmented groups to provide tailor-made services. Governments create an environment that empowers citizens to be more involved with government activities to have a voice in decision-making.

Panama's performance, when compared to the comparable countries, is deficient. In all but the first stage of online services, Panama lags significantly with respect to the leader and the next best. In the case of Enhanced Informational Services, Panama is 53% behind the leader and 20% behind the next best. The respective gaps are 70% and 49% for the Transactional Services Stage and 65% and 24% for the Connected Services Stage.

Table 21 Online Service Index stages composition



Source United Nations

Panama’s lag on transactional services is of special attention because all of its peers are clustered together at the top. The lag on connected services is not as serious as its peers are still making significant progress.

*Best-in-class transactional services: The case of Mexico and Panama*

The government is involved in many transactions with the general public, transactions range from paying taxes, to applying for driving licenses and personal identification cards. By their nature, because of the sensitivity of the information or the complexity of the service, many services and transactions must be performed in-person. However, a significant amount of services should be as simple as going online.

For example, the government of Mexico City runs a website called *Trámites* (<http://www.tramites.cdmx.gob.mx>), where citizens can perform 631 of the total 1707 transactions that the city manages. For example, obtaining a birth certificate takes no more than 10 minutes. A digital copy can be downloaded and printed at home.

Figure 20 Mexico city internet page of procedures



Source <http://www.tramites.cdmx.gob.mx>,

In contrast, Panama is still in the process of simplifying over 200 transactions with an average time-to-solution of 12 days.<sup>35</sup> Panama is moving in the right direction but there is a lot of ground to cover. The following table shows some of the most important transactions that governments can resolve online and their situation in Panama, Colombia and Mexico.

Table 22 Transactional stage examples per country

Transaction	Panama	Colombia	Mexico
Submit income taxes	✓	✓	✓
Register a business	✓	✓	✓
Apply for social security benefits	✗	✗	✓
Apply for a birth certificate	✗	✗	✓
Pay fines	✓	✓	✓
Pay for utilities	✓	✓	✓
Apply for environmental permits	✗	✓	✓
Apply for marriage certificate	✗	✓	✓
Register a motor vehicle	✗	✗	✓
Apply for drivers license	✗	✗	✓
Apply for personal id	✗	✗	✓

Source: author's calculations based on UN's transactional services

<sup>35</sup> Impacto Económico del Gobierno Digital. Reunión Anual Red GEALC. 29 de noviembre de 2017

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## Appendix A: Tables

Table 23 Macroeconomic Indicators

Country	Population	Urban Population	Dense Population	Population density	Urban Population density	Land area	Urban land area	GDP per capita PPP
	million	% of population	% of population	Population / Km <sup>2</sup>	Urban Population / Urban Land (Km <sup>2</sup> )	Km <sup>2</sup>	Urban Land / Total Land	
<b>Argentina</b>	44	92%	44%	16	733	2,737	2%	\$19,934
<b>Australia</b>	24	90%	59%	3	591	7,682	0%	\$46,790
<b>Brazil</b>	208	86%	40%	25	1,323	8,358	2%	\$15,128
<b>Chile</b>	18	90%	37%	24	1,340	744	2%	\$23,960
<b>Colombia</b>	49	77%	43%	44	1,037	1,110	3%	\$14,158
<b>Costa Rica</b>	5	78%	24%	95	935	51	8%	\$16,614
<b>Czech Republic</b>	11	73%	13%	137	-	77	-	\$34,711
<b>Denmark</b>	6	88%	22%	136	543	42	22%	\$49,696
<b>Ecuador</b>	16	64%	28%	66	962	248	4%	\$11,286
<b>El Salvador</b>	6	67%	17%	306	1,181	21	17%	\$8,619
<b>Finland</b>	5	84%	22%	18	230	304	7%	\$43,053
<b>France</b>	67	80%	23%	122	619	548	16%	\$41,466
<b>Germany</b>	83	76%	10%	237	1,007	349	18%	\$48,730
<b>Guatemala</b>	17	52%	18%	155	2,087	107	4%	\$7,947
<b>Honduras</b>	9	55%	13%	81	1,354	112	3%	\$4,738
<b>Ireland</b>	5	64%	25%	69	542	69	8%	\$68,883
<b>Italy</b>	61	69%	18%	206	569	294	25%	\$38,161
<b>Japan</b>	127	94%	66%	348	1,098	365	30%	\$41,470
<b>Mexico</b>	128	80%	38%	66	996	1,944	5%	\$17,862
<b>Netherlands</b>	17	91%	6%	505	1,210	34	38%	\$50,898
<b>Nicaragua</b>	6	59%	-	51	1,259	120	2%	\$5,541
<b>Panama</b>	4	67%	42%	54	935	74	4%	\$23,015
<b>Paraguay</b>	7	60%	36%	17	-	397	-	\$9,577
<b>Peru</b>	32	79%	32%	25	1,528	1,280	1%	\$13,022
<b>Spain</b>	46	80%	25%	93	532	500	14%	\$36,310
<b>Switzerland</b>	8	74%	15%	212	784	40	20%	\$62,881
<b>United Kingdom</b>	66	83%	29%	271	928	242	24%	\$42,609
<b>United States</b>	323	82%	45%	35	330	9,147	9%	\$57,467
<b>Uruguay</b>	3	95%	50%	20	698	175	3%	\$21,625

Table 24 Macroeconomic Indicators: Definitions

Indicator	Description	Source	Date
<b>Population</b>	Population in millions	World Bank	2016
<b>Urban Population</b>	Urban Population as a percentage of total population	World Bank	2016
<b>Dense Population</b>	Population in urban agglomerations of more than 1 million as percentage of total population	World Bank	2016
<b>Population density</b>	Population per square kilometer	World Bank	2016
<b>Urban Population density</b>	Urban population per square kilometer of urban land	World Bank	2016
<b>Land area</b>	Total area in square kilometers	World Bank	2016
<b>Urban land area</b>	Urban area as a percentage of total area	World Bank	2010
<b>GDP per capita PPP</b>	(current international \$)	World Bank	2016

Table 25 ICT Metrics

Country	Mobile Population Coverage % of population	Households with Internet access % of households	Internet Bandwidth kb/s per user	Secure Internet Servers Servers / million population	Mobile Unique subscriptions % of population	Mobile Penetration % of population	Mobile Broadband Penetration % of population	Fixed Penetration % of households
<b>Argentina</b>	99%	52%	48	53	73%	159%	98%	82%
<b>Australia</b>	99%	87%	75	1,349	85%	131%	138%	82%
<b>Brazil</b>	92%	48%	43	69	80%	139%	89%	60%
<b>Chile</b>	98%	54%	73	128	82%	133%	124%	82%
<b>Colombia</b>	74%	38%	35	47	76%	113%	77%	50%
<b>Costa Rica</b>	78%	55%	48	99	83%	144%	118%	66%
<b>Czech Republic</b>	99%	78%	117	692	85%	130%	111%	18%
<b>Denmark</b>	100%	93%	342	2,081	86%	126%	110%	53%
<b>Ecuador</b>	96%	32%	37	35	59%	104%	68%	73%
<b>El Salvador</b>	88%	23%	50	22	81%	144%	49%	49%
<b>Finland</b>	99%	90%	219	1,791	85%	140%	164%	18%
<b>France</b>	100%	83%	222	683	85%	101%	114%	106%
<b>Germany</b>	99%	90%	146	1,420	87%	120%	118%	91%
<b>Guatemala</b>	76%	15%	28	18	54%	107%	108%	62%
<b>Honduras</b>	90%	20%	22	11	66%	94%	95%	21%
<b>Ireland</b>	100%	82%	161	775	81%	105%	82%	83%

<b>Italy</b>	100%	73%	93	249	86%	154%	111%	60%
<b>Japan</b>	99%	98%	49	912	88%	120%	129%	135%
<b>Mexico</b>	93%	34%	21	34	73%	82%	54%	57%
<b>Netherlands</b>	99%	96%	281	2,635	74%	116%	99%	86%
<b>Nicaragua</b>	87%	12%	23	11	79%	115%	22%	32%
<b>Panama</b>	96%	42%	73	117	82%	158%	77%	77%
<b>Paraguay</b>	94%	25%	13	24	75%	106%	91%	27%
<b>Peru</b>	85%	24%	36	28	76%	104%	89%	46%
<b>Spain</b>	99%	74%	112	317	87%	108%	112%	86%
<b>Switzerland</b>	99%	91%	352	2,820	86%	137%	100%	108%
<b>United Kingdom</b>	97%	90%	430	1,291	86%	124%	56%	149%
<b>United States</b>	99%	80%	71	1,548	86%	110%	127%	96%
<b>Uruguay</b>	84%	57%	61	95	92%	161%	135%	81%

Table 26 ICT Metrics: Definitions.

Metric	Description	Source	Date
<b>Mobile Population Coverage</b>	Percentage of population covered by a mobile network signal	OVUM and country regulators	2017
<b>Households with Internet access</b>	Percentage of households with Internet access at home	ITU	2014
<b>Internet Bandwidth</b>	International Internet bandwidth (kb/s) per Internet user	ITU	2014
<b>Secure Internet Servers</b>	Secure Internet servers per million population	World Bank	2016
<b>Mobile Unique subscriptions</b>	Percentage of population with at least one mobile subscription	OVUM and GSMA	2016
<b>Mobile Penetration</b>	Mobile telephone subscriptions as percentage of population	ITU	2014
<b>Mobile Broadband Penetration</b>	3G and 4G Mobile subscriptions as percentage of population	OVUM	2017
<b>Fixed Penetration</b>	Fixed telephone subscriptions as percentage of households	OVUM	2016
<b>Fixed Broadband Penetration</b>	Fixed broadband Internet subscriptions as percentage of households	OVUM	2016
<b>Individuals using Internet</b>	Percentage of population using the Internet	ITU	2014
<b>Fixed broadband Internet tariffs</b>	Monthly subscription charge for fixed (wired) broadband Internet service (PPP \$)	WEF calculations based on ITU	2014
<b>Prepaid mobile cellular tariffs</b>	Average per-minute cost of different types of mobile cellular calls (PPP \$)	WEF calculations based on ITU	2014

Table 27 e-applications metrics

Country	ICT use for business-to-business transactions	Business-to-consumer Internet use	Importance of ICTs to gov't vision	Government Online Service	Gov't success in ICT promotion	Impact of ICTs on business models	Impact of ICTs on access to basic services	Internet access in schools	ICT use & gov't efficiency	E-Participation Index	NRI
Guatemala	4.93	4.64	3.28	0.15	3.46	4.97	4.32	3.62	3.45	0.20	3.45
Honduras	5.01	4.63	3.90	0.40	3.75	4.75	4.22	3.94	3.85	0.33	3.71
El Salvador	4.33	4.63	3.42	0.54	3.23	4.06	4.01	3.62	3.44	0.61	3.71
Nicaragua	3.95	3.43	2.66	0.09	2.74	3.62	3.16	2.69	2.83	0.10	2.81
Costa Rica	5.06	4.74	3.65	0.61	3.90	4.79	4.63	4.68	3.79	0.82	4.48
Paraguay	3.68	3.57	2.90	0.23	2.85	4.00	3.37	2.92	3.04	0.25	3.40
Uruguay	4.45	4.29	4.09	0.85	4.31	4.90	4.76	5.68	4.10	0.98	4.48
Ecuador	4.59	4.08	3.93	0.48	4.02	4.52	4.35	4.12	4.14	0.49	3.92
Colombia	4.70	4.68	4.33	0.79	4.22	4.64	4.21	4.11	4.18	0.88	4.13
Argentina	3.89	4.25	2.58	0.55	2.92	3.61	3.52	4.13	2.98	0.55	3.79
Brazil	4.58	5.00	3.13	0.60	3.16	4.33	3.50	3.63	3.38	0.71	4.01
Chile	5.23	5.06	3.92	0.82	4.09	5.07	4.99	4.76	4.46	0.94	4.62
Peru	4.58	4.19	3.15	0.63	3.26	4.48	3.96	3.71	3.38	0.71	3.76
Mexico	4.81	4.29	3.90	0.66	3.84	4.66	3.98	3.88	3.88	0.61	3.99
Australia	5.50	5.48	4.33	0.93	4.19	4.89	5.40	6.13	4.50	0.94	5.49
Czech Rep.	5.47	5.77	3.34	0.37	3.59	5.04	4.92	5.38	3.77	0.25	4.74
Denmark	5.65	5.56	4.51	0.66	4.60	5.14	5.72	5.93	5.07	0.55	5.60
Finland	5.94	5.10	4.77	0.77	4.72	5.95	5.66	5.96	4.96	0.71	5.96
France	5.33	5.54	4.40	1.00	4.53	5.15	5.44	4.88	4.77	0.96	5.34
Germany	5.69	5.77	4.71	0.67	4.66	5.38	5.76	4.96	4.77	0.71	5.55
Ireland	5.44	5.19	4.78	0.68	4.73	5.60	4.95	5.32	4.74	0.65	5.34
Italy	4.53	4.66	3.30	0.75	3.10	4.40	3.89	3.90	3.43	0.78	4.43
Japan	6.06	5.95	4.94	0.94	4.71	5.31	5.39	5.04	4.68	0.96	5.65
Netherlands	5.95	6.04	4.60	0.93	4.88	5.81	6.17	6.13	4.96	1.00	5.81
Panama	5.09	4.92	4.54	0.37	4.39	5.04	4.75	4.72	4.46	0.49	4.28
Spain	5.00	4.91	3.72	0.94	3.85	5.14	5.02	4.32	4.21	0.78	4.77
Switzerland	6.01	5.72	4.54	0.50	4.82	5.70	6.12	5.92	4.90	0.37	5.75
UK	6.04	6.37	4.88	0.90	4.95	5.85	5.68	6.12	5.09	0.96	5.72
USA	5.71	6.32	4.67	0.94	4.78	5.52	5.73	5.91	4.73	0.92	5.82

Table 28 e-application metrics definitions.

Indicator	Description	Source	Date
<b>ICT use for business-to-business transactions</b>	businesses use of ICTs for transactions with other businesses [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Business-to-consumer Internet use</b>	businesses use of the Internet for selling their goods and services to consumers [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Importance of ICTs to gov't vision</b>	government implementation plan for utilizing ICTs to improve your country's overall competitiveness [1 = not at all—there is no plan; 7 = to a great extent—there is a clear plan]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Government Online Service</b>	government's performance in delivering online services to the citizens. Emerging, Enhanced, Transactional, and Connected.	UNDESA	2013
<b>Gov't success in ICT promotion</b>	how successful is the government in promoting the use of ICTs [1 = not successful at all; 7 = extremely successful]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Impact of ICTs on business models</b>	ICTs enables new business models [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Impact of ICTs on access to basic services</b>	ICTs enables access for all individuals to basic services (e.g., health, education, financial services, etc.) [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>Internet access in schools</b>	Internet use in schools for learning purposes [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>ICT use &amp; gov't efficiency</b>	use of ICTs by the government improve the quality of government services to the population [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey 2014-2015	2014-15
<b>E-Participation Index</b>	The E-Participation Index assesses, on a 0-to-1 (best) scale, the quality, relevance, and usefulness of government websites in providing online information and participatory tools and services to their citizens.	UNDESA	2013
<b>NRI</b>	According to the United Nations, the E-Participation Index assesses the quality and usefulness of information and services provided by a country for engaging its citizens in public policymaking through the use of e-government programs.	WEF, The Global Information Technology Report 2016	2016

Table 29 NRI 2016: E-application concepts

Country	Use of virtual social networks 1-7 (best)	ICT use for b2b transactions 1-7 (best)	B2C Internet use 1-7 (best)	Importance of ICTs to gov't vision 1-7 (best)	Government Online Service Index 0-1 (best)	Gov't success in ICT promotion 1-7 (best)	Impact of ICTs on business models 1-7 (best)	Impact of ICTs on organizational models 1-7 (best)	Internet access in schools 1-7 (best)	ICT use & gov't efficiency 1-7 (best)	E-Participation Index 0-1 (best)
<b>Costa Rica</b>	5.76	5.06	4.74	3.65	0.61	3.90	4.79	4.58	4.68	3.79	0.82
<b>Ecuador</b>	4.80	4.59	4.08	3.93	0.48	4.02	4.52	4.31	4.12	4.14	0.49
<b>Colombia</b>	5.39	4.70	4.68	4.33	0.79	4.22	4.64	4.49	4.11	4.18	0.88
<b>Chile</b>	5.92	5.23	5.06	3.92	0.82	4.09	5.07	4.40	4.76	4.46	0.94
<b>Mexico</b>	5.36	4.81	4.29	3.90	0.66	3.84	4.66	4.36	3.88	3.88	0.61
<b>Panama</b>	5.90	5.09	4.92	4.54	0.37	4.39	5.04	4.61	4.72	4.46	0.49

Spain	5.59	5.00	4.91	3.72	0.94	3.85	5.14	4.45	4.32	4.21	0.78
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Table 30 NRI 2016: E-application concepts: definitions

Indicator	Description	Source	Date
<b>Use of virtual social networks, 1-7 (best)</b>	In your country, how widely are virtual social networks used (e.g., Facebook, Twitter, LinkedIn)? [1 = not at all used; 7 = used extensively]	WEF	2014–15
<b>ICT use for business-to-business transactions, 1-7 (best)</b>	In your country, to what extent do businesses use ICTs for transactions with other businesses? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>Business-to-consumer Internet use, 1-7 (best)</b>	In your country, to what extent do businesses use the Internet for selling their goods and services to consumers? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>Importance of ICTs to gov't vision, 1-7 (best)</b>	To what extent does the government have a clear implementation plan for utilizing ICTs to improve your country's overall competitiveness? [1 = not at all—there is no plan; 7 = to a great extent—there is a clear plan]	WEF	2014–15
<b>Government Online Service Index, 0–1 (best)</b>	The Government Online Service Index assesses the quality of government's delivery of online services on a 0-to-1 (best) scale	UNDESA	2013
<b>Gov't success in ICT promotion, 1-7 (best)</b>	In your country, how successful is the government in promoting the use of ICTs? [1 = not successful at all; 7 = extremely successful]	WEF	2014–15
<b>Impact of ICTs on business models, 1-7 (best)</b>	In your country, to what extent do ICTs enable new business models? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>Impact of ICTs on new organizational models, 1-7 (best)</b>	In your country, to what extent do ICTs enable new organizational models (e.g., virtual teams, remote working, telecommuting) within companies? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>Internet access in schools, 1-7 (best)</b>	In your country, to what extent is the Internet used in schools for learning purposes? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>ICT use &amp; gov't efficiency, 1-7 (best)</b>	In your country, to what extent does the use of ICTs by the government improve the quality of government services to the population? [1 = not at all; 7 = to a great extent]	WEF	2014–15
<b>E-Participation Index, 0–1 (best)</b>	The E-Participation Index assesses, on a 0-to-1 (best) scale, the quality, relevance, and usefulness of government websites in providing online information and participatory tools and services to their citizens.	UNDESA	2013

