



Methodology for the Broadband Development Index (IDBA) for Latin America and the Caribbean

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Abstract*

This discussion paper describes the methodology used to compute the Broadband Development Index (IDBA, Índice de Desarrollo de la Banda Ancha). The main goal of the IDBA is to size the Digital Divide in Latin America and the Caribbean by measuring the state of broadband development in the 26 Bank-member countries, as well as in additional reference countries (64 nations in total). The IDBA is a powerful tool to identify the magnitude of the gap in two different geographic approaches, first when we compare the state of the art of one country versus the cluster region the country belongs to, and second, when we compare the country with respect to the OECD. The IDBA relies on a comprehensive approach based on four pillars: infrastructure, applications and capacity, strategic regulations, and public policy and strategic vision. Those four pillars are built as a result of the combination of 37 indicators from renowned international institutions. As a result, the IDBA provides a tool for decision makers and policymakers to detect, on a country basis, strengths and areas for improvement in developing specific, concrete and actionable plans.

JEL Codes: L4, L5, L86, L88, L96, L98, M15, O38, O54

Keywords: IDBA, index, broadband, digital divide, measure, telecommunications, regulation, public policies, infrastructure

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1 Introduction

We are experiencing a new era of communications among human beings through the use of machines. Telecommunications, Internet, and information and communication technologies (ICTs) transform lives and shape a new panorama of mutual interactions. Exponential technological developments allow citizens, companies, and governments to improve their communication and greatly increase their ability to exchange information.

Broadband plays a crucial role as a catalyst for further development of this communication and facilitates economic growth and social inclusion. According to a study published by the Inter-American Development Bank (IDB), in countries where broadband penetration increases 10 percentage points, there is an increase of 3.19 percent in GDP, a 2.61 percent increase in productivity, and a net generation of more than 67,000 jobs.¹

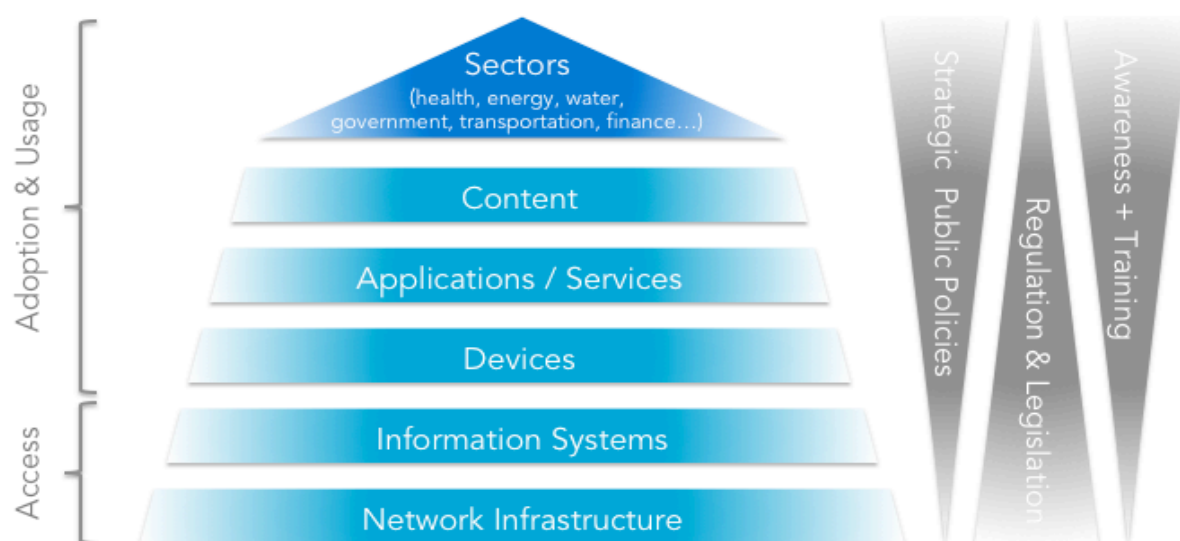
Despite these facts, it is common to regard broadband as being merely high-speed connectivity, and to leave out all of the intertwined social and economic aspects that arise from that connectivity. It is possible to see Broadband more clearly when it is considered from a holistic perspective as an ecosystem of pieces that work together to produce outcomes far greater and more complex than simple increases in the speed of data transmission. A useful way to describe this ecosystem is to look at it as a set of layers that form a pyramid. Herein, this collection of layers is referred to as the *ecosystem of the pyramid* (see Figure 1).

The ecosystem of the pyramid conceives of broadband as a set of supporting layers, ranging from infrastructure to the actual personal use of those connectivity elements. Nonetheless, the layers should not be seen as additive, but rather as part of a comprehensive ecosystem that must be considered as a whole. For instance, Internet content is only accessible and relevant when there is an application that carries it, a device that allows use of the application, information management systems, and an efficient network infrastructure. Infrastructure would be merely a dump channel without all of these layers taken together as a whole. Moreover, the different players fill a key role in each of the elements in the ecosystem of the pyramid.

¹ See García-Zaballos, A., and R. López-Rivas. 2012. "Socioeconomic Impact of Broadband in Latin American and Caribbean Countries." IDB Technical Note No. IDB-TN-471. Washington, DC: IDB. Available at bit.ly/1feSze0.

In addition to the horizontal layers, the ecosystem of the pyramid conceives of a set of facilitating transversal elements: (i) strategic public policies, (ii) regulation and legislation, and (iii) training and creation of awareness. These are levers that boost the different elements of the ecosystem either in access (network infrastructure and information systems) or adoption and usage (devices, applications/services and content).

Figure 1. The Ecosystem of the Pyramid



With the ecosystem approach, the IDB created a comprehensive Broadband Development Index (IDBA) that measures the different elements of the ecosystem arranged around four pillars: (i) infrastructure, (ii) public policies, (iii) strategic regulation, and (iv) applications and capacity. Although the index appears to be a system of ranking, the objective of the IDBA is not to compile a classification but rather to spot the strengths and weaknesses of the countries. This coincides with the goal of helping Latin American and Caribbean (LAC) countries improve their strategies to boost broadband and information and communication technologies (ICTs)

2 The IDBA and Its Importance

The IDBA is a holistic approach to measuring the degree of broadband development with a special focus in the LAC region. As mentioned in the Introduction, the analysis is articulated around four main pillars that map the different elements of the ecosystem: (i) public policy and

strategic vision, (ii) strategic regulation (iii), infrastructure, and (iv) applications and capacity. Each of the pillars is a subindex constructed from the set of variables (28 variables in total) that were selected according to their relevance to the pillar system and for the degree to which the data was easily available.

2.1 The Geographic Scope

The IDBA was computed for the 26 countries where the IDB has operations:

Table 1. IDB Member Countries

Argentina	Colombia	Haiti	Paraguay
Bahamas	Costa Rica	Honduras	Peru
Barbados	Dominican Republic	Jamaica	Surinam
Belize	Ecuador	Mexico	Trinidad/Tobago
Bolivia	El Salvador	Nicaragua	Uruguay
Brazil	Guatemala	Panama	Venezuela
Chile	Guyana		

Due to the importance of analyzing the status of the broadband ecosystem not only in the region but comparing it to the rest of the world, a reference set of international countries was established for the study, and the IDBA was computed for each of them. Rather than highlighting the digital divide between the LAC countries and the reference group, the IDBA instead aims to identify the strongest performers for each of the variables so that the LAC countries can benefit from their experience and best practices.

Table 2. Non-member Countries

Australia	France	Japan	Slovenia
Austria	Greece	Luxembourg	South Africa
Belgium	Hungary	New Zealand	South Korea
Canada	India	Netherlands	Spain
China	Indonesia	Norway	Sweden
Czech Republic	Ireland	Poland	Switzerland
Denmark	Iceland	Portugal	Turkey
Germany	Israel	Russia	United Kingdom
Estonia	Italy	Republic of Slovakia	United States
Finland			

2.2 The Importance of Cross-Regional Analysis: IDBA in Clusters

Given the importance of regionalization, the IDBA incorporates the concept in order to allow cross-regional comparisons, as well as to observe trends and lessons learned within specific regions. For that purpose, the countries are grouped into nine clusters.

