Executive Summary

SOUMITRA DUTTA, INSEAD

IRENE MIA, World Economic Forum

The Global Information Technology Report 2009–2010 appears at a rosier time in economic history than last year's edition, when the world seemed to be plunging into a major recession. Encouraging signs of recovery have appeared in early 2010 in many countries across the world, spearheaded by emerging markets such as China and India, which achieved healthy GDP growth rates in 2009. Information and communication technologies (ICT) is an ever-important enabler of renewed and sustainable growth in such a context. Its unique function as a key element of infrastructure for efficient industries and a critical productivity enhancer is crucial for sustaining recovery and laying the foundations for economies that are competitive in the long term.

Besides supporting economic sustainability, ICT can play a leading role in fostering environmental and social sustainability both within its own sector and as an industry-wide enabling infrastructure. Not only is the ICT industry increasingly adopting measures and strategies to reduce the sector's energy footprint, but it is also developing innovative solutions to diminish other sectors' energy consumption and improve overall sustainability across industries.

As far as social sustainability is concerned, ICT enables greater access to basic services by all segments of society and improves the ways these basic services (e.g., education, finance, and healthcare) are provided to citizens. In addition, it offers to all of us revolutionary and more comprehensive communication channels and innovative ways of interacting and networking, thanks notably to Web 2.0 and mobile telephony applications.

The *Report* series, launched in 2001 and published annually since then, has been following ICT advances and reporting on the changing state of the world's networked readiness for almost a decade now. It has contributed to raising the awareness of multiple actors, including governments, businesses, and civil society, about the importance of ICT for building competitive economies and durable prosperity. Leveraging ICT has many benefits for the above three stakeholders and can significantly improve their effectiveness of operations and quality of services. By identifying a number of enabling factors underpinning networked readiness and monitoring the extent to which more than 130 economies across the globe fare with respect to these factors over time, the *Report* has provided a very useful tool for decision makers and other relevant stakeholders to track national progress vis-à-vis the past as well as the rest of the world. It has also showcased best practices in networked readiness as well as in-depth analyses on several issues relating to the ICT industry, furthering knowledge on the subject and providing inspiring examples to follow for other countries.

The *Report* is the ninth of a series and is the result of a well-established partnership between the World Economic Forum (the Forum) and INSEAD, aimed at advancing the understanding of networked readiness' key drivers. The *Report* is composed of four thematic parts. Part 1 features the findings of the Networked Readiness Index (NRI) for 2009–10, together with selected essays examining different topics related to ICT and sustainability in its economic, environmental, and social dimensions. Part 2 provides insight into best practices and policies in networked readiness and competitiveness, focusing on specific country case studies. The countries selected this year are Spain, Ireland, Tunisia, and China, which all have adopted interesting examples of successful ICT strategies to foster national economic growth and development. Part 3 features detailed profiles for the 133 economies covered in this year's *Report,* offering a detailed assessment of each economy's current networked readiness landscape and allowing for international and historical comparisons on specific variables or components of the NRI. Part 4 includes data tables for each of the 68 variables composing the NRI this year, with rankings for the economies covered, as well as technical notes and sources that provide comprehensive information on hard data variables.

Part 1: The Networked Readiness of the World in 2009–10, ICT, and Sustainability

Part 1 presents the latest findings of the NRI, taking a snapshot of the networked readiness landscape of the world in 2009–10. Further, a number of deep-dive analyses exploring the many and diverse links between ICT and sustainability are included. These deal with: (1) ICT and the sustainable competitiveness of cities; (2) the creation of competitive advantages for firms through driving sustainability; (3) the role of metrics in sustainability; (4) ICT and economic and social sustainability; (5) sustainability and the role of chief information officers (CIOs); (6) the evolving science of managing for sustainability; (7) broadband as an enabler for economic

sustainability; (8) cloud computing and its economic effects; and (9) innovation in business models and policy-making to enhance environmental sustainability.

Gauging the networked readiness of the world in 2009-2010

Chapter 1.1, "How Networked Is the World? Insights from the Networked Readiness Index 2009–2010," presents the latest findings of the Index for 2009–10. The current networked readiness framework and resulting NRI were developed by INSEAD in 2002 as part of an ongoing joint research project with the Forum, and is the main methodological tool featured in the *Report* to gauge economies' preparedness to leverage ICT advances for increased competitiveness and development. The framework aims to measure:

- the degree to which a national environment is conducive to ICT development and diffusion, by taking into account a number of features of the broad business environment, some regulatory aspects, and the soft and hard infrastructure for ICT;

- the extent to which the three main national stakeholders in a society (i.e., individuals, the business sector, and the government) are inclined and prepared to use ICT in their daily activities and operation; and

- the actual use of ICT by the above three stakeholders.

