

# The Networked Readiness Index 2012: Benchmarking ICT Progress and Impacts for the Next Decade

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Last year, the *Global Information Technology Report* (GITR) series celebrated its 10th anniversary. The World Economic Forum, in collaboration with INSEAD, initially began this project to explore the impact of information and communication technologies (ICT) on productivity and development, as a component of the Forum's research on competitiveness. To this end, over the past decade the Networked Readiness Index (NRI) has been measuring the degree to which economies across the world leverage ICT for enhanced competitiveness. During this period, it has been helping policymakers and relevant stakeholders to track their economies' strengths and weaknesses as well as their progress over time. In addition, it has identified best practices in networked readiness and designed roadmaps and strategies for establishing optimal ICT diffusion to boost competitiveness.

Since 2002, the networked readiness framework has remained stable, aside from some minor adjustments at the variable level to better reflect the dynamic trends in the technology landscape. This has allowed for meaningful comparisons across time and created a valuable database of technology metrics. However, the ICT industry has changed dramatically since 2002 and its effects are increasingly transforming our economies and societies.

More precisely, over the past decade, the world has become increasingly "hyperconnected." We live in an environment where the Internet and its associated services are accessible and immediate, where people and businesses can communicate with each other instantly, and where machines are equally interconnected with each other. The exponential growth of mobile devices, big data, and social media are all drivers of this process of hyperconnectivity. Gartner reported that worldwide sales of mobile devices reached 440.5 million units alone in the third quarter of 2011, while smartphone sales increased by 42 percent from the previous year.<sup>1</sup> Ericsson estimates that there will be more than 50 billion connected devices in the world by 2020.<sup>2</sup> Even emerging markets are joining the trend, as mobile penetration increases (after Asia, in 2011 Africa became the second-largest mobile market in the world),<sup>3</sup> and fixed broadband prices in developing countries dropped by over 50 percent in the last two years.<sup>4</sup> This trend is expected to accelerate in the current decade. The topic of hyperconnectivity therefore is appropriate as the main theme of this year's *Report*.

The multitude of connected devices consequently gives rise to the escalating growth of data and data traffic. According to the International Data Corporation (IDC), the amount of data transmitted worldwide surpassed one zettabyte for the first time in 2010.<sup>5</sup> The digital universe is now expected to double every two years.<sup>6</sup> Growing numbers of connected devices have also widened the gateway to online social networks. Facebook boasts more than 800 million active users in 2011,<sup>7</sup> while

### Box 1: Main changes in the NRI framework

In order to ensure that the Networked Readiness Index (NRI) framework remains aligned with the latest changes in the ICT industry and responds better to policy needs, the present edition of the GTR presents an evolved NRI that aims at measuring and benchmarking ICT progress and impacts for the next decade. This box highlights the main changes introduced in this framework this year. These are:

- 1. Introducing an ICT impact subindex:** To emphasize their importance, we have included a fourth subindex measuring the impacts of ICT on both the economy and society. Although measuring ICT impacts is a complex task, this subindex captures some of the broader economic and social impacts accruing from ICT. In the near future, as richer datasets become available, we hope to be able to cover a wider range of impacts and include such areas as the environment, energy, and health.
- 2. Redefining the pillars in the readiness subindex:** We have chosen to redefine the pillars within the readiness subindex to focus on infrastructure, affordability, and skills. We believe these new categories are aligned with key policy action areas that affect all actors within an economy and measure the overall preparedness of a country to use ICT. In this sense, when a government improves the ICT infrastructure or provides greater investment in skills upgrade, everyone—individuals and public- and private-sector organizations—benefit from it.
- 3. Restructuring the pillars in the environment subindex:** The pillars within the environment subindex have been modified to reflect the importance of having an overall framework that is not only conducive to ICT and technology uptake, but that also acts as a catalyst for innovation and entrepreneurship rather than acting as a filter. The previous pillars included political and regulatory environment, market environment, and infrastructure. The revised pillars include political and regulatory environment and the business and innovation environment. The latter reflects the growing role of an innovation- and entrepreneurial-friendly environment for enabling ICT economic transformational impacts to accrue.
- 4. Separating usage from impacts in the usage subindex:** The original distribution of pillars within the usage subindex is maintained according to economic agent (e.g., individuals, business, and government). This allows for in-depth analysis about the role and uptake efforts of specific agents in a society. However, all ICT impact-related variables have been regrouped under the newly created impact subindex.
- 5. Updating and rationalizing the selection of variables:** In order to take into account the rapid changes in the ICT industry, several outdated variables (e.g., number of telephone lines) have been dropped and new and more relevant variables have been included (e.g., mobile broadband Internet subscriptions). Moreover, several variables that captured similar concepts have been eliminated to obtain a more balanced picture of the underlying factors defining networked readiness.

Google Plus surpassed 40 million users in less than six months (it took Facebook three years to reach the 25 million mark).<sup>8</sup> Other factors, identified by Cisco—such as the growth of high-speed broadband penetration, the expansion of digital screen surface area and resolution, the proliferation of networked-enabled devices, and the increase in power and speed of computer devices—have also contributed to the world's hyperconnected state.<sup>9</sup>

As a result, we are beginning to see fundamental transformations in society. Hyperconnectivity is redefining relationships between individuals, consumers and enterprises, and citizens and the state. It is introducing new opportunities to increase productivity and well-being by redefining the way business is done, generating new products and services, and improving the way public services are delivered. However, hyperconnectivity can also bring about new challenges and risks in terms of security, cybercrime, privacy, the flow of personal data, individual rights, and access to information. Traditional organizations and industry infrastructures are also facing challenges as industries converge. This will inevitably have consequences for policy and regulation because regulators will have to mediate the blurring lines between sectors and industries and will be obligated to oversee more facets in a pervasive way. For example, in terms of security and surveillance, hyperconnectivity is transforming the way people, objects, and even animals are being monitored. Experts also predict that it will have an impact on inventory, transport and fleet management, wireless payments, navigation tools, and so on. The impact of ICT in different facets of life and work is growing.

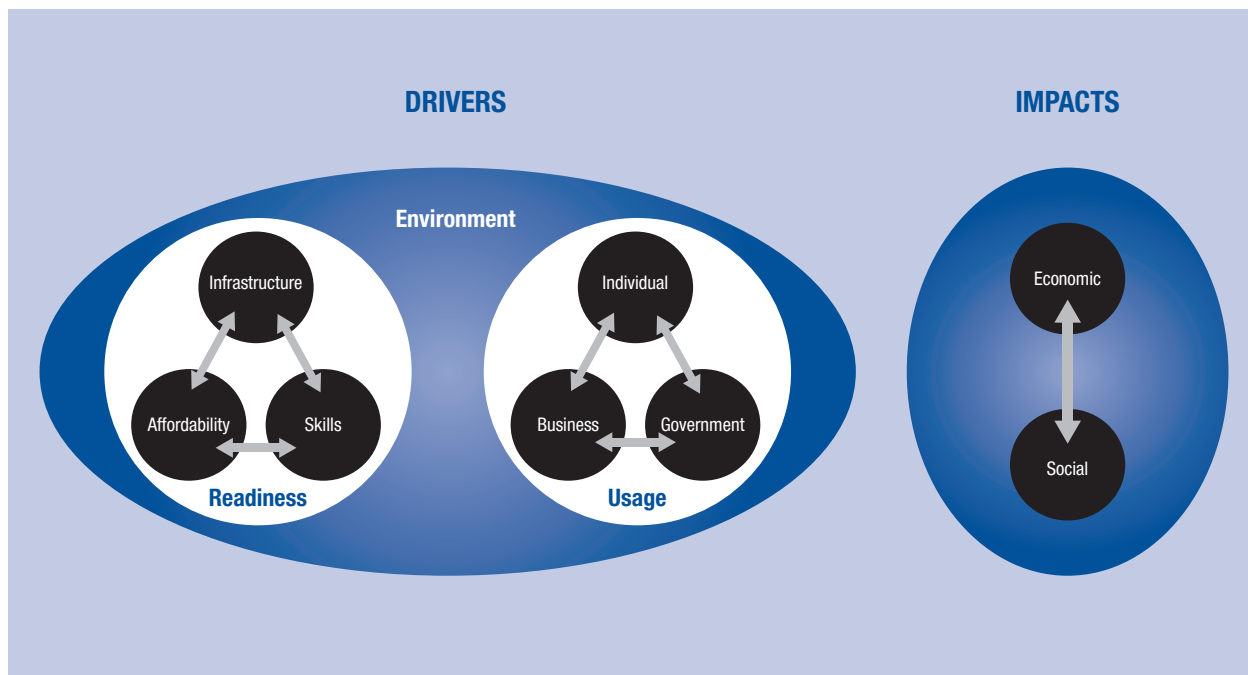
In this context, the way we monitor, measure, and benchmark the deployment and impacts of ICT must evolve to take into account the rapid changes and consequences of living in a hyperconnected world. Reflecting on this imperative of adaptation, a comprehensive review process of the NRI framework has been undertaken, guided by a process of high-level consultations with academic experts, policymakers, and representatives of the ICT industry. The results of this new framework are presented for the first time in this edition of the *Report*.

More precisely, this chapter presents the evolution of the framework and methodology underpinning the NRI. In addition, highlights of the 2012 rankings for a record 142 economies are also presented.

### THE EVOLVING NETWORKED READINESS FRAMEWORK: FROM ICT ACCESS TO ICT IMPACTS

Over the last decade, several attempts have been made to assess ICT developments. Appendix B includes a historical overview of the efforts made by various organizations to measure and benchmark ICT developments. One of the most authoritative exercises has been the NRI, which has been adopted by several governments as a valuable tool for assessing and leveraging technology

Figure 1: The evolved Networked Readiness Index framework



for competitiveness and development. Its success emphasizes the importance of continuing to adapt its framework in alignment with the changing landscape of technology and the new opportunities it introduces (Box 1).

As has been noted in the past two editions of this *Report*, the ICT industry has changed rapidly over the past decade. More powerful technologies, new mechanisms of accessing ICT and integrating it in multiple devices (e.g., through mobile broadband), and new ways of producing digital content (e.g., via social networks) have been developed, radically changing the industry and accelerating the convergence among the ICT, telecommunications, and media industries. Moreover, the many manifestations of ICT have become truly ubiquitous. Economic structures and the ways economic activities are organized have been rapidly transformed by new ICT-based or enabled business practices, generating sharp productivity gains. Society, and the way citizens interact among themselves and with governments, has also changed thanks to ICT. New modes of engagement between governments and citizens, not only in the shape of new ways of delivering public services but also in terms of redefining governance mechanisms and social engagement, have appeared.

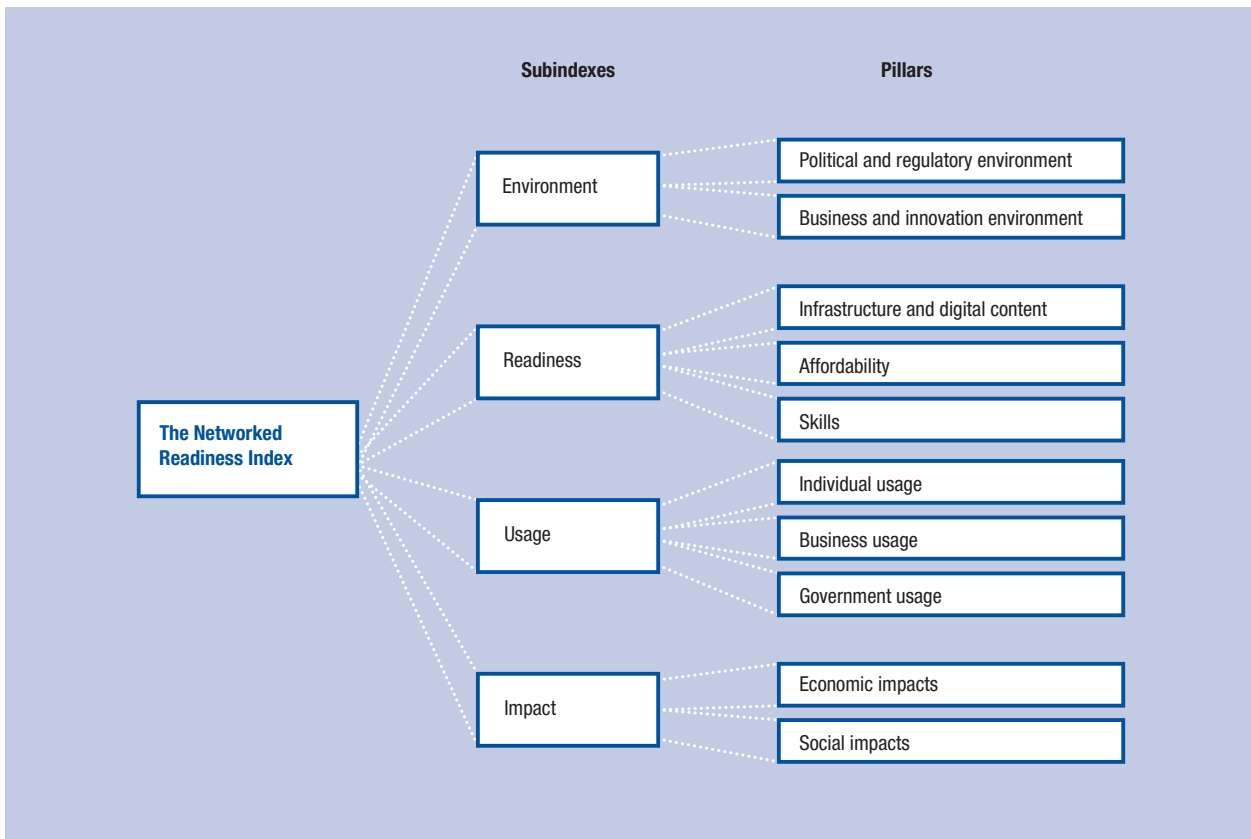
Consequently, much of the policy attention paid to ICT has also shifted. Because ICT has become increasingly omnipresent and almost universal in today's world, the focus has moved from one of how to provide access to one of how to make the best use of ICT in order to improve business innovation, governance, citizens' political participation, and social cohesion.

As described above, although the NRI has benefited from minor adjustments both in its variables—to better reflect the dynamic trends in the technology landscape—and in the methodology employed to compute the rankings, it has remained essentially stable since 2002. However, over the past two years a review of the framework has been undertaken to make certain not only that it continues to effectively capture the main drivers of ICT readiness but also that it increasingly incorporates data on ICT impacts. The objective of this process is to ensure that the framework remains relevant and at the forefront of measuring and benchmarking the role of ICT for competitiveness and well-being for the next decade.

As a result of the efforts of the past two years, in this edition of the *Report* a new framework is being introduced (Figure 1). This evolved framework is inspired by five underlying principles:

1. **Measuring the economic and social impacts of ICT is crucial.** The NRI must include aspects of the way ICT is transforming the economy and society. In the economy, the development of the ICT industry has become increasingly important and now accounts for a significant share of value-added and employment. In addition, ICT interacts closely with many other sectors, thus enabling *innovations* to accrue and affecting the overall productivity of a country. Moreover, the impacts of ICT are also evident in the development of *new skills* that are important in knowledge-based, information-rich societies and that are crucial for employment. In society, ICT empowers citizens to participate more actively and steadily in social and political debates, and to obtain better and faster services—for example, financial services—that

Figure 2: The evolved Networked Readiness Index structure



have an important impact on the quality of life and can potentially transform the quality and outcomes of important services such as education or health.

2. **An enabling environment determines the capacity of an economy and society to benefit from the use of ICT.** The success of a country in leveraging ICT and achieving the desired economic and social benefits will depend on its overall environment—including market conditions, the regulatory framework, and innovation-prone conditions—to boost innovation and entrepreneurship.
3. **ICT readiness and usage remain key drivers and preconditions for obtaining any impacts.** Despite ICT becoming increasingly universal, the question of access and usage remains important—especially for developing countries, given their need to narrow the digital divide. Even within developed nations, the need to provide high-speed broadband to all segments of the population has acquired importance in recent years. The NRI should include aspects related to access and usage covering not only affordable ICT infrastructure but also digital resources, including software, and the development of skills. Moreover, ICT impacts can arise only if ICT is widely used by all key actors—*individuals, businesses, and governments*. It is a society-wide effort. Those actors demonstrating better preparedness and greater interest are likely to use ICT more and more effectively,

contributing to a greater impact on competitiveness and development.

