

Executive Summary

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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. Consequently, 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 of each interaction 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 it will have an impact on inventory, transport and fleet management, wireless payments, navigation tools, and so on. The impact of ICT on 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*.

The *Report* series is the result of a long-standing partnership between the World Economic Forum (the Forum) and INSEAD, aimed at identifying, measuring, and benchmarking the drivers of national capacity to leverage ICT to boost competitiveness and well-being and their impacts. The *Report* is composed of four thematic parts. Part 1 describes the conceptual framework and relates the findings of the NRI 2012. In addition, Part 1 features selected expert contributions on the general theme of hyperconnectivity. Part 2 includes two case studies showing the efforts that two countries, Azerbaijan and Mauritius, are making to develop ICT and fully leverage their potential benefits. Part 3 comprises detailed profiles for the 142 economies covered in this year's *Report*, providing a thorough picture of each economy's current networked readiness landscape and allowing for international comparisons of specific variables or components of the NRI. Part 4 includes data tables for each of the 53 variables composing the NRI, with rankings for the economies covered as well as

technical notes and sources for the quantitative variables used.

PART 1: THE CURRENT NETWORKED READINESS DESCRIBING A HYPERCONNECTED WORLD

Part 1 presents the latest findings of the NRI, offering a comprehensive assessment of the present state of networked readiness in the world. A number of expert contributions that consider the drivers and impacts of hyperconnectivity on individuals, businesses, and governments are included. These relate to (1) the convergence of information technologies and communication technologies; (2) issues in a hyperconnected world, with a specific focus on the role of regulation; (3) network neutrality; (4) the increasing importance of mobile broadband to empower individuals; (5) the cost of broadband; (6) the role of in-memory technology and analytics to harness the power of big data; (7) the role of real-time analytics to make good sense of big data; (8) the value of digital traces for commercial strategy and public policy; (9) the promise and perils of hyperconnectivity for organizations and societies; (10) maximizing the impact of digitization; and (11) the effect of technology in education.

Insight from the NRI 2012 on the world's networked readiness

Chapter 1.1, “The Networked Readiness Index 2012: Benchmarking ICT Progress and Impacts for the Next Decade” by Soumitra Dutta of INSEAD and Beñat Bilbao-Osorio and Thierry Geiger of the World Economic Forum, presents the latest findings of the NRI, putting them into a regional and income-group context while also looking at regional differences.

This year, echoing the rapid changes and consequences of living in a hyperconnected world, the framework we use to measure and benchmark networked readiness has evolved. Following a two-year review process that involved high-level consultations with academic experts, policymakers, and representatives of the ICT industry, the World Economic Forum, in partnership with INSEAD, has undertaken a review to ensure that the framework continues to remain relevant and at the forefront of measuring and benchmarking the role of ICT for competitiveness and well-being for the next decade.

The evolved framework is inspired by five underlying principles:

- Measuring the economic and social impacts of ICT is crucial.
- An enabling environment determines the capacity of an economy and society to benefit from the use of ICT.
- ICT readiness and usage remain key drivers and preconditions for obtaining any impacts.
- All factors interact and co-evolve within an ICT ecosystem.

- The framework should provide clear policy orientations and identify public-private partnership opportunities.

As a result, the framework gauges:

- the friendliness of a country's market and regulatory framework in supporting high levels of ICT uptake;
- the degree of a society's preparation to make good use of an affordable ICT infrastructure;
- the 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 of ICT in their day-to-day activities; and
- the broad economic and social impacts accruing from ICT and the transformation of a country toward an ICT- and technology-savvy economy and society.

As in previous editions, the NRI is composed of a mixture of quantitative data collected by international organizations—such as International Telecommunication Union (ITU), the United Nations, and the World Bank—and survey data from the Executive Opinion Survey (the Survey), conducted annually by the Forum in each of the economies covered by the *Report*. The NRI 2012 covers a record number of 142 economies from both the developed and developing world, accounting for over 98 percent of world GDP.

In terms of the result, 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.