Table 3. Cluster 1: IDB Member Countries

Argentina	Colombia	Haiti	Paraguay
Bahamas	Costa Rica	Honduras	Peru
Barbados	Dominican Republic	Jamaica	Surinam
Belize	Ecuador	Mexico	Trinidad/Tobago
Bolivia	El Salvador	Nicaragua	Uruguay
Brazil	Guatemala	Panama	Venezuela
Chile	Guyana		

Table 4. Cluster 2: IDB Central American Countries

Belize	El Salvador	Honduras	Nicaragua
Costa Rica	Guatemala	Mexico	Panama
Dominican Republic			

Table 5. Cluster 3: IDB Caribbean Countries

Bahamas	Guyana	Jamaica	Trinidad and Tobago
Barbados	Haiti	Surinam	

Table 6. Cluster 4: IDB Andean Countries

Bolivia	Ecuador	Peru	Venezuela
Colombia			

Table 7. Cluster 5: IDB Southern Cone Countries

Argentina	Chile	Paraguay	Uruguay
Brazil			

Table 8. Cluster 6: OECD Countries

Australia	Finland	Luxembourg	South Korea
Austria	France	Mexico	Spain
Belgium	Greece	New Zealand	Sweden
Canada	Hungary	Netherlands	Switzerland
Chile	Ireland	Norway	Turkey
Czech Republic	Iceland	Poland	United Kingdom
Denmark	Israel	Portugal	United States
Germany	Italy	Republic of Slovakia	
Estonia	Japan	Slovenia	

Table 9. Cluster 7: OECD Asia Pacific Countries

Australia	Japan	New Zealand	South Korea
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Table 10. Cluster 8: OECD Europe, Middle East, and African Countries

Austria	Germany	Luxembourg	Spain
Belgium	Greece	Netherlands	Sweden
Czech Republic	Hungary	Norway	Switzerland
Denmark	Iceland	Poland	Turkey
Estonia	Ireland	Portugal	United Kingdom
Finland	Israel	Republic of Slovakia	
France	Italy	Slovenia	

Table 11. Cluster 9: OECD North American, Latin American, and Caribbean Countries

Canada	Chile	Mexico	United States
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Some other countries were considered although not explicitly clustered.

Table 12. Cluster 9: OECD North American, Latin American, and Caribbean Countries

Non-clustered Countries			
China	Indonesia	Russia	South Africa
India			

2.3 The Periodicity of the Computation

It is important to acknowledge the tremendous efforts over the last several years of the LAC countries to promote broadband access, adoption, and usage. The IDBA was calculated annually for the years 2010, 2011, and 2012. The results of this work show the solid progression of the

LAC region in the area of broadband communications. Additionally, it is necessary to recognize the importance of mobile broadband in addition to that of fixed broadband. Mobile broadband is significant due to high mobile penetration in the region. In countries such as Paraguay and Bolivia, mobile broadband penetration is higher than fixed broadband penetration. In fact, the aggregate results show a higher mobile broadband penetration in 2011, with 11.01 percent mobile (growing from 5.64 percent in 2010), while the fixed broadband reached 7.58 percent in 2011 (growing from 6.48 percent in 2010).

2.4 The IDBA Approach

The IDBA offers a holistic approach to assess the status quo of the broadband ecosystem in the LAC region and, more importantly, to identify areas where further effort is needed. Any policymaker, government, or international organization can use the IDBA to identify areas for improvement as well as to find examples of countries within and outside the region that can be used as a model for those who are in an earlier phase of broadband development.

In addition to the above, the IDBA meets the need to measure the impacts and results of the projects that are intended to improve broadband in the region. By helping to identify the needs in terms of development and the measurement of the impacts and results, the IDBA simplifies the processes of project identification, prioritization, and impact evaluation.

Another important contribution of the IDBA is that it offers a comprehensive approach to measuring the broadband status of a country, taking into account the four major pillars (i.e., public policies, regulation, infrastructure, and applications/training), and allowing a fast and global evaluation by calculating a single index.

2.5 Meeting IDB Priorities

The IDB has recently launched a three-part initiative called the Special Program for Broadband (Programa Especial de Banda Ancha). The initiative focuses on three main areas: (i) public policies, (ii) regulatory frameworks, and (iii) capacity building. Three of the IDBA pillars directly match these areas. The fourth, although not part of the Special Program for Broadband, is also a priority for the IDB and is the focus of various projects.

Additionally, the IDBA is the flagship knowledge product of the Special Program and is one of the key tools it uses in its operations. The IDBA is not only a tool used to identify the tasks

that countries and regions should prioritize, but it also allows for the tracking of the impacts and results of IDB projects and technical cooperation.

3 IDBA Computation and Methodology

3.1 Overall Index

The IDBA, which ranges from 1 (lowest) to 8 (highest), is computed as follows:

Equation 1. IDBA Formula

$$IDBA = P_{pol} * w_{pol} + P_{reg} * w_{reg} + P_{inf} * w_{inf} + P_{app} * w_{app}$$

where:

P_{pol} = value of the pillar in public policy and strategic vision (subindex)

w_{pol} = weight of the pillar in public policy and strategic vision = 20%

P_{reg} = value of the pillar in strategic regulation (subindex)

w_{reg} = weight of the pillar in strategic regulation = 25%

P_{inf} = value of the pillar in infrastructure (subindex)

w_{inf} = weight of the pillar in infrastructure = 40%

P_{app} = value of the pillar in application and capacity (subindex)

w_{app} = weight of the pillar in application and capacity = 15%

Each pillar is calculated as follows:

$$P_i = \sum_{j=1}^n V_j * w_j$$

where:

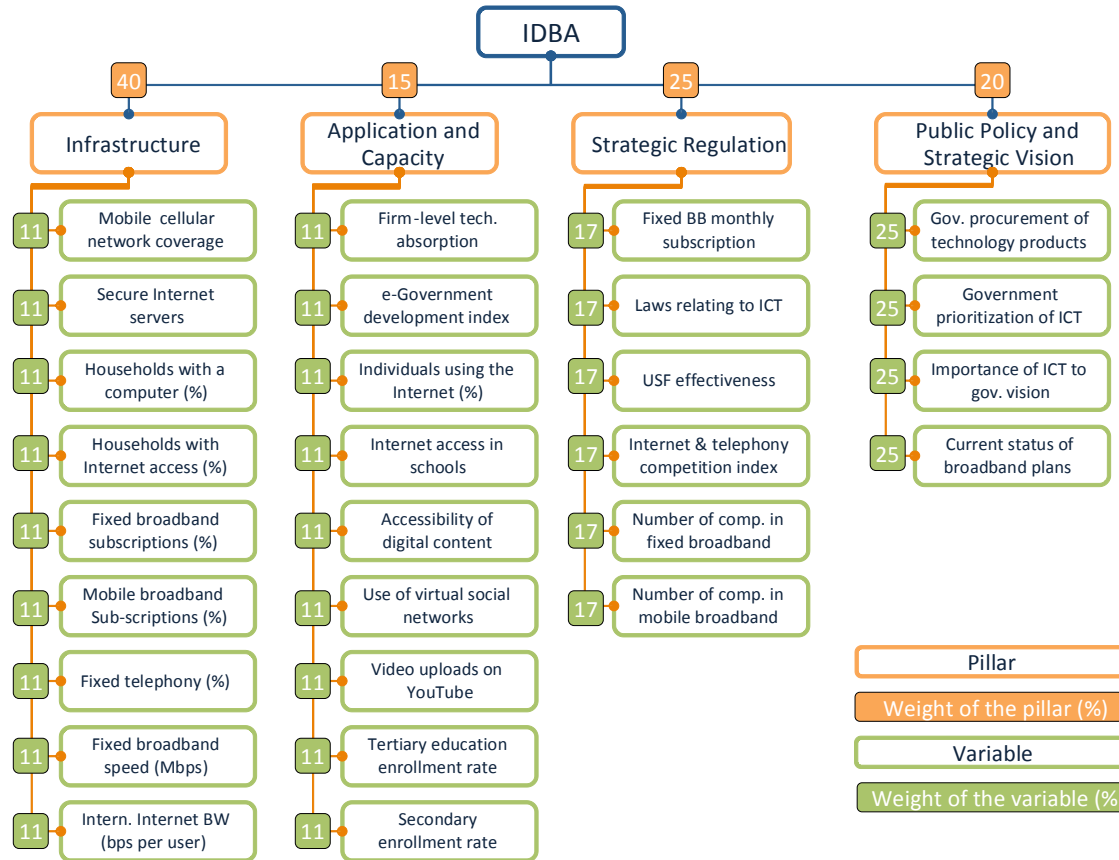
n is the number of variables □

V_j = value of the variable □

w_j = weight of the variable □

Each of the pillars ranges from 1 to 8, as is the case for the index and the variables. The variables, due to their heterogeneity, have been normalized (see Section 3.5). Also, each of the pillars has a specific weight that reflects its importance within the ecosystem, and each of the variables is evenly weighted within the same pillar (see Section 3.4).