4. **All factors interact and co-evolve within an ICT ecosystem.** Those societies that count on better-prepared actors and an enabling environment are more likely to benefit from higher rates of ICT use and impacts. At the same time, those societies that benefit from higher rates of ICT use and positive impacts will, in turn, be more likely to benefit from a push on the part of the different stakeholders to be better prepared and keep improving the framework conditions that will allow for more and stronger benefits to accrue. As a result, a virtuous circle starts where improvements in one area affect and drive improvements in other areas. Conversely, lags in one particular factor also affect the evolution of the other factors.
5. **The framework should provide clear policy orientations and identify public-private partnership opportunities.** The NRI should clearly facilitate the identification of areas where policy intervention—through investment, including public-private partnerships; smart regulation; or the provision of incentives—could boost the impacts of ICT. This is important because the development and general uptake of ICT depends on the capacity of a country to provide an institutional framework with reliable and efficient rules and regulations; favorable business conditions for the birth and growth of new (social and commercial) enterprises; an innovation-prone environment,

capable of developing and absorbing new knowledge; and an ICT-friendly government policy.

## ELEMENTS OF THE NETWORKED READINESS INDEX

The networked readiness framework translates into the NRI, comprising four subindexes that measure the environment for ICT; the readiness of a society to use ICT; the actual usage of all main stakeholders; and, finally, the impacts that ICT generates in the economy and society. The three first subindexes can be regarded as the drivers that condition the results of the fourth subindex—that is, ICT impacts. These four subindexes are divided into 10 pillars and 53 variables according to the following structure (see also Figure 2):

### A. Environment subindex

1. Political and regulatory environment
2. Business and innovation environment

### B. Readiness subindex

3. Infrastructure and digital content
4. Affordability
5. Skills

### C. Usage subindex

6. Individual usage
7. Business usage
8. Government usage

### D. Impact subindex

9. Economic impacts
10. Social impacts

The final NRI score is a simple average of the four composing subindex scores, while each subindex's score is a simple average of those of the composing pillars. In doing this, we assume that all Index subindexes give a similar contribution to national networked readiness. Appendix A at the end of this chapter includes detailed information on the composition and computation of the NRI 2012.

A brief description of the different composing elements (at the subindex and pillar level) follows.

### Environment subindex

The environment subindex gauges the friendliness of a country's market and regulatory framework in supporting high levels of ICT uptake and the development of entrepreneurship and innovation-prone conditions. A supportive environment is necessary to maximize the potential impacts of ICT in boosting competitiveness and well-being. It includes a total of 18 variables distributed into two pillars.

The *political and regulatory environment pillar* (nine variables) assesses the extent to which the national legal framework facilitates ICT penetration and the safe development of business activities, taking into account general features of the regulatory environment (including the protection afforded to property rights, the independence

of the judiciary, and the efficiency of the law-making process) as well as more ICT-specific dimensions (the passing of laws relating ICT and software piracy rates).

The *business and innovation environment pillar* (nine variables) gauges the quality of the business framework conditions to boost entrepreneurship, taking into account dimensions related to the ease of doing business (including the presence of red tape and excessive fiscal charges). This pillar also measures the presence of conditions that allow innovation to flourish by including variables on the overall availability of technology, the demand conditions for innovative products (as proxied by the development of government procurement of advanced technology products), the availability of venture capital for financing innovation-related projects, and the presence of a skillful labor force.

### Readiness subindex

The readiness subindex, with a total of 12 variables, measures the degree to which a society is prepared to make good use of an affordable ICT infrastructure and digital content.

The *infrastructure and digital content pillar* (five variables) captures the development of ICT infrastructure (including the mobile network coverage, international Internet bandwidth, secure Internet servers, and electricity production) as well as the accessibility of digital content.

The *affordability pillar* (three variables) assesses the cost of accessing ICT, either via mobile telephony or fixed broadband Internet, as well as the level of competition in the Internet and telephony sectors that determine this cost.

The *skills pillar* (four variables) gauges the ability of a society to make effective use of ICT thanks to the existence of basic educational skills captured by the quality of the educational system, the level of adult literacy, and the rate of secondary education enrollment.

### Usage subindex

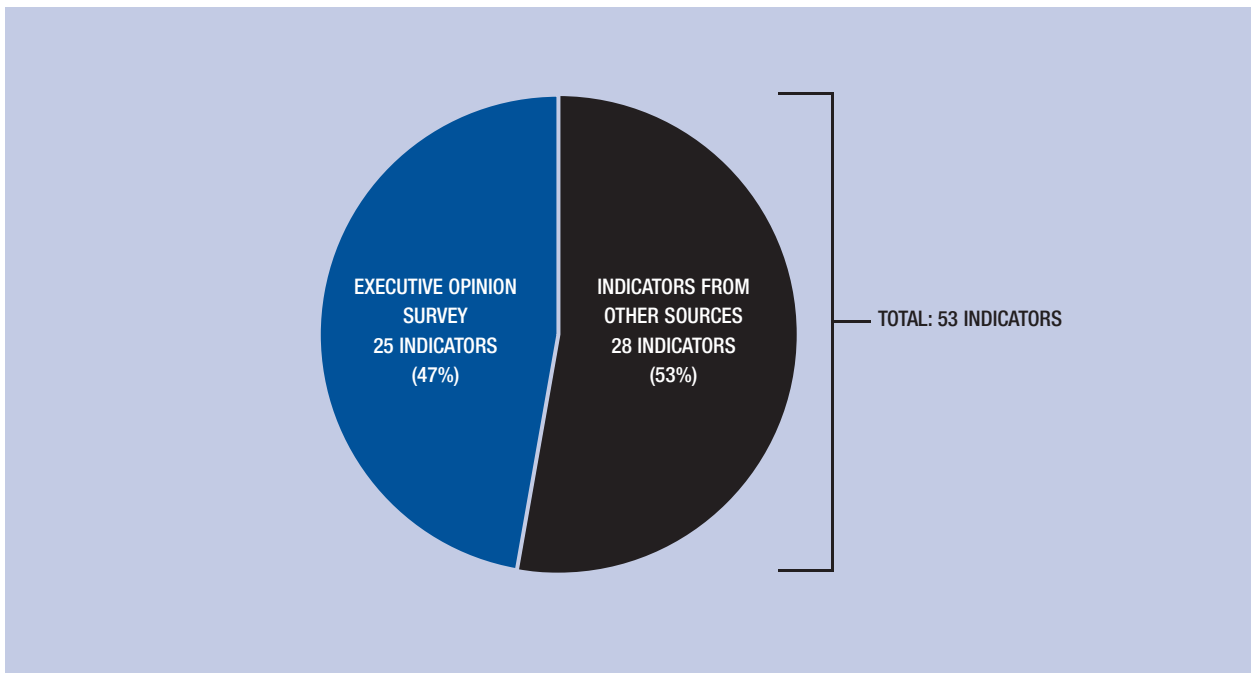
The usage subindex assesses the individual efforts of the main social agents—that is, individuals, business, and government—to increase their capacity to use ICT, as well as their actual use in their day-to-day activities with other agents. It includes 15 variables.

The *individual usage pillar* (seven variables) measures ICT penetration and diffusion at the individual level, using indicators such as the number of mobile phone subscriptions, individuals using the Internet, households with a personal computer (PC), households with Internet access, both fixed and mobile broadband subscriptions, and the use of social networks.

The *business usage pillar* (five variables) captures the extent of business Internet use as well as the efforts of the firms in an economy to integrate ICT into an internal, technology-savvy, innovation-conducive environment



Figure 3: Breakdown of indicators used in the Networked Readiness Index 2012 by data source



that generates productivity gains. Consequently, this pillar measures the firm's technology absorption capacity as well as its overall capacity to innovate and the production of technology novelties measured by the number of PCT patent applications. It also measures the extent of staff training available, which indicates the extent to which management and employees are better capable of identifying and developing business innovations.

The *government usage pillar* (three variables) provides insights into the importance that governments place on carrying out ICT policies for competitiveness and the well-being of their citizens, the efforts they make to implement their visions for ICT development, and the number of government services they provide online.

### Impact subindex

The impact subindex gauges the broad economic and social impacts accruing from ICT to boost competitiveness and well-being and that reflect the transformations toward an ICT- and technology-savvy economy and society. It includes a total of eight variables.

The *economic impacts pillar* measures the effect of ICT on competitiveness thanks to the generation of technological and non-technological innovations in the shape of patents, new products or processes, and organizational practices. In addition, it also measures the overall shift of an economy toward more knowledge-intensive activities.

The *social impacts pillar* aims at assessing the ICT-driven improvements in well-being thanks to its impacts on the environment, education, energy consumption, health progress, or more-active civil participation. At the

moment, because of data limitations, this pillar focuses on measuring the extent to which governments are becoming more efficient in the use of ICT and providing increasing online services to their citizens, and thus improving their e-participation. It also assesses the extent to which ICT is present in education, as a proxy for the potential benefits that are associated with the use of ICT in education.

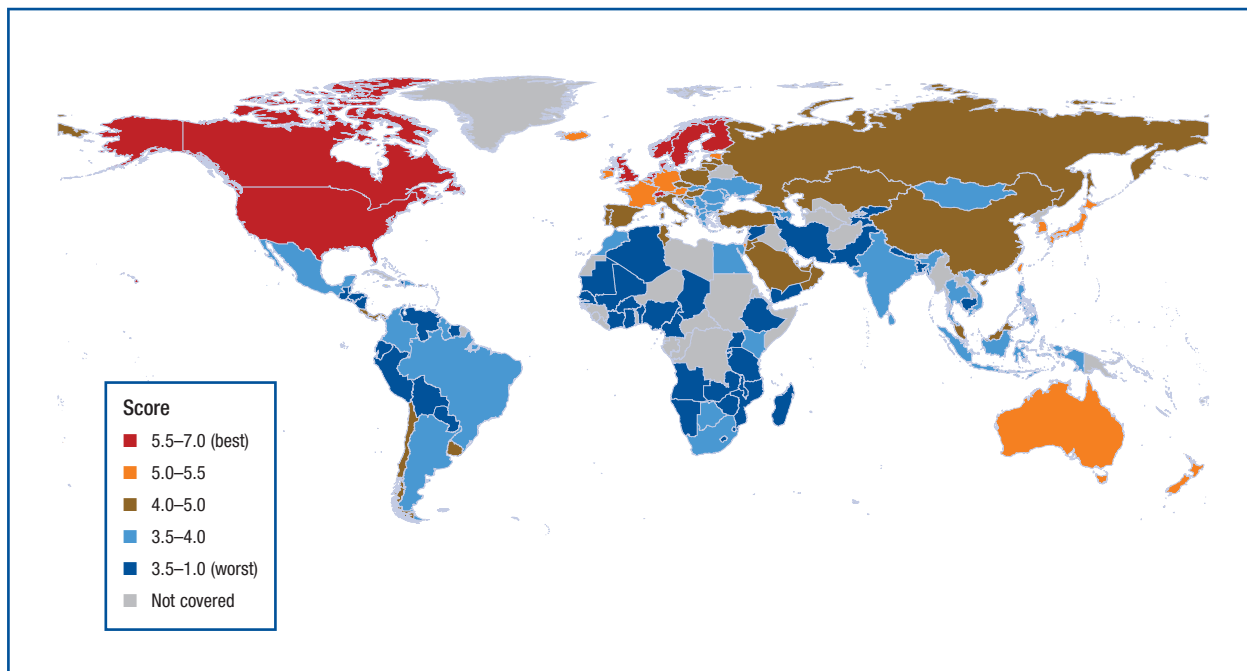
In general, measuring the impacts of ICT is a complex task and the development of rigorous quantitative data to do so is still in its infancy.<sup>10</sup> As a result, many of the dimensions where ICT is producing important impacts—especially when these impacts are not translated into commercial activities, such as the environment of health—cannot be covered yet. Therefore this subindex should be regarded as a work in progress that will evolve to accommodate new data on many of these dimensions as they become available.

### COMPUTATION METHODOLOGY AND DATA

In order to capture as comprehensively as possible all relevant dimensions of societies' networked readiness, the NRI 2012 is composed of a mixture of quantitative and survey data, as shown in Figure 3.

Of the 53 variables composing the NRI, 28—or 53 percent—are quantitative data, collected primarily by international organizations such as International Telecommunication Union (ITU), the World Bank, and the United Nations. International sources ensure the validation and comparability of data across countries. In addition, some other quantitative data come from private enterprises—such as Informa, in the case of mobile

Figure 4: Networked Readiness Index map



broadband penetration—that are leaders in collecting commercial ICT data.

The remaining 25 variables capture aspects that are more qualitative in nature or for which internationally comparable quantitative data are not available for a large enough number of countries, but that nonetheless are crucial to fully measure national networked readiness. These data come from the Executive Opinion Survey (the Survey), which the Forum administers annually to over 15,000 business leaders in all economies included in the *Report*.<sup>11</sup> The Survey represents a unique source of insight on many important dimensions of an enabling environment, such as the effectiveness of law-making bodies and the intensity of local competition; on dimensions of ICT readiness, such as the quality of the educational system and accessibility to digital content; on ICT usage, such as capacity to innovate and the importance of government vision for ICT; and finally on impact, such as ICT impacts on developing new products and services and improving access to basic services.

The NRI's coverage every year is determined by the Survey coverage and quantitative data availability. This year the *Report* includes 142 economies, three more than in the past edition. Three new countries are included for the first time: Belize, Haiti, and Yemen, while Suriname has been reinstated. Libya had to be dropped for lack of Survey data because of the events that took place in the country last spring.

More details on variables included in the Index and their computation can be found in Appendix A at the end of this chapter and in the Technical Notes and Sources section at the end of the *Report*.

#### THE CURRENT NETWORKED READINESS LANDSCAPE: INSIGHTS FROM THE NRI 2012

This section provides an overview of the networked readiness landscape of the world as assessed by the NRI 2012. It highlights the top 10 performers and the main regional results for Europe and the Commonwealth of Independent States, Asia and the Pacific, Latin America and the Caribbean, sub-Saharan Africa, and the Middle East and North Africa. Tables 1 through 5 report the 2012 rankings for the overall NRI, its four subindexes, and its ten pillars. In addition, the Country/Economy Profiles and Data Table sections at the end of the *Report* present the detailed results for the 142 economies covered by the study and the 53 indicators composing the NRI. To complement the analysis of the 2012 results, Box 2 depicts a comparative study of networked readiness across and within different world regions (see also Figure 4) and Box 3 presents the correlation between ICT drivers, calculated as the average of the environment, readiness, and usage subindexes and ICT impacts.

#### TOP 10

The top 10 of the NRI is made up exclusively of advanced economies. That group is dominated by the Nordics, with Sweden, Finland, Denmark, and Norway featuring in the top 7, and Iceland coming in at a not-so-distant 15th place. All members of the top 10 are relatively close to each other, and they tend to do well across all pillars, with some noticeable exceptions mentioned below.

**Sweden's** performance is remarkable in every aspect. The country leads four of the 10 pillars of the

## Box 2: Charting the digital divide

This brief comparative analysis confirms the existence of a global digital divide. Broadly defined, the *digital divide* refers to inequalities between the advanced economies and the rest of the world in terms of access and use of information and communication technologies (ICT), and thus its economic and social impacts. The Networked Readiness Index (NRI) framework and rankings aim to shed light on the reasons behind the persistence and depth of this gap, through a holistic analysis of a country's digital ecosystem.

Figure A plots the average score of selected country groups in the 10 pillars of the NRI and reveals the depth of the digital divide.<sup>1</sup> The advanced economies lead the emerging countries by a significant margin in each category. The gap is the widest with sub-Saharan Africa, and smaller with Developing Asia and with Latin America and the Caribbean.

The divide is particularly deep in terms of infrastructure quality and digital content accessibility. In sub-Saharan Africa, the shortcomings in terms of skills and affordability—two critical areas of ICT readiness—are just as serious. This poor preparedness in turn contributes to explaining the region's dismal performance in terms of usage. Sub-Saharan Africa remains by far the world's least-connected region. Despite mobile telephony becoming almost commonplace in the region, with 49 subscriptions per 100 population, access to other technologies remains the privilege of a few.<sup>2</sup> For instance, only 13 percent of individuals in sub-Saharan Africa use the Internet, 8 percent of households in the region own a personal computer (PC), and less than 4 percent have access to the Internet at home. By comparison, in Developing Asia 20 percent of individuals use the Internet, 22 percent of households own a PC, and 14 percent have access to the Internet at home. In terms of differences across developing regions, Developing Asia and Latin America and the Caribbean are very close in most dimensions. Exceptions are found in the affordability pillar and government usage pillar—that is, the leadership role that governments undertake to develop and leverage ICT in society, where the former outperforms the latter. In fact, Developing Asia has almost closed the gap with advanced economies in this latter dimension.