Sweden's performance is remarkable in every aspect. The country leads four of the 10 pillars of the NRI, namely infrastructure and digital content, individual usage, business usage, and economic impacts; and appears in the top 10 of a further five, while in the last pillar, skills, it ranks a very solid 12th. 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 component, thanks to the 2nd and 3rd rank earned in the economic impacts pillar and social impacts pillar, respectively.

At 8th place overall, the United States delivers a strong performance. The country boasts an environment that is generally conducive to leveraging ICT successfully. 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 (8th). In terms of readiness, the country can rely on a very good (6th) and affordable (10th) ICT infrastructure.

Overall, Europe remains at the forefront of the efforts to leverage ICT to transform its economy and society. Seven European countries are positioned in the top 10 of our rankings, with the Nordic countries, including Sweden at the very top, leading the way. Notwithstanding the 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.

The Nordic countries are the most successful in the world at 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. In Western Europe, besides Switzerland (5th), the Netherlands (6th), and the United Kingdom (10th), five other advanced economies—Germany (16th), Austria (19th), Luxembourg (21st), Belgium (22nd), and France (23rd)—attain high positions, ranging from 16th to 23rd place. Overall, the countries exhibit fairly well developed conditions for ICT, but not to the extent of the Nordic countries.

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 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 in the potential economic impacts accruing from ICT.

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, others confront specific challenges that influence their capacity to take advantage of the potential of ICT. 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) have managed to develop their ICT infrastructures fairly well, although the high costs of accessing it—especially in the Czech Republic and Slovak Republic (93rd and 104th, respectively)—affects the actual uptake capacity of large shares of the population.

Kazakhstan, the Russian Federation, and Azerbaijan are the best performers among the Commonwealth of Independent States (CIS), achieving 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 that underwent a deep restructuring after the collapse of Communism has not yet been fully reorganized or redeveloped.

Asia and the Pacific region is home to some of the world's wealthiest, most innovative and digitized nations in the world and also to some of its poorest, least-connected countries. Six economies besides Singapore feature among the top 20, namely Taiwan, China (11th), Korea, Rep. (12th), Hong Kong SAR (13th), New Zealand (14th), Australia (17th), and Japan (18th). At 51st place, China leads the BRICS, the group of large emerging economies. Yet the country faces important challenges ahead that must be met to more fully adopt and leverage ICT. China's institutional framework and especially its business environment present a number of shortcomings that stifle entrepreneurship and innovation.

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: an insufficient investment in developing the ICT infrastructure; a weak skill base in the population, the result 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.

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.

There are large differences across the Middle East and North Africa, 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 former 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.

An analysis of regional differences in leveraging ICT for competitiveness and well-being is also included in the chapter.

The Convergence of Information and Communication Technologies Gains Momentum

The convergence of information technology (IT) and communications technology (CT) is driven by several factors, including the proliferation of web-enabled mobile devices that allow access to cloud computing services. A discussion of the trends in ICT convergence, which are taking place at three levels of technology innovation—cloud, pipe, and device—and the adaptations that industry is making to deliver enriched user experiences across industries and the private sector is presented in Chapter 1.2., by Ivan Huang, Roc Guo, Harry Xie, and Zhengxian Wu of Huawei Technologies.

Cloud computing services provide a catalyst for ICT convergence. Telecommunications carriers will gradually move IT systems and Internet data centers into the cloud, and telecommunications and IT industries will develop uniform standards to facilitate rapid cloud development. As a result, CT is transforming from voice-services to services supported by integrated mobile networks, and IT is evolving from traditional data centers to cloud computing. Likewise, the “pipes” of the telecommunications industry (fixed and mobile telecommunications networks) are converging along with the evolution to flexible and cost-effective all-IP networks. The addition of optical network technology will ensure the increased transmission speed needed for the high bandwidth transmissions of the future. In addition, the close integration of smart devices with the cloud will change the way consumers use their home devices (television sets, smartphones, and personal computers or PCs) and blur the boundaries between formerly separate industries.