Table 31: Atlas of e-Health

	Panama	Chile	Colombia	Costa Rica	Mexico	Spain	Global
1 National universal health coverage policy or strategy	Yes	Yes	*	Yes	Yes	Yes	75%
2 National eHealth policy or strategy	No	Yes	*	Yes	No	No	58%
3 National health information system (HIS) policy or strategy	Yes	Yes	*	Yes	Yes	Yes	66%
4 National telehealth policy or strategy	No	No	Yes	Yes	No	No	22%
5 Public funding	Yes	Yes	*	Yes	Yes	Yes	77%
6 Private or commercial funding	No	No	*	No	Yes	Yes	40%
7 Donor/non-public funding	Yes	No	*	Yes	Yes	Yes	63%
8 Public-private partnerships	No	No	*	No	Yes	Yes	42%
9 Policy or strategy on multilingualism	No	No	*	No	Yes	Yes	28%
10 Government-supported Internet sites in multiple languages	No	No	*	No	No	Yes	48%
11 Health sciences students – Pre-service training in eHealth	No	Yes	*	Yes	Yes	Yes	74%
12 Health professionals – In-service training in eHealth	Yes	Yes	*	Yes	Yes	Yes	77%
13 Defines medical jurisdiction, liability or reimbursement of eHealth services such as telehealth	No	Yes	Yes	Yes	No	No	31%
14 Addresses patient safety and quality of care based on data quality, data transmission standards or clinical competency criteria	No	Yes	Yes	Yes	Yes	Yes	46%
15 Protects the privacy of personally identifiable data of individuals irrespective of whether it is in paper or digital format	Yes	Yes	Yes	Yes	Yes	Yes	78%
16 Protects the privacy of individuals' health-related data held in electronic format in an EHR	No	Yes	Yes	Yes	Yes	Yes	54%
17 Governs the sharing of digital data between health professionals in other health services in the same country through the use of an EHR	No	No	Yes	Yes	Yes	Yes	34%
18 Governs the sharing of digital data between health professionals in health services in other countries through the use of an EHR	No	No	Yes	No	Yes	Yes	22%
19 Governs the sharing of personal and health data between research entities	No	Yes	Yes	No	Yes	Yes	39%
20 Allows individuals electronic access to their own health-related data when held in an EHR	No	Yes	Yes	No	Yes	Yes	29%
21 Allows individuals to demand their own health-related data be corrected when held in an EHR if it is known to be inaccurate	No	*	Yes	No	Yes	Yes	32%
22 Allows individuals to demand the deletion of health-related data from their EHR	No	Yes	No	No	Yes	Yes	18%
23 Allows individuals to specify which health-related data from their EHR can be shared with health professionals of their choice	No	No	Yes	Yes	Yes	Yes	28%
24 Governs civil registration and vital statistics	Yes	Yes	Yes	Yes	Yes	Yes	76%
25 Governs national identification management systems	Yes	--	Yes	Yes	Yes	Yes	65%

Table 32: spectrum allocation and prices

Country	Frequencies Band	Total assigned spectrum (MHz)	Assigned spectrum in last transaction	\$/MHz/Pop/Year	\$/MHz/Pop/Year /\$ per GB	\$/MHz/Pop/Year /\$ per minute
Chile	700 MHz	80	70	0.00058	-0.60476	-0.33890
Ecuador	700 MHz	30	30	0.00000	-0.68192	-0.37193
Mexico	700 MHz	90	90	0.00125	-0.65310	0.06485
Panama	700 MHz	80	20	0.02550	1.40004	-0.26327
Chile	800 MHz	45				
Colombia	800 MHz	50				
Costa Rica	800 MHz	50	130	0.02244	0.20627	-0.16470
Ecuador	800 MHz	50				
Mexico	800 MHz	68				
Panama	800 MHz	50	65	0.02086	1.02138	-0.28303
Spain	800 MHz	60	60	0.03632	1.47653	-0.28412
Spain	900 MHz	70	20	0.02842	1.00731	-0.30321
Costa Rica	1800 MHz	170	40	0.00972	-0.29723	-0.28217
Spain	1800 MHz	150	30	0.00192	-0.56800	-0.36729
Chile	1900 MHz	120	90	0.00044	-0.62395	-0.34711
Colombia	1900 MHz	115				
Ecuador	1900 MHz	60	60	0.02358	-0.045	-0.359
Mexico	1900 MHz	120	30	0.00867	-0.482	2.656
Panama	1900 MHz	110	80	0.04889	3.310	-0.164
Chile	2100 MHz	60				
Colombia	2100 MHz	90	90	0.00482	-0.553	-0.312
Costa Rica	2100 MHz	140	30	0.00694	-0.407	-0.308
Ecuador	2100 MHz	90	90	0.02340	-0.050	-0.359
Mexico	2100 MHz	130	70	0.01133	-0.421	3.588
Spain	2100 MHz	118	118	0.00229	-0.546	-0.366
Chile	2600 MHz	120	120	0.00017	-0.659	-0.362
Colombia	2600 MHz	150	150	0.00287	-0.605	-0.336
Costa Rica	2600 MHz	190	0	0.00000	-0.682	-0.372
Mexico	2600 MHz	45				
Spain	2600 MHz	160	140	0.00234	-0.543	-0.366
Spain	3500 MHz	80	20	n/a	n/a	n/a

Table 33: Information available

Item	Panama	Mexico	Colombia
<b>Income and Investment</b>			
Income fixed telecommunications			
Income mobile telecommunications			
Income MVMO			
Employees in telecommunication sector			No
Foreign direct investment in telecom	No		No
Change in price indexes	No		No
Investment in telecommunications			No
Investment in fixed telecommunications	No		No
Investment in mobile telecommunications	No		No
Investment in MVMO	No		No
Market share (revenues)	No		
Gross margin	No		No
<b>Competition</b>			
HHI Fixed Telephony	No		No
HHI Fixed Broadband	No		No
HHI TV	No		No
HHI Mobile	No		No
HHI Mobile broadband	No		No
<b>Fixed telephony</b>			
Fixed telephony lines			
Penetration			
Penetration by city	No	No	
Market distribution	No		
Fixed telephony by income distribution	No	No	
Minutes per call		No	
International Calling Destinations		No	
ARPU	No	No	
<b>Fixed Broadband</b>			
Broadband connections			
Penetration			
Penetration by city	No	No	
Broadband connections by technologies			
Broadband connections by velocity	No		
Market distribution	No		
Broadband acces by income distribution	No	No	
ARPU	No	No	
<b>TV</b>			
TV paid connections			No
Penetration			No

TV paid by technologies	No	No
Market distribution	No	No
<b>Mobile telephony</b>		
Mobile Population Coverage		
Mobile telephony lines		
Teledensity		
Mobile lines by type of contract		
Minutes per line		No
Market distribution	No	
ARPU	No	No
Mobile lines by income distribution	No	No
<b>Mobile broadband</b>		
Mobile broadband lines		
Teledensity		
Data traffic by technology	No	No
Market distribution	No	
Broadband acces by income distribution	No	No
ARPU	No	No
<b>International comparations</b>	No	No

Table 34: List of e-applications

Country	Entity	Projects	Type	source
Algeria	AINA Business Services	Ziara developed with the aim of promoting sustainable tourism for development in Algeria.	E-commerce	report on the wsis stocktaking 2017
African countries	African Civil Society on the Information Society (ACSIS)	ACSIS WEB PLATFORM, which aims to provide African civil society a consistent information system focusing on WSIS and ICT activities relating to the African continent.	E-government	report on the wsis stocktaking 2017
Algeria	University of El Oued	Android application to combat the kidnapping of children based on modern technologies	E-government	report on the wsis stocktaking 2017
Algeria	National Social Insurance Fund	Application to track the benefits paid by National Social Insurance Fund	E-government	report on the wsis stocktaking 2017
Algeria	National Agency of Dams and Transfers (ANBT)	The Geoportal of Algeria's dams is an IT infrastructure that enables access to geographic information services via the Internet, as well as search and visualization of geographic and geolocation data on all Algerian dams.	E-government	report on the wsis stocktaking 2017
Algeria	University of El Oued	has undertaken the development of an Android application to combat the kidnapping of children based on modern technologies.	E-government	report on the wsis stocktaking 2017
Algeria	National Social Insurance Fund (CNAS)	El Hanaa is a service for socially insured persons, allowing them to access a private account in order to track the benefits in kind and in cash paid by the National Social Insurance Fund.	E-government	report on the wsis stocktaking 2017
Argentina	Ministry of Education	"Servicio de Educaucón a Distancia" prepare the pupils so they can rejoin the Argentine Education system once the return to the country	E-education	<a href="#">e-education in higher education in latin america</a>

Argentina	National University of Quilmes	The Virtual University has an entirely virtual education system offering bachelor's degrees and foundation degrees.	E-education	<a href="#">e-education in higher education in latin america</a>
Argentina	National Technological University	UTN Virtual platform provide access to seminars and virtual classrooms.	E-education	<a href="#">e-education in higher education in latin america</a>
Australia		In Australia, one of the early Internet and smartphone applications built using government data is the "National Public Toilet Map" (www.toilemap.gov.au). While its value might not be intuitive to grasp, the application can be an important resource for people suffering from incontinence or people with reduced mobility.	E-Health	rebooting public service delivery: how can open government data help to drive innovation?
Australia, Italy, Switzerland, Canada, France,	OECD	Telehealth encompasses a broad set of technologies that support care between patients and providers, or among providers, who are not co-located. Telemedicine is often defined as synchronous video-mediated consultations between physicians and patients. However, it may also include applications such as remote home monitoring of patients, tele-ICUs, and teleradiology.	E-Health	draft oecd guide to measuring icts in the health sector
Azerbaijan	ministry of Foreign Affairs	ASAN Visa is a brand-new system enabling foreigners of 81 nationalities and stateless persons to apply for and obtain e-visas for travel to Azerbaijan.	E-government	report on the wsis stocktaking 2017
Bangladesh	Grameen Intel Social Business	provides expert agricultural advice in critical areas: fertilizer, soil-nutrient analysis, crop/seed recommendations, pest/disease control, harvest management and commercialization.	E-Agriculture	report on the wsis stocktaking 2017
Bangladesh	Bangladesh Rural Advancement Committee (BRAC)	The project Policy Adda seeks to create a virtual platform where people can gather to share their opinions about government policies, dissect or scrutinize them.	E-government	report on the wsis stocktaking 2017
Bangladesh	Prime Minister's Office	By developing an innovation, it has re-engineered the Environmental Clearance Certificate ECC application system to make it more transparent, accessible, accountable and user-friendly.	E-government	report on the wsis stocktaking 2017
Bangladesh	Grameen Intel Social Business Limited (GISB)	applications provides expert agricultural advice in critical areas: fertilizer, soil-nutrient analysis, crop/seed recommendations, pest/disease control, harvest management and commercialization.	E-government	report on the wsis stocktaking 2017
Belarus	Natalia Ovsyanko	We care by employ the powerful tool that is ICT to draw attention to and increase the visibility of the most vulnerable social group, the mentally disabled, showing how they build on their disability.	E-Health	report on the wsis stocktaking 2017
Brasil	Dotopen	VideoVivo is a marketplace for the purchase and sale of professional services through live video.	E-commerce	<a href="http://appcircus.com/apps/videovivo">http://appcircus.com/apps/videovivo</a>
Brazil	Pontifical Catholic University of Rio de Janeiro	AulaNet allows the communication between students and tutors in distance courses.	E-education	<a href="#">e-education in higher education in latin america</a>
Brazil	Pontifical Catholic University of Paraná	Eureka allows the communication between students and tutors in distance courses.	E-education	<a href="#">e-education in higher education in latin america</a>
Brazil	University of Campinas	TelEduc allows the communication between students and tutors in distance courses.	E-education	<a href="#">e-education in higher education in latin america</a>

Brazil	Ministry of Education	"Rede Nacional de Formação de Professores" help improve the training of pupils and teachers by producing guidance material for distance or blended learning.	E-education	<a href="#">e-education in higher education in latin america</a>
Brazil	Ministry of Education	Rede e-Tec Brasil provide professional training through access to free.	E-education	<a href="#">e-education in higher education in latin america</a>
Brazil	Alfredo Leone	Izzui aims to expand the E-education community through Facebook. In this way, this application allows its users to create, publish, share, comment, analyze and sell didactic or training content.	E-education	<a href="http://www.americalearningmedia.com/edicion-020/236-tester/3209-izzui-la-app-gratuita-que-lleva-el-e-education-a-facebook">http://www.americalearningmedia.com/edicion-020/236-tester/3209-izzui-la-app-gratuita-que-lleva-el-e-education-a-facebook</a>
Brazil		SPED – Sistema Público de Escrituração Digital -, was created to standardize and computerize the relationship between the tax authorities and the tax payers.	E-government	<a href="http://thebrazilbusiness.com/article/all-about-sped">http://thebrazilbusiness.com/article/all-about-sped</a>
Brazil, Chile, Spain, Argentina		The Ontojuris project aims to provide access to information on law documents in the area of intellectual property law, consumer rights and electronic law stored on knowledge bases available under the management of the consortium formed by Brazil, Chile, Spain and Argentina.	E-government	ontojuris project: a multilingual legal document search system based on a graphical ontology editor
Burkina Faso	MEDIAPROD	Agribusiness TV is a Web TV which aims to use videos as a promotion tool to valorize agriculture and make the sector more attractive to youth.	E-Agriculture	wsis stocktaking: success stories 2017
Chile	CornerShop	Cornershop is an app that solves life for people who do not have time to go shopping.	E-commerce	<a href="https://cornershopapp.com/">https://cornershopapp.com/</a>
Chile	Papaya Holdings LLC	Cine Star reviews the programming of all the cinemas. Buy tickets and use it as a virtual ticket without queuing at the ticket office	E-commerce	<a href="https://itunes.apple.com/cl/app/cine-star-chile/id910720697?mt=8">https://itunes.apple.com/cl/app/cine-star-chile/id910720697?mt=8</a>
Chile	Compara Online	ComparaOnline is a mobile-app that empowers consumers on acquiring financial products; it shows all options available in the market, the type of service, the price and the interest rate.	E-commerce	<a href="http://www.comparaonline.com">www.comparaonline.com</a>
Chile	Falabella	Viajes Falabella is a website application that enables users to observe a many tickets' and hotels' offers and to plan a trip that efficiently fits their preferences and budgets	E-commerce	<a href="http://www.viajesfalabella.com">www.viajesfalabella.com</a>
Chile	STAR-UP CHILE	eTutor.tv is an E-education platform that offers pedagogical advice for high school students through the Internet. It has a program aimed at the continuous improvement of the learning process in mathematics.	E-education	<a href="http://etutortv.com/">http://etutortv.com/</a>
Chile	Dirección ChileCompra	www.mercadopublico.cl provides updated and free distance training, in an easy, fast, entertaining and segmented way to users of the Public Procurement System, according to their own needs.	E-education	<a href="http://elearning.chilecompra.cl/">http://elearning.chilecompra.cl/</a>
Chile	Chile University	With PEC you can choose between 18 courses in different areas such as language, mathematics, natural sciences and history and in the areas of school coexistence, management and educational leadership, evaluation for learning, among others.	E-education	<a href="http://www.portaluchile.uchile.cl/noticias/19677/cursos-e-education-impartidos-por-el-pec">http://www.portaluchile.uchile.cl/noticias/19677/cursos-e-education-impartidos-por-el-pec</a>