Figure 2. IDBA Structure



3.2 The Pillars

The four pillars correspond to the four areas that explain the broadband ecosystem.

Table 13. Pillar 1: Public Policy and Strategic Vision

Description	This pillar measures the importance given by the government to public policies that foster the development of broadband and ICTs. Other than assessing the role and priority of ICTs for the government, this pillar also assesses the current status of national broadband plans and their importance to the government.
Weight	20%
Variables	1.1. Government procurement of advanced technology products 1.2. Government prioritization of ICT 1.3. Importance of ICT to government's vision of the future 1.4. Current status of broadband development plans

Table 14. Pillar 2: Strategic Regulation

Description	This pillar measures the degree of regulation within the country and its effectiveness by analyzing specific key indicators such as competition, prices, the current status of the telecommunications laws, and the effectiveness of the fund for universal access and service.	
Weight	25%	
Variables	2.1.	Fixed broadband internet monthly subscription
	2.2.	Laws relating to ICT
	2.3.	Effectiveness of the fund for the universal access and service
	2.4.	Internet and telephony sectors competition index
	2.5.	Number of competitors in fixed broadband
	2.6.	Number of competitors in mobile broadband

Table 15. Pillar 3: Infrastructure

Description	This pillar measures the status of telecommunications infrastructure in terms of access (fixed telephony, mobile telephony, fixed broadband, and mobile broadband), adoption (computers and servers), and quality (speeds).	
Weight	40%	
Variables	3.1.	Percentage of the population covered by a mobile cellular network
	3.2.	Secure Internet servers
	3.3.	Percentage of households with a computer
	3.4.	Percentage of households with internet access
	3.5.	Fixed broadband subscriptions per 100 inhabitants
	3.6.	Active mobile broadband subscriptions per 100 inhabitants
	3.7.	Fixed telephony lines per 100 inhabitants
	3.8.	Fixed broadband speed, in Mbit/s
	3.9.	International Internet bandwidth (bit/s) per internet user

Table 16. Pillar 4: Application and Capacity

Description	This pillar measures the degree of ICT literacy and ICT usage by government, private sector, and citizens. It also measures the ease of gaining access to content as well as the level of education within the population, which is a key metric for the development of ICT.	
Weight	15%	
Variables	4.1.	Firm-level technology absorption
	4.2.	eGovernment development index
	4.3.	Percentage of individuals using the internet
	4.4.	Internet access in schools

4.5.	Accessibility of digital content
4.6.	Use of virtual social networks
4.7.	Video uploads on YouTube
4.8.	Tertiary education enrollment rate
4.9.	Secondary enrollment rate

3.3 The Services

The services are two specific subindexes that are horizontal to all of the pillars that measure the degree of development of fixed broadband and mobile broadband. Each of the two services is created from an evenly weighted combination of a subset of the 26 variables.

Table 17. Fixed Broadband Service and Mobile Broadband Service

Variable	Fixed Broadband Service	Mobile Broadband Service
Government procurement of advanced technology products	X	X
Government prioritization of ICT	X	X
Importance of ICT to government vision of the future	X	X
Current status of broadband development plans	X	X
Fixed broadband internet monthly subscription	X	
Laws relating to ICT	X	X
Effectiveness of the fund for universal access and service	X	X
Internet and telephony sectors competition index	X	X
Number of competitors in fixed broadband	X	
Number of competitors in mobile broadband		X
Percentage of the population covered by a mobile cellular network		X
Secure Internet servers	X	X
Percentage of households with a computer	X	X
Percentage of households with Internet access	X	
Fixed broadband subscriptions per 100 inhabitants	X	
Active mobile broadband subscriptions per 100 inhabitants		X
Fixed telephony lines per 100 inhabitants	X	
Fixed broadband speed, in Mbit/s	X	
International Internet bandwidth (bit/s) per Internet user	X	
Firm-level technology absorption	X	X
eGovernment development index	X	X
Percentage of individuals using the Internet	X	X

Internet access in schools	X	X
Accessibility of digital content	X	X
Use of virtual social networks	X	X
Video uploads on YouTube	X	X
Tertiary education enrollment rate	X	X
Secondary enrollment rate	X	X

3.4 The Variables

The variables are a set of indicators selected based on certain criteria, which include relevance to the IDBA ultimate objective and data availability.

Main variables

A total of 28 main, simple variables were included in the analysis: the International Telecommunications Union produces 9, the IDB, 4; the World Economic Forum, 12, the United Nations, 1; and the INSEAD, 1; and the International Telecommunications Union and the World Bank, 1. All of them receive the same weight in their respective pillars (see Table 17), and the description, when derived from a source other than the IDB, corresponds to the description provided by that source.

Table 18. Variables and Weights Per Pillar

	Weight Within Pillar	Weight Within IDBA
Pillar 1: Public policy and strategic vision		
1.1. Government procurement of advanced technology products	25%	5%
1.2. Government prioritization of ICT	25%	5%
1.3. Importance of ICT to government's vision of the future	25%	5%
1.4. Current status of broadband development plans	25%	5%
Pillar 2: Strategic regulation		
2.1. Fixed broadband monthly subscription charge	17%	4.2%
2.2. Laws relating to ICT	17%	4.2%

2.3.	Effectiveness of the fund for universal access and service	17%	4.2%
2.4.	Internet and telephony sectors competition index	17%	4.2%
2.5.	Number of competitors in fixed broadband	17%	4.2%
2.6.	Number of competitors in mobile broadband	17%	4.2%
Pillar 3: Infrastructure			
3.1.	Percentage of the population covered by a mobile cellular network	11%	4.4%
3.2.	Secure internet servers	11%	4.4%
3.3.	Percentage of households with a computer	11%	4.4%
3.4.	Percentage of households with Internet access	11%	4.4%
3.5.	Fixed broadband subscriptions per 100 inhabitants	11%	4.4%
3.6.	Active mobile broadband subscriptions per 100 inhabitants	11%	4.4%
3.7.	Fixed telephony lines per 100 inhabitants	11%	4.4%
3.8.	Fixed broadband speed, in Mbit/s	11%	4.4%
3.9.	International Internet bandwidth (bit/s) per Internet user	11%	4.4%
Pillar 4: Application and capacity			
4.1.	Firm-level technology absorption	11%	1.7%
4.2.	eGovernment development index	11%	1.7%
4.3.	Percentage of individuals using the Internet	11%	1.7%
4.4.	Internet access in schools	11%	1.7%
4.5.	Accessibility of digital	11%	1.7%

	content		
4.6.	Use of virtual social networks	11%	1.7%
4.7.	Video uploads on YouTube	11%	1.7%
4.8.	Tertiary education enrollment rate	11%	1.7%
4.9.	Secondary enrollment rate	11%	1.7%

Pillar 1: Public Policy and Strategic Vision

Table 19. Variable Government Procurement of Advanced Technology Products

Description	This indicator corresponds to a survey asking: “Do government procurement decisions foster technology innovation in your country?” Values range from 1 (no, not at all) to 7 (yes, extremely effectively). Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012
	World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source²	World Economic Forum, Executive Opinion Survey, 2010, 2011, and 2012 editions
Normalization method	Normalization for range variables

Table 20. Variable Government Prioritization of ICT

Description	This indicator corresponds to a survey asking: “How much priority does the government in your country place on information and communication technologies?” Values range from 1 (weak priority) to 7 (high priority). Data for 2010 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below).
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012
	World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010 and 2011

² Indirect source refers to the set of sources used by the direct source to create the indicator. N/A means *not applicable* and corresponds to the case that indicator was created solely by the direct source.

