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Global Information Technology Report 2009–2010

ICT for Sustainability

Soumitra Dutta
Irene Mia

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Editors

The Global Information Technology Report 2009–2010 is a special project within the framework of the Global Competitiveness Network and the Industry Partnership Program for Information Technology and Telecommunications Industries. It is the result of a collaboration between the World Economic Forum and INSEAD.

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The terms *country* and *nation* as used in this report do not in all cases refer to a territorial entity that is a state as understood by international law and practice. The terms cover well-defined, geographically self-contained economic areas that may not be states but for which statistical data are maintained on a separate and independent basis.

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Preface

ROBERT GREENHILL
Chief Business Officer, World Economic Forum

As the world economy begins to recover from one of the worst economic crises in decades, information and communication technologies (ICT) is bound to play an increasingly prominent role as a key enabler of renewed and sustainable growth, given that it has become an essential element of the infrastructure underpinning competitive economies. ICT will continue spreading its revolutionary power to modernize economies and societies and improve living conditions and opportunities around the world. ICT performance will remain crucial not only for developed countries for sustaining and enhancing their innovation potential and long-term competitiveness, but also for middle-income and developing countries in fostering structural transformations, increasing efficiency as well as reducing the digital, economic, and social divides within their territories and vis-à-vis more advanced economies.

If ICT plays a central role in ensuring economic sustainability, it can and must play an equally central role in promoting environmental and social sustainability, both as an industry and as a key element of enabling infrastructure. We believe sustainability, in all its components, should be a priority for policymakers, businesses, and civil society alike to foster a more just, more inclusive and crisis-resilient world. ICT and the ICT industry must now rise to the challenge.

The Global Information Technology Report series, produced by the World EconomicForum in partnership with INSEAD and published annually since 2001, has contributed to illuminating the drivers of ICT performance and the importance of ICT diffusion and usage for long-term competitiveness and societal well-being. The Networked Readiness Index (NRI), featured in the series, has provided a methodological framework that identifies the enabling factors for countries to fully benefit from ICT advances while highlighting the joint responsibility of all social actors, namely individuals, businesses, and governments, in this respect. The *Report* has become one of the most authoritative studies of its kind, providing a unique international benchmarking tool that policymakers and all relevant stakeholders can use to identify national shortcomings and strengths and to design national policies that set their economies on the road toward enhanced networked readiness.

The Global Information Technology Report 2009–2010, the ninth in the series, features the latest results of the NRI, offering a snapshot of the state of networked readiness in the world. Under the general theme of ICT for sustainability, the *Report* explores the central role of ICT in fostering economic, environmental, and social sustainability both as an industry in itself and in the overall economy and society.

The *Report* has established itself as one of the most comprehensive assessments of ICT readiness, covering 133 economies from the developing and developed world, representing over 98 percent of global GDP. A number of essays and case studies on sustainability and best practices in networked readiness are featured in the *Report*, together with a comprehensive data section—including detailed profiles for each economy covered and data tables with global rankings for the NRI's 68 indicators.

We would like to convey our sincere gratitude to the respected academics and industry experts who contributed excellent chapters to this *Report,* investigating the diverse links between ICT and sustainability as well as highlighting best policies and practices in ICT diffusion and leveraging. We especially wish to thank the editors of the *Report,* Soumitra Dutta at INSEAD and Irene Mia at the World Economic Forum, for their leadership and long-lasting dedication to the project. Appreciation goes also to Jennifer Blanke, Head of the Global Competitiveness Network Team and to the other team members: Ciara Browne, Margareta Drzeniek Hanouz, Thierry Geiger, Carissa Sahli, Pearl Samandari, and Eva Trujillo Herrera. Last but not least, we would like to express our gratitude to our network of 150 Partner Institutes around the world and to all the business executives who participated in our Executive Opinion Survey, without whose valuable input and support the production of this *Report* would not have been possible.

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 policymaking 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

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 multinational 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 trustworthy 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 education and human capital development since its independence, and its effort to ensure a better fit between training 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 country, 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 contributions 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.