Chile	Ministry of Education	E-mineduc aims to become the means of dissemination of all instances of distance training and development through the Internet of the Ministry of Education. This training currently reaches the different actors of the Educational Community	E-education	<a href="http://www.e-mineduc.cl/">http://www.e-mineduc.cl/</a>
Chile	Ministry of Education	Enlaces is an education and technology center of the ministry of education. Since 1992 it has been fundamental on Chile's ICT implementation on education, and on promoting digital culture across the country.	E-education	<a href="http://www.enlaces.cl">www.enlaces.cl</a>
Chile	Ministry of Education	Internet Segura is a Chilean platform that aims to educate cybernauts on internet rights and duties and in potential damages that the internet has.	E-education	<a href="http://www.internetsegura.cl">www.internetsegura.cl</a>
Chile	Ministry of Education	. Innovar Para Ser Mejor is an education program directed to schools' professors that aims to provide pedagogical knowledge and to improve students learning	E-education	<a href="http://www.textoscolares.cl/usuarios/cpeip/file/2013%20oei/presentacionregina.pdf">www.textoscolares.cl/usuarios/cpeip/file/2013%20oei/presentacionregina.pdf</a>
Chile	Digital Government Unity	iTransantiago Is an Application that allow people to easily find the best route	E-government	<a href="http://apps.gob.cl/apps/itransantiago/">http://apps.gob.cl/apps/itransantiago/</a>
Chile	Ministry of Justice	Busca Justicia Developed by Justice Ministry it allows users to search justice services in all the country	E-government	<a href="http://apps.gob.cl/apps/itransantiago/">http://apps.gob.cl/apps/itransantiago/</a>
Chile	Aduanas Chile	Aduanas de Chile it displays location and contact information of regional customs	E-government	<a href="http://apps.gob.cl/apps/itransantiago/">http://apps.gob.cl/apps/itransantiago/</a>
Chile	National Goods Ministry	Acceso a lo Nuestro it aims to foster access to rivers, lakes and beaches and report if someone is denying the proper access to them	E-government	<a href="http://apps.gob.cl/apps/itransantiago/">http://apps.gob.cl/apps/itransantiago/</a>
Chile	Ministry of Health	SIDRA aims to digitize all clinic and administrative processes within a healthcare center. Its objective is to be the source of clinical information for healthcare centers, healthcare districts, the Ministry of Health and other health-related Government agencies	E-Health	<a href="http://www.salud-e.cl/proyectos/sidra/">www.salud-e.cl/proyectos/sidra/</a>
Chile	Ministry of Health	Mi Salud is a Self-care e-health applications encourage patients to keep constant monitoring of their health, which triggers early detection and incentives healthy practices.	E-Health	<a href="http://www.miportaldesalud.cl">www.miportaldesalud.cl</a>
Chile	Ministry of Health	Telemedicine has been a significant service on e-health development; it allows Real-time diagnostics and higher feedback on quality care. Some of them are: DART, COSMOS project, Telecardiology among others.	E-Health	escobar et al. (2017)
China	China Mobile Group Jiangsu Co. Ltd	urban and transportation planning: Operators' data can be widely used in urban planning management, traffic planning, etc.	E-government	report on the wsis stocktaking 2017
China	Jiangsu Post and Telecommunication Planning Design Institute Co.	Quanzhou Municipality "Smart City" forward-looking and practical, this project is capable of moving the construction forward in a scientific and orderly manner.	E-government	report on the wsis stocktaking 2017
China	Jiangsu Post and Telecommunication Planning Design Institute Co.	The "Wisdom Nanjing" platform integrates various types of the city's social services and public information resources to serve innovation on urban construction, operation and management.	E-government	report on the wsis stocktaking 2017
China	Haohan Data Technology Co	High-performance Internet DPI system and practices of big data based on outcomes from this project have been widely deployed in the networks of China's three major carriers and applied in the fields of network data acquisition, traffic optimization and control, illegal information blocking, DDoS attack detection.	E-government	report on the wsis stocktaking 2017
China	China Mobile Communications Corporation	has set up the Smart insight on telecom big data project, The project has brought good social benefits.	E-government	report on the wsis stocktaking 2017

China	Beijing Qianyi Health Management	Yihudaojia application. The Yihudaojia app constitutes a platform that connects doctors, nurses and patients to meet the rigid demands of on-site healthcare services for the elderly with limited mobility, pregnant women and children	E-Health	report on the wsis stocktaking 2017
China	Beijing Qianyi Health Management Co. Ltd	Yihudaojia app constitutes a platform that connects doctors, nurses and patient.	E-Health	report on the wsis stocktaking 2017
Colombia	MU TEAM SAS	"Mensajeros Urbanos" solves the messaging needs of companies and people, connecting the closest messenger to the client's place of origin through the digital platform.	E-commerce	<a href="https://mensajerosurbanos.com/">https://mensajerosurbanos.com/</a>
Colombia	Digital Investment Group S.A.S	PinBus is an app for the purchase of bus tickets. It allows travelers to purchase their tickets to travel to and from various destinations throughout Colombia.	E-commerce	<a href="https://www.pinbus.com/">https://www.pinbus.com/</a>
Colombia	Rappi	Rappi is an application where users can buy any item they want, and are brought in an average time between 30 minutes and an hour.	E-commerce	<a href="http://www.portafolio.co/negocios/mejores-aplicaciones-en-colombia-para-2016-501597">http://www.portafolio.co/negocios/mejores-aplicaciones-en-colombia-para-2016-501597</a>
Colombia	Tappsi	Tappsi is an easy to use app to request taxis from smartphones.	E-commerce	<a href="https://tappsi.co/">https://tappsi.co/</a>
Colombia	Undertrail	Undertrail allows its users to find offers of airlines and services of non-traditional and low-cost land transport companies, since it has a large database that integrates all the airline transport offerings.	E-commerce	<a href="http://www.eltiempo.com/archivo/documento/cms-16375787">http://www.eltiempo.com/archivo/documento/cms-16375787</a>
Colombia	Uplace	Uplace It is a guide with accommodation offers for foreign students in Colombia who need housing during their stay.	E-commerce	<a href="http://www.uplace.co/">http://www.uplace.co/</a>
Colombia	EQUIPO TÉCNICO APPS.CO	Suganet save time and money, buying and selling from your cell phone in the commercial auctions of the country.	E-commerce	<a href="https://apps.co/comunicaciones/articulos/suganet-tecnologia-y-rapidez-para-ganaderos-colomb/">https://apps.co/comunicaciones/articulos/suganet-tecnologia-y-rapidez-para-ganaderos-colomb/</a>
Colombia	Vanitech	Vanitech facilitate home orders through the internet for beauty services.	E-commerce	<a href="http://www.eltiempo.com/archivo/documento/cms-12731048">http://www.eltiempo.com/archivo/documento/cms-12731048</a>
Colombia	DANE	(SIPSA), is a Colombian's national statistics office mobile application, that provides daily weekly and monthly information of Colombians' commodity prices on many wholesale farmer's markets across the country	E-commerce	<a href="http://www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa">www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa</a>
Colombia	DANE	(SIPSA), is a Colombian's national statistics office mobile application, that provides daily weekly and monthly information of Colombians' commodity prices on many wholesale farmer's markets across the country	E-commerce	<a href="http://www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa">www.dane.gov.co/index.php/servicios-al-ciudadano/servicios-de-informacion/sipsa</a>
Colombia	Bancolombia	Nequi is an app that helps users to manage their money. It allows to separate income into "pockets," which are categories of expenses; and to create savings goals, with dates and daily quotes.	E-commerce	<a href="http://www.nequi.com">www.nequi.com</a>
Colombia	ANE	PLANEA spectrum E-education platform is a tool that allows people in all regions of the country (even people in more remote areas, and the deaf) to access knowledge about the frequency spectrum	E-Education	report on the wsis stocktaking 2017

Colombia	National Open and Distance Univesity	Currently account for half of E-education enrolments.	E-education	<a href="#">e-education in higher education in latin america</a>
Colombia	Christian Van Der Henst and John Freddy Vega	Platzi allows to expose text content, live and prerecorded video, source code and forums, in a system that resembles a classroom board.	E-education	<a href="http://www.portafolio.co/negocios/mejores-aplicaciones-en-colombia-para-2016-501597">http://www.portafolio.co/negocios/mejores-aplicaciones-en-colombia-para-2016-501597</a>
Colombia	Andes University	SICUA is a commercial online learning system and must be requested by the teacher for the registration of academic courses or groups of researchers	E-education	<a href="https://dsit.uniandes.edu.co/index.php/sicua-plus-movil">https://dsit.uniandes.edu.co/index.php/sicua-plus-movil</a>
Colombia	Manuela Beltran University	VirtualNet 2.0 It offers payment facilities and a registration is easy to do. In virtual modality it offers bachelor's degrees, technical careers, technology and specializations.	E-education	<a href="http://umbvirtual.edu.co/">http://umbvirtual.edu.co/</a>
Colombia	SENA	SENA virtual in the offer of courses there are more than 100 offers from different disciplines, from Languages, Health, Art and culture, Finance and administration, etc.	E-education	<a href="http://oferta.senasofiaplus.edu.co/sofia-oferta/">http://oferta.senasofiaplus.edu.co/sofia-oferta/</a>
Colombia	Koideas	Koideas generates learning through effective and updated methodologies through educational innovation tailored to organizations.	E-education	<a href="https://www.koideas.com/">https://www.koideas.com/</a>
Colombia	ANE	Web-based Open National System for Monitoring of Electromagnetic Fields	E-government	report on the wsis stocktaking 2017
Colombia	DPS	the Master Key website is the main initiative for consolidating information relating to beneficiaries belonging to what the Colombian Government refers to as the "inclusion and reconciliation sector"	E-government	report on the wsis stocktaking 2017
Colombia	Ministry of Information and Communication Technologies	Cine para Todos has been fostering inclusive entertainment, allowing those with visual, hearing or cognitive disabilities to enjoy movie theatres for free	E-government	report on the wsis stocktaking 2017
Colombia	Ministry of Information and Communication Technologies	<i>Nomasfilas.gov.co</i> allows citizens to make online transactions and accessing online services, the website includes education, employment, taxes, justice, finance, health, and many other services.	E-government	<a href="http://www.nomasfilas.gov.co">www.nomasfilas.gov.co</a>
Colombia	Nariño City	developed <i>Gana Control</i> an application that let the citizenship to monitor government budget spending	E-government	<a href="http://centrodeinnovacion.gobiernoenlinea.gov.co/es">http://centrodeinnovacion.gobiernoenlinea.gov.co/es</a>
Colombia	Ministry of Justice	LegalApp offers orientation and information about legal procedures	E-government	<a href="http://centrodeinnovacion.gobiernoenlinea.gov.co/es">http://centrodeinnovacion.gobiernoenlinea.gov.co/es</a>
Colombia	Bogota City	Bogota Abierta is an application that serves as a participation mechanism where people can expose their ideas to develop a better city	E-government	<a href="http://centrodeinnovacion.gobiernoenlinea.gov.co/es">http://centrodeinnovacion.gobiernoenlinea.gov.co/es</a>
Colombia	Ministry of Information and Communication Technologies	Datos.gov.co is a web application that allows recollection and visualization of 6943 datasets of 937 distinct public entities like ministries, regional governments, government agencies, public universities, and companies	E-government	<a href="http://www.datos.gov.co">www.datos.gov.co</a>
Colombia	Ministry of Information and Communication Technologies	Urna Cristal is a Colombian website platform that fosters civic participation and government transparency. It has multiple portals for posting ideas, asking questions and consulting different governments' topics.	E-government	<a href="http://www.urnadecristal.gov.co">www.urnadecristal.gov.co</a>

Colombia	Atom House	Biva Integral Health App seeks to contribute to improve the figures of therapeutic adherence in patients.	E-Health	<a href="http://ehealthreporter.com/es/noticia/biva-app-integral-de-salud/">http://ehealthreporter.com/es/noticia/biva-app-integral-de-salud/</a>
Colombia	Cruz Roja Colombiana	"App primeros auxilios Cruz Roja" allows users to collaborate in community emergencies and domestic accidents.	E-Health	<a href="http://ehealthreporter.com/es/noticia/la-cruz-roja-colombiana-desarrollo-una-app-de-primeros-auxilios/">http://ehealthreporter.com/es/noticia/la-cruz-roja-colombiana-desarrollo-una-app-de-primeros-auxilios/</a>
Colombia	Lysis	Lysis is a platform for storing results of laboratory tests, which doctors and patients access from their cell phones.	E-Health	<a href="http://vm-lysis1.cloudapp.net/lysis.co/lysis_about.pdf">http://vm-lysis1.cloudapp.net/lysis.co/lysis_about.pdf</a>
Colombia	Sebastián Alba Ospina	Infusiones App calculates the dose of infusions for patients through an algorithm	E-Health	<a href="http://www.lapatria.com/node/182408">http://www.lapatria.com/node/182408</a>
Colombia	DoctorApp	Doctor App facilitates the management of medical appointments and contains a list of specialists and users can keep the history of consultations.	E-Health	<a href="http://www.doctorapp.co/">http://www.doctorapp.co/</a>
Colombia	Universidad de Los Andes	MICU a kind of mobile office, a burden from a primary care doctor, who not only has a modern technology for diagnosis, but also is provided with video conferencing devices and satellite connectivity.	E-Health	<a href="http://ehealthreporter.com/es/noticia/una-unidad-diagnostica-movil-lleva-la-telemedicina-a-areas-rurales/">http://ehealthreporter.com/es/noticia/una-unidad-diagnostica-movil-lleva-la-telemedicina-a-areas-rurales/</a>
Colombia	Universidad de Caldas	Telesalud gives the provision of psychiatric services at a distance, in this case for inmates of prisons and penitentiaries, through a technological platform.	E-Health	<a href="http://ehealthreporter.com/es/noticia/proyecto-de-telepsiquiatria-de-u-de-caldas-gano-premio-colsubsidio-de-inclusion-social/">http://ehealthreporter.com/es/noticia/proyecto-de-telepsiquiatria-de-u-de-caldas-gano-premio-colsubsidio-de-inclusion-social/</a>
Colombia	UNAL	Centro de Telemedicina Universidad Nacional de Colombia Desarrollo de software para intercambio de información médica a distancia, multimedia y multiplataforma. Procesamiento, análisis y visualización de imágenes médicas	E-Health	estado del arte del uso de aplicaciones en dispositivos móviles en el área de la telemedicina.
Colombia	1DOC3	1DOC3 is a platform to ask medical questions, with no cost. The developers ensure verified answers, by confirmable doctors.	E-Health	<a href="http://www.1doc3.com">www.1doc3.com</a>
Colombia	Ministry of Information and Communication Technologies	. Teletropic is a mobile phone application which provides online medical consultation, videoconferences, and online diagnostics oriented to tropical diseases	E-Health	<a href="http://www.estrategia.gobienlinea.gov.co/623/w3-article-62117.html">www.estrategia.gobienlinea.gov.co/623/w3-article-62117.html</a>
Colombia	DANE	app that provides information on prices for key agricultural commodities and inputs in Colombia	E-commerce	oecd review of agricultural policies oecd review of agricultural policies

Costa Rica	Shop2Home	In Shop2home users can find items from more than five different categories, with prices even lower than those of physical stores.	E-commerce	<a href="https://www.shop2h.com/">https://www.shop2h.com/</a>
Costa Rica	CS Global Media	Quiago is a mobile app that offers information and promotions of restaurants in Costa Rica. In addition, there is information about cultural and sports events.	E-commerce	<a href="https://play.google.com/store/apps/details?id=com.app.p6148bf">https://play.google.com/store/apps/details?id=com.app.p6148bf</a>
Costa Rica	Teletica	Teletica is an app that publish national and international news, sports, prices, weather and traffic. Information is updated every minute. In addition, it transmits online programs and videos	E-commerce	<a href="https://www.teletica.com/">https://www.teletica.com/</a>
Costa Rica	Costa Rica University	CITA and PROINNOVA consist of a series of specific online courses on the subject of Good Manufacturing Practices and Food Safety.	E-education	<a href="http://www.cita.ucr.ac.cr/e-education">http://www.cita.ucr.ac.cr/e-education</a>
Costa Rica	Costa Rica Institute of Technology	TEC Digital development of teaching activities at the University.	E-education	<a href="https://open-source-software.com/mobile-open-source-technologies/10th-ifip-wg-2.13-...">open source software: mobile open source technologies: 10th ifip wg 2.13 ...</a>
Costa Rica	Word Magic	General Reference Dictionary includes a range of entries, meanings and synonyms broad enough to cover all non-technical areas of the Spanish and English lexicon	E-education	<a href="http://www.bbc.com/mundo/noticias/2011/10/111018_tecnologia_aplicaciones_america_latina_mr">http://www.bbc.com/mundo/noticias/2011/10/111018_tecnologia_aplicaciones_america_latina_mr</a>
Costa Rica	Ministry of education	Recupera is a model were teachers, and hospital staff cooperates to create an environment suitable to the education process	E-education	<a href="http://www.ceaph.com">http://www.ceaph.com</a>
Costa Rica	PANI	“Estudia, Vale por dos” has helped more than 1,300 mothers or pregnant teenagers to return to the formal education system. The program offers courses on the use of information technologies and social media to improve the learning process.	E-education	<a href="http://www.pani.go.cr/">http://www.pani.go.cr/</a>
Costa Rica	OEA	Munet supports the municipalities in their efforts to adopt ICTs in the design of public project and strategies	E-government	<a href="http://portal.oas.org/portal/sector/sap/departamentoparalagestic3%b3nnc3%babli caefectiva/npa/munet egovernment/tabid/1169/default.aspx">http://portal.oas.org/portal/sector/sap/departamentoparalagestic3%b3nnc3%babli caefectiva/npa/munet egovernment/tabid/1169/default.aspx</a>
Costa Rica	Costa Rica Social Security	Oficina Virtual de la Caja Costarricense de Seguro Social (CCSS) simplifies administrative process for the 1.7 millions of employees that are affiliated with the national social security system.	E-government	<a href="http://www.ccss.sa.cr">http://www.ccss.sa.cr</a>
Costa Rica	AYA	Aya app allows citizens to report inadequate services in the Water and Sewer system, increasing quality and transparency of public services.	E-government	<a href="https://www.aya.go.cr/">https://www.aya.go.cr/</a>
Costa Rica	Caja Costarricense de Seguro Social	EDUS allows users to view clinical information, diagnoses, allergies, medications, appointments and validate their insurance status	E-Health	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=costa%20rica&amp;id=423">http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=costa%20rica&amp;id=423</a>
Costa Rica	Ministerio de Salud	App Denuncias Salud allows you to record a report, send it to the authorities. Anyone can access a map and visualize the Health problems that affect the community.	E-Health	<a href="https://www.ministeriodesalud.go.cr/index.php/noticias/noticias-2017/1153-ministerio-de-salud-insta-a-">https://www.ministeriodesalud.go.cr/index.php/noticias/noticias-2017/1153-ministerio-de-salud-insta-a-</a>