Normalization method	Normalization for range variables
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Table 21. Variable Importance of ICT to Government Vision of the Future

Description	This indicator corresponds to a survey asking: “To what extent does the government have a clear implementation plan for utilizing information and communication technologies to improve your country’s overall competitiveness?” Values range from 1 (no plan) to 7 (clear plan). Data for 2010 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010 and 2011
Normalization method	Normalization for range variables

Table 22. Variable Current Status of Broadband Development Plans

Description	This indicator measures the degree of implementation of national broadband plans by the government. For each country, it assesses whether the country has a national broadband plan (value 8); whether broadband is present in plans, agendas and other formats not strictly considered within an official plan (value 5.66); whether broadband is in analysis phase by the government (value 3.33); or whether broadband is completely absent (value 1). This indicator corresponds to a survey asking: “Do government procurement decisions foster technology innovation in your country?” Values range from 1 (no, not at all) to 7 (yes, extremely effectively). Latest data available are for 2010. Data for 2011 and 2012 are the same as for 2010, under the criterion of last known data.
Direct source	Inter-American Development Bank, 2010
Indirect source	DIRSI, CEPAL, 2010
Normalization method	Normalization for range variables (special case)

Pillar 2: Strategic Regulation

Table 23. Variable Fixed Broadband Internet Monthly Subscription

Description	Fixed broadband sub-basket refers to the price of the monthly subscription to an entry level fixed broadband plan. For the sake of comparison, the fixed broadband sub-basket is based on a minimum monthly usage of 1 gigabyte (GB). For plans that limit the monthly amount of data transferred by including caps below the 1 GB level, the cost for additional bytes is added to the sub-basket. The minimum speed of a broadband connection is 256 kbit/s. Prices are reported and collected in national currency and then converted to USD. Prices include taxes. In order to offer a comparable measure, the variable is multiplied by the World Bank's power parity factor. This variable is described among the auxiliary variables.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and database (2011).
Indirect source	N/A
Normalization method	Normalization for absolute value variables (special)

Table 24. Variable Laws Relating to ICT

Description	This indicator corresponds to a survey asking: "How would you assess your country's laws relating to the use of ICTs (e.g., electronic commerce, digital signatures, and consumer protection)?" Values range from 1 (highly undeveloped) to 7 (well developed) This indicator is the 2011–2012 weighted average. Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010 and 2011 editions
Normalization method	Normalization for range variables

Table 25. Variable Effectiveness of the Fund for Universal Access and Service

Description	This indicator measures the degree of implementation of national broadband plans by the government. For each country, it assesses whether the country has a fund for universal access and service and the degree to which it uses the fund reasonably (value 8); whether it exists, but its use is limited (value 6.25); whether it exists but is not used for broadband (value 4.5); or whether an access and service universal fund is completely absent (value 1). The latest data available are for 2010. Data for 2011 and 2012 are the same as for 2010, under the criteria of last known data.
Direct source	Inter-American Development Bank, 2010 and 2011
Indirect source	DIRSI, CEPAL, HIPCAR, ITU
Normalization method	Normalization for range variables (special case)

Table 26. Variable Internet and Telephony Sectors Competition Index

Description	This variable measures the degree of liberalization in 19 categories of ICT services, including 3G telephony, retail Internet access, services, international long distance calls, and international gateways. For each economy, the level of competition in each of the categories is assessed as being a monopoly, partial competition, or full competition. The results reflect the situation as of 2011. The index is calculated as the average "Business Law and the Environment, Custom Edition" of points obtained in each of the 19 categories for which data are available. Full liberalization across all categories yields a score of 2, which is the best possible score. Data for 2012 are collected in October 2011, as is the case in the NRI (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	Authors' calculations based on International Telecommunication Union (ITU), ITU World Telecommunication Regulatory Database (accessed November 29, 2012)
Normalization method	Normalization for range variables

Table 27. Variable Number of Competitors in Fixed Broadband

Description	This variable measures the number of operators offering fixed broadband service in each country. The values are obtained by searching the national regulatory agencies' websites in the fourth quarter of 2012.
Direct source	Inter-American Development Bank (2012)
Indirect source	N/A
Normalization method	Normalization for range variables (special case)

Table 28. Variable Number of Competitors in Mobile Broadband

Description	The variable measures the number of operators offering the mobile broadband service in each country. The values are obtained by searching the national regulatory agencies' websites in the fourth quarter of 2012.
Direct source	Inter-American Development Bank (2012)
Indirect source	N/A
Normalization method	Normalization for range variables (special case)

Pillar 3: Infrastructure**Table 29. Variable Percentage of Population Covered by a Mobile Cellular Network**

Description	Mobile population coverage measures the percentage of inhabitants that are within range of a mobile cellular signal, whether or not they subscribe to mobile cellular services (note that this is NOT the same as the mobile subscription density or penetration). This value is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population. Where there are two or more operators, allowance should be made for the extent of overlapping mobile population coverage (e.g., in the capital and major cities), which must be deducted from the total.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011)
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 30. Variable Secure Internet Servers

Description	It measures the number of Secure Internet servers in every one million people. Secure Internet servers are servers using encryption technology in Internet transactions. Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	The World Bank, World Development Indicators Online (accessed on November 28, 2012; National Sources
Normalization method	Normalization for percentage variables

Table 31. Variable Percentage of Households with a Computer

Description	Households with a computer refers to the percentage of households with a computer at home. A computer includes a desktop, portable, or handheld computer (e.g., a personal digital assistant). It does not include equipment with embedded computing abilities such as mobile phones or TV sets.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 32. Variable Percentage of Households with Internet Access

Description	Households with internet access refers to the percentage of households with internet access at home.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 33. Variable Fixed Broadband Subscriptions Per 100 Inhabitants

Description	Data refer to subscriptions to high-speed access to the public Internet (a TCP/IP connection) at downstream speeds equal to or greater than 256 kbit/s. This includes cable modem, DSL, fiber-to-the-home/building and other fixed (wired) broadband subscriptions. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile cellular networks. It excludes technologies listed under the wireless broadband category. Fixed broadband Internet subscribers per 100
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	inhabitants is obtained by dividing the number of fixed broadband Internet subscribers by the population and then multiplying it by 100.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 34. Variable Active Mobile Broadband Subscriptions Per 100 Inhabitants

Description	Active mobile broadband subscriptions refers to the sum of standard mobile broadband and dedicated mobile broadband subscriptions to the public Internet. It covers actual subscribers, not potential subscribers, even though the latter may have handsets that are enabled for broadband.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 35. Variable Fixed Telephony Lines Per 100 Inhabitants

Description	A fixed telephone line (previously called main telephone line in operation) is an active line connecting the subscriber's terminal equipment to the public switched telephone network (PSTN). The fixed telephone line has a dedicated port in the telephone exchange equipment. This term is synonymous with the terms main station or Direct Exchange Line (DEL) that are commonly used in telecommunication documents. The fixed telephone line may not be the same as an access line or a subscriber; it should includes the active number of analog fixed telephone lines, ISDN channels, fixed wireless, public payphones, and VoIP subscriptions. Active lines are those that have registered an activity in the past three months. Data on fixed telephone lines are derived using administrative data that countries (usually the regulatory telecommunication authority or the ministry in charge of telecommunications) collect regularly, and at least annually, from telecommunications operators. Data are considered to be very reliable, timely, and complete. Data for this indicator are readily available for approximately 90 percent of countries, either through ITU's World Telecommunication Indicators questionnaires or from official information available on the ministry or regulator's website. For the rest, information can be aggregated through operators' data (mainly through annual reports) and complemented by market research reports. The fixed telephone line (per 100 people) indicator is derived by dividing all telephone lines by the country's population and multiplying by 100.
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Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 36. Variable Fixed Broadband Speed

Description	Fixed (wired) broadband speed, in Mbit/s, refers to the advertised maximum theoretical download speed (not the speeds guaranteed to users) associated with a fixed (wired) broadband Internet monthly subscription. The indicator refers to the published download speed of the fixed (wired) broadband monthly subscription. It does not refer to the actual speed delivered. It refers to fixed broadband, and not to speeds less than broadband or wireless broadband. The upload speed should be mentioned in a note. The speed refers to the advertised download speed, not the actual speed that is delivered.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for absolute value variables

Table 37. Variable International Internet Bandwidth Per Internet User

Description	International Internet bandwidth refers to the total used capacity of international Internet bandwidth, in megabits per second (Mbit/s). It is measured as the sum of used capacity of all Internet exchanges (locations where Internet traffic is exchanged) offering international bandwidth. If capacity is asymmetric (i.e., more incoming [downlink] than outgoing [uplink] capacity), then the incoming (downlink) capacity should be provided.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for absolute value variables