Although the networked readiness framework has been kept constant since 2002, with some modification in the nature and number of variables, it is currently undergoing a process of revision to better capture recent trends and evolutions in the ICT sector. The chapter provides some information on expected future developments.

As in the past, the NRI builds on a mixture of hard data collected by well-respected international organizations, such as the International Telecommunication Union (ITU), the United Nations, and the World Bank, and survey data from the Executive Opinion Survey, conducted annually by the Forum in each of the economies covered by the *Report*. The NRI 2009–2010 covers 133 economies from both the developed and developing world, accounting for over 98 percent of world GDP.

The NRI rankings for 2009–10 present Sweden as the most networked economy in the world. A runner-up in the last three editions, the country overtakes Denmark as the world's best performer for the first time since the NRI's inception. The other Nordic countries also continue to optimally leverage ICT in their competitiveness strategy, with Denmark, Finland, Norway, and Iceland at 3rd, 6th, 10th, and 12th place, respectively.

Among the top 10, Singapore leads Asia and the world in networked readiness, climbing two positions to

2nd, followed by Denmark, Switzerland (4th), and the United States (5th).

Europe remains one of the most networked regions of the world, with 12 economies ranked among the top 20 best performers, as follows: the Nordic countries mentioned above, the Netherlands (9th), the United Kingdom (13th), Germany (14th), Luxembourg (17th), France (18th), and Austria (20th). Five other economies from the Asia and Pacific region besides Singapore place in the top 20 this year: Hong Kong (8th), Taiwan (11th), Korea (15th), Australia (16th), and New Zealand (19th). With regard to the largest Asian emerging markets, China and India continue their progression in the NRI rankings, leapfrogging another 9 and 11 places, to 37th and 43rd, respectively. The assessment for Latin America and the Caribbean is less positive, although fairly varied in terms of country performances with respect to last year, with no economy from the region appearing in the top 20 and only four in the top 50, namely Barbados (35th), Chile (40th), Puerto Rico (45th), and Costa Rica (49th). While Brazil is fairly stable at 61st, Mexico and Argentina seem to be losing ground, placing themselves at 78th and 91st, respectively. Despite some positive trends displayed by a number of economies, most of sub-Saharan Africa trails behind the rest of the world in networked readiness, with only Mauritius (53rd) and South Africa (62nd) featuring in the top half of the NRI rankings. In North Africa, Tunisia (39th) remains the best performer by far. With the exception of Egypt, improving six positions from 76th to 70th, all other countries in the region either remain rather stable or drop in the rankings. By contrast, the Middle East continues by and large to improve in networked readiness, with all countries but two (Kuwait and Syria, at 76th and 105th, respectively) appearing in the top half of the NRI rankings, namely the United Arab Emirates (23rd), Israel (28th), Bahrain (29th), Qatar (30th), Saudi Arabia (38th), Jordan (44th), and Oman (50th).

An analysis by income group and, as in the last two years, another on the most dynamic economies in the NRI from 2001 to 2009 are also included in chapter. While the former aims at putting the NRI results in a context more tailored to each economy and making comparisons more relevant, the latter provides additional insight into the evolution of networked readiness in the world over the last nine years.

ICT and the sustainable competitiveness of cities

For the first time in history, more than half of the world's population lives in urban areas. Large cities in emerging countries are becoming global in that they have as much in common with cities in advanced countries as with the rest of their own. As cities increasingly play in the global arena, they are being driven to develop sustainable competitiveness strategies and high-speed networks as basic infrastructure for the 21st century knowledge economy. In their chapter "ICT and the

Sustainable Competitiveness of Cities," authors Darren Ware, Enrique J. Rueda-Sabater, Fernando Gil de Bernabé y Varela, John Garrity, and Julian Lighton (all at Cisco Systems, Inc.) argue that the traditional advantages of cities and of ICT can be mutually reinforcing. Through the advanced use of ICT, cities not only become more competitive; they can also turn into anchors for national competitiveness strategies that incorporate the power of broadband networks. The chapter draws on a review of the current situation in 21 cities across the world to explore the extent and quality of connectivity. It then outlines a framework to assess ICT environment and use in cities. This framework covers four distinct areas: delivery of basic services, services offered online, the use of ICT for city administrative e-efficiency, and the promotion of ICT adoption at the municipal level. This can be used by city leaders to gain a perspective with regard to both the frontier of ICT possibilities and current practice in relatively advanced cities.