Group averages often conceal wide disparities within a group of countries. Although the dominance of advanced economies in the NRI is uncontested, Figure B shows the profound diversity within the group. The performance of the Nordics, led by Sweden, and of the Asian Tigers, led by Singapore, offers a stark contrast to the picture drawn by Southern and Eastern European economies.<sup>3</sup> The average performance of Greece, Italy, Portugal, and Spain, grouped under Southern Europe for the purpose of this analysis, is significantly below that of the Nordic countries. The chasm turns cavernous when considering specific dimensions of the NRI. That is the case in the business usage pillar, where the gap between Southern Europe and the Nordics is comparable to that between Developing Asia and advanced economies.

Similarly, Figure C illustrates the existence of a digital divide within the Middle East and North Africa (MENA) region, where the Gulf Cooperation Council (GCC) countries stand

out remarkably.<sup>4</sup> Five of the GCC member countries place between the 27th (Bahrain) and 40th (Oman) ranks. Most of their governments have embraced ambitious digital strategies coupled with pro-business reforms and massive infrastructure developments as part of their efforts to attract foreign investors and to diversify their economies. This big government-led push is reflected in the strong performance achieved in several dimensions of the NRI where the government plays a critical role, including the creation of an environment and legal framework conducive to business and innovation, skills, and usage of ICT by the government. In those pillars, the GCC average score tends to be very close to the average of advanced economies. The rest of MENA presents a much bleaker picture, with Syria (129th), Mauritania (139th), and Yemen (141st) ranking among the worst-performing countries globally.

Figure 4 in this chapter complements the present analysis. It visualizes on a map the NRI score of the 142 economies covered by the study. The areas of the 10 best-performing countries are shaded dark red, whereas the worst-performing economies appear in dark blue. The orange color identifies economies with a fairly high degree of networked readiness, which, however, does not match that of the top-performing economies. This group of 15 notably includes several economies in Western Europe and all advanced economies in Asia and the Pacific except Singapore, which belongs to the red category. The brown shading is used for countries that are only partly leveraging ICT for enhancing their competitiveness and well-being. This is the case for several countries in Southern and Eastern Europe, Central Asia, and MENA. Indeed, the patchwork of colors in Europe reflects its huge diversity. Finally, blue shadings designate countries that present major weaknesses in various dimensions of the NRI. The impacts of ICT therefore remain very limited, and minimal in the case of dark blue shaded countries. Africa is overwhelmingly blue, and exclusively of the darkest shade in the western part of the continent.

### Notes

- 1 In this box, all cited scores are expressed on a 1-to-7 scale, unless noted otherwise. When referring to a group, scores correspond to simple averages. Refer to Table 1 for the classification of economies by groups.
- 2 Figures cited in this paragraph are weighted average rates for 2010 computed using data from International Telecommunication Union's *World Telecommunication Indicators 2011 Database* (December 2011 update).
- 3 The Nordics group comprises Denmark, Finland, Iceland, Norway, and Sweden. The Asian Tigers group comprises Hong Kong SAR, Korea, Singapore, and Taiwan, China.
- 4 The Gulf Cooperation Council comprises Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

(Cont'd.)



Box 2: Charting the digital divide (cont'd.)

Figure A: Performance in the NRI: Advanced economies and selected emerging regions

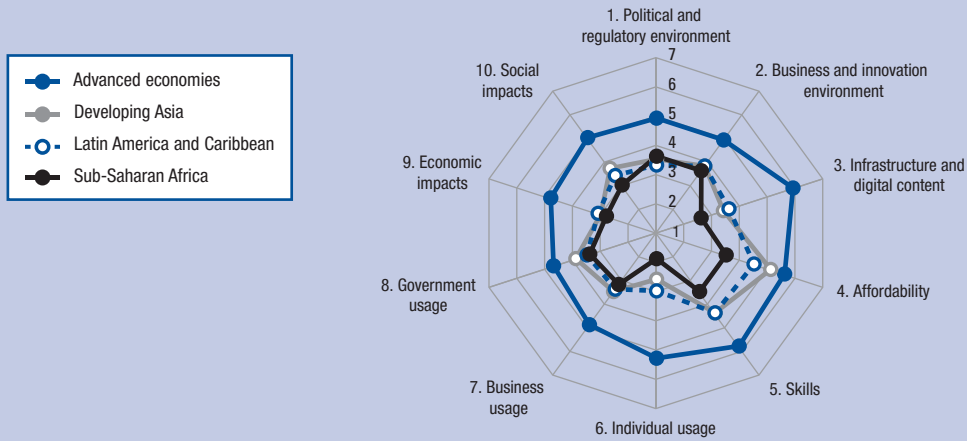


Figure B: Performance in the NRI: Advanced economies, selected subgroups

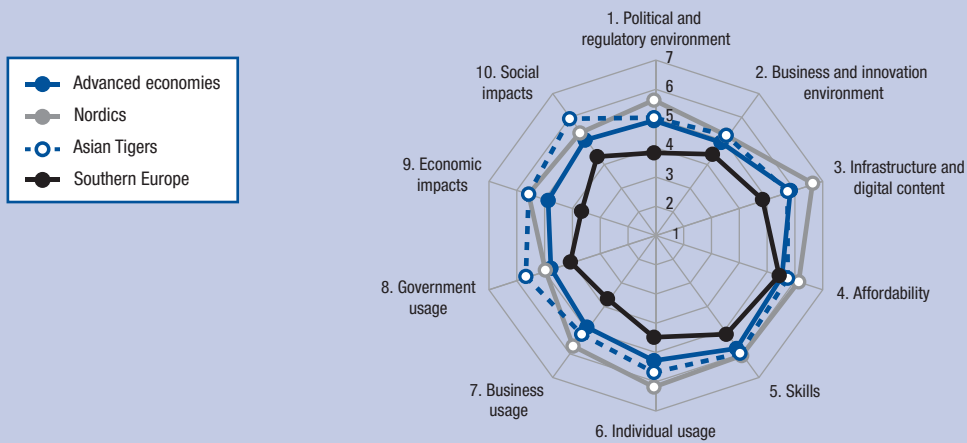


Figure C: Performance in the NRI: Advanced economies, Middle East and North Africa and Gulf Cooperation Council states

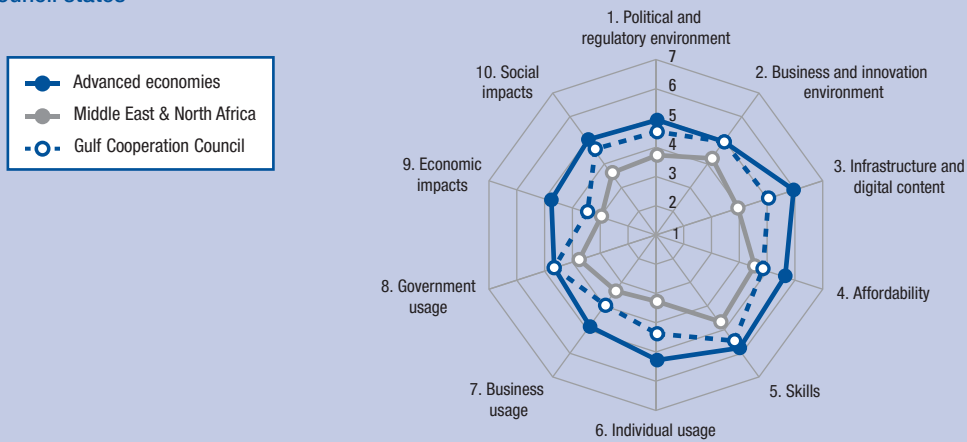


Table 1: The Networked Readiness Index 2012

Rank	Country/Economy	Score	Group*	Rank	Country/Economy	Score	Group*
1	Sweden	5.94	ADV	72	South Africa	3.87	SSA
2	Singapore	5.86	ADV	73	Colombia	3.87	LATAM
3	Finland	5.81	ADV	74	Jamaica	3.86	LATAM
4	Denmark	5.70	ADV	75	Ukraine	3.85	CIS
5	Switzerland	5.61	ADV	76	Mexico	3.82	LATAM
6	Netherlands	5.60	ADV	77	Thailand	3.78	DEVASIA
7	Norway	5.59	ADV	78	Moldova	3.78	CIS
8	United States	5.56	ADV	79	Egypt	3.77	MENA
9	Canada	5.51	ADV	80	Indonesia	3.75	DEVASIA
10	United Kingdom	5.50	ADV	81	Cape Verde	3.71	SSA
11	Taiwan, China	5.48	ADV	82	Rwanda	3.70	SSA
12	Korea, Rep.	5.47	ADV	83	Vietnam	3.70	DEVASIA
13	Hong Kong SAR	5.46	ADV	84	Bosnia and Herzegovina	3.65	CEE
14	New Zealand	5.36	ADV	85	Serbia	3.64	CEE
15	Iceland	5.33	ADV	86	Philippines	3.64	DEVASIA
16	Germany	5.32	ADV	87	Dominican Republic	3.60	LATAM
17	Australia	5.29	ADV	88	Georgia	3.60	CIS
18	Japan	5.25	ADV	89	Botswana	3.58	SSA
19	Austria	5.25	ADV	90	Guyana	3.58	LATAM
20	Israel	5.24	ADV	91	Morocco	3.56	MENA
21	Luxembourg	5.22	ADV	92	Argentina	3.52	LATAM
22	Belgium	5.13	ADV	93	Kenya	3.51	SSA
23	France	5.12	ADV	94	Armenia	3.49	CIS
24	Estonia	5.09	ADV	95	Lebanon	3.49	MENA
25	Ireland	5.02	ADV	96	Ecuador	3.46	LATAM
26	Malta	4.91	ADV	97	Ghana	3.44	SSA
27	Bahrain	4.90	MENA	98	Guatemala	3.43	LATAM
28	Qatar	4.81	MENA	99	Honduras	3.43	LATAM
29	Malaysia	4.80	DEVASIA	100	Senegal	3.42	SSA
30	United Arab Emirates	4.77	MENA	101	Gambia, The	3.41	SSA
31	Lithuania	4.66	CEE	102	Pakistan	3.39	DEVASIA
32	Cyprus	4.66	ADV	103	El Salvador	3.38	LATAM
33	Portugal	4.63	ADV	104	Iran, Islamic Rep.	3.36	MENA
34	Saudi Arabia	4.62	MENA	105	Namibia	3.35	SSA
35	Barbados	4.61	LATAM	106	Peru	3.34	LATAM
36	Puerto Rico	4.59	ADV	107	Venezuela	3.32	LATAM
37	Slovenia	4.58	ADV	108	Cambodia	3.32	DEVASIA
38	Spain	4.54	ADV	109	Zambia	3.26	SSA
39	Chile	4.44	LATAM	110	Uganda	3.25	SSA
40	Oman	4.35	MENA	111	Paraguay	3.25	LATAM
41	Latvia	4.35	CEE	112	Nigeria	3.22	SSA
42	Czech Republic	4.33	ADV	113	Bangladesh	3.20	DEVASIA
43	Hungary	4.30	CEE	114	Tajikistan	3.19	CIS
44	Uruguay	4.28	LATAM	115	Kyrgyz Republic	3.13	CIS
45	Croatia	4.22	CEE	116	Malawi	3.05	SSA
46	Montenegro	4.22	CEE	117	Benin	3.05	SSA
47	Jordan	4.17	MENA	118	Algeria	3.01	MENA
48	Italy	4.17	ADV	119	Belize	3.01	LATAM
49	Poland	4.16	CEE	120	Mozambique	2.99	SSA
50	Tunisia	4.12	MENA	121	Suriname	2.99	LATAM
51	China	4.11	DEVASIA	122	Côte d'Ivoire	2.98	SSA
52	Turkey	4.07	CEE	123	Tanzania	2.95	SSA
53	Mauritius	4.06	SSA	124	Zimbabwe	2.94	SSA
54	Brunei Darussalam	4.04	DEVASIA	125	Cameroon	2.93	SSA
55	Kazakhstan	4.03	CIS	126	Mali	2.93	SSA
56	Russian Federation	4.02	CIS	127	Bolivia	2.92	LATAM
57	Panama	4.01	LATAM	128	Nepal	2.92	DEVASIA
58	Costa Rica	4.00	LATAM	129	Syria	2.85	MENA
59	Greece	3.99	ADV	130	Ethiopia	2.85	SSA
60	Trinidad and Tobago	3.98	LATAM	131	Nicaragua	2.84	LATAM
61	Azerbaijan	3.95	CIS	132	Timor-Leste	2.84	DEVASIA
62	Kuwait	3.95	MENA	133	Lesotho	2.78	SSA
63	Mongolia	3.95	CIS	134	Madagascar	2.73	SSA
64	Slovak Republic	3.94	ADV	135	Burkina Faso	2.72	SSA
65	Brazil	3.92	LATAM	136	Swaziland	2.70	SSA
66	Macedonia, FYR	3.91	CEE	137	Burundi	2.57	SSA
67	Romania	3.90	CEE	138	Chad	2.55	SSA
68	Albania	3.89	CEE	139	Mauritania	2.55	MENA
69	India	3.89	DEVASIA	140	Angola	2.49	SSA
70	Bulgaria	3.89	CEE	141	Yemen	2.41	MENA
71	Sri Lanka	3.88	DEVASIA	142	Haiti	2.27	LATAM

Note: Group classification follows the International Monetary Fund's classification (situation as of September 2011).

\* Groups: ADV = Advanced economies; CEE = Central and Eastern Europe; CIS = Commonwealth of Independent States and Mongolia; DEVASIA = Developing Asia; LATAM = Latin America and the Caribbean; MENA = Middle East and North Africa; SSA = Sub-Saharan Africa.