				<a href="#">denunciar-mediante-aplicación</a>
Costa Rica	Ministerio de Salud	Dengue Breeding Report to give a tool to the people for report the presence of dengue breeding sites in homes, roads and public places across the country.	E-Health	<a href="http://www.geotecnologias.com/dengue-breeding-report/">http://www.geotecnologias.com/dengue-breeding-report/</a>
Costa Rica	Caja Costarricense de Seguro Social	with telemedicine seeks to strengthen the tool of telemedicine to lower waiting lists and give an economic savings to the institution and the pocket of patients.	E-Health	<a href="http://ehealthreporter.com/es/noticia/legacy-2331/">http://ehealthreporter.com/es/noticia/legacy-2331/</a>
Costa Rica	GeoVision	The Geographic Health Observatory or OGES had generated information valuable to diminish premature mortality rates and works towards meeting the target of 25%. OGES generates a map with information about diseases and health conditions by zones. The information is available to everybody on the website.	E-Health	<a href="http://geovision.uned.ac.cr/oges/index.html">http://geovision.uned.ac.cr/oges/index.html</a>
Cuba	Joven Club de Computación	the Cuban Collaborative Encyclopaedia (EcuRed), is a collaborative encyclopaedia to bring knowledge to communities and actively tries to involve them in the elaboration of content related to their actions.	E-education	report on the wsis stocktaking 2017
Cuba	National Medical Sciences Information CentreCountry	Infomed is a network integrating a number of institutions joined by ties of commitment and professionalism, where knowledge is disseminated multilinearly via complex node systems.	E-Health	wsis stocktaking: success stories 2017
Cyprus	EAFRD	Final stages of a major modernisation programme at a leading seedling nursery in Cyprus with co-financing for the installation of a modern new 'smart' irrigation system that is both saving costs and conserving water.	E-Agriculture	<a href="https://ec.europa.eu">https://ec.europa.eu</a>
Dominican Republic	Open University for Adults	Provide advance training to the various modes of distance education.	E-education	<a href="#">e-education in higher education in latin america</a>
Dubai	Smart Dubai Government	DubaiNow Mobile Application, as a single smart citywide platform and single point of interaction for accessing city services.	E-commerce	report on the wsis stocktaking 2017
Ecuador	Technical University of Loja	"Modalidad Abierta y a Distancia" allowed to teachers who had been unable to attend university and needed to improve skills.	E-education	<a href="#">e-education in higher education in latin america</a>
Ecuador	Medium Multimedia	E-Learnig Ecuador, designs different courses according to the need and objective of different public and private entities	E-education	<a href="http://www.elearningecuador.ec/capacitacion-empresarial-ecuador/">http://www.elearningecuador.ec/capacitacion-empresarial-ecuador/</a>
Ecuador	Escuela Politécnica Nacional	Escuela Politécnica Nacional is a higher education entity that offers online courses for all people in Ecuador; its programs include programming learning, pedagogical skills, and business management.	E-education	<a href="http://www.epn.edu.ec">www.epn.edu.ec</a>
Ecuador	Ministry of telecommunications	Ventanilla Unica is an online platform that allows the user to make tax submissions and obtain exports and imports certificates online.	E-government	<a href="http://www.comercioexterior.gob.ec/ventanilla-unica-ecuatoriana-facilita-el-comercio-internacional">www.comercioexterior.gob.ec/ventanilla-unica-ecuatoriana-facilita-el-comercio-internacional</a>
Ecuador	Ministry of telecommunications	Tramiton is an online portal that allows citizens to propose solutions that can improve government efficiency and simplify cumbersome procedures.	E-government	<a href="http://www.tramiton.to">www.tramiton.to</a>
Ecuador	Ministry of telecommunications	Quipux is an Ecuadorian web platform, that facilities public entities the management of all their e-mails and allow citizens to track their sent e-mails to specific public institutions	E-government	<a href="http://www.gestiondocumental.gob.ec">www.gestiondocumental.gob.ec</a>

Ecuador	Cruz Roja Ecuatoriana	Social Blood automatically sends an alert to users with the required blood group and will indicate which is the closest center to perform the blood draw.	E-Health	<a href="http://ehealthreporter.com/es/noticia/legacy-3785/">http://ehealthreporter.com/es/noticia/legacy-3785/</a>
Ecuador	Innovasystem	Mi Veris book your appointments directly, save the record in the agenda, give the results of the laboratory, receive the recipes and reminders of the medicine.	E-Health	<a href="https://play.google.com/store/apps/details?id=ec.com.innovasystem.veris&amp;hl=es_419">https://play.google.com/store/apps/details?id=ec.com.innovasystem.veris&amp;hl=es_419</a>
Ecuador	Pontificia Universidad Católica del Ecuador	In Floramed you can find medicinal plants native to Ecuador, which are not known by most people.	E-Health	<a href="https://www.redaccionmedica.ec/secciones/salud-publica/floramed-la-primera-app-sobre-plantas-medicinales-del-ecuador-90174&amp;previo=79762671">https://www.redaccionmedica.ec/secciones/salud-publica/floramed-la-primera-app-sobre-plantas-medicinales-del-ecuador-90174&amp;previo=79762671</a>
Ecuador	IBM	Cognitical: Healthcare is an app able to translate questions made by doctors or patients into an analysis that includes stashed away data from clinical studies and research and through the use of probabilistic reasoning, find the best solutions ranked in a confidence level scale	E-Health	<a href="http://www.ibm.com/industries/no-cognitivehealthcare">www.ibm.com/industries/no-cognitivehealthcare</a>
European Union		EUCARIS is a network for European Union member states for exchanging vehicle registration, driving licence and traffic fine information. The information system works in a closed network and the document exchange takes place directly between the systems of the member states.	E-government	electronic government : 15th ifip wg 8.5 international conference, egov 2016, guimarães, portugal, september 5-8, 2016, proceedings
European Union		ECRIS is used to exchange criminal records between EU member states. The documents are exchanged through a decentralised information system. By 2013, the information system had been introduced in five member states.	E-government	<a href="https://ec.europa.eu">https://ec.europa.eu</a>
Germany	City of Berlin	In 2013, the City of Berlin introduced a new web portal (Berlin Open Data) on which open data sets of the city of Berlin are gathered and freely shared.	E-government	electronic government : 15th ifip wg 8.5 international conference, egov 2016, guimarães, portugal, september 5-8, 2016, proceedings
Germany		In Germany, public sector data and crowd collaboration contribute to the successful web service and smartphone apps "Wheelmap", which helps people with reduced mobility get around in cities.	E-Health	<a href="https://ec.europa.eu">https://ec.europa.eu</a>
Germany	the Diplomatic Council	Smart Service Power project increase women's access to healthcare and information	E-Health	report on the wsis stocktaking 2017

Ghana	Healthy Career Initiative	the Phoenix project designed to help children, especially girls, see technology in a whole new light as a medium for self-expression, and as a means for changing the world.	E-education	report on the wsis stocktaking 2017
Guatemala	Galileo University	IDEA delivers six undergraduate degrees in Technology and Management using E-education.	E-education	<a href="#">e-education in higher education in latin america</a>
Honduras	National Autonomous University of Honduras	SUED ro provide access to higher education in remote areas where the university did not have the capacity to plant regional sites.	E-education	<a href="#">e-education in higher education in latin america</a>
Iceland		Reykjavik is a website where the citizens of the Icelandic capital can propose policy ideas and proposals to the local government	E-government	electronic government : 15th ifip wg 8.5 international conference, egov 2016, guimarães, portugal, september 5-8, 2016, proceedings
India		Shekru is a smartphone-based free application in India, operating in both English and Marathi, that provides agricultural information as it relates specifically to events and schemes in Maharashtra and beyond.	E-Agriculture	report on the wsis stocktaking 2017
India		Kanyashree Scheme is an exceptional example where an e-governance application reaches Digital Transformation level in a span of 3 years since inception. It goes beyond the basic mandate of e-governance and touches lives of millions who belong to the socio-economically poor strata of the society	E-government	report on the wsis stocktaking 2017
India	Ministry of Agriculture	Shekru provides agricultural information as it relates specifically to events and schemes in Maharashtra and beyond.	E-government	report on the wsis stocktaking 2017
India		Trust+ is an innovative app can discuss sexual and reproductive health-related topics without any hesitation.	E-Health	report on the wsis stocktaking 2017
Indonesia	The Bandung Institute of Governance Studies (BIGS)	Data Revolution for Monitoring Sustainable Development Goals: The platform involves the development of software and guidelines.	E-government	report on the wsis stocktaking 2017
Indonesia	8Villages Indonesia PT	Information System for Farmers (LISA) that focuses on empowering rural communities, starting with farmers but also including other micro businesses, too. It helps farmers to increase yields and micro businesses to improve and connect rural communities across Indonesia.	E-government	report on the wsis stocktaking 2017
Israel		Gov.il,The Israeli government portal offers services geared towards citizens, the private sector and tourists wishing to visit the country, as well as students and members of the Jewish Diaspora.	E-government	best practices and lessons learned in ict sector innovation: a case study of israel
Israel	Check Point Software Technologies Ltd.	Software Blade Architecture, providing customers with flexible and simple solutions that can be customized to meet the security needs of any organization.	E-commerce	best practices and lessons learned in ict sector innovation: a case study of israel
Israel	Wix.com	Wix.com . the Wix Editor and App Market enable businesses, organizations, professionals, and individuals to take their businesses, brands and workflow online and manage an integrated digital presence.	E-commerce	best practices and lessons learned in ict sector innovation: a case study of israel

Israel	Silverbyte	Silverbyte's Optima Line platform can be operated either as a system installed at the customer's premises or as cloud software.	E-commerce	best practices and lessons learned in ict sector innovation: a case study of israel
Israel	Shadow Technologies	Shadow helps to collect and summarize what people say about any topic, product, or person on review sites, social networks, and news sites.	E-commerce	best practices and lessons learned in ict sector innovation: a case study of israel
Italy	Swipe Story	Il Medioevo APPadova is the simplest way to discover the stories hidden under the paved roads and below the stone curtains of the palaces of medieval Padua.	E-Education	report on the wsis stocktaking 2017
Italy	LibraRisk	LibraRisk is a technology platform for innovative risk communication on Internet mobile and WebGIS.	E-education	report on the wsis stocktaking 2017
Italy	Ministry of Finance	OpenCoesione acts as the national transparency portal under the new regulations. OpenCoesione was created in 2012 by the Ministry of Economic Development to publish information about every project carried out in the 2007–13 period.	E-government	electronic government : 15th ifip wg 8.5 international conference, egov 2016, guimarães, portugal, september 5-8, 2016, proceedings
Kazakhstan	Electronic Government of the Republic of Kazakhstan	website is a single mechanism for government interaction between citizens and government agencies enabling coordination through information technologies.	E-government	report on the wsis stocktaking 2017
Kuwait	Public Authority for Civil Information	Kuwait Finder was released to equip Kuwaiti society with a localized GIS-based search engine, supporting address search up to individual apartment level, and by establishment name and business type. The Kuwait Finder application was developed by PACI to serve users'	E-government	report on the wsis stocktaking 2017
Kuwait	Public Authority for Civil Information (PACI)	Kuwait Finder search using PACI electronic number for building, apartment, etc. Search using area name, block number, street name or house number Search for points of interest like hospital, shop or mall, etc. search through shortcuts for various different categories of entities such as shopping centres, schools or other activities and crafts	E-government	report on the wsis stocktaking 2017
Kyrgyzstan	IT Attractor Plus	The ESD project, is an innovative method of software developer training aimed at overcoming the shortcomings of the modern educational model.	E-education	report on the wsis stocktaking 2017
Malaysia	Pos Malaysia Berhad	Smart Postman - Catalyst of local improvement project. Issues such as potholes and dumped rubbish are captured via icons, along with corresponding GPS coordinates and photos.	E-government	report on the wsis stocktaking 2017
Mexico	Capacimac	"Beto el Taxista" is an application that helps children with mild cerebral palsy to train on their own in the process of reading and writing.	E-education	<a href="http://www.capacimac.com/noticias-sobre-elearning-y-tecnologia-educativa/recursos-educativos?limitstart=0">http://www.capacimac.com/noticias-sobre-elearning-y-tecnologia-educativa/recursos-educativos?limitstart=0</a>
Mexico	Fundación Carlos Slim	Aldea Digital offers a website with more than 30 online workshops, 92 conferences, and access to educational content	E-education	<a href="http://aldeadigitalmx.com/">http://aldeadigitalmx.com/</a>
Mexico	Secretary of public education	EDUCATIONAL TV distributed education by television to 1.9 million of students and professors in Mexico, through programs like TELE middle and high school	E-education	<a href="http://www.televisioneducativa.gob.mx">http://www.televisioneducativa.gob.mx</a>

Mexico	Fundación Carlos Slim	Aprende.org offers more than 80 free academic and technical courses. Aprende.org offers not only free educational content but also offers free data to access it, using the network of Telmex and Telcel. Also, the user can get official certification for the courses.	E-education	<a href="http://www.aprende.org">www.aprende.org</a>
Mexico	Secretary of public performance	ComprasNet increases the transparency of public expenditure and generates opportunities for small and medium enterprises to sell products and service to the government	E-government	<a href="https://compranet.fuccionpublica.gob.mx/web/login.html">https://compranet.fuccionpublica.gob.mx/web/login.html</a>
Mexico	Secretary of Finance and Public Credit	Declarasat allowed more than 596,000 companies and 1.9 million people to present their annual tax declaration	E-government	<a href="https://tramitesdigitales.sat.gob.mx/declarasat.enlinea/login.aspx?returnurl=%2fdeclarasat.enlinea%2fdefault.aspx">https://tramitesdigitales.sat.gob.mx/declarasat.enlinea/login.aspx?returnurl=%2fdeclarasat.enlinea%2fdefault.aspx</a>
Mexico	Federal Police	The app of the Federal Police represents a constant channel of communication between the citizens and the federal police, improving security and preventing crimes.	E-government	<a href="https://www.gob.mx/policiafederal/articulos/aplicacion-pf-movil?idiom=es">https://www.gob.mx/policiafederal/articulos/aplicacion-pf-movil?idiom=es</a>
Mexico	Nimbo X	Nimbo X is an assistant that helps doctors provide better care for their patients	E-Health	<a href="https://www.nimbo-x.com/">https://www.nimbo-x.com/</a>
Mexico	Universidad Autónoma San Luis Potosí	“Plataforma de Vigilancia Sindrómica y Alerta Epidemiológica de Vectores en Salud Humana apoyados en Sensores Remotos y Geotecnologías” seeks to prevent and limit the impact of epidemics	E-Health	<a href="http://ehealthreporter.com/es/noticia/prueban-una-plataforma-geoweb-para-la-vigilancia-de-dengue-y-otras-enfermedades-transmitidas-por-vectores/">http://ehealthreporter.com/es/noticia/prueban-una-plataforma-geoweb-para-la-vigilancia-de-dengue-y-otras-enfermedades-transmitidas-por-vectores/</a>
Mexico	Medical Tab	Red Medical Tab offers remote monitoring services, disease control and data transmission over the Internet to the specialist to evaluate the information.	E-Health	<a href="http://www.medicaltab.com.mx/">http://www.medicaltab.com.mx/</a>
Mexico	Cine+	Cinema + not only allows you to review the hours of the functions, but also buy or set aside your tickets without any problem and present the purchase code from the application at the box office to see the function.	E-commerce	<a href="https://cinemasapp.co/">https://cinemasapp.co/</a>
Mexico	Nubleer	Nubleer has content in real time, magazines, newspapers, comics, books and videos.	E-commerce	<a href="https://nubleer.com/#/">https://nubleer.com/#/</a>
Mexico	Laudrive	LAUDRIVE is a service that connects those who offer a transport service to those who need it but can only be used by women.	E-commerce	<a href="https://www.laudrive.com/">https://www.laudrive.com/</a>
Mexico	Capptu	Capptu makes it possible to sell images. The companies and agencies that look for photographic material when they see the image and like it, pay for the rights.	E-commerce	<a href="https://capptu.com/">https://capptu.com/</a>
Mexico	Federal Telecommunications Institute	Telecommunication Services Comparator, is an online tool which makes it possible to consult and compare in detail the characteristics of the current offering of all types of both mobile and fixed services.	E-commerce	report on the wsis stocktaking 2017
Mexico	Conekta	OXXO Pay is an alternative payment method for online purchases for people that do not have a bank account. To make a payment, the user gets a code from the e-store and make the payment in cash in an OXXO store	E-commerce	<a href="https://www.conekta.com/es/oxxopay">https://www.conekta.com/es/oxxopay</a>

Mexico	Laudrive	Laudrive gives the opportunity to women to work as a private driver and offer transportation to other women. It is a service that connects those who offer a transport service to those who need it but can only be used by women	E-commerce	<a href="https://www.laudrive.com">https://www.laudrive.com</a>
Mexico	IMSS	IMSS digital aims to save patients time improving processes as schedule an appointment, registration, and change of health center. The app allows patients to administrate appointments and concentrates information regarding the health insurance	E-Health	<a href="http://www.imss.gob.mx/imssdigital">http://www.imss.gob.mx/imssdigital</a>
Mexico	Previta	Prevista introduces the use of electronic clinic record to prevent diseases and hospitalizations. Previta offers health services to private insurance agencies, companies and individuals, using telemedicine and decisions support systems	E-Health	<a href="http://previta.com.mx/">http://previta.com.mx/</a>
Netherlands		In the Netherlands, government data was used to create a web service and smartphone applications that help locate the nearest public defibrillator in case of a heart-related emergency.	E-Health	<a href="http://www.independent.co.uk/life-style/gadgets-and-tech/defibrillator-iphone-app-launched-to-help-locate-life-saving-first-aid-equipment-8939301.html">http://www.independent.co.uk/life-style/gadgets-and-tech/defibrillator-iphone-app-launched-to-help-locate-life-saving-first-aid-equipment-8939301.html</a>
Norway	Government	Through the eRule Project, the Government, has undertaken a review of all laws and regulations in order to identify and remove obstacles to electronic communication.	E-government	implementing e-government in oecd countries: experiences and challenges
Pakistan	The Pakistan Institute of Development Economics (PIDE)	The app PIDE Smart Application bridges the gulf between students and teachers and provides relevant information instantaneously to students.	E-Education	report on the wsis stocktaking 2017
Pakistan	Pakistan Institute of development	PIDE Smart Application (PSA). The app bridges the gulf between students and teachers and provides relevant information instantaneously to students. It transmits notifications to remind students about their classes in accordance with the timetable, as well as readings of the day, which are also made available through the app.	E-education	report on the wsis stocktaking 2017
Pakistan	NED University of Engineering and Technology	the Getinfo programme informs users, mainly students, about the opportunities offered by various organizations worldwide, such as scholarships, internships, sponsorships, jobs, competitions, etc.	E-education	report on the wsis stocktaking 2017
Pakistan	The NED University of Engineering and Technology	Illegal Parking Detector, with a view to implementing an artificially intelligent software to prevent inappropriate car parking on main roads and public streets (no parking zones) for the safety of citizens.	E-government	report on the wsis stocktaking 2017
Pakistan	National University of Sciences and Technology (NUST)	Smart Meter Data Collection collect the data from all smart electricity meters in a community, and transfer them to a central facility for billing and other services.	E-government	report on the wsis stocktaking 2017
Panama	Panamá University	Método Panama offers you the opportunity to train and refine your resume with an online, flexible methodology that you can take from anywhere.	E-education	<a href="http://panama.metodocampus.com/">http://panama.metodocampus.com/</a>
Panama	Caja de Seguro Social	Mi Seguro Social APPs allows the management of appointments and to request ambulances.	E-Health	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=411&amp;lang=en">http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=411&amp;lang=en</a>