The resulting analysis of ICT opportunity gaps in any given city can then serve as a basis on which municipal authorities and city leaders can formulate a strategy and develop specific action plans to exploit ICT potential for competitive sustainability—including through efficiency improvements, greater responsiveness to citizen demands, and inclusive connectivity. Preliminary application of the assessment framework has produced results indicating considerable gaps between current practices and the potential that the Web 2.0 paradigm offers for cities at all stages of development—even among relatively advanced cities. The gaps are larger in emerging-country cities and in basic services and administration. The authors conclude that cities that seize the moment of this change in the technological paradigm stand to benefit enormously—particularly as the global economic map becomes redefined by growth paths that have become more divergent as a result of the recent financial crisis. These cities are the ones that will be reaping the benefits of sustainable competitiveness for a long time to come.

Competitive advantage and sustainability

As a competitive force, sustainability is already changing the world, bringing with it new business models, new winners, new losers, and completely new ways to operate. Chief executive officers (CEOs) are just waking up to this reality, and most struggle in their implementation of a sustainability strategy. The chapter "Creating Profitable Competitive Advantage by Driving Sustainability" by Peter Graf and Jim Hagemann Snabe (both at SAP AG) offers some management guidelines to steer through the massive transformation companies are facing and presents a new model SAP has developed through its extensive work in helping companies become more sustainable. This roadmap to sustainability, explored in detail in the chapter, consists of three major stages, namely: engaging with stakeholders, evolving profitability, and executing

processes in a sustainable way. The stages exist in an ongoing loop of improved performance that continually optimizes an organization's sustainability and its ability to respond to new conditions and innovation. The authors believe that there are real and tangible forces driving the need for sustainability. They claim business applications can help companies solve the problems they face by automating and driving processes in a more sustainable way, helping to extract operational data from processes and even helping companies engage feedback from stakeholders. Sustainability could be advanced by business applications the same way the latter applications did for the latest two major transformations: globalization (technologies supported by the client-server model of networked and distributed computing, for example, enabled executives to close books on a global scale and consolidate data quickly while companies could manufacture products in one market and sell them in another without having to locate offices in either) and the Internet (new types of applications drove significant change through disintermediation, putting more power than ever into the hands of consumers and creating totally innovative ways for people to interact via the net). What they expect moving forward is that sustainability will rise to the same level as other management issues, benefitting as much from the use of technology to automate the strategy-to-execution process and driving greater operational and financial performance.

Metrics and environmental sustainability

Even as the world introspects about the environmental impact of its technological and consumption choices, technology will help create a sustainable response to climate change and global warming. From assessing emission levels of carbon dioxide (CO_2) and other toxic substances and measuring success rates to telling us where we stand and what is the ideal state to be in, technology will help us step into a safer tomorrow. In "The Role of Metrics in Sustainability," Janaki Murali, Praveen Gupta, and Kiran Pereira (all at Infosys) argue that information technology (IT) companies are already blazing this trail, setting goals for themselves to reduce energy consumption and be more ecologically sensitive. Energy efficiency in buildings, data centers, and air conditioning, and, above all, developing a green conscience among employees are all steps that IT companies have started to take. They are also ensuring their efforts are steered toward achieving substantial results as they delve deeply into all available data on usage, wastage, and their consequences. Backed by data, their efforts detail plans at the most granular level, all of which integrate into a meaningful concerted effort. For example, green buildings, fast becoming a norm in the private sector, encompass "building-envelope optimization" that regulates the amount of heat and daylight entering the building, which in turn affects the design of the lighting and the air-conditioning systems—both of which are major

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energy consumers. The shading on the windows cuts down direct radiation, thereby reducing heat gains into the building and minimizing visual glare. Technologies such as light shelves are used to cut off direct sunlight and reflect light deep into the office spaces.