Table 2: Environment subindex and pillars

ENVIRONMENT SUBINDEX			Political and regulatory environment		Business and innovation environment		ENVIRONMENT SUBINDEX			Political and regulatory environment		Business and innovation environment	
Rank	Country/Economy	Score	Rank	Score	Rank	Score	Rank	Country/Economy	Score	Rank	Score	Rank	Score
1	Singapore	5.73	1	5.96	1	5.51	72	Indonesia	3.79	88	3.48	64	4.09
2	Finland	5.56	4	5.80	4	5.32	73	Bulgaria	3.78	99	3.30	53	4.27
3	Sweden	5.51	2	5.86	11	5.15	74	Georgia	3.77	98	3.31	55	4.23
4	New Zealand	5.48	3	5.84	14	5.12	75	Italy	3.75	85	3.50	70	3.99
5	Denmark	5.44	6	5.63	7	5.24	76	Trinidad and Tobago	3.73	90	3.48	72	3.99
6	Switzerland	5.37	7	5.61	13	5.13	77	Azerbaijan	3.73	75	3.60	80	3.86
7	Hong Kong SAR	5.34	15	5.32	3	5.36	78	India	3.72	71	3.65	91	3.80
8	Canada	5.33	12	5.36	5	5.30	79	Mexico	3.72	86	3.50	77	3.94
9	Netherlands	5.33	8	5.55	17	5.10	80	Iran, Islamic Rep.	3.71	78	3.57	81	3.85
10	Norway	5.32	9	5.53	16	5.12	81	Kazakhstan	3.70	92	3.42	71	3.99
11	United Kingdom	5.28	10	5.51	20	5.05	82	Albania	3.70	89	3.48	78	3.92
12	Australia	5.28	11	5.48	18	5.07	83	Romania	3.69	95	3.37	68	4.02
13	Luxembourg	5.27	5	5.79	27	4.75	84	Ethiopia	3.69	72	3.64	99	3.75
14	United States	5.11	21	4.99	9	5.22	85	Egypt	3.68	76	3.59	94	3.76
15	Qatar	5.10	27	4.82	2	5.37	86	Guyana	3.67	81	3.52	88	3.81
16	Iceland	5.02	22	4.98	19	5.06	87	Tajikistan	3.67	52	3.97	128	3.36
17	Saudi Arabia	5.00	29	4.75	8	5.24	88	Senegal	3.66	106	3.18	63	4.15
18	Germany	4.99	13	5.34	32	4.63	89	Cambodia	3.66	73	3.64	106	3.69
19	Israel	4.98	28	4.79	10	5.16	90	Costa Rica	3.66	67	3.70	108	3.62
20	Ireland	4.95	18	5.16	28	4.75	91	Uganda	3.64	63	3.78	120	3.50
21	Austria	4.93	14	5.33	37	4.53	92	Lebanon	3.64	129	2.78	42	4.50
22	Belgium	4.93	26	4.84	21	5.01	93	Peru	3.64	114	3.05	56	4.23
23	Malaysia	4.92	24	4.87	24	4.97	94	Colombia	3.63	82	3.51	95	3.76
24	Taiwan, China	4.88	37	4.47	6	5.28	95	Mongolia	3.59	105	3.18	69	4.01
25	France	4.87	17	5.17	33	4.57	96	Vietnam	3.58	79	3.55	109	3.62
26	Japan	4.85	16	5.18	39	4.53	97	Dominican Republic	3.58	104	3.19	73	3.98
27	Bahrain	4.84	35	4.53	12	5.14	98	Nigeria	3.58	91	3.45	104	3.71
28	United Arab Emirates	4.83	31	4.66	22	5.00	99	Kenya	3.55	94	3.38	101	3.73
29	Barbados	4.82	20	5.09	35	4.55	100	Russian Federation	3.54	102	3.24	83	3.84
30	Chile	4.72	38	4.45	23	4.99	101	Brazil	3.52	77	3.59	121	3.46
31	Cyprus	4.69	36	4.53	25	4.86	102	Tanzania	3.51	65	3.75	129	3.28
32	Estonia	4.69	25	4.85	36	4.54	103	El Salvador	3.46	121	2.97	74	3.96
33	Rwanda	4.66	19	5.10	57	4.22	104	Mali	3.45	93	3.39	118	3.51
34	South Africa	4.65	23	4.92	50	4.37	105	Serbia	3.45	113	3.05	84	3.84
35	Korea, Rep.	4.63	43	4.14	15	5.12	106	Moldova	3.45	109	3.08	89	3.81
36	Oman	4.63	34	4.59	31	4.67	107	Honduras	3.44	100	3.28	112	3.60
37	Malta	4.60	30	4.68	41	4.51	108	Mozambique	3.43	97	3.34	116	3.52
38	Portugal	4.47	42	4.20	29	4.74	109	Bosnia and Herzegovina	3.43	108	3.10	97	3.75
39	Puerto Rico	4.42	41	4.33	40	4.52	110	Armenia	3.42	112	3.06	93	3.77
40	Spain	4.39	44	4.12	30	4.67	111	Philippines	3.42	107	3.15	107	3.69
41	Mauritius	4.38	39	4.36	46	4.40	112	Pakistan	3.42	110	3.08	96	3.76
42	Slovenia	4.34	57	3.88	26	4.81	113	Burkina Faso	3.40	96	3.36	123	3.45
43	Uruguay	4.22	50	4.01	45	4.42	114	Benin	3.35	101	3.27	124	3.43
44	Namibia	4.22	33	4.60	87	3.83	115	Syria	3.33	126	2.88	92	3.79
45	Hungary	4.19	45	4.10	52	4.27	116	Guatemala	3.32	128	2.81	86	3.84
46	Lithuania	4.17	53	3.95	49	4.39	117	Ukraine	3.31	125	2.88	98	3.75
47	Montenegro	4.17	61	3.80	38	4.53	118	Cameroon	3.30	119	2.98	111	3.61
48	Jordan	4.16	58	3.87	43	4.45	119	Ecuador	3.30	120	2.98	110	3.62
49	Latvia	4.14	59	3.87	44	4.42	120	Lesotho	3.28	115	3.03	115	3.54
50	Czech Republic	4.11	51	4.00	59	4.21	121	Belize	3.26	116	3.03	119	3.50
51	Zambia	4.10	70	3.66	34	4.55	122	Argentina	3.26	122	2.94	113	3.57
52	Botswana	4.10	40	4.33	79	3.88	123	Bangladesh	3.24	130	2.75	100	3.73
53	Turkey	4.06	62	3.80	51	4.33	124	Madagascar	3.20	134	2.68	103	3.72
54	Gambia, The	4.06	32	4.61	117	3.51	125	Nepal	3.19	123	2.93	122	3.46
55	Tunisia	4.02	49	4.02	67	4.03	126	Paraguay	3.18	138	2.63	102	3.72
56	Kuwait	3.99	60	3.81	61	4.17	127	Zimbabwe	3.13	111	3.06	132	3.21
57	Brunei Darussalam	3.99	48	4.03	76	3.95	128	Swaziland	3.09	103	3.21	136	2.96
58	Poland	3.98	66	3.75	58	4.22	129	Timor-Leste	3.08	124	2.90	130	3.27
59	Thailand	3.96	69	3.67	54	4.24	130	Côte d'Ivoire	3.03	135	2.68	127	3.38
60	Macedonia, FYR	3.95	83	3.51	47	4.40	131	Suriname	3.02	137	2.64	126	3.40
61	Panama	3.95	84	3.51	48	4.39	132	Kyrgyz Republic	2.99	131	2.73	131	3.25
62	Jamaica	3.93	56	3.91	75	3.95	133	Bolivia	2.98	118	2.99	135	2.98
63	Ghana	3.89	55	3.94	82	3.85	134	Yemen	2.86	142	2.31	125	3.42
64	China	3.88	46	4.07	105	3.69	135	Mauritania	2.85	117	3.01	140	2.69
65	Cape Verde	3.88	54	3.95	90	3.80	136	Algeria	2.83	132	2.70	137	2.96
66	Morocco	3.86	68	3.68	66	4.04	137	Nicaragua	2.82	136	2.66	134	2.99
67	Slovak Republic	3.86	74	3.63	65	4.09	138	Venezuela	2.78	139	2.45	133	3.12
68	Croatia	3.85	80	3.53	62	4.17	139	Chad	2.68	127	2.82	142	2.54
69	Greece	3.85	87	3.49	60	4.21	140	Burundi	2.63	141	2.33	138	2.93
70	Malawi	3.80	47	4.05	114	3.56	141	Angola	2.63	133	2.69	141	2.57
71	Sri Lanka	3.79	64	3.75	85	3.84	142	Haiti	2.62	140	2.38	139	2.86







Table 5: Impact subindex and pillars

IMPACT SUBINDEX			Economic impacts		Social impacts		IMPACT SUBINDEX			Economic impacts		Social impacts	
Rank	Country/Economy	Score	Rank	Score	Rank	Score	Rank	Country/Economy	Score	Rank	Score	Rank	Score
1	Singapore	6.03	2	6.14	3	5.91	72	Albania	3.44	75	3.18	69	3.69
2	Sweden	5.90	1	6.15	6	5.64	73	Russian Federation	3.43	53	3.45	89	3.41
3	Taiwan, China	5.78	7	5.61	2	5.95	74	Egypt	3.43	62	3.33	83	3.52
4	Korea, Rep.	5.76	12	5.31	1	6.21	75	Ukraine	3.42	66	3.28	80	3.56
5	Netherlands	5.64	4	5.89	13	5.40	76	Peru	3.41	72	3.22	75	3.61
6	Denmark	5.53	8	5.48	7	5.58	77	Greece	3.40	73	3.21	77	3.59
7	Finland	5.50	5	5.84	18	5.17	78	Gambia, The	3.37	78	3.16	78	3.58
8	United States	5.42	9	5.47	14	5.38	79	Vietnam	3.33	102	2.85	61	3.81
9	Switzerland	5.42	3	5.92	25	4.92	80	Dominican Republic	3.33	76	3.16	86	3.50
10	Hong Kong SAR	5.37	16	5.05	5	5.69	81	South Africa	3.32	59	3.36	98	3.29
11	United Kingdom	5.35	14	5.18	9	5.52	82	Jamaica	3.32	81	3.13	84	3.51
12	Israel	5.29	6	5.70	28	4.88	83	Mauritius	3.29	83	3.06	82	3.53
13	Norway	5.28	11	5.33	17	5.24	84	Philippines	3.29	77	3.16	88	3.42
14	Canada	5.23	17	5.02	11	5.45	85	Thailand	3.28	96	2.93	71	3.64
15	Estonia	5.21	21	4.65	4	5.77	86	Indonesia	3.28	106	2.84	66	3.72
16	Australia	5.16	20	4.75	8	5.57	87	Georgia	3.26	100	2.91	73	3.62
17	Japan	5.13	10	5.37	26	4.90	88	Nigeria	3.25	60	3.33	102	3.16
18	Germany	5.10	13	5.31	27	4.89	89	Moldova	3.21	91	2.98	87	3.44
19	France	5.03	15	5.08	23	4.98	90	Romania	3.21	98	2.92	85	3.50
20	Austria	5.02	19	4.76	16	5.29	91	Trinidad and Tobago	3.20	89	2.99	90	3.41
21	New Zealand	4.98	25	4.50	10	5.45	92	Mali	3.18	86	3.01	94	3.35
22	Belgium	4.86	22	4.65	20	5.08	93	Kuwait	3.17	110	2.73	76	3.60
23	Iceland	4.67	23	4.58	32	4.77	94	Pakistan	3.12	94	2.95	99	3.29
24	Malaysia	4.64	31	3.97	15	5.31	95	Ecuador	3.12	97	2.92	95	3.31
25	Malta	4.61	28	4.11	19	5.12	96	Argentina	3.07	82	3.07	108	3.08
26	Ireland	4.58	18	4.82	41	4.34	97	Honduras	3.07	85	3.01	104	3.12
27	Lithuania	4.52	30	4.07	24	4.96	98	Botswana	3.06	113	2.70	91	3.41
28	Luxembourg	4.50	27	4.28	34	4.72	99	Armenia	3.05	90	2.98	106	3.11
29	Puerto Rico	4.45	24	4.50	39	4.40	100	Ghana	3.02	88	2.99	111	3.04
30	Bahrain	4.44	54	3.44	12	5.44	101	Guyana	3.00	114	2.69	96	3.30
31	Spain	4.44	33	3.86	22	5.02	102	El Salvador	2.99	93	2.96	113	3.03
32	Qatar	4.43	34	3.81	21	5.05	103	Tajikistan	2.99	115	2.69	97	3.30
33	United Arab Emirates	4.42	29	4.09	33	4.76	104	Lebanon	2.99	92	2.97	114	3.00
34	Slovenia	4.32	32	3.87	31	4.77	105	Bosnia and Herzegovina	2.97	111	2.73	101	3.21
35	Portugal	4.30	37	3.74	29	4.87	106	Benin	2.97	101	2.88	110	3.05
36	Barbados	4.26	26	4.32	44	4.20	107	Venezuela	2.97	95	2.94	115	2.99
37	Chile	4.21	35	3.78	36	4.63	108	Mozambique	2.95	104	2.84	109	3.06
38	Cyprus	4.11	43	3.59	37	4.63	109	Morocco	2.94	127	2.49	92	3.40
39	Uruguay	4.08	47	3.51	35	4.65	110	Cambodia	2.94	126	2.52	93	3.36
40	Saudi Arabia	4.01	40	3.64	40	4.37	111	Serbia	2.94	108	2.76	105	3.11
41	China	3.96	79	3.15	30	4.77	112	Malawi	2.94	99	2.91	117	2.96
42	Oman	3.92	55	3.44	38	4.41	113	Iran, Islamic Rep.	2.93	107	2.76	107	3.10
43	Czech Republic	3.91	38	3.71	48	4.10	114	Kyrgyz Republic	2.91	120	2.59	100	3.24
44	Tunisia	3.90	51	3.46	42	4.33	115	Uganda	2.86	121	2.59	103	3.12
45	Hungary	3.87	44	3.56	45	4.18	116	Bolivia	2.85	117	2.65	112	3.04
46	Latvia	3.83	42	3.62	53	4.04	117	Cameroon	2.84	105	2.84	124	2.84
47	Montenegro	3.80	39	3.70	57	3.91	118	Côte d'Ivoire	2.81	103	2.84	125	2.78
48	Colombia	3.76	58	3.36	47	4.15	119	Namibia	2.81	116	2.68	118	2.93
49	Kazakhstan	3.73	80	3.15	43	4.31	120	Nicaragua	2.78	118	2.63	119	2.93
50	Brunei Darussalam	3.73	64	3.28	46	4.18	121	Zambia	2.77	122	2.58	116	2.96
51	Croatia	3.71	61	3.33	50	4.09	122	Burkina Faso	2.74	109	2.75	127	2.72
52	India	3.70	41	3.64	65	3.76	123	Belize	2.72	123	2.56	122	2.88
53	Brazil	3.70	52	3.46	54	3.93	124	Bangladesh	2.72	125	2.53	120	2.91
54	Italy	3.68	36	3.74	74	3.62	125	Ethiopia	2.66	128	2.43	121	2.89
55	Turkey	3.67	67	3.27	52	4.07	126	Paraguay	2.62	112	2.72	131	2.52
56	Rwanda	3.67	50	3.49	60	3.85	127	Tanzania	2.57	133	2.30	123	2.84
57	Jordan	3.66	70	3.23	49	4.10	128	Nepal	2.54	132	2.33	126	2.75
58	Costa Rica	3.66	45	3.55	63	3.77	129	Madagascar	2.47	134	2.29	128	2.66
59	Kenya	3.59	56	3.41	64	3.77	130	Zimbabwe	2.44	124	2.55	137	2.34
60	Bulgaria	3.59	69	3.26	55	3.92	131	Suriname	2.44	119	2.59	138	2.29
61	Panama	3.58	65	3.28	59	3.88	132	Syria	2.43	136	2.26	129	2.61
62	Mongolia	3.56	84	3.04	51	4.09	133	Timor-Leste	2.43	131	2.36	132	2.49
63	Slovak Republic	3.56	49	3.50	72	3.62	134	Mauritania	2.40	137	2.25	130	2.55
64	Senegal	3.56	46	3.53	79	3.58	135	Chad	2.37	130	2.38	136	2.37
65	Mexico	3.56	71	3.22	58	3.89	136	Lesotho	2.27	139	2.11	134	2.44
66	Poland	3.53	57	3.37	68	3.69	137	Angola	2.26	135	2.26	139	2.26
67	Guatemala	3.52	48	3.51	81	3.54	138	Haiti	2.25	129	2.42	140	2.08
68	Cape Verde	3.50	74	3.20	62	3.79	139	Swaziland	2.24	142	2.01	133	2.47
69	Sri Lanka	3.49	63	3.30	70	3.68	140	Algeria	2.24	140	2.10	135	2.37
70	Azerbaijan	3.48	68	3.27	67	3.70	141	Burundi	2.07	138	2.19	141	1.95
71	Macedonia, FYR	3.45	87	2.99	56	3.91	142	Yemen	1.93	141	2.08	142	1.77

NRI, namely infrastructure and digital content, individual usage, business usage, and economic impacts; and in the remaining six pillars, it ranks no lower than 12th. Sweden has in place a virtuous circle. A conducive environment, combined with the highest degree of readiness and widespread use of ubiquitous technologies, maximize the economic and social impacts of ICT, create new business opportunities, foster innovation, and contribute to reinforce a knowledge-based economy. In this near-perfect assessment, only a handful of indicators call for attention: the typical corporate tax rate is fairly high at 53 percent of profits (114th), and two indicators reveal the length of certain administrative procedures, contrasting with the otherwise extremely efficient institutional framework. In addition, the government could certainly improve its online presence and its degree of interaction with the population, on which two measures Sweden earns a middling 0.53 and 0.49, respectively, on a 0-to-1 scale.

Second to Sweden, **Singapore** leads the group of the Asian Tigers, ahead of Taiwan, China (11th), Korea, Rep. (12th), and Hong Kong SAR (13th), which stand at the doorway of the top 10. Compared with Sweden, Singapore's performance is nearly as impressive. The city state leads the political and regulatory environment pillar and the business and innovation environment pillar, and is among the top 10 of five more pillars. It tops the impact subindex thanks to the 2nd and 3rd rank earned in the economic impacts pillar and social impacts pillar, respectively.

Third overall and second among the Nordics, **Finland** posts a strong performance across all pillars, earning the top spot in the skills pillar, placing in the top 10 of six others, and ranking no lower than 17th in the remaining three. The country's level of readiness is first rate, thanks to its world-class educational system, relatively inexpensive technologies, and excellent infrastructure. As a result, ICT is ubiquitous and uptake by the population is quasi universal. Over 80 percent of households own a PC (16th) and are connected to the Internet (13th). A staggering 87 percent (7th highest rate) of individuals are regular Internet users and mobile broadband Internet is already widespread, with 61 such subscriptions per 100 population. A conducive environment, a skilled population, and pervasive technology all contribute to making Finland one of the most prolific innovators in the world, ranking 3rd for the number of patent applications per capita. In this context, one would almost be concerned by the government's limited success in promoting (20th) and using ICT to engage with the population (30th).

As for the two Nordics preceding it, **Denmark's** state of networked readiness is astounding (4th). The country ranks in the top 10 of six pillars and no lower than 18th in the remaining four. The environment is particularly conducive, be it the institutional and regulatory

framework (6th) or the business context (7th). Individual and business usage is widespread. Denmark posts some of the world's highest per capita figures in terms of Internet users, fixed and mobile broadband Internet subscribers, and PCs. The use of virtual social networks is pervasive, as reflected in Denmark's score (6.6 out of 7) and rank (2nd, behind Iceland) in the associated indicator.