Panama	MINSA Panama	Consejo Tecnico de Salud (MINSA) allows validating information about the doctor's name, suitability number, professions or specialties.	E-Health	<a href="https://www.prensa.com/sociedad/minsa-aplicacion-validar-idoneidad-profesionales_0_4884261561.html">https://www.prensa.com/sociedad/minsa-aplicacion-validar-idoneidad-profesionales_0_4884261561.html</a>
Panama	Luz Gloriela Mendoza Taylor	iMuni is an application that informs users about vaccine information and will generate individual vaccination schedules.	E-Health	<a href="http://laestrella.com.pa/vida-de-hoy/tecnologia/panama-para-salud-publica-mundial/24018834">http://laestrella.com.pa/vida-de-hoy/tecnologia/panama-para-salud-publica-mundial/24018834</a>
Panama	Hospital Materno Infantil José Domingo De Obaldía	They use Telemedicine to study exams and consultations remotely. Providing information about exams and consultations in a virtual way.	E-Health	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=403">http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=403</a>
Peru	Pontifical Catholic University of Peru	PUCP Virtual platform is responsible for the masters's degrees, diplomas and other postgraduate programmes.	E-education	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=403">e-education in higher education in latin america</a>
Peru	Pontifical Catholic University of Peru	INFOPUCP Courses comprising short courses, refresher courses and specialisation diplomas.	E-education	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=403">e-education in higher education in latin america</a>
Peru	Uladech Católica	"Sistema de Universidad Abierta" offers blended-learning degrees in Education, Law, Accountin, etc.	E-education	<a href="http://www.paho.org/ict4health/projects/?page_id=190&amp;ps=panama&amp;id=403">e-education in higher education in latin america</a>
Philippines	The Department of Information and Communications Technology	Next Wave Cities (NWC): The programme aims to provide access to digital jobs and opportunities.	E-commerce	report on the wsis stocktaking 2017
Poland		In 2013, the Polish city of Krakow introduced a pilot project to create an open and participatory way of budgeting. By doing this, the city gathered information about civic priorities, set by their inhabitants whilst at the same time giving citizens more power in allocating the city budgets	E-government	electronic government : 15th ifip wg 8.5 international conference, egov 2016, guimarães, portugal, september 5-8, 2016, proceedings
Republic of Belarus	Ministry of Natural Resources and Environmental Protection	Greenmap Belarus is a popular, relating to waste recycling and management, renewable energy, important nature areas, and environmental organizations and initiatives.	E-government	wsis stocktaking: success stories 2017
Republic of Latvia	Rural Support Service	The Electronic Application System (EAS) is a modern, easy-to-use tool for farmers. Its implementation is aimed at a number of target groups, clients of the Rural Support Service of Latvia.	E-Agriculture	wsis stocktaking: success stories 2017
Republic of Tatarstan	Government of the Republic of Tatarstan	the mobile application 'Services of the Republic of Tatarstan' for iOS and Android devices, available in AppStore and Play Market.	E-government	wsis stocktaking: success stories 2017

Saudi Arabia	Metrology and Quality Organization (SASO)	has launched Takkad, a mobile application which enables consumers in Saudi Arabia to validate and verify the authenticity of a SASO quality mark and efficiency labels on products.	E-commerce	report on the wsis stocktaking 2017
Saudi Arabia	Saudi Commission for Tourism and National Heritage (SCTH)	Digital portal for tourist accommodation licensing services is an online website designed to provide users with a virtual link to SCTH for licensing services.	E-commerce	report on the wsis stocktaking 2017
Saudi Arabia	Saudi Commission of Tourism and National Heritage	the MAS Website is the collection and dissemination of information and data on tourism for internal and external users.	E-commerce	report on the wsis stocktaking 2017
Saudi Arabia	Ministry of the Interior	Kollona Amn, a system that allows citizens and expatriates to report any criminal offence or traffic violation through a mobile application.	E-government	report on the wsis stocktaking 2017
Saudi Arabia	Ministry of Municipal and Rural Affairs	the Municipal Elections System run the communications system, hardware and software for the electoral process in the main information centre in Riyadh and the headquarters of the local committees in the election centres in each district.	E-government	report on the wsis stocktaking 2017
Saudi Arabia	Public Security Directorate in the Ministry of the Interior	has launched Kollona Amn, a system that allows citizens and expatriates to report any criminal offence or traffic violation through a mobile application.	E-government	report on the wsis stocktaking 2017
Saudi Arabia	Saudi Tourism Portal	It provides a number of tourism services and other valuable interactive integrated content, such as tourist information, photos, short films and interactive maps to help tourists pre-plan their tours	E-commerce	report on the wsis stocktaking 2017
Saudi Arabia	The Saudi Standards	Takkad, a mobile application which enables consumers in Saudi Arabia to validate and verify the authenticity of a SASO quality mark and efficiency labels on products and to report fake SASO quality marks or efficiency labels	E-commerce	report on the wsis stocktaking 2017
Singapore	Singapore Customs	The National Trade Platform (NTP) will be the next-generation digitized platform to support businesses and the government, particularly in the logistics and trade finance sectors.	E-commerce	wsis stocktaking: success stories 2017
Slovenia	Ministry of Public Administration of the Republic Slovenia	Big Data Analysis for HR efficiency improvement is a pilot project, with the aim of identifying the right big data tool that, when installed on Slovenian State cloud infrastructure, could improve HR data efficiency in the ministry.	E-government	report on the wsis stocktaking 2017
Spain	Red Educa	Red Educa offers more than one hundred online courses at university level with official certifications	E-education	<a href="https://www.rededuc.a.net/">https://www.rededuc.a.net/</a>
Spain	Ministry of Education	"Formacion Profesional a Distancia" aims to generated opportunities for people that cannot attend school because of their location or schedule. The program offers distance education to autonomous communities in Spain.	E-education	<a href="https://www.mecd.gob.es/fpadistancia/inicio.html">https://www.mecd.gob.es/fpadistancia/inicio.html</a>
Spain	Escuela 20	Escuela 20 contributes to the implementation of information technologies in the classrooms of the public schools	E-education	<a href="http://www.escuela20.com">http://www.escuela20.com</a>
Spain	Secretary of Digital Administration	The eGovernment portal unifies and centralizes information about all government dependencies. It offers the possibility of doing procedures at any time and access to information, analysis, initiatives, and status of all activities of the government	E-government	<a href="https://administracionelectronica.gob.es/pa_e_home#.wptq-2rowuk">https://administracionelectronica.gob.es/pa_e_home#.wptq-2rowuk</a>
Spain	Secretary of Digital Administration	Red Sara connects more than 3,708 local entities, representing more than 90% of the population, increasing collaboration within all government levels. Red Sara is Spain's Government Intranet. It aims to save costs and time, and facilitate the integration of systems and exchange of data.	E-government	<a href="https://administracionelectronica.gob.es/ctt/redsara#.wprtrowuk">https://administracionelectronica.gob.es/ctt/redsara#.wprtrowuk</a>
Spain	XALOC	A new sensory system for detecting parking spaces ('XALOC') has been developed as part of an innovative project to cut fuel consumption and reduce traffic density in Barcelona,	E-commerce	<a href="https://ec.europa.eu">https://ec.europa.eu</a>

		Spain. Research shows that XALOC reduces the time taken to find a parking space by 5-7 minutes.		
Spain	Wallapop	Wallapop has more than 40 million users, and more than 100 million products have been commercialized. Wallapop is a virtual and mobile market. It allows to buy and sell second-hand products in a simple way, from a device or website	E-commerce	<a href="https://es.wallapop.com/">https://es.wallapop.com/</a>
Spain	Heygo	Heygo connects hourly workers searching for a job to households looking for them. It has more than 200,000 members. The services offered range from teachers to carpenters	E-commerce	<a href="https://www.heygo.com/es">https://www.heygo.com/es</a>
Spain	Ministry of Economy Industry and Competition	Circe is a website that enables the online completion of procedures related to the creation of new businesses	E-government	<a href="http://portal.circe.es/es-es/paginas/home.aspx">http://portal.circe.es/es-es/paginas/home.aspx</a>
Spain	Ministry of Health and Consumer Affairs	Tarjeta Sanitaria contains the clinic information of the patients, and the information is shared in all the network of public hospital and clinics	E-Health	<a href="https://www.msssi.gob.es/organizacion/sns/plancalidadesns/tic01.htm">https://www.msssi.gob.es/organizacion/sns/plancalidadesns/tic01.htm</a>
Spain	Social Diabetes	Social Diabetes is an app that helps to control diabetes types 1 and 2. It allows patients to calculate the right doses of insulin and other medication in emergencies	E-Health	<a href="https://www.socialdiabetes.com/">https://www.socialdiabetes.com/</a>
Spain	Fundacion Recover	Solidarity-Health Telemedicine 2.0 has helped in the diagnoses of 694 complicated medical cases. The program connects health professionals from Africa (Cameroon, Ivory Coast, and Congo) with doctors in Spain.	E-Health	<a href="https://fundacionrecover.org/salud-2-0/">https://fundacionrecover.org/salud-2-0/</a>
Spain	Universitas Nebrissensis	Global Campus Nebrija has methodology, technology, resources and digital tools, teaching innovation, personal teaching-learning experiences, services available for students, etc.	E-education	<a href="http://www.nebrija.com/nebrija-global-campus/">http://www.nebrija.com/nebrija-global-campus/</a>
Spain	DKV Seguros	runners4health is a game that is not only adding points from the mobile, but also traveling miles in real life.	E-Health	<a href="http://ehealthreporter.com/es/noticia/en-espana-apuestan-a-un-videojuego-para-frenar-la-obesidad-infantil/">http://ehealthreporter.com/es/noticia/en-espana-apuestan-a-un-videojuego-para-frenar-la-obesidad-infantil/</a>
Spain	Colegio Oficial de Enfermeras y Enfermeros de Barcelona	Infermera Virtual infermeta aims to improve the physical and psychological state of users through simple and friendly digital resources.	E-Health	<a href="http://ehealthreporter.com/es/noticia/infermera-virtual-una-alternativa-para-prescribir-enlaces-de-salud/">http://ehealthreporter.com/es/noticia/infermera-virtual-una-alternativa-para-prescribir-enlaces-de-salud/</a>
Spain	Departamento de Salud de Cataluña	In iVacunes the user can upload their data and those of their family group to check what vaccines they need.	E-Health	<a href="http://ehealthreporter.com/es/noticia/ivacunes-un-nuevo-calendario-de-vacunacion-movil/">http://ehealthreporter.com/es/noticia/ivacunes-un-nuevo-calendario-de-vacunacion-movil/</a>
Spain	Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM)	SIMPLe and REMaTch are two applications that try to use the large amount of relevant information collected from mobiles to detect and prevent falls in bipolar disorders.	E-Health	<a href="http://ehealthreporter.com/es/noticia/los-celulares-pueden-prevenir-las-recaidas-de-los-pacientes-con-trastorno-bipolar/">http://ehealthreporter.com/es/noticia/los-celulares-pueden-prevenir-las-recaidas-de-los-pacientes-con-trastorno-bipolar/</a>

Spain	Jorge Negrotti	hear, here is to learn English looking for a solution to help distinguish homophones in English.	E-education	<a href="https://itunes.apple.com/es/app/here-learn-english-homophones/id1065231742?mt=8">https://itunes.apple.com/es/app/here-learn-english-homophones/id1065231742?mt=8</a>
Spain	minimúsica-Sones	TOC AND ROLL is designed so that children can compose their first songs and develop their creativity in an easy, fun and intuitive way. offers the possibility of mixing different instruments in a virtual multitrack.	E-education	<a href="https://itunes.apple.com/es/app/toc-and-roll/id792034886?mt=8">https://itunes.apple.com/es/app/toc-and-roll/id792034886?mt=8</a>
Spain	Meikme	ABCine is an application with which children who are learning the alphabet can review the letters and have fun with interactive animations based on the best movies of all time	E-education	<a href="https://play.google.com/store/apps/details?id=air.com.meikme.alphamovie&amp;hl=es">https://play.google.com/store/apps/details?id=air.com.meikme.alphamovie&amp;hl=es</a>
Spain	Tangible Fun	Niní learns to count is an application with which children will learn numbers and practice shared reading.	E-education	<a href="http://www.tangiblefun.com/apps/nini-aprende-a-contar/">http://www.tangiblefun.com/apps/nini-aprende-a-contar/</a>
Spain	Glovo!	With Glovo you can order or deliver what you want, and receive it in less than 60 minutes. It is an urban and collaborative home delivery service.	E-commerce	<a href="https://glovoapp.com/es/">https://glovoapp.com/es/</a>
Spain	Byhours	Byhours is the first and only application that allows you to book 3, 6 or 12 hours a hotel from the best hotel chains in the main European cities.	E-commerce	<a href="https://www.byhours.com/">https://www.byhours.com/</a>
State of Kuwait	Kuwait University (Dr Salah Alnajem)	The E-education and Virtual Classroom website is a learning-management system (LMS) integrated with a virtual classroom functionality using advanced e-collaboration and videoconferencing technology.	E-education	wsis stocktaking: success stories 2017
Sweeden	Migration Board	Wilma, the Web-based Information System Linking Migration Authorities, is a new IT support tool shared by Swedish authorities involved in processing migration cases.	E-government	oecd e-government studies the e-government imperative
Switzerland		Smartvote is a Swiss voting advice application (VAA) similar to Stemwijzer in the Netherlands or Wahl-o-Mat in Germany. In Switzerland, smartvote has been offering its services since 2003, and since 2005 it has been operated in collaboration with local partners in other countries (e.g. Bulgaria, Luxembourg, Austria).	E-government	<a href="https://www.smartvote.ch/">https://www.smartvote.ch/</a>
Thailand	Advanced Info Services (AIS)	Social Network for Health Promoting Hospitals. will be a key transformative feature of digital Thailand, converts a manual work process into a digital process. Information in the app is referenced by HPHs.	E-Health	report on the wsis stocktaking 2017
Thailand	Advance Info Service PLC (AIS)	the Child Safety App for Community School Bus project, Its objectives are to build a social community collaboration app for driver, teacher and parent, ensure real-time GPS location tracking and notification.	E-government	report on the wsis stocktaking 2017
turkey	Turkcell	The "Hello Hope" app was developed to ease the adaptation phase of refugees in Turkey and to give the Syrian community in Turkey connectivity to essential services.	E-government	report on the wsis stocktaking 2017
Uganda	Ronald Katamba	Jaguz Livestock App enabled artificial intelligence and computer vision system (IoT), that is aimed at improving livestock production in Uganda and on the African continent.	E-government	report on the wsis stocktaking 2017
Ukraine		Roopor provides instant access to education and enlightenment from all over the world. It connects people to knowledge anytime and anywhere, on the go.	E-Education	report on the wsis stocktaking 2017
United Arab Emirates	Ministry of Social Affairs	Nomow is a free smart application which detects any type of developmental delay in children aged five years or younger	E-Health	report on the wsis stocktaking 2017

United Arab Emirates	Ministry of the Interior (Moi)	Hemayati child protection application is a smart band that enhances the implementation of smart security concepts for the protection and care of children in a creative and innovative style.	E-Health	report on the wsis stocktaking 2017
United Arab Emirates	Smart Navigation System (SNS)	mobile application smartphone to navigation and location-based information alerts to easily find and explore places.	E-commerce	report on the wsis stocktaking 2017
United Arab Emirates	Electricity and Water Authority (DEWA)	DEWA's services on the app, for all segments of society including customers, consultants, suppliers, job seekers, government entities as well as unregistered users.	E-commerce	report on the wsis stocktaking 2017
United Arab Emirates	Sheikh Zayed Housing Programme (SZHP)	The Zayed Complexes application provide a link between an applicant wishing to obtain housing assistance.	E-commerce	report on the wsis stocktaking 2017
United Arab Emirates	Deputy Prime Minister's Office	through video games promote learning and awareness in diferent areas.	E-Education	report on the wsis stocktaking 2017
United Arab Emirates	The Dubai Land Department (DLD)	EJARI: programme providing a bridge between property owners and tenants with clear end-to-end governance from DLD, so that Dubai can host a transparent, secure and sustainable real-estate market.	E-government	report on the wsis stocktaking 2017
United Arab Emirates	Ministry of the Interior (Moi)	the Moi UAE Smart Application introduced a qualitative shift in service delivery channels by transforming from E-government to more advanced and innovative smart government concepts	E-government	report on the wsis stocktaking 2017
United Arab Emirates	Abu Dhabi Department of Transport's DARB	smart application traveller information system is designed to provide multimodal, real-time information and route guidance using the web.	E-commerce	report on the wsis stocktaking 2017
United Arab Emirates	Abu Dhabi Department of Transport's	DARB smart application traveller information system is designed to provide multimodal, real-time information and route guidance using the web (DARB upgrade), mobile phones (new mobile DARB app) and satellite navigation systems (in-vehicle and OEM)	E-commerce	report on the wsis stocktaking 2017
United Arab Emirates	Smart Dubai Government Establishment	has launched the DubaiNow Mobile Application, as a single smart citywide platform and single point of interaction for accessing city services.	E-government	report on the wsis stocktaking 2017
United Arab Emirates	The Directorate of Public Works (DPW) project	DPW developed a mobile application support collaboration between the customer, contractor and DPW employee.	E-government	report on the wsis stocktaking 2017
United Arab Emirates	Federal Authority for Government Human Resources (FAHR)	FAHR Smart Application is a initiative to provide an integrated application that serves the human resources.	E-government	report on the wsis stocktaking 2017
United Arab Emirates	UAE Vision of 2021	M-Environment is a smart reporting application which helps decision-makers to analyse and monitor work progress along with a detailed screen with the associated statistics.	E-government	report on the wsis stocktaking 2017
United Kingdom		The Office of the E-Envoy in the United Kingdom has outlined a skills map as part of the UK Online Strategy to prepare UK government agencies for E-government adoption.	E-government	<a href="http://www.oecd.org/internet/ieconomy/1952944.pdf">http://www.oecd.org/internet/ieconomy/1952944.pdf</a>
United States		The case of the app — Asthmopolis   in the U.S. is an excellent example of an application developed thanks to an ecosystem that has brought social value and improved quality of life to a vulnerable segment of the population: people with asthma.	E-Health	data-driven innovation for growth and well-being
United States	The Massachusetts Institute of Technology	Decided to support open content creation and started a pilot programme to publish its coursework under the "creative commons" license. Its OpenCourseWare programme will eventually make the teaching materials for all MIT courses available free of charge on its website.	E-education	ict policy: a beginner's handbook
United States	BethClip, Inc	the BethClip is a lightweight and very easy to handle piece of software whose main function resides in synchronizing your clipboard across multiple devices, enabling you to have access to the same data regardless of the device you are working on.	E-commerce	report on the wsis stocktaking 2017