ICT convergence significantly impacts consumers, industries, and governments. For consumers, the integration of smart devices with peripheral devices, ubiquitous networks, and robust cloud data centers is changing experiences involving entertainment, travel, healthcare, and shopping. For industry, ICT convergence extends employee productivity with collaborative tools, reduces travel expense with videoconferencing, and

enables customized products to develop across many industries.

As the chapter points out, governments can encourage ICT convergence in three key ways. They can reform policies and regulations to encourage competition and remove barriers to investment; they can offer financial incentives to firms that deploy ICT services; and they can directly invest in ICT infrastructure and services. By taking these steps, governments can facilitate the technological innovation required for ICT convergence and meet market demands.

Emerging Issues for our Hyperconnected World

Chapter 1.3, contributed by International Telecommunication Union (ITU), considers the growth and expansion of our hyperconnected world as well as some of the issues associated with it. Our future hyperconnected world will build on the functionality made possible by converged next-generation networks (NGN) and open access networks, but extends the concept of NGN in several ways—through embedded ambient intelligence, automated machine-to-machine traffic, and the sheer size and scale of the Internet of Things. In practice, we should be able to enjoy super-fast connectivity on the move, always-on, roaming seamlessly from network to network, wherever we go—anywhere, anytime, via any device.

In this chapter, Phillipa Biggs and her co-authors explore some of the consequences and issues that may arise through embedding ICTs and connectivity into mobile devices and everyday objects. From technological advances and growth in connection speeds to an explosion in data traffic and a more extensive role for regulators, this chapter provides an overview of some of the major trends shaping the hyperconnected world of converged ICTs. Given the predicted massive expansion of data traffic, the chapter highlights the importance of traffic prioritization and the different approaches possible to the net neutrality debate. It concludes that regulators and policymakers have a vital role to play at this point in time in establishing the mores and norms for the online world—in what is and is not acceptable, and in developing principles and best practices going forward, so that the risks and opportunities of our hyperconnected world are managed appropriately to protect both consumers and citizens.

Network Neutrality: An Opportunity to Create a Sustainable Industry Model

Network neutrality is the principle that inhibits telecommunications network operators from discriminating among different kinds of Internet content, applications, and services traveling across their networks. In Chapter 1.4, authors Scott Beardsley, Yavuz Demirci, Luis Enriquez, Mehmet Guvendi, Stagg Newman, Sergio Sandoval, Malin Strandell-Jansson, Oleg Timchenko, and

Wim Torfs of McKinsey & Company consider the debate surrounding this issue. Advocates of network neutrality argue that the principle underpins the Internet's explosive growth: if any and every kind of content, service, and application can be distributed over the Internet, then there is no limit to the innovations that Internet companies will invent for consumers to choose from. But network neutrality has, arguably, become the victim of its own success. Internet traffic has grown faster than network operators' related revenues and they are now struggling to invest in the new network infrastructure needed to support more Internet traffic.

Not surprisingly, network operators are also trying to manage traffic volumes. Some are even deploying sophisticated network management technologies, such as deep packet inspection, which examine the nature and content of the traffic to identify possible sources of harm to network performance and also to protect the networks and consumers from increasingly sophisticated attacks and abuse. But as soon as network operators start scrutinizing the content of Internet traffic, edge players (providers of content, applications, and services as well as aggregators) worry that network neutrality may be infringed, limiting their will to innovate. Both consumers and regulators also worry about maintaining the confidentiality of consumer data.

Mobile Broadband: Redefining Internet Access and Empowering Individuals

With more than 6 billion connections worldwide and US\$1.3 trillion in annual revenue, mobile telephony has become the largest ICT in history. Mobile connects four times as many people as landline telephony because of its better reach, convenience, and functionality, as well as its lower costs. Mobile telephony also surpasses the landline Internet by more than 3.5 billion users, while driving economic growth and important societal benefits, as documented in the World Economic Forum's *Global Information Technology Report 2008–2009: Mobility in a Networked World* and other research.