**Switzerland** rounds up the top 5. The country features in the top 10 of six pillars, and comes in at 4th place in the skills pillar. Boosted by the high degree of readiness and a propitious environment, the country boasts very high usage rates. It ranks 6th on the individual usage pillar, owing to very high penetration rates of mobile telephony, computers, Internet, and broadband Internet. Furthermore, it places 2nd in the business usage pillar, behind Sweden. ICT is having a very significant impact on the economy (3rd), leading to new services, products, and business models and fostering innovation. Its impact on society seems to be less marked (25th). This relates to the weakest aspect of Switzerland's performance, namely the modest engagement of its government in promoting and using ICT (35th). The country's performance is also affected by the costliness of ICT (48th) even when adjusting for purchasing power differentials.

The **Netherlands** (6th) delivers a strong performance. The affordability pillar represents the only real weakness in its assessment (47th). The country earns excellent marks in terms of ICT usage (9th). In particular, the Netherlands boasts the world's highest broadband Internet penetration rate with 40 subscriptions per 100 population, the second-highest percentage of computer ownership (92 percent of households), and third-highest percentage of individuals using the Internet (90.1 percent). The country's best rank is achieved in the economic impacts pillar (4th), thanks to the high share of knowledge-intensive jobs in the economy—almost 50 percent, the third highest in the world—and the country's knack for innovation, as reflected in the fifth-highest ratio of ICT-related patent applications per capita.

At 7th place, **Norway** does very well across the board. Yet its average performance in the skills pillar contrasts with that of the other Nordics, which all excel in this dimension, starting with Finland (1st). This turns out to be Norway's weakest performance among the 10 pillars (34th), owing to the relatively low assessment of its educational system. For the rest, the picture is mostly bright. Highlights include 3rd rank in the individual usage pillar. In particular, some 90 percent of households are equipped with a computer and have access to the Internet. Overall, 93 percent of the population use the Internet on a regular basis (the second-highest percentage after Iceland).

At 8th place overall, the **United States** delivers a strong performance. It features in the top 10 of six pillars,

yet fails to make the top 3 of any. Almost all dimensions of the NRI offer room for improvement. The country boasts an environment that is generally conducive for successfully leveraging ICT. Yet the political and regulatory framework (21st) presents some impediments, including the poor functioning of the law-making institutions and regulation that remains burdensome in several aspects. The business and innovation environment is more propitious (9th). In terms of readiness, the country can rely on a very good (6th) and affordable (10th) ICT infrastructure. In order to further boost readiness, efforts are needed to upgrade the skill set of its population (32nd). In terms of individual usage, the United States fails to play a leading role (18th) as usage, though high, is not as widespread as in several other countries, most noticeably the Nordics. For instance, whereas Sweden posts penetration rates of around 90 percent for Internet and PC ownership, the United States' rates do not exceed 75 percent. The picture in terms of business usage is brighter, thanks to the country's innovation capacity. However, once the champion of innovation, challenged only by Japan, for the past two decades the United States has been witnessing several Asian Tigers, the Nordics, Switzerland, and Israel emerging as innovation powerhouses. Indeed, when taking into account their size, some of these economies are actually more prolific than the United States as measured by the number of patent applications per population.

**Canada** ranks 9th overall, earning its best marks in the environment (8th) and readiness (4th) subindexes of the NRI, while lagging behind the best-performing countries in the usage (18th) and impacts (14th) subindexes. In particular, the country ranks 3rd for the quality of its infrastructure and accessibility of digital content, 5th in the business and innovation environment pillar, and 5th in the skills pillar. Despite their proximity in the NRI rankings—with a score difference of only 0.05—Canada and the United States present some disparities when considering the different subindexes. Whereas Canada offers a more conducive environment than the United States, it trails the latter in terms of business usage as well as economic impacts—one of the chief reasons for this is the superior innovation capacity of the United States.

Rounding up the top 10, the **United Kingdom** delivers a consistent, yet perfectible, performance in the NRI. The country obtains its best marks in the usage and impact subindexes. ICT is pervasive among the population at large and in the government. Yet in all these categories, the United Kingdom does not play a leading role as it is systematically outperformed by the Nordics, the Asian Tigers, or both. Finally, its business and innovation environment (20th) would benefit from reforms to further encourage entrepreneurship.

## EUROPE AND THE COMMONWEALTH OF INDEPENDENT STATES (CIS)

Overall, Europe remains at the forefront of the efforts to leverage ICT to transform its economy and society. As previously presented, seven European countries are positioned in the top 10 of the NRI rankings, with the Nordic countries, including Sweden at the very top, leading the way. Notwithstanding this overall strength of Europe as a whole, there are important disparities within the region. Four broadly defined groups of countries sharing different ICT development paths and facing different challenges to further leverage ICT can be identified: the Nordic countries, advanced economies of Western Europe, Southern Europe, and Central and Eastern Europe.

As presented in the section above, the **Nordic countries**, together with Singapore, are the most successful in the world in leveraging ICT. They have fully integrated ICT in their competitiveness strategies to boost innovation, and ICT is present everywhere and in all areas of society, such as education and healthcare. The constant efforts to upgrade ICT infrastructure, coupled with world-class educational systems that specifically focus on developing ICT-related competencies, have resulted in very high rates of penetration. Moreover, the development of business-friendly environments and strong and well-rounded innovation systems conclude the virtuous circle that has led to an emergence of global players in high-tech and innovative products that have transformed these economies.

In **Western Europe**, besides Switzerland (5th), the Netherlands (6th), and the United Kingdom (10th), five other advanced economies attain high positions, ranging from 16th to 23rd place. Overall, these countries exhibit fairly well developed conditions for ICT, although not to the extent of the Nordic countries.

**Germany**, at 16th position, manages to achieve fairly good economic impacts (13th) thanks to its high level of ICT-related innovations and a robust innovation system led by the business community (6th). The country's well-developed ICT infrastructure (14th) and its high-quality educational system (17th), which provides the vast majority of the population with the required skills to effectively use ICT (20th), result in high levels of ICT usage by individuals (14th). Notwithstanding these clear strengths, further improvements could be achieved by rendering access to ICT, especially fixed broadband, more affordable (38th); also the government should recognize further the importance of ICT for the future economic and social development of the country (47th), in line with the Nordic experiences.

With a very similar profile, **Austria** is in 19th position in our rankings. Its very good ICT infrastructure development (12th), including access to digital content (4th) and the fact that virtually the entire population has the basic skills to utilize and access ICT (24th), result in very good

penetration rates by individuals (17th) and the business community (11th). Moreover, the successful integration of ICT in a well-performing innovation system results in positive economic impacts (19th) in terms of innovation and focus on knowledge-intensive activities. On a less positive note, the high tax rate (115th) and the cumbersome procedures to open new businesses (97th) can affect the spirit of entrepreneurship and hinder seizing new ICT-based business opportunities.

**Luxembourg** and **Belgium**, while placed very close to each other at 21st and 22nd place, respectively, present slightly different pictures in terms of ICT development. Although both countries benefit from a fairly well developed ICT infrastructure that facilitates a good uptake by individuals and businesses, Belgium benefits from a better-performing and more robust innovation and educational system that allows the country to obtain better economic impacts thanks to higher innovation rates. On the other hand, Luxembourg counts on more affordable access to ICT and a more entrepreneurial-prone environment with lower taxes.

**France**, in 23rd position, achieves a harmonious uptake of ICT by all agents in society, producing good economic results (15th) in terms of developing innovative products and services (6th) and granting a wide access to basic services (18th). Despite the high cost of mobile cellular rates (121st), ICT infrastructure is fairly well developed and the educational system has allowed the population to acquire a skill base to use ICT. In order to further boost entrepreneurship and innovation via the creation and development of new technology-based companies, the high corporate tax rate (127th) and the insufficient development of venture capital (36th) are areas that may require further attention.

All four of the **European Union's Southern countries**—Portugal, Spain, Italy, and Greece—are still lagging behind in terms of ICT uptake and impacts vis-à-vis the rest of the Western European economies. In general, despite acceptable levels of ICT infrastructure development, the traditional lag in poorly performing educational and innovation systems does not allow these countries to benefit to the same extent from the potential economic impacts accruing from ICT.

**Portugal** and **Spain**, in 33rd and 38th position, respectively, benefit from a fairly well developed ICT infrastructure as reflected by the international Internet bandwidth values, where Portugal ranks 7th and Spain 24th. However, the cost of accessing this infrastructure, especially in the case of Spain (90th), is still high and therefore the uptake rates by individuals and businesses in both countries still lag behind those of more advanced economies. Moreover, the poor quality of the educational system (76th and 98th, respectively) and the traditional lag in research and development and other related innovation investments—especially at the corporate level—do not allow these countries to fully leverage ICT and obtain

the positive economic impacts of other advanced economies in the European Union.

**Italy**, in 48th position, presents a profile similar to those of Portugal and Spain, with a couple of singular characteristics that have relegated the country to this lower position. In addition to the underperformance of the educational and innovation systems, the first particular feature of the Italian case is the weak functioning of the political and regulatory environment (85th), which hinders the overall functioning of the economy. The second singular characteristic is that the government is clearly lagging behind in the effort to leverage ICT to boost competitiveness (113th). Addressing these weaknesses should be a priority not only to leverage the use of ICT, but to boost competitiveness more broadly.

**Greece**, at 59th place, depicts important weaknesses that hinder its capacity to take full advantage of its fairly good ICT infrastructure (42nd). Despite a good ICT penetration at the individual level (49th), both businesses (97th) and the government (102nd) have failed to recognize and fully integrate ICT in their activities. Moreover, in addition to the traditional severe lag in innovation, the convulsive political and regulatory environment (87th) is contributing to the country's inability to fully benefit from ICT, both economically (73rd) and socially (77th).

**Central and Eastern Europe** presents a mixed picture in terms of ICT development and uptake. While some large countries in Central Europe share similar characteristics, other countries are confronted with specific challenges that influence their capacity to take more or less advantage of the potential of ICT.

In the Baltic states, **Estonia**, in 24th place, following the example of the Nordic countries, has widely recognized the role that ICT can play to transform its economy and society. In general, a good ICT infrastructure development coupled with fairly well performing educational systems has resulted in good uptake rates by all agents in the region, especially in Estonia and to a lesser extent in **Latvia**. The government vision to develop the sector and spread its effects to all areas of the economy has been significantly important in Estonia (18th), while this has lagged behind a bit in both **Lithuania** (71st) and **Latvia** (103rd). As a result, Estonia is benefiting from important ICT-related impacts both in the economy and society (15th), while Lithuania (27th) and Latvia (46th) are not yet at that level.

**Slovenia** (37th) and **Croatia** (45th) have both managed to develop a fairly good ICT infrastructure that, coupled with high rates of adult literacy and secondary education enrollment, allows for important penetration rates (37th and 47th, respectively). Improving the quality of the educational system and strengthening the overall innovation system so that ICT investments can be fully integrated and yield better economic results remain an outstanding challenge, especially for Croatia. In contrast



with this rather good outlook, **Bosnia and Herzegovina** and **Serbia** are relegated to 84th and 85th position, respectively, in our rankings. These scores are the result not so much of the level of infrastructure development or the skill base of their populations, but of the actual ICT uptake, especially by the business community (126th and 133th, respectively) and the government (123rd and 115th, respectively). In addition, serious weaknesses in their innovation systems, which need to be restructured and expanded, hinder their capacity to leverage ICT for deeper economic and social impacts.

In Central Europe, the **Czech Republic**, **Hungary**, **Poland**, the **Slovak Republic**, and to a lesser extent **Romania** and **Bulgaria**—in 42nd, 43rd, 49th, 64th, 67th, and 70th place, respectively—manage to develop their ICT infrastructures fairly well, although the high costs of accessing it, especially in the Czech Republic (93rd) and the Slovak Republic (104th), affects the actual uptake capacity of large shares of the population. The ICT development in these countries has been favored by their integration into the European Union and the positive actions carried out under the Digital Agenda initiative of the European Commission. However, their governments seem to lag behind in recognizing the importance of ICT and drawing a clear vision and development plan (ranking 106th, 95th, 116th, 107th, 117th, and 101st, respectively, on this indicator) for its expansion. Moreover, with the exception of the Czech Republic, important weaknesses in the overall innovation system, especially at the corporate level, hinder full leverage of ICT and therefore the economic transformation of these economies toward more knowledge-intensive activities. Finally, in the cases of Romania and Bulgaria, the overall political and regulatory environment (95th and 99th) also affects the development of privately led economic activity in general, and the birth and growth capacity of any innovation-related business in particular.

**Turkey**, in 52nd position, does not manage to enter into the top 50 economies that are best leveraging ICT to boost competitiveness and well-being. The population's insufficient level of skills (92nd), caused by its relatively low levels of secondary education enrollment (93rd) and the poor quality of the educational system (94th), hinder an effective ICT use of all the agents in the economy (59th). In order to further benefit from the positive impacts of ICT and move its economy toward more knowledge-intensive activities, an overall strengthening of the educational and innovation systems, with more and more efficient investments, will be crucial. These investments cannot be the exclusive responsibility of the government; the business community will have to contribute as well by fully recognizing the business opportunities that they can offer and how these affect their capacity to compete in an increasingly globalized market.

**Kazakhstan**, the **Russian Federation**, and **Azerbaijan** are the best performers among the CIS

countries, at 55th, 56th, and 61st position, respectively. All three countries count on affordable access to ICT infrastructure, although the development of this infrastructure is superior in the case of the Russian Federation (40th, compared with 71st and 72nd for Kazakhstan and Azerbaijan). However, the vision and commitment of the government to boost ICT as a driver of economic growth is lower in Russia, and in all three cases the innovation system, which underwent deep restructuring after the collapse of Communism, has not yet been fully reorganized or redeveloped. The Russian Federation still maintains pockets of scientific excellence, but unfortunately they do not seem to spill over into the productive sector. This, coupled with a weak political and regulatory environment (92nd, 102th, and 75th for Kazakhstan, Russia, and Azerbaijan, respectively) and a somewhat entrepreneurship- and innovation-averse environment (71st, 83rd, and 80th, respectively) affect the capacity of all three countries to reap the full economic benefits associated with higher rates of technology development (80th, 53rd, and 68th, respectively). Moving forward, in addition to continuing to upgrade and develop their ICT infrastructure, all three countries should improve the quality of their educational systems and build effective innovation systems with the active participation of the private sector. Improvements in these three areas should go hand in hand with more and stronger economic impacts associated with higher rates of innovation and the development of more knowledge-intensive activities.

Despite benefiting from a relatively skillful population (39th), a considerable development of the innovation capacity of its firms (42nd), and one of the lowest access tariffs for ICT (2nd), **Ukraine** places only at 75th position. Its ICT infrastructure needs to be further developed. Moreover, the lack of a strong government vision to develop ICT coupled with unfavorable innovation conditions (98th) and weak legal foundations for economic activity (125th) are jeopardizing the country's great potential to benefit from stronger social and economic impacts (75th). Improvements in the framework conditions will be a prerequisite for the country to boost the economic benefits accruing from deeper levels of technological progress.

**Georgia**, **Armenia**, and especially **Tajikistan** and the **Kyrgyz Republic**, in 88th, 94th, 114th, and 115th position, respectively, close the regional rankings. Weaknesses in the development of ICT infrastructure, especially for the two Central Asian republics, coupled with the high costs of accessing it, result in a poor technology uptake by all agents. Unlike the cases of mineral-rich Kazakhstan and Azerbaijan, governments in these countries have not yet led the process of fully deploying ICT; this results in inevitable lower economic and social impacts.



## ASIA AND THE PACIFIC

Asia and the Pacific region is home to some of the world's wealthiest, most innovative, and most digitized nations in the world and also to some of its poorest, least-connected countries.

The second of the Tigers, **Taiwan, China** comes in at 11th place overall. ICT has been at the core of the island's economic success since the early 1980s when it started moving up quickly the value chain, away from agriculture and low-end manufacturing, to become a major manufacturer of electronics and high-tech products and later an innovation hub. The government has been instrumental in this transformation. In the NRI, Taiwan, China ranks 3rd in the government usage pillar, 7th in the economic impacts pillar, and 2nd in the social impacts pillar. Yet, unlike Singapore and Hong Kong SAR, which feature prominently in this category, Taiwan, China suffers from weaknesses in its political and regulatory framework (37th). By contrast, its business and innovation environment are very favorable (6th).