The Networked Readiness Index Rankings

The Networked Readiness Index 2009–2010

Country/ Economy	Rank	Score	Rank within income group*	
Sweden	**1**	**5.65**	**HI**	**1**
Singapore	2	5.64	HI	2
Denmark	3	5.54	HI	3
Switzerland	4	5.48	HI	4
United States	5	5.46	HI	5
Finland	6	5.44	HI	6
Canada	7	5.36	HI	7
Hong Kong SAR	8	5.33	HI	8
Netherlands	9	5.32	HI	9
Norway	10	5.22	HI	10
Taiwan, China	11	5.20	HI	11
Iceland	12	5.20	HI	12
United Kingdom	13	5.17	HI	13
Germany	14	5.16	HI	14
Korea, Rep.	15	5.14	HI	15
Australia	16	5.06	HI	16
Luxembourg	17	5.02	HI	17
France	18	4.99	HI	18
New Zealand	19	4.94	HI	19
Austria	20	4.94	HI	20
Japan	21	4.89	HI	21
Belgium	22	4.86	HI	22
United Arab Emirates	23	4.85	HI	23
Ireland	24	4.82	HI	24
Estonia	25	4.81	HI	25
Malta	26	4.75	HI	26
Malaysia	**27**	**4.65**	**UM**	**1**
Israel	28	4.58	HI	27
Bahrain	29	4.58	HI	28
Qatar	30	4.53	HI	29
Slovenia	31	4.51	HI	30
Cyprus	32	4.48	HI	31
Portugal	33	4.41	HI	32
Spain	34	4.37	HI	33
Barbados	35	4.36	HI	34
Czech Republic	36	4.35	HI	35
China	**37**	**4.31**	**LM**	**1**
Saudi Arabia	38	4.30	HI	36
Tunisia	39	4.22	LM	2
Chile	40	4.13	UM	2
Lithuania	41	4.12	UM	3
Montenegro	42	4.10	UM	4
India	43	4.09	LM	3
Jordan	44	4.09	LM	4
Puerto Rico	45	4.07	HI	37
Hungary	46	3.98	HI	38
Thailand	47	3.97	LM	5
Italy	48	3.97	HI	39
Costa Rica	49	3.95	UM	5
Oman	50	3.91	HI	40
Croatia	51	3.91	HI	41
Latvia	52	3.90	UM	6
Mauritius	53	3.89	UM	7
Vietnam	**54**	**3.87**	**LO**	**1**
Slovak Republic	55	3.86	HI	42
Greece	56	3.82	HI	43
Uruguay	57	3.81	UM	8
Panama	58	3.81	UM	9
Romania	59	3.80	UM	10
Colombia	60	3.80	UM	11
Brazil	61	3.80	UM	12
South Africa	62	3.78	UM	13
Brunei Darussalam	63	3.77	HI	44
Azerbaijan	64	3.75	LM	6
Poland	65	3.74	UM	14
Jamaica	66	3.73	UM	15
Indonesia	67	3.72	LM	7
Kazakhstan	68	3.68	UM	16
Turkey	69	3.68	UM	17
Egypt	70	3.67	LM	8
Bulgaria	71	3.66	UM	18
Sri Lanka	72	3.65	LM	9
Macedonia, FYR	73	3.64	UM	19
Dominican Republic	74	3.64	UM	20
Senegal	75	3.63	LO	2
Kuwait	76	3.62	HI	45
Gambia, The	77	3.61	LO	3
Mexico	78	3.61	UM	21
Trinidad and Tobago	79	3.60	HI	46
Russian Federation	80	3.58	UM	22
El Salvador	81	3.55	LM	10
Ukraine	82	3.53	LM	11
Guatemala	83	3.53	LM	12
Serbia	84	3.51	UM	23
Philippines	85	3.51	LM	13
Botswana	86	3.47	UM	24
Pakistan	87	3.44	LM	14
Morocco	88	3.43	LM	15
Namibia	89	3.40	UM	25
Kenya	90	3.40	LO	4
Argentina	91	3.38	UM	26
Peru	92	3.38	UM	27
Georgia	93	3.38	LM	16
Mongolia	94	3.36	LM	17
Albania	95	3.27	LM	18
Mali	96	3.27	LO	5
Zambia	97	3.26	LO	6
Ghana	98	3.25	LO	7
Nigeria	99	3.25	LM	19
Guyana	100	3.22	LM	20
Armenia	101	3.20	LM	21
Mauritania	102	3.19	LO	8
Libya	103	3.16	UM	28
Côte d'Ivoire	104	3.16	LM	22
Syria	105	3.13	LM	23
Honduras	106	3.13	LM	24
Lesotho	107	3.12	LM	25
Burkina Faso	108	3.10	LO	9
Tajikistan	109	3.09	LO	10
Bosnia and Herzegovina	110	3.07	UM	29
Benin	111	3.06	LO	11
Venezuela	112	3.06	UM	30
Algeria	113	3.05	UM	31
Ecuador	114	3.04	LM	26
Uganda	115	3.03	LO	12
Mozambique	116	3.03	LO	13
Cambodia	117	3.03	LO	14
Bangladesh	118	3.01	LO	15
Malawi	119	3.01	LO	16
Tanzania	120	3.01	LO	17
Madagascar	121	3.00	LO	18
Ethiopia	122	2.98	LO	19
Kyrgyz Republic	123	2.97	LO	20
Nepal	124	2.95	LO	21
Nicaragua	125	2.95	LM	27
Suriname	126	2.92	UM	32
Paraguay	127	2.88	LM	28
Cameroon	128	2.86	LM	29
Burundi	129	2.80	LO	22
Timor-Leste	130	2.69	LM	30
Bolivia	131	2.68	LM	31
Zimbabwe	132	2.67	LO	23
Chad	133	2.57	LO	24