While the global scale of mobile telephony and its economic impacts are well understood by ICT industry participants and governments today, the authors of Chapter 1.5, William Bold and William Davidson of Qualcomm, envision that mobile broadband—with its ability to connect people to the Internet in an ultra-personal and pervasive manner—will have a far greater impact.

Mobile broadband, or high-speed access to the Internet and other data services over mobile networks, is already changing the way people across the globe access the Internet. It promises to drive even stronger economic growth than mobile telephony alone and to fundamentally change the way in which we live, learn, work, and collaborate. This in turn is driving seismic shifts across the communications and computing

industries. Perhaps most importantly, it provides unprecedented opportunities to empower individuals across all socioeconomic classes.

The authors present this view within the framework of two fundamental shifts, or tipping points, and related trends that underscore how mobile broadband is changing the way people access the Internet and, in turn, how the Internet itself is changing. They explore the transformative opportunities these shifts create in areas such as healthcare and education, as well as some key steps stakeholders can take to both enable and take advantage of these new possibilities.

Reaching the Third Billion: Arriving at Affordable Broadband to Stimulate Economic Transformation in Emerging Markets

In Chapter 1.6, authors Chris S. Thomas and Frederico Carvalho of Intel Corporation present an analysis of the background to the current issues affecting network operators' revenue and capacity as well as measures so far taken by the industry to address them, and discuss current regulatory positions on network neutrality. The authors then propose a set of aims that all industry players—network operators, companies offering Internet services and applications, and regulators—can pursue that will balance growing industry revenues to fund infrastructure investment with safeguarding network neutrality, and so release the next wave of services and applications over the Internet, with all the economic and societal benefits they promise.

Direct correlations can be made between the affordability of broadband connectivity and an individual's or country's ability to successfully transform itself through the utilization of ICT capabilities.

The chapter outlines several examples of countries arriving at affordable broadband programs, and considers the bundling of total computing and connectivity packages. Many creative and successful strategies are being employed to extend the reach and impact of technology by driving broader Internet access, affordability, and awareness, ultimately accelerating the use of technology to improve national competitiveness and GDP as well as individual livelihoods.

Advocating reaching more people by paying less for less, these strategies are employed in many different countries with the aim of closing the affordability gap. Business and deployment strategies similar to those of the pre-paid mobile phone market that enabled its successful reach to the majority of the world population are then encouraged.

The chapter provides a number of examples that highlight an informed leadership emerging in the form of national broadband strategies, programs, and incentives; new private and nationalized telecommunications offerings and programs; vendor bundles; and financing options as well as the cooperation of development

organizations and funds. By implementing different ICT programs with more affordable broadband, countries are providing impacts through levels of computing and Internet accessible to a much higher percentage of the population.

Harnessing the Power of Big Data in Real Time through In-Memory Technology and Analytics

Chapter 1.7, by SAP AG, considers the power and the complications presented by the enormous quantity of data that can now be experienced as overwhelming. The world today is flooded with data from multiple sources such as corporate databases, sensor networks, and the Internet—and the trend is increasing. In the face of this rising tide of data, organizations are finding it difficult to keep up.

Since the 1960s, many companies have used computers to manage their business—to determine such things as how much cash is available, how much debt is outstanding, what the risks are for certain ventures, and so on. Complex software programs called enterprise resource planning (ERP) systems have been created to manage and provide insights into the daily operations of a company. However, increasing data volumes have led to a problem. By the turn of the 21st century, large organizations were no longer always able to access the information they required in a timely manner. There were just too many data to analyze.

As the chapter points out, at the heart of any enterprise application is the database management system, responsible for storing the myriad of data generated by the day-to-day operations of a business. Today, enterprise data are split into separate databases for performance reasons. Analytical data reside in data or business warehouses, synchronized periodically with transactional ERP systems. This separation makes real-time reporting on current data impossible.