For the **Republic of Korea** (12th), the regulatory framework also represents the main area of concern (43rd). The third-ranked Tiger earns low marks in areas related to the functioning of its public institutions. For the rest, the country's performance ranges from good to outstanding. It ranks 2nd to Sweden in terms of individual usage, with impressive penetration rates. In particular, Korea shows the way in terms of mobile broadband access, with close to 80 subscriptions per 100 inhabitants. At home, a staggering 97 percent of households have access to the Internet. Furthermore, Korea leads the government usage and social impacts pillars.

**Hong Kong SAR** (13th) delivers a consistent performance, although punctuated by fewer highlights than the other three Tigers. The territory appears in the top 10 of three pillars, ranking 3rd in the business and innovation environment pillar, and 5th in both the affordability pillar and the social impacts pillar. In addition, and unlike Korea and Taiwan, China, its economy is not innovation driven and relies more on trade and financial services. On the other hand, Hong Kong does not exhibit any major weaknesses in the NRI, its lowest pillar rank being a quite strong 28th in the infrastructure and digital content pillar. And when looking at individual indicators, one notices that Hong Kong has almost 200 mobile telephone subscriptions per 100 inhabitants, a world record. It also boasts the world's largest Internet bandwidth per user (780 kilobytes per second).

**New Zealand** (14th) offers one of the most conducive environments for the successful development and leveraging of ICT. Its public institutions are particularly well functioning and efficient (3rd). The country also boasts a high degree of readiness, thanks to the excellent skill base of the population (6th) and world-class infrastructure (9th). As for most advanced economies featuring high in the NRI, the affordability pillar is the only real weakness of New Zealand (63rd).

New Zealand's distant neighbor, **Australia**, ranks three notches behind at 17th position. Its institutional framework and business climate also offer a favorable context (12th in the environment subindex). The country's readiness would be excellent if not for its pricy ICT. Australia ranks 100th in the affordability pillar, at odds with its 7th rank in the infrastructure and digital content pillar and 11th in the skills pillar. The government's success at ICT promotion and usage is reflected in its good marks in the government usage (8th) and social impacts (8th) pillars.

One of the world most prominent innovation powerhouses, **Japan** ranks only 18th, owing to a number of important shortcomings in the environment subindex of the NRI, including red tape. The biggest competitive advantage of Japan is, without contest, its innovative and sophisticated business sector (3rd). Technology and innovation have greatly contributed to making Japan one of the most productive economies in the world. Beyond this economic impact, they have not had such a transformational impact on society at large (26th). A more supportive business environment and renewed commitment by the government to lead the digital revolution could usher in a new development model for Japan.

In 29th position, **Malaysia** is the top-ranked country from the Developing Asia region. Trying to emulate the success of Korea and other Asian Tigers, the Malaysian government has been pursuing a long-term plan with the ambition of achieving high-income status by the end of the decade, with ICT playing a critical role. Most government-related indicators reflect this commitment, and Malaysia ranks 6th in the government usage pillar—not too far behind three Asian Tigers. Businesses are quite aggressive at adopting technology and increasingly innovative. These government-led efforts seem to be starting to have a transformational impact on the economy (31st) and on society at large (15th). On a less positive note, Malaysia ranks an average 47th in the individual usage pillar.

More than 20 places separate Malaysia from **China**, the next-ranked Developing Asian country. At 51st, China leads the BRICS, the group of large emerging economies.<sup>12</sup> Yet this should offer little consolation in light of the important challenges ahead that must be met to more fully adopt and leverage ICT. China's institutional framework (46th) and especially its business environment (105th) present a number of shortcomings that stifle entrepreneurship and innovation, including excessive red tape and long administrative procedures, lofty taxation amounting to 64 percent of profits (124th), uncertain intellectual property protection—it is estimated that almost 80 percent of installed software in China is pirated—and limited or delayed availability of new technologies (100th). In terms of readiness, the country ranks a low 87th in the infrastructure and digital content pillar, mainly because of its underdeveloped Internet infrastructure. China gets

high marks in the cost measures (42nd, with a score of 5.7) and to some extent in the education-related variables, as reflected in the satisfactory score of 5.2 in the skills pillar. Looking at actual ICT usage, figures remain quite low in absolute terms but should be considered in light of the sheer size of the country. ICT usage by businesses is significant (37th). China is becoming more and more innovative and this in turn encourages further and quicker adoption of technologies. The government is placing great hopes in ICT as a catalyst for future growth, because more traditional sources of growth will dry up. The efforts of the government in promoting and using ICT are reflected in China's good showing in the government usage pillar (33rd). For the time being, the impact of ICT on the economy remains limited (79th in the economic impacts pillar).

Almost 20 ranks behind China, **India** at 69th place overall delivers a very mixed performance, with encouraging results in a few areas and a lot of room for improvement elsewhere, notably in the political and regulatory environment (71st) and the business and innovation environment (91st). Extensive red tape stands in the way of businesses and corporate tax is among the highest of all analyzed countries. For instance, it typically takes four years and 46 procedures to enforce a contract. Starting a business is longer and requires more paperwork than in most countries. Other variables in the environment subindex are better assessed, including the availability of new technologies (47th), the availability of venture capital (27th), the intensity of local competition (31st), and the quality of management schools (30th). One of the weakest aspects of India's performance lies in its low penetration of ICT. The country ranks 117th in the individual usage pillar. There are 61 mobile subscriptions for every 100 population—a relatively low figure. A mere 7.5 percent of the population uses the Internet. Six percent of households own a PC and broadband Internet remains the privilege of a few, with less than one subscription per 100 population. Upgrading skills and infrastructure would contribute to increasing these figures. Already, fierce competition and innovations for the “bottom of the pyramid” have made India the leader in the affordability pillar, thus providing a significant boost to the country's readiness. Although penetration is still limited among the population at large, businesses are early and assiduous adopters of new technologies (47th). And the government is placing a great deal of emphasis on ICT as a way to address some of the country's most pressing issues, including job creation, corruption and red tape, and education. Whether this vision will translate into a transformation of the economy and society remains to be seen. But already ICT is having a—small—transformational impact on the economy, which is partly reflected in India's performance in the economic impacts pillar (41st).

Coming in at a low 77th rank, **Thailand** presents a number of shortcomings in all dimensions of the NRI. Thailand ranks in the top 50 of just one pillar, affordability (33rd), and as low as 107th in infrastructure and digital content. Indeed, there are only 2 indicators out of 53 in which the country ranks better than 50th: the number of procedures to start a business (28th) and mobile cellular tariffs (14th). ICT usage (83rd) remains scant by international standards. And, unlike other economies in the region, ICT development does not seem to be a priority for the government, witness Thailand's 86th rank on government usage.

Thailand is followed closely by three fellow Association of Southeast Asian Nation (ASEAN) members: **Indonesia** at 80th position, **Vietnam** at 83rd, and the **Philippines** at 86th. The performances of these four countries, which together are home to almost 500 million people, are remarkably similar across the different components of the Index, and disappointing, too. Some differences exist in the environment subindex and to some extent the readiness subindex. The environment is significantly more conducive in Thailand (59th) and Indonesia (72nd) than in Vietnam (96th) and the Philippines (111th). Using ICT is also much cheaper in Thailand and Indonesia. When it comes to ICT usage, all four countries display very limited uptake among the population, especially Indonesia (103rd) where the Internet, for instance, is used by less than 10 percent of the population. Businesses are generally prompter at adopting technology in Indonesia, but even then figures are low by international standards. As for the efforts of the respective governments in using and promoting ICT, they remain very timid, with the exception of Vietnam, which ranks 48th in government usage, while the others are found beyond the 70th mark. In light of the many shortcomings, the economic and social impacts of ICT in these countries are necessarily limited. No doubt these countries could learn from Singapore and Malaysia, two ASEAN members that have been very successful at leveraging ICT. This could be done in the context of the recently adopted ASEAN ICT Master Plan 2015.

## LATIN AMERICA AND THE CARIBBEAN

Latin America and the Caribbean continues to suffer from an important lag in adopting ICT and technology more broadly. This is reflected in the rankings, as no country manages to reach the top 30 and only a handful of small economies manage to be included among the top 50—the exceptions are Barbados, Puerto Rico, Chile, and Uruguay. Although the region is vast and heterogeneous, three shared reasons for this lag can be identified: these countries all exhibit an insufficient investment in developing their ICT infrastructure, a weak skill base in the population because of poor educational systems that hinder society's capacity to make an effective use of these technologies, and unfavorable business

conditions that do not support the spur of entrepreneurship and innovation. Addressing these weaknesses will be crucial for improving the region's competitiveness and shifting its economies toward more knowledge-based activities.

Two small Caribbean islands top the regional rankings: **Barbados** in 35th place and **Puerto Rico** in 36th place. Both economies boast environments conducive for entrepreneurship and benefit from relatively robust ICT infrastructures, although mobile coverage in Puerto Rico (123rd) remains insufficient. In the case of Barbados, the strong skill base (10th) results in a large individual uptake of technology (24th) and offsets the high costs of using ICT (102nd). On the other hand, Puerto Rico needs to further develop the skills of its population (78th), which currently negatively affects the uptake of technology by individuals (53rd). In both cases, ICT development has been led mainly by the private sector, especially in the case of Puerto Rico (21st), as the governments in both islands have lagged behind in steering ICT progress (61st and 54th, respectively). Moving forward, Barbados would obtain higher economic impacts from its overall good ICT uptake should the private sector further improve its overall innovation capacity (91st). In the case of Puerto Rico, improvements in the performance of its educational system, especially in math- and science-related subjects (91st), would also allow a better integration of ICT in a more solid innovation system.

**Chile**, in 38th position, clearly depicts the strongest performance in Latin America. Benefiting from an entrepreneurial-friendly and well-functioning legal framework, recent efforts to improve the overall innovation system, while still insufficient, have paved the way for this top position within the region. Notwithstanding these important merits, the country still suffers from a series of weaknesses that do not allow it to benefit from the potential benefits of ICT and technology more broadly. Although its ICT infrastructure achieves good scores in certain dimensions, notably mobile network coverage (1st), the technological preparedness of the country is severely hindered by the excessive costs of accessing ICT (89th) and above all the poor quality of an educational system that requires improvement and that fails to provide the necessary skill base (83rd) to fully optimize the use of ICT. Therefore, despite the government-led effort to leverage ICT (26th) with one of the widest offerings of online services in the world (18th), the penetration rates in individual households (55th) still lags behind. In addition, the business community needs to invest in upgrading its capacity for innovation (62nd) in order to facilitate the achievement of further economic impacts and shift the national economy toward more knowledge-intensive, higher-value-added activities.

Close behind, **Uruguay**, at 44th place, is one of the leading countries in the region that has recognized the

importance of ICT. This process has been led by the government (36th), which has made important efforts to build a good ICT infrastructure in the country (49th) and grant wide access to ICT to school pupils (11th) with its one computer per student policy. Despite these efforts, the technological readiness (63rd) of the country still needs improvement, especially in terms of raising the quality of the educational system that presently hinders the ability to seize the full benefits of the opportunities that ICT, and technology more broadly, can offer. Moreover, weaknesses in the innovation system, especially at the corporate level (65th), hamper the capacity of the country to move toward more knowledge-intensive activities (67th). Addressing these weaknesses would represent the next step to fully leveraging ICT deployment for competitiveness and social well-being.

**Panama** and **Costa Rica**, in 57th and 58th position, respectively, clearly stand out from the rest of the countries in Central America—a region that suffers overall from an important connectivity lag, a low skill base, and weaknesses in its business environment. Despite obtaining similar scores and levels of ICT usage (56th and 63rd, respectively), Panama and Costa Rica face different challenges to improving their level of preparedness to leverage ICT for competitiveness and well-being. In the case of Panama—while by regional standards the country benefits from a fairly good ICT infrastructure (55th), especially in terms of international Internet bandwidth (47th)—the very low skill base hinders its capacity to achieve higher ICT uptakes and stronger economic impacts (65th). Conversely, Costa Rica benefits from a strong skill base (26th) thanks to a well-performing educational system (23rd), but the country suffers from an ICT infrastructure lag (77th) that thwarts its ability to achieve higher ICT uptake rates. In both cases, improving their overall innovation systems would allow them to benefit further from the ICT efforts and contribute to shifting their economies toward more knowledge-intensive activities, especially in the case of Panama (84th).

**Brazil**, positioned narrowly above the middle range of our rankings at 65th place, benefits from strong levels of business ICT usage (33rd). These, combined with fairly advanced levels of technological capacity (31st) in particular segments of its industry, allows the country to achieve one of the strongest performances of ICT-enabled innovations in the region, both in terms of new products and services (29th) and more efficient processes (34th). Notwithstanding these strengths, its overall business environment with its burdensome procedures to create new businesses (138th) and its high tax rates (130th), in addition to its high mobile cellular tariffs (133rd) and poor skill availability (86th), hinder the potential of the Brazilian economy to fully benefit from ICT and shift toward more knowledge-based activities (76th) at a faster pace.

**Colombia**, at 73rd place, right below the median of our sample, presents a mixed picture in terms of ICT development and uptake. On the one hand, the government offers a large number of public services online (9th) and the information it provides through its websites encourages citizens' participation (26th). Moreover, Colombia benefits from a relatively skillful population (58th). On the other hand, the country still suffers from important challenges that hamper its capacity to leverage ICT to boost competitiveness and raise well-being. The lag in terms of ICT infrastructure and digital content (88th), coupled with unfavorable framework conditions for entrepreneurship and innovation (95th), result in a low ICT usage by businesses (71st). In addition, the uptake of ICT by individuals (76th) is still low, with less than 20 percent of the population accessing the Internet at home.

The lack of a holistic digital agenda, currently under debate, prevents **Mexico** from taking full advantage of ICT. At 76th position, the government of Mexico has made important efforts to increase the number of services online (38th) and boost the e-participation of citizens through useful, high-quality, and relevant websites (32nd) that provide information, thus enhancing public governance. However, the country still faces significant weaknesses. An insufficient development of ICT infrastructure (81st), especially in terms of international Internet bandwidth (87th), coupled with the high costs of telecommunications (100th) and poor educational standards (107th) negatively influence the effective and productive use of ICT by individuals (77th) and businesses (75th). Moreover, despite the recent improvements that facilitate entrepreneurship by reducing the number of procedures and time to open a business (42nd), the functioning of some public institutions and the development of a strong innovation system are still pending challenges to creating a conducive environment for higher ICT impacts (79th). Addressing these weaknesses in a holistic manner will determine the success of the country in benefitting from the opportunities that ICT has to offer.

**Argentina**, in 92nd position, benefits from a fairly well developed ICT infrastructure (58th), especially in terms of international Internet bandwidth (41st) and high levels of adult literacy (51st) that could pave the way to a high and effective ICT uptake by all members of society. However, while individuals reach acceptable usage rates (58th), businesses (86th) seem to lag behind, and the perception of the business community is that the government is not prioritizing the use of ICT sufficiently (134th). In order to further leverage ICT usage, reducing the high costs of accessing ICT (103rd) would be beneficial. In addition, addressing the enduring shortcomings in the political and regulatory environment (122nd) as well as in the framework conditions to boost entrepreneurship and innovation (113rd) would allow the country to increasingly shift its economy toward more knowledge-intensive, higher-value-added activities.

Despite the economic growth that **Peru** has experienced in the past year, at 106th place the country still lags significantly behind in terms of ICT. An insufficiently developed and expensive (141st) ICT infrastructure (86th) coupled with a low-quality educational system (128th) hinders the preparedness of Peru to make an effective use of ICT. As a result, the use of ICT by all three actors—individual, business, and government—is still low (81st), and despite relatively good framework conditions for entrepreneurship (56th), the potential economic impacts are not yet accruing.

Finally, **Venezuela** (107th), **Paraguay** (111th), **Bolivia** (127th), **Nicaragua** (131st), and, closing the rankings, **Haiti** (142nd) trail behind the rest of countries in the region. These countries continue to suffer from some worrisome connectivity weaknesses, both in terms of physical and human infrastructure, which—coupled with an innovation-adverse environment—result in poor leverage of ICT for boosting competitiveness and raising well-being.

### SUB-SAHARAN AFRICA

The level of ICT readiness in sub-Saharan Africa is still very low, with most countries evidencing strong lags in connectivity because of an insufficient development of ICT infrastructure, which remains too costly. Low levels of skills that do not allow for an efficient use of the available technology add to the challenges these countries face if they are to increase ICT uptake. Moreover, most countries still suffer from poor framework conditions for business activity that, coupled with the above-explained weaknesses, result in poor economic impacts that hinder the much-needed transformation of the region toward less resource extraction-oriented activities and higher-value-added production. Nine out of the last 10 countries in our sample belong to the region and the results evidence the digital divide the region suffers vis-à-vis more developed regions.