Sustainability is increasingly becoming a quintessential part of corporate governance. As more and more organizations will be called upon to disclose their performance on the triple bottom-line principle of economic, environmental, and social issues, the authors believe that merely publishing an annual sustainability report will not suffice because the metrics they use to measure the effectiveness of their reports will become vital. The Global Reporting Initiative (GRI) started by the non-profit Ceres in 1997–98 has now grown into a global body for benchmarking the framework for sustainability reporting. By 1999, the United Nations Environment Programme had come on board as a partner, the GRI Reporting Guidelines had been released, and 20 organizations had released their sustainability reports based on these guidelines. By 2005, the third-generation guidelines, called the *G3,* had been formulated; by 2008, 507 organizations from 55 countries had become stakeholders. The authors believe all this to be good news and that the governments should follow and make commitments.

ICT and economic and social sustainability

The ICT industry has become an increasingly important industry in the global economy, accounting for approximately 5 percent of total GDP growth between 2003 and 2008 and representing 5.4 percent of GDP worldwide in 2008. In their chapter "Fostering the Economic and Social Benefits of ICT," Scott Beardsley, Luis Enriquez, Sheila Bonini, Sergio Sandoval, and Noëmie Brun (all at McKinsey & Company Inc., working in different locations) argue that the industry has an important role to play in encouraging economic growth and in building a more socially sustainable future for citizens all over the world, thanks to its huge potential contribution to societies' well-being (including the provision of better education and healthcare services and enhanced market access for the poorest). Concretizing these economic and social benefits will require not only large investment and commitment from different national stakeholders but also changes to existing regulatory frameworks, compromises between governments and industries, and strong public engagement. Moreover, the authors warn about the difficulty of aligning the different interests of the various stakeholders, namely ICT companies' focus on revenues, governments' desire to have access to innovative services and tax revenues as well as to encourage economic growth, and regulators' interest in consumer welfare and competition. Countries that successfully manage to bring these different agendas together will see faster adoption of ICT and will be better positioned to

benefit from it. After exploring the ways in which ICT drives growth and discussing its outstanding economic and social impact, the chapter suggests a number of steps governments, businesses, and regulators should take to fully leverage ICT and to reap its many and diverse economic and social benefits. In a nutshell, the authors believe that: governments should help craft and financially support a vision for the ICT sector that can bring the interests of the different parties together and put them to work toward a common goal, businesses should use their know-how to deploy state-of-the-art networks and create innovative products, and regulators should design incentives in a way that allows the ICT industry to generate enough profits to make its investment affordable while maintaining low enough prices to promote service adoption.

Sustainability and the role of CIOs

Organizations cannot ignore the significant environmental pressures facing them today, even though the causes, scope, and impact of global climate change may be subject to a divergence of opinion. Volatile energy costs, limitations on available energy, rapidly expanding rules/legislated regulations, and a general desire for transparent enterprise operations are all realities organizations must address. To date, the general response has often proven to be reactive rather than forward-thinking, isolated rather than coordinated, and department-centered rather than business-wide. An organization's response must be more comprehensive and systematic to maximize resources and drive the best outcomes for its business overall.

In his chapter "Unlocking Sustainability: Why the CIO Should Hold the Key," Terrence Clark (at CA) argues that current conditions create a perfect opportunity for IT to step up and play a critical role in helping shape organizations' responses to these growing environmental challenges. IT can do this by working in tandem with business units and by using technology across the enterprise to help reduce cost and mitigate risk, and also uncover and seize new opportunities. Clark outlines the main drivers causing organizations to act today, including cost cutting, regulatory pressures, and corporate transparency. He then goes on to provide an overview of how organizations typically respond to environmental pressures today, and why this opens the door for the CIO and the IT department to play a critical role in driving an enterprise-wide sustainability program. A two-step prescription plan for the IT department to attack this problem is also provided, which starts with examining measures that IT can implement to reduce the environmental impact of its operations, or "IT helping itself"; and then by exploring the strategic role IT can play in addressing the issue across the organization, or "IT helping the enterprise." Last, he offers a framework for implementing a systematic approach to sustainability, providing more in-depth details into

building a successful program across the enterprise. IT has a touch point in every department, it is already using technologies to improve its own environmental issues, and it has a desire to play a more strategic role in the business. Therefore the author believes that now is an opportune time for CIOs to seize the moment and take a leadership role in sustainability.