United States		'Terrorist Information Awareness' programme will add data from sources such as public lending libraries, credit card transactions, ATM withdrawals or even seat reservations on aircraft in order to try and link geographical references to communications traffic.	E-government	ict policy: a beginner's handbook
United States	MIT	the OpenCourseWare allowed open sharing of educational resources	E-education	<a href="#">e-education in higher education in latin america</a>
United States	Musinetwork School of Music	Musinetwork School of Music is an online music school that offers specialized certification courses and programs in Contemporary Popular Music and Jazz.	E-education	<a href="http://musinetwork.com/mnw-school-of-music/">http://musinetwork.com/mnw-school-of-music/</a>
Uruguay	Paganza	Paganza allows you to make payments for different services, such as: electricity, water and more, without having to go to a banking establishment.	E-commerce	<a href="https://www.paganza.com/">https://www.paganza.com/</a>
Venezuela	Rafael Belloso Chacín University	"Dirección de Estudios a Distancia" deliver virtual E-education programmes and a blended courses and diplomas.	E-education	<a href="#">e-education in higher education in latin america</a>
Venezuela	Andrés Moreno	Open English is an application that seeks to offer English classes live 24/7 to its users	E-education	<a href="https://www.openenglish.com/corporativo/quienes-somos/">https://www.openenglish.com/corporativo/quienes-somos/</a>
Zimbabwe	Kudakwashe	has launched Fish-it, to assist young people, particularly in urban areas, through outreach, notifications, announcements, advertising, education, awareness and information dissemination	E-Health	report on the wsis stocktaking 2017
Zimbabwe	Ian Nyasha Mutamiri	NatiV assistive learning technology is, and should be, positioned as an avant-garde, breakthrough technology on the Zimbabwean market.	E-Education	report on the wsis stocktaking 2017

Table 35: Big data, Machine Learning, and IoT cases

Country	Entity	Projects	Source	IoT	Big Data	Machine Learning
Albania	World Bank Group	To improve the transparency of information systems used to manage road safety and maintenance activities in Albania, which has the highest rate of road-related fatalities in SE Europe	Big Data UN Work Group	0	1	0
Argentina	Instituto Nacional de Estadística y Censos (INDEC)	Using webscraping techniques to build an online consumer price index and monitor inflation	Data Pop Alliance	0	1	0
Australia	UN - Global Pulse	This study explored whether online search data could be analyzed to understand migration flows and produce a proxy for migration statistics, using Australia as case study.	Big Data UN Work Group	0	1	0
Austria	Austria - Statistics Austria	Scanner data from big retail chains can be used to collect prices and quantities. Currently a pilot with a small data snapshot is being conducted. Negotiations with retail chains are ongoing.	Big Data UN Work Group	0	1	0
Austria	Austria - Statistics Austria	Development and implementation of automatic price collection procedures using Web Crawlers for price index compilations.	Big Data UN Work Group	0	1	0

Bangladesh	World Bank Group	The proposed activity draws from modeling data readily available on the Google cloud platform, including elevation, satellite imagery, and census data to dynamically refine a surface of risk within a flood prediction zone produced by weather services.	Big Data UN Work Group	0	1	0
Bangladesh, Sri Lanka, Mozambique	University of Tokyo	Develop a method to create a human mobility dataset by analyzing mobile phone data with various secondary data such as land use and transportation networks. For collecting training and validation data, field surveys were conducted	Big Data UN Work Group	0	1	0
Belarus	World Bank Group	This proposal aims to pilot a technical innovation that will allow the determination of user-focused road condition indicators and road safety concerns by extracting information from big data collected through crowdsourcing among drivers and other road users.	Big Data UN Work Group	0	1	0
Belgium	Belgium - Statistics Belgium	Study the feasibility of using geographical data from web services, either open (e.g. Nominatim, OpenStreetMaps) or proprietary (e.g. Google maps) for the geocoding of static objects not covered by other sources	Big Data UN Work Group	1	1	0
Belgium	Belgium - Statistics Belgium	Assess the feasibility of using mobile phone data to supplement or even replace data sources for statistical products, mainly in the areas of tourism or transport statistics.	Big Data UN Work Group	0	1	0
Belgium	Belgium - Statistics Belgium	Explore the possibility of using web scraping as input for labor market indicators, focusing on job vacancies but not excluding other potentially interesting information.	Big Data UN Work Group	0	1	0
Belgium	Belgium - Statistics Belgium	Explore the possibility of using electricity and gas and water smart meter data for energy, environment and other statistics (e.g. non-occupancy rates, household consumption).	Big Data UN Work Group	1	1	0
Belgium	Belgium - Statistics Belgium	Using very detailed scanner data from the major supermarket chains as input for monthly consumer prices (national CPI and very soon European HICP), particularly for food and personal hygiene products.	Big Data UN Work Group	0	1	0
Brazil	Instituto Brasileiro de Geografia e Estadística (IBGE)	Using cellphone data to monitor tourism in Brazil	Data Pop Alliance	1	1	0
Brazil	Agencia Nacional de Aguas, Ministerio do Meio Ambiente, Instituto de Geografia e Estadística (IBGE)	Installing smart meters to help the NSO monitor customer water bills	Data Pop Alliance	1	1	0
Brazil	Operations Center of the City of Rio	Using satellite and weather data to improve emergency management in Rio de Janeiro	Data Pop Alliance	0	1	0
Brazil	ecovec	Monitoring Dengue fever vectors in individual homes through SMS reporting	Data Pop Alliance	0	1	0
Brazil	UN women	Predicting malaria risk levels through satellite remote sensing of geophysical and demographic data	Data Pop Alliance	0	1	0

Brazil	World Bank Group	Vendor lock-in with proprietary systems and lack of access to their bus fleet AVL data. Implementation of Onebusaway software to replace existing software for estimating bus arrival in real-time.	Big Data UN Work Group	1	1	0
Brazil	World Bank Group	his exploratory research project, which supports the strategic priorities of the Governance Practice, aims to gain new insights into the relationship among citizens' sentiment about governance institutions, trust in Government, and civil unrest.	Big Data UN Work Group	0	1	0
Brazil (Academic)	Fundacao Getulio Vargas	Monitoring population movements through cell-phone use to help plan transportation and control epidemics in Brazil	Data Pop Alliance	0	1	0
Cameroon	Cameroon - National Institute of Statistics	Capacity building to develop national skills in processing Big Data for officials statistics. Share experience and benchmarking with other countries.	Big Data UN Work Group	0	1	0
Cameroon	Cameroon - National Institute of Statistics	As a developing country, Cameroon needs to build capacities and skills in this new domain in statistics. We are exploring these opportunities to learn and adapt methodologies and processing.	Big Data UN Work Group	0	1	0
Canada	Canada - Statistics Canada	We completed a feasibility study for the development of a Canadian inventory of non-residential building (commercial, industrial, government and institutional buildings).	Big Data UN Work Group	0	1	0
Canada	Canada - Statistics Canada	The goal of the project is to implement a set of indices of physical accessibility to services and a general index of remoteness.	Big Data UN Work Group	0	1	0
Canada	Canada - Statistics Canada	use smart meter data as an example of big data, to explore what is and isn't feasible, as well as the tools and skills required, and the potential benefits and pitfalls of utilizing data of that magnitude at Statistics Canada	Big Data UN Work Group	1	1	0
Chile	Ministry of Education	On 2016 to detect which socioeconomic factors and school geographic locations better explain school dropouts and performance on Santiago de Chile, The Ministry of Education in association with Universidad de Chile performed machine learning explanatory and predictive models	, news.microsoft.com/es-xl/apoyo-a-las-politicas-publicas-mediante-el-analisis-predictivo/	0	0	1
Chile	Universidad de Valparaiso and Hospital Carlos Van Buren	identify relevant variables that may help in the process of predicting the risk of intracranial aneurysm rupture using machine learning and image processing techniques based on structured and non-structured data from multiple sources	Chabert S et al. (2017).	0	1	1
Chile	CEINE	market basket analysis using graph mining techniques	<a href="http://www.ceine.cl">www.ceine.cl</a>	0	1	0
Chile	CEINE	profiling clients using high-frequency individual mobility data, targeting clients using social media analysis and data mining	<a href="http://www.ceine.cl">www.ceine.cl</a>	0	1	1
Chile	CEINE	optimizing SERNAC claims to process through text mining analysis	<a href="http://www.ceine.cl">www.ceine.cl</a>	0	1	0
Chile	CEINE	detecting Sleep-Disordered Breathing through machine learning and data mining techniques	<a href="http://www.ceine.cl">www.ceine.cl</a>	0	1	1
Chile, Colombia, Guatemala	World Bank Group	his project proposes a Big Data solution to increase the income tax base and boost public revenue.	Big Data UN Work Group	0	1	0

China	China - National Bureau of Statistics	Crawling the particular cellphone price data by Crawler program and establishing the daily price index as a reference for the monthly price data.	Big Data UN Work Group	0	1	0
China	China - National Bureau of Statistics	Build up the spatial sampling frame by using the data from land use surveys and agricultural census. Then update the sampling frame by satellite and aerial remote sensing.	Big Data UN Work Group	0	1	0
China	China - National Bureau of Statistics	We get the year-on-year data and the chain data of the credit card transaction amounts in different industries from the headquarters of UnionPay on a monthly basis.	Big Data UN Work Group	0	1	0
China	China - National Bureau of Statistics	Transport Ministry has studied the networks of the toll highway system and marine visa system.	Big Data UN Work Group	0	1	0
China	World Bank Group	We propose to implement a big data analytics prototype platform that specialized in analyzing medical insurance data to monitor the insurance cost and potentially detect insurance fraud.	Big Data UN Work Group	0	1	0
Colombia	Departamento administrativo Nacional de Estadística (DANE)	Using webscraping to enhance Colombia's national database of wholesale food prices and quantities	Data Pop Alliance	0	1	0
Colombia	Departamento administrativo Nacional de Estadística (DANE)	Using satellite data to complement the National Agricultural Census	Data Pop Alliance	0	1	0
Colombia	Departamento administrativo Nacional de Estadística (DANE)	Using webscraping techniques to build an online consumer price index and monitor inflation	Data Pop Alliance	0	1	0
Colombia	Ministerio de Hacienda y Credito Publico	Using Google Trends data to nowcast economic activity in Colombisa and create better indicators for the NSO	Data Pop Alliance	0	1	0
Colombia	International Center for Tropical Agriculture, Fedearroz	Using information on farmers' crop and weather patterns to identify what kind of agricultural practices have historically worked well in specific locations during particular spells of weather	Data Pop Alliance	0	1	0
Colombia	Telefonica, World Bank, Data-Pop Alliance, Departamento Nacional de Estadística (DANE)	Using cellphone and survey data to build socioeconomic indicators and study networks patterns	Data Pop Alliance	0	1	0
Colombia	Ministerio del trabajo	Using webscraping techniques to monitor job vacancies in Colombia	Data Pop Alliance	0	1	0

Colombia	Ministerio de Justicia, UN Office on Drugs and Crime	Using satellite data to monitor coca crops	Data Pop Alliance	0	1	0
Colombia	Telefonica, World Bank, Data-Pop Alliance, Transmilenio, Policia Nacional	Using cellphone data, police data, and transit data to study dynamics of crime hotspots in Bogota	Data Pop Alliance	0	1	0
Colombia	World Bank Group	This project aims to evaluate techniques that use Call Detail Records (CDRs) to offer more timely and complete estimates of these variables.	Big Data UN Work Group	0	1	0
Colombia	World Bank Group	Recent climate change analytical studies by the WBG revealed that LAC could benefit from a more suitable future climate for rice.	Big Data UN Work Group	0	1	0
Colombia	World Bank Group	Using rich and robust data we intend to quantify the association of crime with specific built environment characteristics measured through street audits as well as using existing infrastructure information. Using Bayesian Maximum Entropy (BME) and Risk Terrain Modeling (RTM) we will quantify with incidence rate ratios\	Big Data UN Work Group	0	1	1
Colombia	Instituto Nacional de Vias (INVIAS)	Using GPS data to improve traffic circulation and to serve as input for transport statistics in Colombia	Data Pop Alliance	1	1	0
Colombia	Univerisdad del Rosario	measures tax evasion of illegal miners constructing a dataset using machine learning predictions on satellite imagery features	Saavedra et al. (2017)	0	1	1
Colombia	Quantil	adjusted alternative risk adjustment measures of health insurers using machine learning methods	Serna et al. (2017)	0	1	1
Colombia	Quantil	predicts readmissions mortality and infections using artificial neural networks and random forest regressions.	Riascos et al. (2016)	0	1	1
Colombia, Chile	World Bank Group	This project aims to create a pilot platform based on recommendations of an earlier study which provided a need assessment and high level system architecture design on using big data for just-in-time analysis.	Big Data UN Work Group	0	1	0
Congo - Democratic Republic of, Cote d'Ivoire, Ghana, Uganda, Zambia	World Bank Group	the project will collect data such as call detail records and (mobile) financial transaction data from Mobile Network Operators and Financial Institutions to understand customer profiles.	Big Data UN Work Group	0	1	0
Costa Rica	Hacienda	"Modelo predictivo" is a program that found 3 thousand false providers registered as tax payers to evade taxation. In the las 5 years, the amount of tax evasion was estimated near 32 million dollars. The ministry of finance is using big data to trends and patrons to identify suspicious transactions that may lead to tax evasion or money laundry	Hacienda	0	1	1

Costa Rica	Costa Rica Tourism Institute	The Costa Rican Tourism board made available four tools for big data management, aiming to improve the information available to businesses. The project includes access to essential software and programs internationally approved such as Review Pro, OAG, information through GPS and STR. These allow the user to generate analyses using big data.	<a href="http://www.ict.go.cr">http://www.ict.go.cr</a>	0	1	0
Costa Rica	CABEI	Dinamica Initiative is a program that positively impacts 2-3 thousand people per year, using an artificial intelligence platform that provides support to entrepreneurs. The platform will answer the most common doubts and offer live webinars in order to promote virtual training.	<a href="https://www.bcie.org/en/news/news/article/costa-rican-entrepreneurs-will-have-an-artificial-intelligence-platform/">https://www.bcie.org/en/news/news/article/costa-rican-entrepreneurs-will-have-an-artificial-intelligence-platform/</a>	0	0	1
Czech Republic	Czech Republic - Statistical Office	Data sharing of scanner data with the most important retail chains. The project aims at creating a new data source for price statistics and foresees potential secondary use for national accounts, household income and expenditure or business statistics.	Big Data UN Work Group	0	1	0
Czech Republic	Czech Republic - Statistical Office	This pilot project aims at assessing the feasibility of using mobile positioning data for generating statistics on inbound and domestic tourism flows in the Czech Republic.	Big Data UN Work Group	0	1	0
Denmark	Denmark - Statistics Denmark	The purpose of this project is to test whether scanner data from the two major supermarket chains in Denmark can be used in the production of the CPI.	Big Data UN Work Group	0	1	0
Ecuador	Instituto Nacional de Estadística y Censos (INEC)	Using webscraping techniques to build an online consumer price index and monitor inflation	Data Pop Alliance	0	1	0
Ecuador	Ecuador - National Institute of Statistics and Censuses	Develop index of happiness based on the use of data from social networks	Big Data UN Work Group	0	1	1
Ecuador	Ecuador - National Institute of Statistics and Censuses	Build on prices published on websites, in order to make various technological and methodological exercises that can generate different types of analysis and development of indicators or indices, such as the consumer price index, based on information posted on the web.	Big Data UN Work Group	0	1	0
Ecuador	Instituto Nacional de Estadística y Censos (INEC)	Using Twitter data to measure subjective wellbeing in Ecuador	Data Pop Alliance	0	1	0
Ecuador	Instituto Nacional de Estadística y Censos (INEC)	Using cellphone data to track daytime migration	Data Pop Alliance	0	1	0
Ecuador	Academy	satellite or drones monitoring that could take high definition pictures of all the harvest season	Castillo (2016)	0	1	0
Ecuador	Academy	applies evolutionary computation and machine learning methods to study the transportation system of Quito from a design optimization perspective	Armas et al. (2017)	0	1	1