Multi-core CPUs, large main memories, cheaper and more powerful hardware, and cloud computing are now laying the foundation for the transition of enterprises away from this restrictive model. New database systems called *in-memory technology* can execute fast, flexible analyses in real time to facilitate decision making for top managers and other users. These can now accelerate business processes by a factor of up to 1,000.

The use of in-memory technology marks an inflection point for enterprise applications. The availability and capacity per dollar of main memory have increased markedly in the last few years, leading to a rethinking of how mass data should be stored.

The Wisdom of the Cloud: Hyperconnectivity, Big Data, and Real-Time Analytics

The exponential increases in data volumes—often referred to as *big data*—are increasingly driven by unprecedented hyperconnectivity and the rapid adoption of

social media that present new opportunities for savvy organizations to capture “the wisdom of the cloud” and leverage the flood of unstructured data that is being created.

Using case studies, in Chapter 1.8 Mikael Hagström and Neena Gill of SAS discuss the implications of these trends in re-engineering the healthcare industry, transforming the public sector, and creating new and intelligent intersections between businesses and consumer that allow for fluid dialogue. The chapter explains how, in healthcare, researchers can share results with one another to tap their collective knowledge, clinicians can improve their ability to manage disease outbreaks, and hospitals can improve patient safety. In the public sector, the “civic long tail” is making it easier for people to voice their views and connect with like-minded citizens. Government can use these data to become more efficient and responsive. In the business world, companies are leveraging big data to improve their offers, respond to key influencers, reduce churn, manage risks, strengthen brands, get to know their customers, and more.

On the Value of Digital Traces for Commercial Strategy and Public Policy: Telecommunications Data as a Case Study

At a time when governments and corporations are looking to target policy, strategy, and investment so as to reduce costs and improve impact measurement, the potential value of real-time data and, in particular, a real-time census is becoming increasingly clear. Digital data from large-volume transactional sources such as credit cards and telecommunications, as well as health and other administrative systems, offers the timeliness and scalability required for such applications, and it promises to transform the way that policymakers and strategic planners see the social, environmental, and economic context of their work.

Eventually, historical approaches to the classification and characterization of households and places—such as though lifestyle segmentation and geodemographics—may be replaced with novel real-time, adaptive systems based on up-to-the-minute spatially referenced (geo-coded) data. In Chapter 1.9, authors Rob Claxton, Jon Reades, and Ben Anderson use telecommunications data—coupled with the network-oriented methods of an emerging computational social science—as a lens through which to examine society and the knowledge economy. The authors present results from four studies that offer a taste of the ways in which this type of data can be used to expand our understanding of social and economic activity.

They begin with a study of regions, comparing the “geographies of talk” with existing administrative units; then they consider the ways in which social networks reflect underlying problems of access to opportunity

before turning to access of a different sort, using indicators of globalization within Britain's most competitive industries. Finally, the authors conclude with early work on real-time data-driven household classification systems and a discussion of the implications for government and corporations.

The Promise and Peril of Hyperconnectivity for Organizations and Societies

Hyperconnectivity is a relatively new term that was coined in response to the rapid availability and broad assimilation of entirely new ways to communicate. Hyperconnectivity refers not only to the means of communication and interaction, but also to the impact this phenomenon has on both personal and organizational behavior.

Hyperconnectivity results from a combination of broadband expansion, the proliferation of mobile devices and wireless access, the dominance of social media in daily life and, most recently, the use of the cloud for data and applications access. Hyperconnected communication includes not only people-to-people formats (as individuals and as members of groups and using a vast array of media), but also communication between people and machines and between machines themselves without any direct human involvement.

In a short period of time, the hyperconnectivity phenomenon has had a notable impact on society, which authors John Fredette, Revital Marom, Kurt Steinert, and Louis Witters of Alcatel-Lucent explore in Chapter 1.10. For institutions and organizations, research reveals hyperconnectivity's influence on the nature of work practices, functions, and missions. Hyperconnectivity breaks down the boundaries of both time and space. It brings people (and things) together from anywhere and at anytime. Its impact is both ubiquitous and unceasing. Thanks in part to hyperconnectivity we now live in a world of neo-urbanization, where the distinctions between rural and urban are decreasing. Hyperconnectivity has also given rise to a globalized "168" world ($24 \times 7 = 168$), where the work day continues around the clock.