The evolving science of managing for sustainability

For individuals, businesses, and public-sector organizations, managing energy, greenhouse gas emissions, and social responsibility have important implications. First, there is the moral and regulatory imperative to operate in an environmentally responsible manner. Second, dramatic cost savings can be gained by reducing resource consumption and waste. Finally, there is pressure from suppliers, customers, communities, and other stakeholders that place more and more importance on "green" practices. In their chapter "The Evolving Science of Managing for Sustainability: Using ICT to Optimize Environmental and Economic Outcomes," Mikael Hagström, Jonathan Hornby, and Alyssa A. Farrell (all at SAS) discuss the role of ICT in driving sustainability efforts—for measuring the impact of organizations' activities, reducing negative effects, optimizing outcomes, and extending visibility deeper into an organization and across the greater value chain. They argue that a holistic perspective, providing a view of business processes in full context, is essential when it comes to managing sustainability. It is not just about measuring and reporting discrete environmental indicators—such as kilowatts of electricity and gallons of water—but about understanding how the metrics affect each other, uncovering cause-and-effect relationships that would not be immediately apparent, and predicting the environmental impact of business decisions. Existing analytic, performance management, and activity-based costing methodologies, which have already been proven effective in financial analysis and scenario modeling, can help substantially in dealing with greenhouse gases and other sustainability issues. The authors believe that by not succumbing to the temptation to simply calculate and instead leverage an enterprise-class business modeling tool, an organization can move beyond compliance and provide insight to drive increased environmental performance and bottom-line value.

Broadband and economic sustainability

In recent years, broadband's positive impact on economic development and social networks has become evident to leaders in both the public and private sectors. This essential technology facilitates pivotal socioeconomic elements: education, health, trade, and innovation across various industries. Broadband has transformed interaction among businesses, consumers, and governments. The chapter "Enabling Sustainable Digital Highways," by Karim Sabbagh, Roman Friedrich, Bahjat El-Darwiche, and

Milind Singh (all at Booz & Company), argues that the creation of national broadband networks is crucial to sustainable economic development and social progress—and not only in emerging economies, but in developed ones as well. Despite the widespread recognition of its benefits, most of the world's households today lack access to adequate broadband connections. Legacy policies, regulations, and obsolete business models are limiting the ability of the public and private sectors to make the timely and adequate investment in necessary infrastructure to ensure universal access. In order to break this investment gridlock and pave the way for universal broadband access, both governments and private-sector operators need to make fundamental changes in their principles and business models. The authors believe broadband needs to move to the top of national strategic agendas. Policymakers ought to consider rebalancing their goal of advocating for consumer welfare with providing for an efficient industry structure that entices investment in national networks. Operators must adopt new business models to account for a transformative shift in the industry's evolution. The authors make the case that timing is critical and that the faster a country moves to provide national broadband access, the swifter it can gain or improve its standing in the global economy. After exploring broadband's impact on economic and social development and the potential risks looming on the sector's sustainability, the chapter outlines a new approach, proposing a shift of paradigms for governments and private-sector operators.

Cloud computing and its economic effects

Cloud computing is an emerging general purpose technology that could crucially enhance efficiency in the private and public sectors alike, as well as promote growth, competition, and business creation. This Internet-based technology allows information to be stored in servers and provided as an on-demand service to clients. In his chapter "The Economic Consequences of the Diffusion of Cloud Computing," Federico Etro from the University of Milano-Bicocca and Intertic argues that the impact of cloud computing on both households and companies will be substantial. Not only will consumers be able to access all their documents and data from any device (e.g., the home or work personal computer, the mobile phone, an Internet point), but firms will be able to rent computing power (both hardware and software in their latest versions) and storage from a service provider and pay on demand. Cloud computing will affect citizens' lifestyles while having a profound impact on the cost structure of all the industries using hardware and software, and therefore having an indirect but crucial impact on business creation and on the macroeconomic performance of countries. In the chapter, Etro estimates the economic impact of the diffusion of cloud computing on economic growth, business creation, and employment in the European Union. Starting from conservative

assumptions about the cost-reduction process associated with the spread of cloud computing over five years, he obtains results showing that the spread of cloud computing could provide a positive and substantial contribution to the annual growth rate (up to a few decimal points), helping to create about a million new jobs through the development of a few hundred thousand new small- and medium-sized enterprises (SMEs) in the whole European Union. The driving mechanism behind the positive contribution works through incentives to create new firms, in particular SMEs, since it affects entry barriers to new markets. As a consequence, he makes the case for policymakers to promote as rapid an adoption of cloud computing as possible and proposes some concrete actions toward that end.