Pillar 4: Application and Capacity

Table 38. Variable Firm-level Technology Absorption

Description	This indicator corresponds to a survey asking: “To what extent do businesses in your country absorb new technology? Values range from 1 (not at all) to 7 (aggressively absorb). Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below).
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010, 2011, and 2012 editions
Normalization method	Normalization for range variables

Table 39. Variable eGovernment Development Index

Description	The Government Online Service Index assesses the quality of the government’s delivery of online services on a zero-to-one (best) scale. According to the United Nations’ Public Administration Network, the Government Online Service Index captures a government’s performance in delivering online services to its citizens. There are four stages of service delivery: Emerging, Enhanced, Transactional, and Connected. Online services are assigned to each stage according to their degree of sophistication, from the more basic to the more sophisticated. In each country, the performance of the government in each of the four stages is measured as the number of services provided as a percentage of the maximum services in the corresponding stage. Examples of services include online presence, deployment of multimedia content, government solicitation of citizen input, widespread data sharing, and the use of social networking. The data was collected for 2010, 2011, and 2012.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	United Nations, United Nations E-Government Survey 2012: E-Government for the People
Normalization method	Normalization for range variables

Table 40. Variable Percentage of Individuals Using the Internet

Description	This variable refers the percentage of individuals who have used the Internet (from any location) in the last 12 months. Internet can be used via computer, mobile phone, personal digital assistant, game machine, digital TV, etcetera. The Internet is a worldwide public computer network. It provides access to
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	a number of communication services including the World Wide Web and carries email, news, entertainment, and data files, irrespective of the device used (not assumed to be only via computer—it may also be via mobile phone, PDA, game machine, digital TV, etc.) Access can be via fixed or mobile network.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 41. Variable Internet Access in Schools

Description	This indicator corresponds to survey asking: “How would you rate the level of access to the Internet in schools in your country?” Values range from 1 (very limited) to 7 (extensive). Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010, 2011 and 2012 editions
Normalization method	Normalization for range variables

Table 42. Variable Accessibility of Digital Content

Description	This indicator corresponds to a survey that asks: “In your country, how accessible is digital content (e.g., text, audiovisual content, and software products) via multiple platforms (e.g., fixed line Internet, wireless Internet, mobile networks, and satellite)?” Values range from 1 (not accessible) to 7 (widely accessible). Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010, 2011 and 2012 editions
Normalization method	Normalization for range variables

Table 43. Variable Use of Virtual Social Networks

Description	This indicator corresponds to a survey that asks: “How widely used are virtual social networks (e.g., Facebook, Twitter, and LinkedIn) for professional and personal communications in your country?” Values range from 1 (not used at all) to 7 (used widely). Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	World Economic Forum, Executive Opinion Survey, 2010, 2011 and 2012 editions
Normalization method	Normalization for range variables

Table 44. Variable Video Uploads on YouTube

Description	This indicator corresponds to the total number of video uploads on YouTube from citizens ranging in age from 15 to 64, expressed as a percentage of the total population.
Direct source	INSEAD, Global Innovation Index (GII), 2012
Indirect source	N/A
Normalization method	Normalization for percentage variables

Table 45. Variable Tertiary Education Enrollment Rate

Description	Tertiary enrollment rate is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the tertiary education level. Tertiary education, whether or not it leads to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level. Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	United Nations Education, Science and Culture Organization (UNESCO), UNESCO Institute for Statistics Data Centre (accessed November 29,

	2011), UNESCO Science Report 2010: The Current Status of Science Around the World World Bank, World Development Indicators 2009National Sources
Normalization method	Normalization for percentage variables

Table 46. Variable Secondary Enrollment Rate

Description	The reported value corresponds to the ratio of total secondary enrollment, regardless of age, to the population of the age group that officially corresponds to the secondary education level. Secondary education (ISCED levels 2 and 3) completes the provision of basic education that began at the primary level and aims to lay the foundations for lifelong learning and human development by offering more subject- and skills-oriented instruction using more specialized teachers. Data for 2012 are the average of those for 2010 and 2011 from the NRI (see below). Data for 2011 and 2012 were acquired from 2013 GCR (see below). Data for 2010, 2011, and 2012 are the same under the criterion of last known data.
Direct source	World Economic Forum, Networked Readiness Index (NRI), 2012 World Economic Forum, Global Competitiveness Report (GCR), 2013
Indirect source	Sources: United Nations Education, Science and Culture Organization (UNESCO), UNESCO Institute for Statistics Data Centre (accessed November 29, 2012) UNESCO, UNESCO Science Report 2010: The Current Status of Science around the World National Sources
Normalization method	Normalization for percentage variables

Auxiliary variables

Additionally, a total of 9 auxiliary simple variables were considered for adjusting purposes. The International Telecommunications Union compiled 4 and the World Bank compiled 5.

Table 47. Auxiliary Variable Population

Total population	
Description	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship—except for refugees not permanently settled in the country of asylum, which are generally considered part of the population of their country of origin. The values shown are midyear estimates. Latest data available are for 2010 and 2011. Data for 2011 and 2012 are the same under the criterion of last known data.
Direct source	World Bank Indicators 2011
Indirect source	(1) United Nations Population Division. World Population Prospects, (2) United Nations Statistical Division. Population and Vital Statistics Report (various years), (3) Census reports and other statistical publications from national statistical offices, (4) Eurostat: Demographic Statistics, (5) Secretariat of the Pacific Community: Statistics and Demography Programme, and (6) U.S. Census Bureau: International Database.

Table 48. Auxiliary Variable GDP

GDP	
Description	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2005 USD. Dollar figures for GDP are converted from domestic currencies using 2000 official exchange rates. For several countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used. Latest data available are for 2010 and 2011. Data for 2011 and 2012 are the same under the criterion of last known data.
Direct source	World Bank Indicators 2011
Indirect source	World Bank National Accounts Data and OECD National Accounts Data Files.

Table 49. Auxiliary Variable GDP per capita

GDP per capita	
Description	GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Latest data available is for 2010 and 2011. Data for 2011 and 2012 is the same under the criterion of last known data.
Direct source	World Bank Indicators 2011
Indirect source	World Bank National Accounts Data, and OECD National Accounts Data Files

Table 50. Auxiliary Variable Households

Households	
Description	The indicator refers to the number of houses with one or more people living inside. Latest data available are for 2010 and 2011. Data for 2011 and 2012 are the same under the criterion of <i>last known data</i>.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011).
Indirect source	Census reports and other statistical publications from national statistical offices.

Table 51. Auxiliary Variable Population Density

Population density	
Description	Population density is midyear population divided by land area in square kilometers. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship—except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.
Direct source	World Bank Indicators 2011
Indirect source	Food and Agriculture Organization and World Bank Population Estimates.

Table 52. Auxiliary Variable Surface Area

Surface area (square kilometers)	
Description	Surface area is a country's total area, including areas under inland bodies of water and some coastal waterways.

	Latest data available are for 2010. Data for 2011 and 2012 are the same under the criterion of last known data.
Direct source	World Bank Indicators 2011
Indirect source	Food and Agriculture Organization (electronic files and web site)

Table 53. Auxiliary Variable Persons per household

Persons per household	
Description	Persons per household, or average household size, is obtained by dividing the number of persons (5.1) by the number of households (5.4).
Direct source	Prepared by the authors
Indirect source	World Bank Indicators 2011, International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011)

Table 54. Auxiliary Variable Purchasing Power Parity (PPP) Conversion Factor

Purchasing power parity (PPP) conversion factor	
Description	Purchasing power parity conversion factor is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market that a US dollar would buy in the United States. This conversion factor is for GDP.
Direct source	World Bank Indicators 2011
Indirect source	World Bank, International Comparison Program Database

Table 55. Auxiliary Variable Fixed broadband Internet monthly subscription (USD)

Fixed broadband internet monthly subscription (USD)	
Description	Fixed broadband sub-basket refers to the price of the monthly subscription to an entry-level fixed broadband plan. For comparability reason, the fixed broadband sub-basket is based on a monthly usage of (a minimum of) 1 Gigabyte (GB). For plans that limit the monthly amount of data transferred by including caps below 1 Gigabyte, the cost for additional bytes is added to the sub-basket. The minimum speed of a broadband connection is 256 kbit/s. Prices are reported and collected in national currency and then converted to USD. Prices include taxes. In order to offer a comparable measure, the variable is multiplied by the World Bank's power parity factor. This variable is described among the auxiliary variables.
Direct source	International Telecommunication Union, World Telecommunication/ICT Development Report and Database (2011)
Indirect source	N/A

3.5 Variables Normalization

Due to the heterogeneity of the variables, which range from absolute values to percentages, they have been normalized to fit into the range of the IDBA from 1 (lowest) to 8 (highest). The normalization methods include the following:

Normalization for percentage variables

This method has been used for all percentage variables and the variable [secure Internet servers] since it is measured per million of inhabitants.