On a societal level, the impact of hyperconnectivity can be readily discerned in neo-urbanization, government, education, healthcare, business, workforces, and sustainability.

The authors point out that hyperconnectivity has rapidly become an influential aspect of contemporary life. There is great potential for it to be used to improve the quality of life on a global basis, thus providing heretofore unforeseen opportunity. There is also the possibility that hyperconnectivity could remain a key differentiator between the haves and the have nots. Public-private alliances appear to be the best model to get optimum value from hyperconnectivity. To embrace an alliance model, both public and private organizations need to accept that a hyperconnected public is certain to be better

informed, more easily aligned, and more responsive than ever before; this can have both positive and negative consequences.

Maximizing the Impact of Digitization

Policymakers today face a different environment for information and communications technology (ICT) than the one for which they designed policies. ICT technologies are far more pervasive than they were previously: more people today have access to a cell phone than to electricity, powering exponential growth in global data generation. With ICT access approaching ubiquity, policymakers' next challenge is to ensure that individuals, businesses, and governments are making the best possible use of networks and applications. Countries that have achieved advanced levels of digitization—the mass adoption of connected digital technologies and applications by consumers, enterprises, and governments—have realized significant benefits in their economies, their societies, and the functioning of their public sectors.

The authors of Chapter 1.11—Karim Sabbagh, Roman Friedrich, Bahjat El-Darwiche, Milind Singh, and Sandeep Ganediwalla of Booz & Company and Raul Katz of Telecom Advisory Services LLC—note that previous attempts to measure the impact of ICT have focused primarily on assessing the economic effects of widespread access to either wireless or broadband technologies. But in developing a comprehensive methodology to measure the impact of digitization, Booz & Company found greater benefits linked to growing usage of digital technologies and applications rather than access alone. Benefits are not just economic, but social and political. Digitization offers incremental economic growth: countries at the most advanced stage of digitization derive 20 percent more in economic benefits than those at the initial stage. Digitization also has a proven impact on reducing unemployment, improving quality of life, and boosting citizens' access to public services. Finally, digitization allows governments to operate with greater transparency and efficiency.

The chapter concludes that policymakers have an important role to play in ensuring that their countries are progressing toward advanced stages of digitization. They need to acknowledge where they currently stand, and recognize the benefits of digitization. Finally, they need to shift focus away from access and set into motion programs and plans that focus on the widespread adoption and usage of technology. That includes elevating digitization on the national agenda, including the systematic planning and tracking of their efforts; evolving sector governance structure; adopting an ecosystem perspective; enabling competition; and stimulating demand.

Trusting the Unknown: The Effects of Technology Use in Education

Governments have been investing in educational technology since the early 1980s. The devices, services, and applications are constantly evolving, as is the nature of the school and classroom arrangements aimed at making the most out of those technologies. The increasing emphasis on personal ubiquitous access to connectivity, for communication or information purposes, coupled with the evolution of technology and lower prices represent additional factors that contribute to modify the context in which investment decisions about educational technology—the so-called technology policies in education—have to be made.

When reviewing these policies, one of the most striking findings is how little is known about the effects of technology use on the quality of school education, and more specifically which particular uses of technology can result in better student performance. If a good evidence-supported knowledge base existed in this domain, then the analysis of these effects, and the factors that determine or condition them, could be used to unveil what works and why. But in the absence of hard evidence, the evaluation of these policies remains an almost impossible endeavor and the whole issue of how policy decisions are made remains open.

In Chapter 1.12, author Francesc Pedró from UNESCO addresses two particular questions. First is the question of what is currently known in this area and what are the limitations of the existing knowledge base—with the paradox that developing countries, which make comparatively bigger efforts in this domain, lag behind also in terms of knowledge base. Second is the issue of what elements are missing, and how the important methodological challenges required to gather those elements could be addressed.