**Mauritius**, in 53rd position, leads the regional classification and is the only economy in the top half of our rankings. By means of a process decisively led by the government that has identified ICT development as one of its three pillars for economic development,<sup>13</sup> the country has managed to create a fairly sophisticated enabling environment for ICT development (41st), with a stable political and regulatory framework (39th) and fairly good conditions for entrepreneurship and innovation (46th), although the rate of tertiary education enrollment is low (82nd). However, despite ICT infrastructure (73rd), which is still in need of improvement, becoming affordable (23rd), the level of uptake by businesses (62nd) and individuals (73rd) remains low. This, in turn, results in low economic (83rd) and social (82nd) impacts. Improving the overall skills (63rd) and the capacity to integrate ICT into a broader innovation system at the corporate level will be crucial for the country to benefit from the



transformational impacts of ICT and drive the national economy toward more value-added activities.

Despite counting on one of the most solid political and regulatory environments (23rd) and better framework conditions for entrepreneurship and innovation (50th) in the region, **South Africa**, at 72nd place, is not yet leveraging the potential benefits associated with ICT. Important shortcomings in terms of basic skills availability (94th) in large segments of the population and the high costs (94th) of accessing the insufficiently developed ICT infrastructure (82nd) result in poor rates of ICT usage (76th), despite efforts on the part of the business community to use ICT and integrate it in a broader, firm-based innovation system (34th). As a result, the economic impacts accruing from ICT are patchy (59th) and the social impacts disappointing (98th). Upgrading the overall skills at all layers of society and increasing efforts to build affordable infrastructure for all would allow the country to increase its ICT readiness and uptake and, in turn, spread its impacts across society.

**Rwanda**, in 82nd position, evidences important problems of connectivity associated with a poor deployment of an expensive (119th) ICT infrastructure (113th) and very low levels of basic skills (118th) that hinder the capacity of the population to make effective use of ICT. As a result, levels of ICT usage are very low, especially for individuals (133rd) and businesses (66th). Improving the ICT readiness of the country by developing the necessary infrastructure—which could be done through public-private partnerships—and enhancing the overall skills of the population would result in higher economic and social impacts, especially because the country counts on fairly favorable framework conditions, allowing these benefits to accrue.

Similar to Rwanda, **Kenya** and **Ghana**, in 93rd and 97th position, respectively, suffer from low levels of ICT readiness due to the underdevelopment of ICT infrastructure and the lack of a widespread skill base that would enable society to make an optimal use of technology. In the case of Kenya, as for Rwanda, in addition the cost of accessing these technologies is still high for a large share of the population (109th). As a result, both countries suffer from low ICT uptake rates by all agents, especially individuals, and hence the transformational impacts of ICT are low. Other countries in East Africa, such as **Zambia**, **Uganda**, and **Tanzania**—in 109th, 110th, and 123rd position, respectively—depict a similar profile and face similar challenges to boosting the development and uptake of ICT.

Finally, a last tier of countries in West and South Africa, including **Zimbabwe**, **Cameroon**, **Lesotho**, **Madagascar**, **Burkina Faso**, **Swaziland**, **Burundi**, **Chad**, **Mauritania**, **Angola**, and **Yemen**—ranging from 124th to 141st position—essentially close our rankings. All these countries suffer from severe weaknesses in all components of our Index, from poor connectivity caused

by expensive and poor-quality ICT infrastructure to very low levels of basic skills and weak framework conditions for technology-rich activities to flourish. Not surprisingly, these countries also present the weakest results in terms of ICT impacts.

### MIDDLE EAST AND NORTH AFRICA

Overall, there are large differences in ICT use and impacts across the region, with countries grouping around three subregions: Israel and the Gulf Cooperation Council states; the Levantine nations; and, finally, the countries in North Africa. While Israel and most of the Gulf Cooperation Council states seem to have embraced ICT uptake and have started to gain from the associated benefits, countries in the latter two groups still suffer from important weaknesses that hinder their capacity to fully leverage the use of ICT to increase competitiveness and accelerate the positive social impacts that are associated with technology.

**Israel**, in 20th position in the rankings, epitomizes the success of an economy that—despite not counting on vast endowments of natural resources—has succeed in securing a high level of development thanks to ICT and innovation. Ranked 6th in terms of economic impacts, with one of the highest rates of ICT PCT patent applications (3rd), the country has managed to create very favorable market conditions for entrepreneurship and innovation (10th), which has acted as a catalyst for the high ICT uptake and readiness of the business community (7th). Moving forward, the country could benefit even more should it be able to address some of its key infrastructure shortcomings, especially in terms of international Internet bandwidth (84th), and improve further the quality of its educational system (48th), especially in fields related to math and science (79th).

Leading the Arab World, **Bahrain**, in 27th place, as in the case of Israel, creates a fairly sophisticated enabling environment for entrepreneurship and innovation (11th) that, coupled with a good ICT readiness (25th) in terms of infrastructure, affordability, and overall skills, has brought the country to this good position. However, unlike Israel, this process has been led mainly by a strong commitment from the government (4th) that has not yet been followed by the rest of the agents with the same intensity, notably the business community (39th). As a result, the positive economic impacts reflecting higher rates of innovation and the shift toward more knowledge-based activities have not yet taken off (54th). Efforts to integrate ICT in a more general innovation ecosystem at the corporate level should help to boost the desired economic impacts of ICT and technology more broadly.

Closely following Bahrain, **Qatar** appears in 28th position. As in the case of Bahrain, the emirate has managed to create one of the best environments for entrepreneurship and innovation worldwide (2nd). This, coupled with the government's strong commitment to



boosting ICT-related infrastructure (27th) and spilling over the effects across the economy (34th) and society (21st), has allowed the country to rank in the top quarter of our sample. On a less positive note, the low levels of competition existing in the ICT and telecommunications sectors (122nd) are affecting the overall affordability of accessing ICT (111th), especially in terms of broadband (109th), hindering a wider diffusion and usage of ICT across the different agents in the country, such as broadband Internet subscriptions (57th).

The **United Arab Emirates**, at 30th place, presents a profile similar to neighboring Qatar's. With the government's strong commitment to develop and prioritize ICT (7th) as one of the key engines to diversify its still oil dependent economy, the country has managed to develop a good ICT-related infrastructure (25th) and a favorable framework for business and innovation (21st) that result in fairly good innovation rates in the form of both new products and services (15th) and new organizational models (21st). Notwithstanding these efforts, the country would benefit further from expanding its overall skill base, especially eradicating adult illiteracy (86th) and increasing tertiary education participation (86th). As in the case of Qatar, liberalizing the ICT and telecommunications markets (117th) would help reduce the high costs of accessing the Internet (94th).

**Saudi Arabia**, in 34th place, has equally recognized the importance of ICT as a key driver of its economic transformation. A committed and strong government-led effort (5th) to prioritize ICT (14th) coupled with a very favorable environment for business development (8th) has yielded fairly good results to get the country ready for the ICT revolution, especially in terms of infrastructure development (36th). However, as in the case of the United Arab Emirates and Qatar, boosting higher levels of competition to reduce the costs of communications (85th), improving the skill base by reducing adult illiteracy (98th), and increasing tertiary education participation (66th) should be the immediate priorities to further increase ICT uptake by all agents in the country.

**Kuwait**, in 62nd position, is the laggard in the region in terms of embracing ICT. Despite a fairly good ICT-related infrastructure development, the high costs of accessing it and the population's relatively low level of skills are affecting the ICT readiness of the country. As a result, Kuwait depicts fairly poor rates of ICT usage (67th) that, coupled with a less business friendly environment for entrepreneurship (56th) than other Gulf Cooperation Council states, result in low levels of ICT impacts (93rd).

**Jordan**, in 47th position, leads the ICT race by far in the group of Levantine states. Despite the need to improve its ICT infrastructure (79th), especially in terms of getting access to a wider international Internet bandwidth (92nd), the country—led by a strong commitment of the government (37th)—has managed to liberalize the markets and provide affordable access to ICT (9th)

and improve its business and innovation environment (43rd), although some weaknesses remain. **Lebanon** and **Syria**, in 95th and 125th position, respectively, on the other hand, still suffer from important weaknesses in terms of ICT development that hinder their capacity to take full advantage of the benefits accruing from the deployment and use of these and other technologies.

**Tunisia**, ranked in 50th place, leads the rankings in North Africa. ICT development in the country has been led by a strong commitment of the government to boost ICT uptake. This commitment, coupled with a fairly good educational performance—despite a high rate of adult illiteracy (108th)—allows the country to position itself ahead its North African neighbors. Improving affordable (73rd) access to a more robust ICT infrastructure and digital content (70th) would help improve the still-low uptake of ICT by individuals (78th) and businesses (51st).

ICT development in **Egypt** has been traditionally led by the government that in the past years has made a strong effort to make ICT access affordable (12th) and enlarge the number of services it offers online (23rd). However, despite these efforts, neither the individuals (79th) nor especially the business community (103rd) have managed to match this effort, and as a result the country is placed at 79th place. Upgrading the ICT infrastructure (89th), developing more digital content in Arabic (100th), improving the general environment for entrepreneurship and innovation (94th), and enhancing the available skill base (108th) should be the four priorities for the country to encourage higher and more homogeneous usage rates and achieve increased positive impacts.

**Morocco** and **Algeria**, in 91st and 118th places, respectively, are lagging in benefiting from the transformational impacts of ICT, especially in the economy (127th and 140th). Low levels of ICT infrastructure development, coupled with insufficient available skills, translate to weak uptake rates of technology by all agents, especially the business community and individuals. In addition, in the case of Algeria, the very unfavorable business condition (137th) that acts as a filter for innovation hampers the capacity of already-scarce efforts to result in meaningful economic impacts. Addressing these weaknesses in a timely manner will be crucial for both countries to start shifting their national economies toward knowledge-rich and higher-productivity activities.

## CONCLUSIONS

The rapid changes that the ICT industry has experienced in the last decade have brought about deep transformations in the way our economic activity and society are organized. We live in a hyperconnected world where the sense of immediateness and constant accessibility is redefining the relationships between and across individuals, businesses, and governments. Societies that recognize the potential opportunities that new technologies unveil will be better prepared to reap the potential

### Box 3: Testing the robustness of the evolved NRI framework: The relationship between ICT drivers and ICT impacts

Any data-driven model that aims at capturing a complex process such as measuring the determinants of ICT uptake and its associated economic and social impacts can only be tentative. No quantitative analysis can fully take into account the richness and complexity of the relationships that exist between the underlying factors. Furthermore, in many cases the available data, especially for a large set of countries, are patchy and incomplete. Therefore, assessing the robustness of any model becomes crucial to ensure that it captures the right factors and the relationship between the determinants and the results of the analyzed phenomenon.

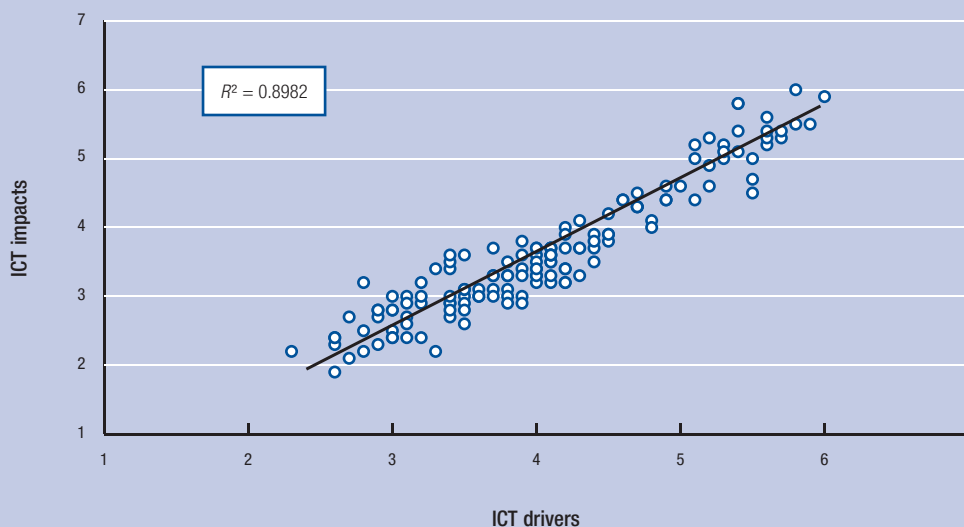
The present edition of *The Global Information Technology Report* introduces an evolved framework where, for the first time, the ICT economic and social impacts (ICT impacts) are explicitly and clearly differentiated from the three factors that drive these impacts (ICT drivers): an environment enabling a strong ICT uptake and favorable for economic and social impacts to accrue, a strong ICT readiness, and substantial ICT usage. As a result, the model allows—also for the first time—the ability to check on the relationship between the

drivers of ICT on the one hand and their associated impacts on the other. In other words, it allows testing whether the framework is robust enough to identify and measure those factors that are relevant for achieving the desired ICT impacts, which is the end policy objective.

Running an econometric model to test the causality effect of each of the ICT drivers on the impacts in the NRI framework would be statistically difficult because of problems of multi-collinearity—that is, the values of the drivers are highly correlated with each other and therefore it is difficult to isolate unique effects—and also because of reverse causality—that is, the drivers affect the results of the impacts and vice versa. However, a simple correlation analysis could help us shed some light about the validity of the model.

Figure A presents this correlation analysis. As can be observed, the relationship between ICT drivers and impacts is very strong, with a correlation coefficient of 90 percent. This very high correlation, coupled with the practically nonexistent statistical outliers that largely divert from the relationship line, seems to corroborate the robustness of the NRI framework.

Figure A: Relationship between ICT drivers and impacts



Source: Authors' calculations.

benefits and weather the risks of these technologies. The potential benefits of ICT have been widely researched. Improvements in innovation performance and raises in productivity in those technology-savvy organizations have been widely documented. Moreover, improvements in people's well-being, thanks to new ICT-enabled products in healthcare or environmental solutions, are transforming the quality of life of many of our citizens.

The GITR series and the NRI in particular have contributed over the past decade to raise awareness about the determinants that drive the capacity of societies to transform and benefit from the multiple impacts that ICT can bring about. Moving forward, this new edition of the GITR continues to innovate and introduces an evolved framework that keeps abreast of the latest changes in the ICT industry and responds better to policy needs. While measuring ICT access remains important, especially for developing and emerging economies, the ubiquity of ICT in all areas of society has rendered the measuring and benchmarking of ICT impacts even more important.

An analysis of the ICT landscape thanks to the NRI results reveals that large differences across regions persist regarding the uptake and impacts of ICT. Despite the global economic convergence of the past decade, owing to the sharp economic growth of Southeast Asia, Latin America, and Africa on the one hand and to the stagnation of the advanced economies on the other, the digital divide seems to follow a different process. Advanced economies, especially the Nordic countries and the Asian Tigers, continue to dominate with well-rounded, society-wide strategies to fully leverage ICT. At the other end of the scale, sub-Saharan Africa continues to trail the rest of the world with important weaknesses, both in terms of preparedness caused by a low skill base and an environment that does not enable significant economic impacts to accrue. Latin America, despite the region's strong resilience in the face of the economic crisis, still lags behind, and the need to integrate ICT better in more robust innovation systems remains an important challenge looking forward. On a more positive note, some emerging economies in Asia seem to make good progress, inspired by the good practices of regional champions such as Korea and Singapore.

The GITR series and the NRI is proud to continue, with renewed energy, its task of providing an analytical framework that sheds light on national efforts to leverage ICT for increased competitiveness and well-being, creating a platform for multi-stakeholder interaction and action.

## NOTES

- 1 Gartner 2011.
- 2 Ericsson 2011.
- 3 GSMA-At Kearney 2011, p. 4.

- 4 ITU 2011b.
- 5 IDC 2011.
- 6 IDC 2011.
- 7 Facebook Statistics, available at <http://www.facebook.com/press/info.php?statistics> (accessed December 21, 2011).
- 8 BT Online Bureau (November 8, 2011), available at <http://businessstoday.intoday.in/story/google-plus-starts-service-for-businesses-brands/1/19906.html> (accessed December 21, 2011).
- 9 Cisco 2010, p. 3.
- 10 The difficulty in the definition of impacts is one of the main handicaps, as ICT has proven transformational in many aspects of the economy and society, influencing not only the outcomes but also the process through which products and services are delivered. As a result, developing metrics to capture these dimensions is both difficult and costly, especially when it comes to covering a large number of emerging countries. In addition, even when impact areas can be defined, it is not always easy to trace back specific impacts to all their original sources. Often observed economic and social impacts are the result of a thick network of several interacting factors, where ICT is but one of them.
- 11 The NRI 2012 includes the results of the 2010 and 2011 Surveys. For more details on the Survey methodology, see Browne and Geiger 2010.
- 12 The BRICS are Brazil, the Russian Federation, India, China, and South Africa.
- 13 For an in-depth review of the policies carried out in Mauritius to develop the ICT sector, please refer to Part 2 of the *Report*.