Equation 2. Normalization Formula for Percentage Variables

$$V_j = 7 * \frac{v_j - \min(v_j)}{\max(v_j) - \min(v_j)} + 1$$

where:

V_j = normalized value of the variable □

v_j = non – normalized value of the variable □

$\min(v_j)$ = minimum value of the variable j for all the countries□

$\max(v_j)$ = maximum value of the variable j for all the countries□

Normalization for range variables

This method was used for all variables whose values are within a range, except for four special cases (see the following normalization method).

Equation 3. Normalization Formula for Range Variables

$$V_j = 7 * \frac{v_j - \min(v_j)}{\max(v_j) - \min(v_j)} + 1$$

where:

V_j = normalized value of the variable □

v_j = non – normalized value of the variable □

$\min(v_j)$ = minimum value of the variable j for all the countries□

$\max(v_j)$ = maximum value of the variable j for all the countries□

Normalization for range variables (special case)

This method has been used for four range variables: [number of competitors in fixed broadband], [number of competitors in mobile broadband], [current status of Broadband development plans] and [effectiveness of the fund for the universal access and service].

Table 56. Normalization Method for Variables: Number of Competitors in Fixed Broadband and Number of Competitors in Mobile Broadband

No operator is offering the service.	1
Monopoly	2.75
Two operators are offering the service (it is not necessarily a monopoly).	4.5
Three operators offer the service	6.25
Four or more operators offer the service.	8

Table 57. Normalization Method for Variable Current Status of Broadband Development Plans

No broadband plan is available.	1
Broadband is in analysis phase.	3.33
Broadband is in plans, agendas, and similar formats; but there is no national broadband plan.	5.66
Three operators offer the service.	8

Table 58. Normalization Method for Variable Effectiveness of the Fund for Universal Access and Service

No fund is available.	1
A fund exists, but it is not used for broadband initiatives.	4.25
A fund exists, and it is used for broadband initiatives but in a limited manner.	6.25

Normalization for absolute value variables

This method has been used for variables that have absolute values except for the variable of fixed broadband Internet monthly subscription.

Equation 4. Normalization Formula for Absolute Value Variables

$$V_j = 7 * \frac{\log_{10} v_j - \log_{10} \min(v_j)}{\log_{10} \max(v_j) - \log_{10} \min(v_j)} + 1$$

where:

V_j = normalized value of the variable □

v_j = non – normalized value of the variable □

$\min(v_j)$ = minimum value of the variable j for all the countries □

$\max(v_j)$ = maximum value of the variable j for all the countries □

Normalization for absolute value variables (special)

This method has been used for the variable [fixed broadband internet monthly subscription] since it has an inverse effect on the development of broadband: the higher the price, the lower the penetration

Equation 5. Normalization Formula for Absolute Value Variables (special case)

$$V = -7 * \frac{v - \min(v)}{\max(v) - \min(v)} + 8$$

where:

V = normalized value of the variable □

v = non – normalized value of the variable

$\min(v)$ = minimum value of the variable for all the countries □

$\max(v)$ = maximum value of the variable for all the countries □

3.6 The Clusters

As explained before, the IDBA and its pillars are calculated not only for countries but also for regions (i.e., the aforementioned clusters). The pillars are calculated using the aggregated value of the variables in the cluster.

To determine the aggregated value of each one of the variables for a single cluster, the former have been grouped. The grouping methodology varies according to the nature of the specific variable. Four aggregation or grouping methods were used (see Table 59) for variable and specific grouping methods.

- By Population (POP). This method is used to aggregate variables that are expressed as a fraction of the total population.
- By GDP (GDP). This method is used to aggregate variables that express either economic values or connection speeds in Mbps.
- By Households (HOU). This method is used to aggregate variables that are expressed as a fraction of the total number of households.
- By number of countries (NUM). This method is used to aggregate variables that refer to surveys or indexes.

Table 59. Grouping Method Per Variable

Variable	Grouping Method
Government procurement of advanced technology products	NUM
Government prioritization of ICT	NUM
Importance of ICT to government vision of the future	NUM
Current status of broadband development plans	NUM
Fixed broadband monthly subscription charge	GDP
Laws relating to ICT	NUM
Effectiveness of the fund for the universal access and service	NUM
Internet and telephony sectors competition index	NUM
Number of competitors in fixed broadband	NUM
Number of competitors in mobile broadband	NUM
Percentage of the population covered by a mobile cellular network	POP
Secure Internet servers	POP
Percentage of households with a computer	HOU
Percentage of households with Internet access	HOU
Fixed broadband subscriptions per 100 inhabitants	POP
Active mobile broadband subscriptions per 100 inhabitants	POP
Fixed telephony lines per 100 inhabitants	POP
Fixed broadband speed, in Mbit/s	GDP
International Internet bandwidth (bit/s) per Internet user	POP
Firm-level technology absorption	NUM
eGovernment development index	NUM
Percentage of individuals using the Internet	POP
Internet access in schools	NUM
Accessibility of digital content	NUM
Use of virtual social networks	NUM
Video uploads on YouTube	POP
Tertiary education enrollment rate	POP
Secondary enrollment rate	POP

4 Determining the Pillar Weights

The pillars are the key elements of the IDBA. In order to determine the weights of each one of the pillars, an accurate analysis was performed that included both statistical analysis and expert consultations.

4.1 Statistical Analysis

The independent variables selected to perform the correlation analysis are fixed broadband penetration and mobile broadband penetration. These two variables were selected because they are the ones that better explain broadband development in a country. Table 60 summarizes the result of the correlation factor, R^2 , evaluated for each one of the pillars against these two independent variables.

Table 60. Correlation Factor for the Pillars against Fixed Broadband Penetration and Mobile Broadband Penetration

Pillar	Fixed Broadband	Mobile Broadband
Public policy and strategic vision	54%	44%
Strategic regulation	71%	55%
Infrastructure	94%	76%
Application and capacity	90%	70%

After evaluating the results of the statistical analysis, the infrastructure pillar stands out as being the most important, since it is the one with higher correlations with the two independent variables. Likewise, the pillar that represents application and capacity shows a high correlation with the infrastructure variables. This is partly explained because this pillar is a consequence of the level of development of the others. The pillar with least degree of correlation is the one representing public policy and strategic vision. This lack of correlation may be explained by the fact that there is a lag between the time when public policies are enacted and when the expected results appear.

4.2 A Pillar Depending on the Other Three

Another statistical analysis was performed that focused on expressing every pillar depending on the other three, by means of a multivariable linear regression. Table 61 summarizes the result of the correlation factor, R^2 , evaluated for each one of the pillars against the combination of the three other pillars.

Table 61. Correlation Factor for Each of the Pillars Against the Other Three Pillars

Pillar	Correlation with three other pillars
Public Policy and strategic vision	46%
Strategic regulation	30%
Infrastructure	90%
Application and capacity	91%

From the table above, it appears that the strategic regulation pillar is the one that is less correlated with the others. This is logical since its variables are more of a cause than an effect. The infrastructure pillar is very conditioned by the other three. This also happens with the applications and capacity pillar.

4.3 Expert Consultations

In parallel with the statistical analysis explained above, a series of expert consultations were obtained. The question asked was: “How important do you consider the following factors to explain broadband development in the Latin America and Caribe Region?” Table 62 summarizes the results.

Table 62. Results of Expert Consultations (weights given to each of the pillars)

Pillar	Importance
Public policy and strategic vision	23%
Strategic regulation	23%
Infrastructure	33%
Application and capacity	19%

The results show the importance given to infrastructure, which is the most important pillar in the opinion of the experts. Public policy and strategic vision and strategic regulation were the next two pillars in order of importance. Finally, the least important pillar, in the experts' opinion, was the pillar for application and capacity. Nevertheless, and as is noted in the table, the experts considered all four pillars to be fairly important for broadband development.

4.4 Conclusions

The selection of the final weights for the pillars takes into account the two analyses described above, the statistical analysis, and the expert consultations. Additionally, the quality and availability of the data was also considered. Table 63 summarizes the analysis of the variables as well as the final weights.