PART 2: CASE STUDIES OF LEVERAGING ICT FOR COMPETITIVENESS AND WELL-BEING

Part 2 presents deep-dive studies of selected national experiences of leveraging ICT or developing the sector, showcasing the main challenges faced and the articulation of strategies to overcome them. In this edition, the cases of Azerbaijan and Mauritius are presented.

Big Ambitions in a Rapidly Changing World: Azerbaijan

The Republic of Azerbaijan is leveraging its position as an oil and gas center and developing strong regional ties, while also promoting economic diversity. Development of the ICT sector is expected to play a crucial role in this policy as a result of its considerable impact on the country's socioeconomic life in recent years.

In Chapter 2.1, authors Rasim Aliguliyev of the Information Technology Institute, Azerbaijan National Academy of Sciences, and Galib Gurbanov of the

Azerbaijan Internet Society note that Azerbaijan has been successful in implementing the following policy actions: (1) maintaining compliance of domestic legislation with relevant international standards and requirements of the World Trade Organization, (2) attracting new telecommunications operators to the market and establishing sound competitive environment for market participants, (3) ensuring effective and fair use of limited number and frequency resources, and (4) regulating interconnection issues and ensuring implementation of advanced licensing.

However, there are still some serious challenges that need to be addressed. Individual and business technological readiness, industry-university cooperation, and the accompanying institutional framework are all areas that will require further improvement to boost ICT impacts for competitiveness. In addition, the government will also need to improve the quality, relevance, and usefulness of its websites as well as its willingness to provide online information and participatory tools and services to the people, where country still lags behind.

Domestic and regional ICT projects carried out in accordance with the government programs and strategies, as well as the sectorial growth rate and evaluations by international experts, allow the expectation that Azerbaijan's ICT sector will catch up with oil revenues by 2025, and the country will become a regional ICT hub.

The Making of a Digital Nation: Toward i-Mauritius

Globally, the past few years have been marked by profound geopolitical changes against a backdrop of unabated financial turmoil. The credit crunch has irrevocably altered consumer behaviors, which in turn challenged many business processes and models. In this context, the ICT sector has been recognized as one of the most resilient sectors of many world economies. In fact, the foresightedness of the Government of Mauritius in developing its ICT sector as a strong pillar of the Mauritian economy has been handsomely rewarded by the double-digit growth that the sector has recently experienced.

In Chapter 2.2, authors Krishna Oolun of the Information & Communications Technologies Authority, Suraj Ramgolam of the National Computer Board, and Vasenden Dorasami of the Ministry of Information and Communication Technology present the state of the ICT/business process outsourcing in Mauritius through illustrative indicators. The chapter also describes the main challenges the country has faced in making the ICT sector what it is today, particularly because ICT is not only a sector/industry in its own right but also a vital support for almost all industries that contribute to the national wealth. In addition, the authors demonstrate how the adoption of a coherent policy-orientation approach and a sound governance structure that steers the implementation process, underpinned by various national ICT strategic plans over the last 15 years, has

resulted in widespread adoption of ICT by its citizens. This has led to an all-inclusive information society where the digital divide has been effectively bridged in terms of the key performance indicators set under the Millennium Development Goals.

Finally, the chapter focuses on the way forward for Mauritius and its ICT sector against the backdrop that presented earlier, particularly the anticipated euro crisis within the European market (see <http://www.ft.com/intl/indepth/euro-in-crisis>), which is Mauritius's major trading partner.

PARTS 3 AND 4: COUNTRY/ECONOMY PROFILES AND DATA PRESENTATION

Parts 3 and 4 feature comprehensive profiles for each of the 142 economies covered in this year's *Report* and data tables for each of the 53 variables composing the NRI, with global rankings. Each part begins with a description of how to interpret the data provided.

Technical notes and sources, included at the end of Part 4, provide additional insight and information on the definitions and sources of specific quantitative non-Survey data variables included in the NRI computation this year.