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## Appendix A: Structure and computation of the Networked Readiness Index 2012

This appendix presents the structure of the Networked Readiness Index 2012 (NRI). As explained in the chapter, the NRI framework separates environmental factors from ICT readiness, usage, and impact. That distinction is reflected in the NRI structure, which comprises four subindexes. Each subindex is in turn divided into a number of pillars, for a total of 10. The 53 individual indicators used in the computation of the NRI are distributed among the 10 pillars.

In the list below, the number preceding the period indicates the pillar to which the variable belongs (e.g., indicator 2.05 belongs to the 2nd pillar; indicator 8.03 belongs to the 8th pillar). The numbering of the indicators matches the numbering of the data tables at the end of the *Report*.

The computation of the NRI is based on successive aggregations of scores, from the indicator level (i.e., the most disaggregated level) to the overall NRI score (i.e., the highest level). Unless noted otherwise, we use an arithmetic mean to aggregate individual indicators within each pillar and also for higher aggregation levels (i.e., pillars and subindexes).<sup>a</sup>

Throughout the *Report*, scores in the various dimensions of the NRI pillars are reported with a precision of one or two decimal points. However, exact figures are used at every step of the computation of the NRI.

Variables that are derived from the World Economic Forum's Executive Opinion Survey (the Survey) are identified here by an asterisk (\*). All the other indicators come from external sources, as described in the Technical Notes and Sources section at the end of the *Report*. These variables are transformed into a 1-to-7 scale in order to align them with the Survey's results. We apply a min-max transformation, which preserves the order of, and the relative distance between, scores.<sup>b</sup>

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### NETWORKED READINESS INDEX 2012

Networked Readiness  
Index = 1/4 Environment subindex  
+ 1/4 Readiness subindex  
+ 1/4 Usage subindex  
+ 1/4 Impact subindex

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### ENVIRONMENT SUBINDEX

Environment subindex = 1/2 Political and regulatory environment  
+ 1/2 Business and innovation environment

#### 1st pillar: Political and regulatory environment

- 1.01 Effectiveness of law-making bodies\*
- 1.02 Laws relating to ICT\*
- 1.03 Judicial independence\*
- 1.04 Efficiency of legal system in settling disputes\*<sup>c</sup>
- 1.05 Efficiency of legal system in challenging regulations\*<sup>c</sup>
- 1.06 Intellectual property protection\*
- 1.07 Software piracy rate, % software installed
- 1.08 Number of procedures to enforce a contract<sup>d</sup>
- 1.09 Time to enforce a contract, days<sup>d</sup>

#### 2nd pillar: Business and innovation environment

- 2.01 Availability of latest technologies\*
- 2.02 Venture capital availability\*
- 2.03 Total tax rate, % profits
- 2.04 Time required to start a business, days<sup>e</sup>
- 2.05 Number of procedures to start a business<sup>e</sup>
- 2.06 Intensity of local competition\*
- 2.07 Tertiary education gross enrollment rate, %
- 2.08 Quality of management schools\*
- 2.09 Government procurement of advanced technology products



## READINESS SUBINDEX

Readiness subindex = 1/3 Infrastructure and digital content  
+ 1/3 Affordability  
+ 1/3 Skills

### 3rd pillar: Infrastructure and digital content

- 3.01 Electricity production, kWh/capita
- 3.02 Mobile network coverage rate, % population
- 3.03 International Internet bandwidth, kb/s per user
- 3.04 Secure Internet servers per million population
- 3.05 Accessibility of digital content\*

### 4th pillar: Affordability<sup>f</sup>

- 4.01 Mobile cellular tariffs, PPP \$/min.
- 4.02 Fixed broadband Internet tariffs, PPP \$/month
- 4.03 Internet and telephony sectors competition index, 0–2 (best)

### 5th pillar: Skills

- 5.01 Quality of educational system\*
- 5.02 Quality of math and science education\*
- 5.03 Secondary education gross enrollment rate, %
- 5.04 Adult literacy rate, %

## USAGE SUBINDEX

Usage subindex = 1/3 Individual usage  
+ 1/3 Business usage  
+ 1/3 Government usage

### 6th pillar: Individual usage

- 6.01 Mobile phone subscriptions per 100 population
- 6.02 Internet users per 100 population
- 6.03 Households with personal computer, %
- 6.04 Households with Internet access, %
- 6.05 Fixed broadband Internet subscriptions per 100 population
- 6.06 Mobile broadband Internet subscriptions per 100 population
- 6.07 Use of virtual social networks\*

### 7th pillar: Business usage

- 7.01 Firm-level technology absorption\*
- 7.02 Capacity for innovation\*
- 7.03 PCT patent applications per million population
- 7.04 Extent of business Internet use\*
- 7.05 Extent of staff training\*

### 8th pillar: Government usage

- 8.01 Government prioritization of ICT\*
- 8.02 Importance of ICT to government vision of the future\*
- 8.03 Government Online Service Index, 0–1 (best)

## IMPACT SUBINDEX

Impact subindex = 1/2 Economic impacts  
+ 1/2 Social impacts

### 9th pillar: Economic impacts

- 9.01 Impact of ICT on new services and products\*
- 9.02 PCT ICT patent applications per million population
- 9.03 Impact of ICT on new organizational models\*
- 9.04 Employment in knowledge-intensive activities, % workforce

### 10th pillar: Social impacts

- 10.01 Impact of ICT on access to basic services\*
- 10.02 Internet access in schools\*
- 10.03 ICT use and government efficiency\*
- 10.04 E-Participation Index, 0–1 (best)

## NOTES

a Formally, for a category  $i$  composed of  $K$  indicators, we have:

$$\text{category}_i = \frac{\sum_{k=1}^K \text{indicator}_k}{K}$$

b Formally, we have:

$$6 \times \left( \frac{\text{country score} - \text{sample minimum}}{\text{sample maximum} - \text{sample minimum}} \right) + 1$$

The *sample minimum* and *sample maximum* are, respectively, the lowest and highest country scores in the sample of economies covered by the GCI. In some instances, adjustments were made to account for extreme outliers. For those indicators for which a higher value indicates a worse outcome (i.e., indicators 1.07, 1.08, 1.09, 2.03, 2.04, 2.05, 4.01, and 4.02), the transformation formula takes the following form, thus ensuring that 1 and 7 still corresponds to the worst and best possible outcomes, respectively:

$$-6 \times \left( \frac{\text{country score} - \text{sample minimum}}{\text{sample maximum} - \text{sample minimum}} \right) + 7$$

c For Indicators 1.04 and 1.05, the average of the respective normalized scores is used in the computation of the NRI.

d For Indicators 1.08 and 1.09, the average of the respective normalized scores is used in the computation of the NRI.

e For Indicators 2.04 and 2.05, the average of the respective normalized scores is used in the computation of the NRI.

f The affordability pillar is computed as follows: the average of the normalized scores of indicators 4.01 mobile cellular tariffs and 4.02 Fixed broadband Internet tariffs is multiplied by a *competition factor*, the value of which is derived from indicator 4.03 Internet and telephony sectors competition index. It corresponds to the score achieved by an economy on this indicator normalized on a scale from 0.75 (worst) to 1.00 (best), using the min-max transformation described above. A normalized score of 0.75 is assigned to an economy with a competition index score of 0, which means that a monopolistic situation prevails in the 19 categories of ICT services considered. A normalized score of 1.00 is assigned to an economy where all 19 categories are fully liberalized. Where data are missing for indicator 4.03 (i.e., Hong Kong SAR, Puerto Rico, and Timor-Leste), the score on the affordability pillar is simply the average of the normalized scores of indicators 4.01 and 4.02 is used. For example, Albania obtains a score of 1.69 on the competition index. This translates into a competition factor of 0.96, which multiplies 5.65, corresponding to the average of Albania's normalized scores on the two tariff measures. Albania's score on the affordability pillar therefore is 5.43.

## Appendix B: Historical overview of the efforts to measure and benchmark ICT developments

The Networked Readiness Index (NRI) framework was first developed to make conceptual sense of the complex realities of information communication technologies (ICT) and to provide guidance to policymakers and civil society. When the original NRI framework was established in 2002, numerous attempts had already been made to measure comparative levels of ICT development in nations.<sup>1</sup>

The task of capturing a nation's competitiveness in a single index score was a significant challenge in 2002; it continues to present difficulties today. Since the development of the original framework, further efforts have been made and new models have emerged in the attempt to find effective measurements for assessing ICT development in economies. From a review of these models, as presented in Table B1, we found that the conceptual frameworks for measuring ICT have evolved in three stages and that previous works in this field could be grouped in three categories.

The first group includes frameworks that were developed prior to the original NRI framework, launched in 2002. Conceptual frameworks in measuring ICT competitiveness were then still in their infancy. Various organizations, such as the Computer Systems Policy Project (CSPP) and the Center for International Development (CID) at Harvard, worked out some of the first policymaking and evaluation tools for countries.<sup>2</sup>

The focus of these initial frameworks was on individual assessment and policy development around e-readiness and increasing Internet penetration rates: APEC's *e-Commerce Readiness Assessment Guide* (2002) and the Mosaic Group's *Framework for Assessing the Global Diffusion of the Internet* (2001) attempted to do this.<sup>3</sup> There were few ranking systems for comparative analysis of countries. Furthermore, because of the lack of or difficulty in obtaining data, low-income economies were often excluded from the analysis. In 2002, the NRI became the most comprehensive index for assessing and evaluating a large number of countries (82 economies) by taking into consideration the main stakeholders (individuals, businesses, and governments) in the development and use of ICT, as well as the general macroeconomic and regulatory environments in which these stakeholders play out their respective roles.<sup>4</sup>

Following the 2002 NRI, many more comparative analyses and country indexes emerged. Since the World Summits on the Information Society (in Geneva in 2003 and Tunis in 2005), a stronger sense of urgency in leveraging ICT for meeting the UN Millennium Development Goals emerged. This is reflected in the second group of frameworks, which widened their scope and included a broader range of countries, especially developing countries. Models such as International Telecommunication Union's Digital Opportunity Index and ICT Development Index (IDI) were developed in order to find opportunities to bridge the digital divide.<sup>5</sup> However, the increase in the number of countries analyzed often meant a reduction in the number of indicators used. This was the result of a lack of reliable data from numerous countries. Guidebooks and methodologies—such as the Organisation for Economic Co-operation and Development (OECD)'s *Guide to Measuring the Information Society* and the World Bank Institute's Knowledge Assessment Methodology<sup>6</sup>—have therefore been produced in an attempt to create worldwide standards in collecting data for measuring the state of ICT development.

Yet with time, as Internet penetration began to stabilize in several developed economies, the need for a broader and more comprehensive measurement of ICT (not just penetration and adoption rates) became apparent. The third group of work follows this focus in understanding the role of ICT in long-term economic and social growth and in fostering competitiveness. In addition to the NRI, the Economist's Intelligence Unit (EIU)'s Digital Economy Rankings—previously known as the E-readiness Rankings—and Waverman et al.'s *Connectivity Scorecards* have attempted to examine both countries' e-readiness and the challenges they will face in maximizing ICT use.<sup>7</sup> This underlines the growing shift toward measuring the impact of ICT in numerous dimensions.

In our analysis of past works to measure levels of ICT competitiveness we find that approaches vary significantly with the type of organizations by which they were developed, their aims and objectives, their methodology, and finally in the results they produced (see Table B2).

Table B1: Evolution of conceptual ICT frameworks, rankings, and indexes

Objective	Characteristics	Initiative and institution
<b>Prior to the original NRI framework (2001)</b>		
Measuring ICT competitiveness	<p>Developed prior to the original NRI framework in 2002</p> <p>Development of first policymaking and evaluation tools for countries</p> <p>Relatively few ranking systems for comparative analysis of countries</p> <p>Measure state of Internet acceptance (or e-readiness) in a country or community</p> <p>Measure the growth of Internet in the world</p>	<p>Readiness for Living in the Networked World, by the Computer Systems Policy Project (CSPP), 2000</p> <p>Readiness for the Networked World: A Guide for Developing Countries, by the Center for International Development (CID) at Harvard University, 2000</p> <p>International Survey of E-Commerce, by The World Information Technology and Service Alliance (WITSA), 2000</p> <p>APEC e-Commerce Readiness Assessment Guide, by the Asian Pacific Economic Cooperation (APEC) Electronic Commerce Steering Group, 2000</p> <p>A Framework for Assessing the Global Diffusion of the Internet, by The Mosaic Group, 2001</p> <p>Ready? Net. Go!, by McConnell International, 2001</p>
<b>After the development of the NRI framework (2002–07)</b>		
Leveraging ICT for development	<p>Focus on bridging the digital divide and meeting the Millennium Development Goals</p> <p>Wider range of economies to include low-income countries</p> <p>Many self-assessment tools to help governments and policymakers assess their country's state</p> <p>Developed shortly before or after the World Summits on the Information Society (Geneva 2003, Tunis 2005)</p>	<p>2002 Global Technology Index, by Howard Rubin, Metricnet.com, 2002</p> <p>The Knowledge Economy, the KAM Methodology and World Bank Operations, by Chen and Dalhman, World Bank Institute, 2005</p> <p>Digital Opportunity Index (DOI), by ITU, 2006–07</p>
<b>More recent frameworks (after 2007)</b>		
Understanding and measuring ICT in a broader sense	<p>Overall increase of indicators as data become more available</p> <p>Stronger focus on business and social perspective and on developing more economic competitiveness among countries</p> <p>Attempts to include more measurements of the impact of ICT</p>	<p>ICT Development Index (IDI), by ITU, 2008–11</p> <p>Guide to Measuring the Information Society, by the OECD, 2011</p> <p>Digital Economy Rankings 2010-Beyond e-readiness, by the Economist Intelligence Unit, 2010 (previously the E-readiness Rankings)</p> <p>Connectivity Scorecard, by Waverman, Dasgupta and Rajala, 2008–11</p>

**Table B2: Key differences among approaches used to measure ICT**

<b>Type of organization</b>	Private-sector organizations
	Government organizations
	Academic institutions
<b>Objectives</b>	Policymaking and evaluation tool for countries
	Measure state of Internet acceptance (or e-readiness) in a country or community
	Measure the growth of the Internet in the world and ICT impact
<b>Methodology and data</b>	Questionnaire-based data (based on opinions of key decision makers and leaders)
	Hard data-based, using sources such as the World Bank, Pyramid, ITU, and so on
	Individual country self-assessment tools and guides
<b>Results</b>	Comparative analysis of countries
	Identification of gaps and strong points within independent communities
	Stage of ICT development of a country determined
	Guidelines in data collection and methodology

The methodology used in research prior to the NRI has varied. Studies such as the APEC e-Commerce Readiness Assessment Guide and the Mosaic Group's Global Diffusion of the Internet rely on questionnaire-based data. Others, such as the work of the CID and the EIU, are a hybrid of survey questionnaires and hard data. The *Connectivity Scorecard* insists on using only hard data. The move to incorporate impact metrics is not new. Some of the older models, such as the CSPP and APEC models, are primarily readiness-based analyses. Reflecting the development of thought in this direction, agencies such as the EIU and the CID have incorporated selected impact metrics in their frameworks. ITU's ICT Digital Index and the EIU's Digital Economy Rankings have also included some indicators of impact. However, measurements of impacts in previous frameworks are very limited and finding suitable metrics remains a considerable challenge.

The results produced by the different tools fall primarily into four categories. The first category comprises those that look to provide a comparative analysis among the various countries (e.g., *Connectivity Scorecard*, ICT Digital Index, Digital Economy Rankings); the second is those designed to identify gaps and strong points of independent communities (e.g., McConnell's Ready? Net. Go! and the World Bank Institute's Knowledge Assessment Methodology); the third is the identification of the stage of development of a country (e.g., those of the CID and the CSPP); and the fourth consists of guidelines and methodology in collecting comparable and reliable data for a larger number of countries (e.g., the work of the OECD).

## NOTES

- 1 See the Comparison of E-Readiness Assessment Models, October 2001, at [http://www.bridges.org/e\\_readiness\\_assessment](http://www.bridges.org/e_readiness_assessment).
- 2 See CSPP 2000; CID 2000.
- 3 See APEC e-Commerce Readiness Initiative 2000; Wolcott et al. 2001.
- 4 Dutta and Jain 2003.
- 5 See ITU 2007, 2011a.
- 6 See OECD 2011; Chen and Dahlman 2005.
- 7 See EIU 2010; Waverman et al. 2010.