Table 63. Variables and Pillars' Weight Calculation

Variable	Public policy and strategic vision	Strategic regulation	Infrastructure	Application and capacity
Data Quality (for each pillar)	Low	High	Very High	High
Statistical Analysis (importance of each pillar)	High	Very High	Very High	Very High
Survey Results	23%	23%	33%	19%
Final Weight	20%	25%	40%	15%

5 Main Results

Table 64 summarizes the 2012 results of the IDBA, which is led by Sweden, South Korea and Iceland.

Table 64. IDBA Main Results

Country	Position at IDBA	IDBA Value
Sweden	1	7.28
South Korea	2	7.18
Iceland	3	7.05
Luxembourg	4	6.98
United Kingdom	5	6.90
Finland	6	6.90
Denmark	7	6.89
Netherlands	8	6.84
Switzerland	9	6.73
United States	10	6.65
Estonia	11	6.57
New Zealand	12	6.55
Japan	13	6.50
Norway	14	6.50
Germany	15	6.48
France	16	6.42
Canada	17	6.41
Portugal	18	6.38
Austria	19	6.33
Australia	20	6.26
Israel	21	6.21
Belgium	22	6.21
Ireland	23	6.15
Slovenia	24	5.72
Spain	25	5.64
Chile	26	5.57
Barbados	27	5.47
Czech Republic	28	5.36
Hungary	29	5.33
Brazil	30	5.32
Turkey	31	5.24
Italy	32	5.17
Republic of Slovakia	33	5.13
China	34	5.07
Greece	35	5.05
Panama	36	5.01
Poland	37	4.99

Russia	38	4.97
Uruguay	39	4.81
Colombia	40	4.77
Mexico	41	4.62
Argentina	42	4.53
Indonesia	43	4.37
Ecuador	44	4.34
India	45	4.32
Jamaica	46	4.29
Peru	47	4.26
Costa Rica	48	4.23
Dominican Republic	49	4.22
South Africa	50	4.22
Trinidad and Tobago	51	4.14
Bahamas	52	4.04
Venezuela	53	3.80
Paraguay	54	3.78
Guatemala	55	3.71
Nicaragua	56	3.64
Honduras	57	3.58
El Salvador	58	3.52
Guyana	59	3.16
Bolivia	60	3.16
Surinam	61	3.12
Belize	62	3.11
Haiti	63	1.71

Table 65 summarizes the 2012 results of the first pillar, public policy and strategic vision, which is led by Sweden, Luxemburg, and Finland.

Table 65. Public Policies and Strategic Vision Pillar Main Results

Country	Position at public policies and strategic vision pillar	Public policies and strategic vision pillar value
Sweden	1	7.86
Luxembourg	2	7.77
Finland	3	7.30
China	4	7.12
Portugal	5	7.00
South Korea	6	6.86
Estonia	7	6.80
United States	8	6.69
Israel	9	6.68

Switzerland	10	6.56
United Kingdom	11	6.36
Denmark	12	6.34
New Zealand	13	6.30
Norway	14	6.27
Germany	15	6.25
Panama	16	6.22
Australia	17	6.21
Iceland	18	6.14
Netherlands	19	6.12
Barbados	20	6.04
Brazil	21	5.87
Chile	22	5.82
France	23	5.80
Japan	24	5.79
Canada	25	5.78
Austria	26	5.77
Uruguay	27	5.67
Belgium	28	5.62
India	29	5.54
Turkey	30	5.48
Indonesia	31	5.37
Colombia	32	5.31
Guyana	33	5.06
Ireland	34	4.97
Costa Rica	35	4.92
Mexico	36	4.79
Trinidad and Tobago	37	4.78
Dominican Republic	38	4.58
Ecuador	39	4.54
Jamaica	40	4.44
Surinam	41	4.24
Slovenia	42	4.12
Russia	43	4.09
Honduras	44	4.07
Spain	45	4.05
Hungary	46	3.97
South Africa	47	3.97
Peru	48	3.80
Czech Republic	49	3.45
Guatemala	50	3.39
Poland	51	3.39
Republic of Slovakia	52	3.23
Bolivia	53	3.19

Italy	54	3.19
Nicaragua	55	3.08
Paraguay	56	3.00
Argentina	57	2.98
Greece	58	2.97
Venezuela	59	2.92
El Salvador	60	2.36
Belize	61	1.97
Haiti	62	1.35
Bahamas	NA	NA

Table 66 summarizes the 2012 results of the second pillar, strategic regulation, which is led by Estonia, Chile, and the United States.

Table 66. Strategic Regulation Pillar Main Results

Country	Strategic regulation pillar	Strategic regulation pillar value
Estonia	1	7.76
Chile	2	7.53
United States	3	7.52
Portugal	4	7.43
United Kingdom	5	7.39
India	6	7.38
Brazil	7	7.34
Turkey	8	7.32
Iceland	9	7.30
South Korea	10	7.30
Sweden	11	7.27
Colombia	12	7.27
Slovenia	13	7.25
Netherlands	14	7.25
Canada	15	7.23
Luxembourg	16	7.18
France	17	7.18
Hungary	18	7.14
Austria	19	7.13
Spain	20	7.08
Finland	21	7.07
Japan	22	7.07
Ireland	23	7.03
Germany	24	6.99
Switzerland	25	6.97

Czech Republic	26	6.94
Belgium	27	6.91
Israel	28	6.91
Republic of Slovakia	29	6.90
Indonesia	30	6.86
Denmark	31	6.86
Peru	32	6.86
China	33	6.80
Poland	34	6.74
Argentina	35	6.69
Greece	36	6.68
Russia	37	6.65
Nicaragua	38	6.62
Paraguay	39	6.62
New Zealand	40	6.60
Norway	41	6.60
South Africa	42	6.59
Ecuador	43	6.56
Panama	44	6.53
Italy	45	6.50
Guatemala	46	6.48
Dominican Republic	47	6.43
Mexico	48	6.18
Australia	49	6.09
Jamaica	50	6.04
El Salvador	51	5.94
Venezuela	52	5.87
Bahamas	53	5.46
Bolivia	54	5.46
Honduras	55	5.41
Uruguay	56	4.83
Costa Rica	57	4.80
Belize	58	4.66
Barbados	59	4.52
Trinidad and Tobago	60	3.98
Haiti	61	3.34
Surinam	62	3.14
Guyana	63	1.92

Table 67 summarizes the 2012 results of the third pillar, infrastructure, which is led by South Korea, Iceland, and Denmark.

Table 67. Infrastructure Pillar Main Results

Country	Infrastructure pillar	Infrastructure pillar value
South Korea	1	7.52
Iceland	2	7.24
Denmark	3	7.16
Sweden	4	7.15
United Kingdom	5	6.98
Netherlands	6	6.92
Luxembourg	7	6.90
Switzerland	8	6.79
Germany	9	6.76
Japan	10	6.75
Finland	11	6.56
France	12	6.47
New Zealand	13	6.45
Norway	14	6.37
Ireland	15	6.31
Canada	16	6.23
Australia	17	6.21
Austria	18	6.16
United States	19	6.12
Belgium	20	6.05
Estonia	21	5.80
Barbados	22	5.67
Portugal	23	5.64
Israel	24	5.63
Slovenia	25	5.61
Spain	26	5.52
Italy	27	5.50
Czech Republic	28	5.27
Greece	29	5.21
Republic of Slovakia	30	4.98
Hungary	31	4.93
Poland	32	4.86
Bahamas	33	4.73
Russia	34	4.65
Chile	35	4.43
Uruguay	36	4.27
Turkey	37	4.23
Brazil	38	4.12
Argentina	39	4.03
Trinidad and Tobago	40	3.91
Mexico	41	3.85

Panama	42	3.70
Costa Rica	43	3.52
China	44	3.32
Jamaica	45	3.29
Ecuador	46	3.28
Colombia	47	3.24
South Africa	48	3.19
Peru	49	3.04
Guyana	50	2.95
Venezuela	51	2.91
Dominican Republic	52	2.88
Paraguay	53	2.86
Belize	54	2.86
Surinam	55	2.80
El Salvador	56	2.74
Indonesia	57	2.66
Nicaragua	58	2.60
Honduras	59	2.43
Guatemala	60	2.41
India	61	2.39
Bolivia	62	1.92
Haiti	63	1.00

Finally, Table 68 summarizes the 2012 results of the fourth pillar, application and capacity, which is led by Iceland, Finland, and Denmark.