Innovation in business models and policymaking to enhance environmental sustainability

Governments, businesses, and societies are all looking into more efficient and greener manners to operate and grow. Supporting this pressing need is a growing consumer population and a proliferation of many innovative services. However, it is not easy to get society to behave in a greener way unless there is an underlying support system from both businesses and governments providing a personal impetus for such behavioral change. The creative use of technology coupled with innovative business models and progressive policymaking will play a critical role in delivering the CO_2 emissions cuts needed to meet global climate change targets. "How Technology Will Drive the Transition to the Low-Carbon Economy: ICT and the Sustainability Imperative," by GBS Bindra (Logica plc), explores how the creative use of ICT, coupled with innovative business models aimed at reducing energy consumption (through smart buildings, smart grids, reduced travel, and improved energy efficiency, among others), as well as progressive policymaking frameworks can and will play a significant role in delivering the CO_2 emissions cuts needed to meet global climate change targets. It argues that ICT-led business models can influence human behavior, which will play a critical role in how we work, live, and play in a low-carbon economy. ICT companies can leverage their ability in smart information management and create new services that positively influence human behavior to combat the climate challenge, while benefiting companies, society, and the government in a triple win-win-win ecosystem, or the economic opportunity triangle. A few of the many examples in this area are ICT-based travel optimizing solutions, which can help reduce or substitute the travel requirements (both business and personal); and ICT-enabled systems that allow consumers to make carbon label–based choices at the point of sale itself. Bindra sees these examples as just the tip of the opportunity iceberg of ICT's potential to catalyze pro-green behavioral changes through innovative, smart business models.

Part 2: Best Practices in ICT to Foster Growth and Competitiveness: Selected Case Studies

Part 2 presents deep-dive studies on selected national experiences in leveraging ICT for increased competitiveness, showcasing best practices and policies relating the experiences of several countries: namely Spain, Ireland, Tunisia, and China.

Plan Avanza: Promoting information societies in Spain

The example of Spain offers remarkable insights into how governments can influence and guide the design and implementation of national information society strategies. A member of the European Union since 1986, Spain has known some of the highest growth rates since then. The current crisis has been all the more painful for Spain's economy and society as it has struck the country at a time of high expectations for the near and longer term.

"Promoting Information Societies in Complex Environments: An In-Depth Look at Spain's Plan Avanza" by Bruno Lanvin (INSEAD, eLab), Daniel Torres Mancera (National Observatory for Telecommunications and the Information Society, Spain), and Javier Busquets (ESADE Business School) relates how Plan Avanza has been Spain's primary government tool for enhancing the emergence of a world-class, inclusive and dynamic information society. Launched in 2005, the Plan is now entering a new phase, to be launched during Spain's current presidency of the European Union until June 2010. This triple coincidence of the renewal of Plan Avanza, Spain's European presidency, and the extremely serious economic crisis makes it particularly interesting to analyze how the country is preparing to confront and use this unprecedented context. Moreover, Spain offers a rather unique example in combining three levels of governance, namely regional (as a member of the European Union), national (as an independent nation state), and local (Spain being one of the countries in the world where local entities—regions and municipalities—have the highest degree of autonomy and power). In this complex political and economic environment, compounded by high levels of social and cultural diversity, Spain's efforts to build a cohesive information society go far beyond telecommunication infrastructure and e-government services. They convey many lessons that should be of interest to any country aiming to make the best of ICT to improve the well-being of its population and the competitiveness of its economy. After providing a brief history of efforts deployed to define the nature and goals of Spain's information society vision, with a focus on internationalization and innovation and the genesis of Plan Avanza in that context, the chapter highlights some of the main results obtained to date. Among these, one can cite reaching critical mass in terms of telephone and Internet penetration, the development of citizen-centric services in health and public administration, and placing Spain at the forefront of international competition in

areas such as digital content and e-banking. Finally, the challenges faced by Plan Avanza in the future are identified, while some lessons for other countries are put forward.

The smart grid in Ireland

Ireland's industrial development policies have resulted in a thriving high-tech manufacturing sector increasingly developing, manufacturing, and exporting a range of innovative products and services in ICT but also in the pharmaceutical, biotechnology, and green-tech/energy areas. The ICT sector employs 87,000 people in total, with 29,000 in manufacturing and 58,000 in services, and has a combined turnover of €75 billion, which is just over 40 percent of GDP. Seven of the top 10 Fortune 500 ICT companies are based in Ireland. There are 166 manufacturing enterprises and over 5,000 companies specializing in ICT services. In addition to a strong multi-national presence, the indigenous sector is comprised of specialist clusters in the telecommunications, finance, and e-learning areas.