Europe	European Commission - Eurostat	Use call detail records (CDRs) for population, mobility and urban statistics estimation and inferences	Big Data UN Work Group	0	1	0
Europe	European Commission - Eurostat	Exploring Wikipedia page view counts as a source for official statistics.	Big Data UN Work Group	0	1	0
Europe	European Commission - Eurostat	Assessment of the potential of the Google Trends product	Big Data UN Work Group	0	1	0
Europe	European Commission - Eurostat	Explore the potential of flight reservation systems data for official statistics	Big Data UN Work Group	0	1	0
Europe	European Commission - Eurostat	Eurostat supports a number of projects aimed at integrating different price statistics and using collected prices for multiple purposes.	Big Data UN Work Group	0	1	0
Europe	European Commission - Eurostat	The aim of this project was to assess the feasibility of employing modern and enhanced methodologies and indicators for collecting high quality statistics from non-traditional data sources such as the Internet	Big Data UN Work Group	1	1	0
Europe	European Commission - Eurostat	The aim of the current study was to assess the feasibility of using mobile positioning data for generating statistics on domestic	Big Data UN Work Group	0	1	0
Finland	Finland - Statistics Finland	On-going pilot project on consumer prices searching opportunities for web scraping and scanner data usage.	Big Data UN Work Group	0	1	0
Finland	Finland - Statistics Finland	The project produced new commuting time estimates based on many data sources.	Big Data UN Work Group	0	1	0
Germany		The core intention of the AutoMat project is to establish a novel and open ecosystem in the form of a cross-border Vehicle Big Data Marketplace that leverages currently unused information gathered from a large amount of vehicles from various brands	Big Data UN Work Group	1	1	0
Guatemala	Instituto Nacional de Estadística (INE), Telefonica, Worldbank	Using cellphone data to monitor poverty levels in Guatemala	Data Pop Alliance	0	1	0
Guatemala	World Bank Group	Cellphones generate large datasets of "digital footprints" from a population, which can be analyzed using data mining and computer-learning techniques to reveal behavioral patterns that can then be used to estimate and forecast poverty and shared prosperity.	Big Data UN Work Group	1	1	1
Hungary	Hungary - Central Statistical Office	uses the web scraping technique to get price data from a general retailer's website.	Big Data UN Work Group	0	1	0
Hungary	Hungary - Central Statistical Office	The main objective is to support the estimation of the job vacancies of Hungary.	Big Data UN Work Group	0	1	0
Hungary	Hungary - Central Statistical Office	The main objective is to support the estimation of retail sales statistics.	Big Data UN Work Group	0	1	0

Hungary	Hungary - Central Statistical Office	The main objective is to support the estimation of the incoming and outgoing traffic at the borders of Hungary.	Big Data UN Work Group	0	1	0
India	World Bank Group	there is an online job matching platform called Babajob, which connects job seekers and employers, including in the informal sector.	Big Data UN Work Group	0	1	0
Indonesia	UN - Global Pulse	This project deployed data analysis and visualization tools to structure and combine data from the Indonesian national citizen reporting complaint system and a local SMS based feedback system (representing active citizen complaints)	Big Data UN Work Group	0	1	1
Indonesia, Brazil, Morocco	World Bank Group	This project introduces substantive technical developments upon current proof of concept applications to human mobility.	Big Data UN Work Group	0	1	0
Ireland	Ireland - Central Statistics Office	The project will use roaming records to produce tourist information statistics.	Big Data UN Work Group	0	1	0
Ireland	Ireland - Central Statistics Office	CSO worked with University College Dublin researchers in a project to estimate household occupancy and composition.	Big Data UN Work Group	0	1	0
Ireland	Ireland - Central Statistics Office	The office is currently investigating the statistical information that wikistats can provide, such as sleep patterns. It is looking for correlations with current statistics.	Big Data UN Work Group	1	1	0
Israel	Israel - Central Bureau of Statistics	We are in the execution phase of the scanner data for Price statistics project.	Big Data UN Work Group	0	1	0
Italy	Italy - National Institute of Statistics	Use of scanner data provided by the largest supermarket chains for estimating the consumer price index.	Big Data UN Work Group	0	1	0
Italy	Italy - National Institute of Statistics	Explore the possibility to use web scraping techniques in the estimation phase (apply to text and data mining algorithms)	Big Data UN Work Group	0	1	0
Italy	Italy - National Institute of Statistics	Currently flash statistics on unemployment rate are produced after one month. The project aims to reduce this time-lag	Big Data UN Work Group	0	1	0
Italy	Italy - National Institute of Statistics	The project focuses on the production of the origin/destination matrix of daily mobility for purpose of work and study at the spatial granularity of municipalities	Big Data UN Work Group	0	1	0
Italy		Sii-Mobility is a national smart-city project that uses new technologies and social media platforms so as to improve urban mobility and optimize citizen services.	Big Data UN Work Group	1	1	0
Japan	Japan - Ministry of Internal Affairs and Communications	Price collection using web scrapping. Quality adjustment using scanner data for compiling price index.	Big Data UN Work Group	0	1	0
Korea Republic	Korea Republic of - Statistics Korea	The project is to compile price index using the price data through the website	Big Data UN Work Group	0	1	0

Korea Republic	Korea Republic of - Statistics Korea	Analysis of the situation of migration to the city, the district, etc. using mobile call detail record (CDR) data of three provinces	Big Data UN Work Group	0	1	0
Latin America & the Caribbean	World Bank Group	Explore the potential of Big Data to address development challenges and promote cooperation and discussion on the topic of Big Data for Development.	Big Data UN Work Group	0	1	0
Latin America & the Caribbean	World Bank Group	number of successful examples of the use and management of big data in the agricultural sector via a series of two-day workshops leveraging national agricultural information systems to facilitate evidence-based decision-making	Big Data UN Work Group	0	1	0
Luxembourg	Luxembourg - National Institute of Statistics	The project consists in receiving scanner data from retailers which should be used in the Consumer Price Index (CPI) compilation.	Big Data UN Work Group	0	1	0
Mexico	Instituto Nacional de Estadística y Geografía, InfoTec, Tec. De Monterrey	Using Twitter data to analyze subjective wellbeing in Mexico	Data Pop Alliance	0	1	0
Mexico	Instituto Nacional de Estadística y Geografía, Data2x, University of Pennsylvania	Using Twitter data to analyze subjective wellbeing of women and disaggregate poverty data with regard to gender in Mexico	Data Pop Alliance	0	1	0
Mexico	Instituto Nacional de Estadística y Geografía (INEGI)	Using Twitter data to track movement across borders	Data Pop Alliance	0	1	0
Mexico	Secretaría de turismo de México, Instituto Nacional de Estadística y Geografía (INEGI)	Using geolocated Twitter data to track domestic tourism in the states of Guajajuato and Puebla	Data Pop Alliance	0	1	0
Mexico	Municipality of Halisco, Telefonica	Using cellphone data to monitor displacement after natural disasters in Mexico	Data Pop Alliance	0	1	0
Mexico	Microsoft Research	Assessing social media trends and in particular Twitter hashtags to examine the drug war	Data Pop Alliance	0	1	0
Mexico	Mexico - National Institute of Statistics and Geography	Exploration of different topics to review the feasibility of using information from Twitter to produce statistical and geographical information	Big Data UN Work Group	0	1	0
Mexico	Mexico - National Institute of Statistics and Geography	Today in Mexico we use different types of satellite imagery to produce several kinds of data: topographical, geological, land use and geostatistical cartography	Big Data UN Work Group	0	1	0

Mexico	UN - Global Pulse	This project combined the analysis of mobile phone activity data with remote sensing data during severe flooding in the Mexican state of Tabasco as a method to inform emergency management response.	Big Data UN Work Group	1	1	0
Mexico	Trato	Trato is a software that allows companies to create contracts easily. The app enables to create contracts using suggestions of most common clauses, allows management of electronic contracts and eSignatures. Also, the platform offers guidance to organize legal agendas. Trato uses Big Data from Federal Laws to create contracts and Blockchain Technology that enable the contract to be time-stamped	<a href="https://trato.io/">https://trato.io/</a>	0	1	1
Mexico	Konfio	Konfio is an online lending platform for small businesses in Mexico that uses transactional data for rapid credit assessment. Konfio uses machine learning technology to assess the credit profile of small and medium enterprises and authorize an online credit	<a href="https://konfio.mx/">https://konfio.mx/</a>	0	0	1
Mexico (Academic)	University of Chicago, Office of the President	Scraping public records to study maternal mortality	Data Pop Alliance	0	1	0
Mexico (Academic)	Michele Coscia and Viridiana Rios	Using data on google search to track Mexican drug trafficking organizations	Data Pop Alliance	0	1	0
Mexico, Brazil	World Bank Group	Our proposal intends to use data from Easy Taxi, one of the largest e-hailing services (27 countries and 120 cities) for Mexico City, Sao Paulo and possibly Rio de Janeiro to feed an array of tools with data. We have already started negotiations with the founders and the possibility of a promising partnership is on its way.	Big Data UN Work Group	0	1	0
Mongolia	National Statistical Office of Mongolia	he NSO Mongolia has planned to conduct its first agricultural by-census in 2017. For this time around, we are planning to use satellite imagery to identify crop types and estimate the production.	Big Data UN Work Group	0	1	0
Netherlands	Netherlands - Statistics Netherlands	On the basis of road sensor data for Dutch motorways, monthly traffic intensities are calculated for each road per COROP region. The project results in official statistics.	Big Data UN Work Group	1	1	0
Netherlands	Netherlands - Statistics Netherlands	The aim of the project is to produce statistics on the spatial distribution of the Dutch population during the day, as opposed to the spatial distribution as registered by the municipality of residence	Big Data UN Work Group	0	1	0
Netherlands	Netherlands - Statistics Netherlands	This is a research project that explores the usability of public social media messages for selected statistics, the methodology to be used for such statistics, and the reliability of the results	Big Data UN Work Group	0	1	0
Netherlands	Netherlands - Statistics Netherlands	For the CPI and other price indices, several sources may be used. Apart from price observation in shops, Statistics Netherlands uses scanner data from retail businesses.	Big Data UN Work Group	0	1	0
Norway	Norway - Statistics Norway	Identify areas where internet trade is significant and where prices are obtainable.	Big Data UN Work Group	0	1	0

Pakistan	World Bank Group	We propose to use high resolution satellite imagery (< 1m) and detection algorithms to improve traditional poverty mapping techniques to better measure and monitor poverty in Pakistan.	Big Data UN Work Group	0	1	1
Poland	Poland - Central Statistical Office	The goal of the experimental project is to decide whether the data on job offers (labor market statistics) can be gathered from websites.	Big Data UN Work Group	0	1	0
Poland	Poland - Central Statistical Office	The goal is to use web scraping to prepare the survey frame for training institutions. At the moment there is no reliable frame for new survey that will cover several aspects of training institutions activities.	Big Data UN Work Group	0	1	0
Poland	Poland - Central Statistical Office	Migration statistics based on data from mobile operators	Big Data UN Work Group	0	1	0
Poland	Poland - Central Statistical Office	Collaboration in big data sandbox on web scraping on enterprise data. Evaluation of technologies and methodologies for web scraped enterprise data.	Big Data UN Work Group	0	1	0
Poland	Poland - Central Statistical Office	The Central Statistical Office currently does not recognize the sources of Big Data and entities that can provide this type of data in terms of their use for production of statistics.	Big Data UN Work Group	0	1	0
Romania	Romania - National Statistics Institute	We intend to use scanner data for improvement of price statistics and other economic statistics indicators.	Big Data UN Work Group	0	1	0
Rwanda	Univeristy of California-Berkley University of Washington	they show that it is possible to predict the wealth of an individual based on the analysis of his past history of mobile phone calls,	Aeweb.org	0	1	0
Salvador	World bank	Using Twitter data to analyze public perception of a gas subsidy reform in el Salvador	Data Pop Alliance	0	1	0
Singapore	Singapore - Department of Statistics	is an integrated platform that enables the centralised collection of various environmental and weather data for processing, analysis, visualization and distribution.	Big Data UN Work Group	0	1	0
Singapore	Singapore - Department of Statistics	Singapore adopted the de jure concept for Singapore's population estimates based on a person's place of usual residence.	Big Data UN Work Group	0	1	0
Slovenia	Slovenia - Statistical Office of the Republic of Slovenia	The aims of the project is: modernization of collecting the price data; testing the web scraping tools for price	Big Data UN Work Group	0	1	0
Slovenia	Slovenia - Statistical Office of the Republic of Slovenia	The aim of the project is testing usage of mobile data for geospatial statistics.	Big Data UN Work Group	0	1	0
South Africa	South Africa - Statistics South Africa	Assessing the transactional data of large retail chains with the aim of determining their suitability for transforming into data for the Consumer Price Index.	Big Data UN Work Group	0	1	0

Spain	Spain - National Statistical Institute	This project aims at the construction of origin-estimation mobility matrices using mobile phone data.	Big Data UN Work Group	0	1	0
Spain	Spain - National Statistical Institute	This project aims at collecting price data from the web for specific articles in the CPI whose availability is progressively more difficult.	Big Data UN Work Group	0	1	0
Spain	SEGITTUR	Tourism Intelligence System improved the strategic planning process for tourist businesses, generating new important information. It is an instrument based on the analysis of different sources of information through technologies as Big Data and Business Intelligence.	<a href="http://www.segittur.es">http://www.segittur.es</a>	0	1	1
Spain	Urbiotica	Estimations are intelligent parking can reduce 30% traffic and 20% of CO2 emissions in the center of cities. Intelligent parking uses sensors to generate information about parking spots and traffic. The sensor transmits data about the availability of parking spots to users in real time Using the application users can save time in the process of looking for parking and pay for it if need it.	<a href="http://www.urbiotica.com">http://www.urbiotica.com</a>	1	1	1
Sri Lanka	World Bank Group	As urban populations grow, managing urban growth in a way that fosters cities' resilience to natural hazards and the impacts of climate change requires detailed, up-to-date geographic data of the built environment.	Big Data UN Work Group	0	1	0
Sweden	Sweden - Statistics Sweden	Pilot study to identify if the data can be used for new or improved statistics, by means of linking AIS to geocoded data	Big Data UN Work Group	0	1	0
Sweden	Sweden - Statistics Sweden	Identifying sources and usage. Just beginning to look at it, and partly in connection with UNECE Sandbox.	Big Data UN Work Group	0	1	0
Sweden	Sweden - Statistics Sweden	Starting up work to explore what sources and methods can be used to improve HBS	Big Data UN Work Group	0	1	0
Switzerland	Switzerland - Federal Statistical Office	Some of the biggest convenience stores give us aggregated data in the food sector.	Big Data UN Work Group	0	1	0
Switzerland	Switzerland - Federal Statistical Office	using scanner data for the consumer price index calculation of the commodity groups food and near-food (products for personal care, washing and cleaning products as well as animal food).	Big Data UN Work Group	0	1	0
Tunisia	Tunisia - National Institute of Statistics	Unlock the potential of Big Data to strengthen the monitoring of at least one SDG indicator. We will start using social media and web content .	Big Data UN Work Group	0	1	0
Turkey	Turkey - Statistical Institute	We are currently analyzing some logs being produced by different resources by using big data technologies such as Hadoop	Big Data UN Work Group	0	1	0
Uganda	UN - Global Pulse	In the Northern Uganda region, as in many African countries, where poverty levels are high and the majority of population is rural, a proxy indicator of poverty is the type of roof at the household.	Big Data UN Work Group	0	1	0
United Kingdom	United Kingdom - Office for National Statistics	Counts of individuals by age band and sex were obtained from the data provider Experian.	Big Data UN Work Group	0	1	0

United Kingdom	United Kingdom - Office for National Statistics	To source aggregated data from one of the main mobile phone providers for comparison with worker flow estimates from Census.	Big Data UN Work Group	0	1	0
United Kingdom	United Kingdom - Office for National Statistics	This is exploratory research, commissioned out to academia, into the potential of electricity smart meter type data to identify household structure and size.	Big Data UN Work Group	1	1	0
United Kingdom	United Kingdom - Office for National Statistics	Very much exploratory research. The Office for National Statistics (ONS) has acquired electricity smart meter data from trials of energy usage.	Big Data UN Work Group	1	1	0
United Republic of Tanzania	World Bank Group	The objective of this project is to collect high-resolution and high-frequency data on intra-city movements of a randomly selected group of individuals that will be interviewed as part of a planned household survey	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Collecting data on physicians' use of EHRs and considering how EHRs might be used to obtain data on patients more efficiently.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Data purchased from IRI are used in food economics research, seven years of U.S. coverage, with location and date.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Comparing estimates from credit card spending to estimates of consumer spending by state.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Research and mapping of weather and climate data, and use of satellite imagery, to support research in rural and resource economics and in markets and trade economics.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Develop spending and prices by disease for health care in the U.S.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Explore the possibility of scraping websites to obtain relevant data.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Collect large amounts of data from physical activity monitors	Big Data UN Work Group	1	1	0
United States	U.S. Office of Management and Budget	Technology classifications assigned to US patents are extracted, and automatically indexed to one of 13,141 mainline subclass categories	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Autocoding job titles to allow receipt of electronic files with job titles and wage levels for each employee that can be converted to the US Standard Occupational Classification system.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	he project obtains, parses and standardizes computerized criminal history records (CCHR) and transforms the relatively unstructured record of arrest and prosecution	Big Data UN Work Group	0	1	0

United States	U.S. Office of Management and Budget	Collect genetic samples from survey respondents	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	This project uses high-frequency market trading data to study information shocks and resulting price, volatility, and market quality effects in important agricultural markets.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	The project uses a combination of open source (e.g., Google Alerts) and direct survey methods to capture all deaths that occur in contact with police officers.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Working with BLS respondents to provide corporate data.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	This project matches national compensation survey (NCS) data with publicly available Form 5500 filings to augment information not collected as part of the NCS, to compare information collected in both sources, and to evaluate whether respondent burden can be reduced through the use of Form 5500 records.	Big Data UN Work Group	0	1	0
United States	U.S. Office of Management and Budget	Assess data quality for alternative sources of data for measuring housing quality and other characteristics about housing units.	Big Data UN Work Group	0	1	0
United States	Stanford University	uses a novel dataset (based on mobile phone location data) to analyze the impact of travel time on consumers' choices about lunch restaurants. they make use of computational techniques from the machine learning literature to estimate the model	aeweb.org	0	1	1
United States	Harvard University	Pairing user-generated data on local business activity from Yelp with government data sources including the Quarterly Census of Employment and Wages (QCEW) and housing price data, they examine the potential and limitations of using Yelp data to improve the measurement of real time economic activity, as well as economic forecast	aeweb.org	0	1	0

Table 36 Summary of Conditions in Mobile Concessions in Panama: C&W

Subject	First contract	Renovation
Signature	May 29, 1997	November 22, 2013
Object	Licensee to provide mobile telecommunication services type "B". 25 MHz in the 850 MHz band 20 MHz in the 1900 MHz band	+20 MHz in the 700 MHz band
Duration	20 years, from May 29, 1997	20 years, from October 24, 2017
Obligations	Provide mobile telecommunication services without interruptions, in an environment of competition	
Fees paid	72.61 million USD	100 million USD
Extra payments	1% of gross revenues years 1-5: 0.35%, 6-10: 0.50%, 11-15: 0.75%, 16-20: 1%	
Min. development plan	Expand coverage in specific cities and roads	
Quality	14 quality standards, aiming to increase efficiency and customer service	
Anti-competitive measures	Prohibition of tied sales, monopolistic activities, cross subsidies	

Price regulations	Authority could impose price caps to eliminate anticompetitive practices.	
Interconnection	Obligation and right of interconnection with other operators. Principle of equality and competition. Authority would act only in case of no agreement	
Link	<a href="http://www.asep.gob.pa/telecom/Contratos/banb.asp">http://www.asep.gob.pa/telecom/Contratos/banb.asp</a>	<a href="http://www.asep.gob.pa/telecom/Contratos/contrato_cable%20wireless(re n).pdf">http://www.asep.gob.pa/telecom/Contratos/contrato_cable%20wireless(re n).pdf</a>

Source: ASEP.