Table 68. Application and Capacity Pillar Main Results

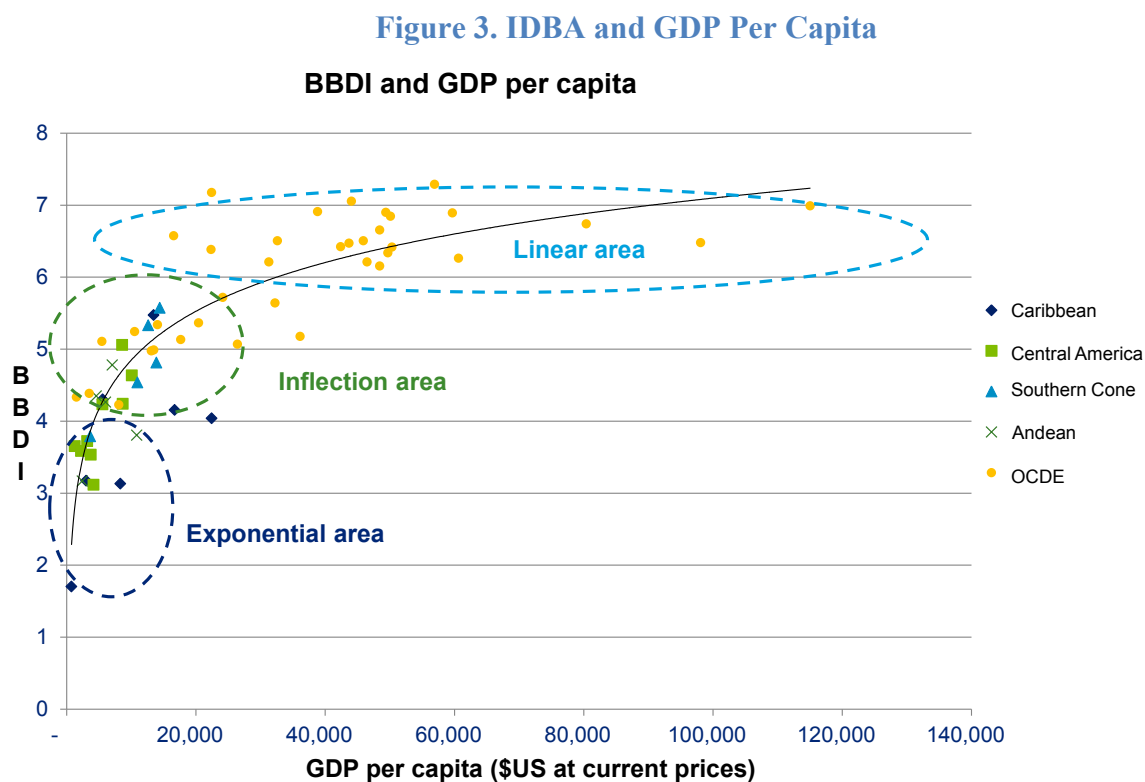
Country	Position at application and capacity pillar	Application and capacity pillar value
Iceland	1	7.34
Finland	2	6.98
Denmark	3	6.95
Netherlands	4	6.89
Sweden	5	6.89
Norway	6	6.83
Australia	7	6.75
New Zealand	8	6.71
United Kingdom	9	6.62
United States	10	6.58
South Korea	11	6.49
Switzerland	12	6.42
Canada	13	6.39

Estonia	14	6.34
Austria	15	6.23
Belgium	16	6.23
Israel	17	5.94
Luxembourg	18	5.83
Ireland	19	5.82
Japan	20	5.82
France	21	5.81
Portugal	22	5.76
Barbados	23	5.75
Spain	24	5.66
Slovenia	25	5.65
Czech Republic	26	5.58
Hungary	27	5.52
Bahamas	28	5.22
Republic of Slovakia	29	5.21
Germany	30	5.09
Uruguay	31	5.06
Chile	32	5.00
Greece	33	4.78
Italy	34	4.69
Panama	35	4.58
Brazil	36	4.43
Poland	37	4.42
Costa Rica	38	4.25
China	39	4.25
Argentina	40	4.22
Trinidad and Tobago	41	4.19
Russia	42	4.16
Turkey	43	4.12
Colombia	44	3.99
Mexico	45	3.90
Venezuela	46	3.87
Jamaica	47	3.85
Peru	48	3.76
Dominican Republic	49	3.66
Indonesia	50	3.47
South Africa	51	3.30
Guyana	52	3.27
Ecuador	53	3.16
El Salvador	54	3.14
Guatemala	55	2.99
Honduras	56	2.91
India	57	2.76

Belize	58	2.69
Bolivia	59	2.58
Paraguay	60	2.55
Surinam	61	2.46
Nicaragua	62	2.17
Haiti	63	1.36

5.1 What the Ranking Shows

The results obtained from the IDBA suggest that countries are situated along the digital divide at primarily one of three different stages of growth: exponential, inflective, and linear.



As a result, countries can be grouped into three different categories:

- Countries that need to take action in each of the four dimensions of the broadband ecosystem (four pillars on the IDBA). These countries are those located at the exponential stage and their IDBA is below 4.

- Countries that have basic infrastructure but need to revise their regulatory framework in a way that fosters investment and innovation. These countries are located at the inflection stage and their IDBA is between 4 and 6.
- Countries where infrastructure is adequately developed, but where the major areas of improvement are those related to the development and use of services and applications. These countries are in the linear stage of growth and their IDBA is above 6.

6 Sources

It is important to distinguish between the sources of information used in the compiling of the IDBA. On the one hand, the IDBA was created and produced by a set of experts from Inter-American Development Bank and from the consulting firm of Deloitte. As for the information itself, the IDBA relies on a conglomerate of existing variables that were produced and consolidated by highly renowned institutions (see the variables section for the specific source for each particular variable). These sources are as follows (in alphabetical order):

- INSEAD
- Inter-American Development Bank
- International Telecommunications Union
- United Nations
- World Bank
- World Economic Forum

7 Data Availability

The IDBA was computed for three consecutive years: 2010, 2011, and 2012. When data was not available for a given year, data of the latest year available was considered for that year. In the event that no data was available for a variable, then that variable was ignored and its weight was distributed among the rest of the variables.

8 Next Steps

8.1 Improvements to the Index

The IDB experts as well as renowned experts from academia, the public sector, and industry will review the IDBA on a yearly basis to update its structure and verify the accuracy of the weights assigned to the pillars and variables. Table 69 summarizes possible future improvements to the IDBA.

Table 69. Future Improvements to the IDBA

Name of the improvement	Description	Difficulty
GDP per capita clusters	This functionality allows for the clustering of countries depending on their GDP per capita. This is particularly useful to show how a country is performing in relation to similar economies.	Medium
Personalized clusters	This feature consists of the creation of personalized clusters (i.e., the ability to select a certain group of countries and place them into a cluster at the discretion of the user).	High
Include more countries	In order to broaden the spectrum of data inside the index, this feature considers including data not only from the IDB and OECD countries but also from other countries reported in the WEF and ITU indexes.	High

8.2 Data Visualization: The Web Platform

The usefulness of the IDBA will dramatically increase when the data become available on the Inter-American Development Bank Broadband Platform. The objective is to broaden the target audience that will access the index results, as well as to incorporate visualization features. This platform will provide a simple, intuitive, and complete visualization of the index, its pillars, and their variables. The Broadband Platform aims to become a reference inside the region and will provide not only IDBA visualization but also provide research reports, infrastructure maps, and other important information that promotes the development of broadband.

9 Final Conclusions

The holistic approach of the IDBA is a tool for diagnosis as well as a facilitator of dialogue for the IDB countries. It is clear that the Digital Divide is a reality. Countries acknowledge that the lack of access to broadband and ICTs creates digital exclusion, but more importantly, it creates social exclusion. The current challenge is how and where to prioritize actions, plans, and investment. The IDBA is a powerful tool for making progress around its four pillars: (i) public policy and strategic vision, (ii) strategic regulation (iii), infrastructure, and (iv) application and capacity. Moreover, the ranking of countries in the IDBA should not be regarded as a mere classification but as an effective means to: (i) identify countries' strengths and successes so that they can inspire other countries, and (ii) identify the areas in which countries' need to define strategic and efficient plans and actions to make improvements across all the elements of the broadband ecosystem.