In his chapter "ICT Supporting the Smart Economy: The Case of Ireland," author Barry McSweeney (National Knowledge Society Strategy, Ireland) explains that the combination of ICT and energy is a strong feature of future economic development and a key strategic direction of the 2008 government blueprint for economic recovery, *Building Ireland's Smart Economy*. It is also the main theme of the government's 2009 knowledge society strategy report, *Technology Actions to Support the Smart Economy*. This report features a set of innovative actions including an exemplar communications test-bed based on optical burst switching—a technology where Ireland is a global leader, supporting the development of energy-efficient communication devices and services; an initiative to establish Ireland as a location for energy-efficient data and cloud computing centers; the establishment of an international content services center; the convergence of communications and energy technology in the development of a smart electricity network/grid; the development of a real-time remote water monitoring system; and a combined intelligent traffic/work commuting system. McSweeney points out that a number of lessons can be drawn from the Irish experience, particularly for small countries. Countries that decide to adopt a knowledge approach to economic and social development should focus their strategies on a small number of areas of distinct strength capable of addressing national challenges. Ireland has a significant strength in attracting foreign direct investment but faces challenges in its cost base. It has adapted by increasing the knowledge intensity of its manufacturing and service sectors and by harnessing and focusing its strength in the ICT area to advance its low-carbon/energy efficient agenda.

ICT as a strategic competitiveness lever in Tunisia

ICT can be used as a strategic lever for socioeconomic development and a key competitive tool in an increasingly global and deregulated market. The chapter "ICT in Tunisia: A Strategic Lever for Building a Knowledge-Based Economy," by Tawfik Jelassi (of the Ecole Nationale des Ponts et Chaussées in France), relates the way in which Tunisia has positioned these technologies at the heart of its national development plan to build a knowledge-based economy. It also describes the way the government created a national digital culture and provided ICT access for all, regardless of gender, region, or any other criteria. The government also established a trust-worthy ICT environment through the development of a specific legal framework, which is seen as a prerequisite for the successful implementation of e-commerce, e-banking, and other online services that are described briefly in the text. Moreover, the chapter discusses the consistent focus the government has placed on educa-tion and human capital development since its independ-ence, and its effort to ensure a better fit between train-ing supply and market demand. On a related note, the government has focused on fostering scientific research and technological innovation, by adopting an action plan for setting up technology parks all over the coun-try, among other initiatives. These parks host science and technology education and training programs as well as research and development projects and startups. The challenges faced by the country in implementing its ICT strategy and in developing e-content are described, together with future perspectives for fostering Tunisia's position as an international destination for value-added ICT services. In this context, the new US$3 billion Tunis Telecom City mega-project and the President's program for the period 2009–14 are highlighted. The chapter concludes by suggesting some lessons learned from Tunisia's experience that other countries may find relevant to their own context.

The rise and development of the Internet in China and the sustainable development of ICT

The emergence and rise of the Internet has enabled a massive amount of information to be aggregated and has substantially transformed the way the public can obtain and disseminate information, as well as increased the digitalization of society. Many different nations are exploring ways to develop the ICT industry, and the Internet specifically, as a means of advancing sustainable development. China is no exception. Like all other nations, it has its own experiences and knowledge to share as far as the construction and development of the ICT industry are concerned. ICT seems to have played an indispensable role in facilitating China's increasing integration into the global economy and international community. Moreover, ICT has made positive contribu-tions to such societal progress as the establishment of a

civil society and the increasing democratization in the country.

In their chapter "The Sustainable Development of ICT in China: The Rise and Future Development of the Internet," Liu Yunjie (China Unicom), Cao Shumin (China Academy of Telecommunication Research), and Luo Wen (China Center for Information Industry Development) present the recent history of ICT development in China (including telecommunications, the Internet, and the electronic and information technology industry) while discussing ICT's contribution to the country's economy and society. They also consider the problems and challenges facing the sustainable development of the ICT industry. The chapter concludes with recommendations for future steps to ensure the industry's sustainability going into the future.

Parts 3 and 4: Country/Economy Profiles and Data Presentation

Parts 3 and 4 present comprehensive profiles for each of the 133 economies covered this year in the *Report* and data tables for each of the 68 variables composing the NRI, with global rankings. Each part is preceded by 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 the specific hard data variables included in the NRI computation this year.