Table 37 Summary of Conditions in Fixed Concessions in Panama: C&W

Subject	First contract	Renovation
Signature	May 20, 1997	May 20, 2017
Object	Grant a concession to provide basic national, local and international telecommunications services (101-105)	
Duration	20 years, from May 20, 1997	20 years, from May 20, 2017
Temporal exclusivity	Exclusivity until January 1, 2013. After the period, the regulator can grant licenses to other operators in services 101-105.	No exclusivity
Obligations	Provide telecommunication services without interruptions, and increase quality and coverage.	
Rights	Annual payment while concession is type B.	
Cellular concession	The operator is obligated to sign a contract on mobile telecommunications (later contract 309).	
Quality	19 expansion and quality goals	
Controls on anti-competitive behaviour	Prohibiton monopolistic activities and abuse of dominant position	
Price regulations	Authority could impose price caps in the precense of anticompetitive practices.	
Interconnections	Obligation and right of interconnection with other operators. Principle of equality and competition. Authority would act only in case of no agreement. Obligation to provide portability.	
Universal service	Obligation to maintain a tariff for universal service fixed by the regulator. The obligation expired with the exclusivity period.	
Link	<a href="http://www.asep.gob.pa/telecom/Contratos/conce.asp">http://www.asep.gob.pa/telecom/Contratos/conce.asp</a>	<a href="https://impresaprensa.com/economia/Renuevan-concesion-CWP-anos_0_4759774121.html">https://impresaprensa.com/economia/Renuevan-concesion-CWP-anos_0_4759774121.html</a>

Source: ASEP.

## Appendix B: K-nearest neighbor classification algorithm

In order to find the most similar countries to Panama, the study performs a K-nearest-neighbors (Knn) classification algorithm, taking three different training sets based on distinct categories: macroeconomic variables, ICT indicators and the union of them. Using macroeconomics variables from Table 2, and ICT indicators from Table 4, Table 5 and Table 7 first a standardization is done for each variable, a subtraction of the mean and a division by the standard deviation. Standardization allows to isolate scale effects on comparing variables, and compare a set of vectors where each vector is a list of country-specific characteristics.

Having a set of country vectors, the goal is to find which is the most similar country to Panama in a manner that takes in account all vectors' dimensions. The study resolves that issue, finding the Euclidean distance between Panama and the rest countries vectors, and sorting the countries in descending order by their respective distance to Panama.<sup>36</sup> For vectors that contain missing values, that dimension is not taking in account. Table 9 presents the closest countries to Panama on the three distinct groups of variables in descending order according to their respective distance to Panama.

Table 38 Knn neighbor algorithm results

All Variables		Macroeconomic Variables		ICT Indicators	
Country	Distance to Panama	Country	Distance to Panama	Country	Distance to Panama
<b>Costa Rica</b>	4.2	Paraguay	1.0	Costa Rica	3.8
<b>Chile</b>	4.6	Ecuador	1.1	Chile	4.0
<b>Ecuador</b>	4.6	Colombia	1.2	Brazil	4.4
<b>Colombia</b>	4.8	Nicaragua	1.4	El Salvador	4.4
Czech Republic	5.0	Costa Rica	1.6	Ecuador	4.5
<b>Spain</b>	5.3	Peru	2.0	Czech Republic	4.5
El Salvador	5.4	Czech Republic	2.2	Italy	4.6
<b>Mexico</b>	5.5	Mexico	2.2	Colombia	4.6

## Appendix C: Unit price Regression Analysis

The information for prices, velocity, minutes, telecom operator and data (Gb) for each fixed or mobile plan across the comparable countries is gathered from the internet. A regression analysis is performed to establish average price per data (Gb), average price per minutes, and average price per fixed internet speed (Mbps). All plans' prices are converted to current 2018 dollars at the official exchange rate in order to obtain a comparable measure.

$$Package\_price_i = constant + \beta_1 MB_i + \varepsilon_i \quad (1)$$

$$Package\_price_i = constant + \beta_1 Unlim\_minutes_i + \beta_2 Unlim\_data_i + \beta_3 Minutes_i + \beta_3 Data_i + \varepsilon_i \quad (2)$$

<sup>36</sup> The Euclidean distance is the most widely used, and there is some evidence that it performs well on numerical sets in contrast to many other distance functions Hu Li-Yu et al (2016).

The average price per Mbps on fixed mobile services is obtained by the regression of equation (1);  $Package\_price_i$  is Price of individual fixed internet plan,  $MB_i$  is internet velocity and  $\varepsilon_i$  is a noise error. The following tables shows the regression results, the velocity coefficient serves as a measure of average price per MB for each comparable country, and the constant shows a base price level for fixed internet packages. Results shows Costa Rica has the highest average price per MB and the highest base price level, besides Spain has the lower average price per MB and Ecuador the lower base price level for fixed internet packages.

Table 39: Regression results for fixed internet.

VARIABLES	Chile PriceUSD	Colombia PriceUSD	Mexico PriceUSD	Panama PriceUSD	Spain PriceUSD	Uruguay PriceUSD	Costa Rica PriceUSD	Ecuador PriceUSD
VelocityMbps	0.106* (0.0530)	0.956*** (0.234)	0.327*** (0.0331)	0.367*** (0.0487)	0.0542*** (0.00856)	0.323*** (0.00681)	1.722*** (0.221)	0.733*** (0.164)
Constant	34.42*** (5.810)	21.71 (12.61)	17.73*** (2.327)	27.12* (11.58)	15.91*** (1.748)	20.69*** (0.693)	40.81*** (9.401)	14.96 (8.554)
Observations	17	14	14	9	7	4	23	10
R-squared	0.211	0.582	0.890	0.890	0.889	0.999	0.744	0.714

Standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Average price per Gb and average price per minute is obtained from equation (2) it is a regression of Price of mobile individual plan ( $Package\_price_i$ ) on mobile data ( $Data_i$ ) and two dummy variables ( $Unlim\_minutes_i$ ,  $Unlim\_data_i$ ) that binds when the plan has unlimited minutes or unlimited internet data. Results are shown in the following table, it shows mobile internet data and unlimited minutes are significant covariates on explaining each package price.

Table 40: Regression results for mobile phone

VARIABLES	Chile PriceUSD	Colombia PriceUSD	Panama PriceUSD	Spain PriceUSD	Ecuador PriceUSD	Mexico PriceUSD	Costa Rica PriceUSD
minunlim	12.58* (6.512)	7.643*** (1.319)		11.27*** (3.657)	25.77* (13.72)	0.857 (1.778)	32.66** (13.00)
gbunlim	30.64*** (7.203)				6.102 (15.36)		
Minutes	0.00556 (0.00426)	0.00509*** (0.00133)	0.0456*** (0.00424)	0.0585** (0.0231)	0.116 (0.0807)	0.000157 (0.00261)	0.0102* (0.00472)
DataGB	0.692*** (0.188)	3.444*** (0.203)	1.129** (0.427)	1.551*** (0.238)	3.414*** (0.756)	3.999*** (0.108)	2.329*** (0.576)
Constant	10.36*** (1.569)	8.535*** (1.042)	12.52*** (4.145)	10.44*** (2.414)	3.507 (10.73)	6.312*** (1.959)	17.29*** (3.808)

Observations	33	18	24	17	34	32	16
R-squared	0.885	0.975	0.915	0.898	0.624	0.982	0.911

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix D: Mobile Mbps Regression Analysis

$$Mbps_i = constant + \beta_1 Spectrum_i + \varepsilon_i \quad (1)$$

$$Spectrum_i = constant + \beta_2 Internet\_servers_i + u_i \quad (2)$$

To measure how the spectrum allocated correlates with average mobile internet velocity, an instrumental variable regression is performed. Equation (1) and (2) are used to perform a two-stage least squares regression; the former explains average mobile internet speed on spectrum allocated, the latter controls for spectrum endogeneity, through secure internet servers. The following table presents the regression results, it shows internet mobile velocity positively depends on the allocated spectrum in the sample of 29 countries. Furthermore, all the variables are in logs, then the coefficient has an elasticity interpretation, 1% increase on the allocated spectrum increases average internet speed on 1.47%.

Table 41: Mbps IV regression

VARIABLES	(1) Mbps	(2) Spectrum
Spectrum	1.472*** (0.439)	
Internet Servers		0.133*** (0.0343)
Constant	-5.775** (2.650)	5.335*** (0.191)
Observations	29	29
R-squared	-0.411	0.357

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \*

p<0.1

## Appendix E: Price per Mbps in Panama

$$price\_Mbps_i = constant + \beta_1 fixed\_speed_i + \beta_2 gdppc_i + \beta_3 urban\_pops\_density_i + \varepsilon_i \quad (1)$$

$$fixed\_speed_i = \beta_1 gdppc_i + \beta_2 urban\_pops\_density_i + \beta_3 mobile\_price\_gb_i + u_i \quad (2)$$

To measure estimate the price per Mbps in Panama based on country characteristics, an instrumental variable regression is performed. Equation (1) and (2) are used to perform a two-stage least squares regression. The following results shows the results of the regression. The regression was performed with data from 27 countries, the Czech Republic and Paraguay were dropped from the regression analysis because of lack of estimate for urban land area.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	- 41. 4385	17. 2401	- 2. 404	0. 0247 *
fixed_speed	- 3. 9487	2. 6119	- 1. 512	0. 1442
gdppc	3. 7499	2. 1528	1. 742	0. 0949 .
urban_pops_density	2. 6146	0. 9101	2. 873	0. 0086 **

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## Appendix F: e-consultations

Table 42: Mexico's Consultations

Project	No. Consultations	No. Published pages	No. Respondants	No. Sent pages
Consulta pública sobre el "Modelo de costos para determinar las tarifas de los servicios de compartición de infraestructura prestados por el Agente Económico Preponderante en el sector de radiodifusión".	1	74	1	9
Consulta pública sobre el "Anteproyecto de Acuerdo por el que se aprueba la modificación del Acuerdo de registro electrónico de tarifas a los usuarios que deben cumplir los concesionarios y autorizados de servicios de telecomunicaciones".	2	183	6	25
Consulta Pública "Propuestas de las Ofertas de Referencia para los Servicios Mayoristas de Usuario Visitante; Comercialización o Reventa de Servicios; Acceso y Uso Compartido de Infraestructura; y Arrendamiento de Enlaces Dedicados Prestados por el AEP"	3	1194	10	577
Consulta pública sobre el "Modelo de Costos del servicio de arrendamiento de enlaces dedicados locales, entre localidades y larga distancia internacional que será prestado por el agente económico preponderante en el sector de las telecomunicaciones".	4	57	6	183
Consulta pública del "Anteproyecto de Condiciones Técnicas Mínimas para la Interconexión entre Concesionarios de Redes Públicas de Telecomunicaciones y las Tarifas que resulten de las Metodologías de Costos que estarán vigentes para el año 2018".	5	109	15	331

Opinión pública sobre el “Proyecto de Bases de Licitación Pública para concesionar el uso, aprovechamiento y explotación comercial de 130 MHz de espectro radioeléctrico disponibles en la banda de frecuencias 2500-2690 MHz (Licitación No. IFT-7)”.	6	126	16	201
Opinión pública sobre la identificación de las necesidades de espectro para las Telecomunicaciones Móviles Internacionales (IMT) entre 24.25 GHz y 86 GHz en México.	7	93	19	214
Consulta pública sobre el “Anteproyecto de Disposición Técnica IFT-011-2017, Parte 2. Equipos Terminales Móviles que operan en las bandas de 700 MHz, 800 MHz, 1900 MHz, 2100 MHz y/o 2500 MHz”.	8	53	15	139
Consulta pública sobre las “Propuestas de Ofertas Públicas de Infraestructura presentadas por el Agente Económico Preponderante en el Sector de Radiodifusión”.	9	1143	0	0
Consulta pública sobre el “Anteproyecto de Metodología de Separación Contable aplicable a los Agentes Económicos Preponderantes, agentes declarados con poder sustancial de mercado y redes compartidas”.	10	116	9	207
Consulta pública sobre el “Anteproyecto de Procedimiento de Evaluación de la Conformidad en materia de Telecomunicaciones y Radiodifusión”.	11	32	12	171
Consulta pública del Anteproyecto de Lineamientos que crean el Sistema de Métricas y establecen la metodología con que los operadores entregarán información para acervo estadístico del sector de telecomunicaciones y diversas medidas de simplificación	12	254	15	127
Consulta pública sobre la “Metodología de Replicabilidad Económica aplicable a los Servicios del Agente Económico Preponderante en Telecomunicaciones”.	13	84	15	547
Opinión pública del “Proyecto de Bases de Licitación Pública de 10 MHz en la Banda 440-450 MHz para el servicio de provisión de capacidad para sistemas de radiocomunicación privada”	14	107	7	42
Consulta pública sobre el Anteproyecto de Lineamientos para el otorgamiento de la constancia de autorización respecto al uso y aprovechamiento de bandas de frecuencias del espectro radioeléctrico para uso secundario.	15	30	14	95
Consulta Pública sobre las “Propuestas de Convenios Marco de Interconexión presentados por el Agente Económico Preponderante en el sector de las telecomunicaciones aplicables al año 2018”.	16	549	6	133
Consulta pública sobre el “Anteproyecto de clasificación de la banda de 57 - 64 GHz como espectro libre”.	17	43	20	62
Consulta pública del “Anteproyecto de Acuerdo por el cual se modifican los artículos 3 y 8 de los Lineamientos Generales para el Otorgamiento de Concesiones a que se refiere el Título Cuarto de la Ley Federal de Telecomunicaciones y Radiodifusión”.	18	17	1	10
Consulta pública sobre el “Anteproyecto de Guía para el control de concentraciones en los sectores de telecomunicaciones y radiodifusión”.	19	141	7	29

Source <http://www.ift.org.mx/industria/consultas-publicas>

Table 43: Colombias' Consultations

Project	No. Consultations	No. Published pages	No. Respondants	No. Sent pages
El Comercio Electrónico en Colombia, Análisis Integral y Perspectiva Regulatoria	1	257	9	71
Precisiones al Nuevo Régimen de Protección de los Derechos de los Usuarios de Servicios de Comunicaciones	2	36	18	52
Revisión de mercado internet fijo y portador	3	337		0

Mercados audiovisuales en un entorno convergente	4	450	21	193
Compartición de infraestructura para TV radiodifundida y revisión de condiciones de acceso y uso de elementos pasivos de redes TIC	5	807	28	248
Mecanismos alternativos de solución de conflictos	6	20	10	68
Condiciones de acceso al servicio de larga distancia	7	57	8	61
Revisión del valor regulado de facturación y recaudo y gestión operativa de reclamos	8	23	3	12
Precisiones a la Revisión integral del Régimen de Calidad TIC	9	318	36	352
Definición y condiciones regulatorias para banda ancha	10	67	31	222
Contrato Marco para Servicios Fijos	11	111	15	79
Ajustes a la obligación de separación contable por parte de los PRST y OTVS	12	17	5	10
Revisión integral del Régimen de Protección de los Derechos de los usuarios de servicios de comunicaciones	13	342	37	498
Condiciones para la provisión de la instalación esencial de Roaming Automático Nacional	14	128	8	261
Revisión de los mercados de servicios móviles	15	448	41	1113

Source <https://www.crcom.gov.co/es/pagina/proyectos>

Table 44 Panamas' Consultations

Project	No. Consultations	No. Published pages	No. Respondants	No. Sent pages
Directrices para la ejecución del cese de las transmisiones analógicas de la televisión abierta dentro de las provincias de Panamá, Panamá Oeste y Colón (FASE I) y el fortalecimiento de la Televisión Digital Terrestre de Panamá (TDT de Panamá), utilizando la tecnología Digital Video Broadcasting - Terrestrial (DVB-T).	1	15	3	9
Propuesta de Modificación del Plan Nacional de Numeración de la República de Panamá	2	6	4	4
Propuesta de modificación del Procedimiento para la Asignación de los Números de Cobro Revertido Automático establecido mediante la Resolución No. JD-4752 de 18 de junio de 2004	3	13	4	14
Propuesta por la cual se modifica la Resolución AN No. 10130-Telco de 5 de julio de 2016 y se propone el Reglamento para el Control y Fiscalización del cumplimiento de las Metas de Calidad del Servicio Internet para Uso Público No. 211	4	44	4	33

Source [http://www.asep.gob.pa/index.php?option=com\\_content&view=article&id=197&Itemid=237](http://www.asep.gob.pa/index.php?option=com_content&view=article&id=197&Itemid=237)