* Income groups: HI = high income; UM = upper-middle income; LM = lower-middle income; LO = low income. The highest-ranked economy of each income group appears in bold blue typeface. Country classification by income group is from the World Bank (situation as of December 2009).

(Cont'd.)

Part 1

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

CHAPTER 1.1

How Networked Is the World? Insights from the Networked Readiness Index 2009–2010

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A year ago, when the last *Global Information Technology Report* (GITR) was going to print, the world was on the brink of a global recession. There was widespread concern that the financial meltdown of autumn of 2008 would soon make its effect felt on the real economy and drag down investments in all sectors, including information and communication technologies (ICT). There was a fear that the largest emerging economies were not strong enough to pull the world out of recession and start leading a course toward recovery. A year later, in early 2010, the economic outlook appears rosier. Thanks to active government intervention all over the world, the financial sector did not capsize—in fact, it surprised many by achieving healthy profits by the end of 2009. The real economy also turned out to be surprisingly resilient. While unemployment and consumer confidence remain stubborn challenges in many parts of the developed world, emerging markets such as China and India have spearheaded the global recovery by achieving GDP growth rates of 8.5 and 5.4 percent, respectively, in 2009.[1] Despite differences in the economic upturn across the globe, it is fair to say that the world is looking at a healthy resurgence of growth in most of its regions in 2010.

The ICT sector has done well in these difficult times. While some subsectors, such as semiconductors, have suffered because of decreased consumer demand, most segments of the ICT sector have continued to grow through the difficult months of 2009. The information technology (IT) services sector expanded as firms, even in struggling sectors of the economy, turned to technology to increase automation levels and reduce costs. Social networking and Web 2.0 companies such as Facebook grew at a brisk pace over the last year and have emerged as major players in the technology space. The growing popularity of smart phones such as those produced by Apple and Google have enabled the creation of thousands of innovative applications (more than 100,000 of them on Apple's iPhone platform alone), which are changing the lives of millions on a daily basis. With an estimated 4 billion mobile telephone subscriptions around the world, technology has made the world more connected than ever before.

The growing importance of technology for the future is now reflected in the market capitalization of the largest firms in the world. Google moved from 35th to 10th position globally in terms of market capitalization in 2009.[2] Apple, which was not in the top 50 global firms at the end of 2008, is now ranked 11th, having gained nearly 150 percent in market capitalization in 2009. At the start of this new decade, eight of the fifty largest firms as measured by market capitalization are technology firms: Microsoft, Google, Apple, IBM, Cisco, Oracle, HP, and Intel, as compared with eleven firms from the oil and energy sector, nine from the financial services sector, and only one from the automotive sector. Clearly a shift is occurring from the traditional sectors

of energy and automotive to the new economy and technology-intensive sectors—the market capitalization of the top five technology firms is close to that of the top five from the oil and energy sector.

The World Economic Forum has devoted particular attention to innovation and technology in its three decade research on competitiveness, given the role these play in building long-term growth and prosperity. In particular, *The Global Information Technology Report* series, produced jointly with INSEAD since 2002, intends to shed light on the extent to which 133 developed and developing economies worldwide, representing over 98 percent of global GDP, benefit from latest ICT advances for increased competitiveness.

The *Report* series features, as the main methodological tool, the Networked Readiness Index (NRI), identifying the enabling factors for ICT readiness and providing governments and relevant stakeholders across the world with a unique benchmarking assessment of their respective economy's strengths and weaknesses vis-à-vis their past performance and relevant comparators.[3] Each year the *Report* has also included a number of contributions written by eminent experts and academics on topics of particular interest for the industry. This year the focal theme is sustainability, as this has emerged to be both a major challenge and an opportunity for firms in the ICT sector. Energy efficiency is included as one of the key performance parameters—along with productivity, scalability, security, and availability—for ICT firms. Firms in the sector are both actively trying to reduce their own energy footprints and re-design the data centers and desktop management of their customers' ICT systems to reduce energy consumption. ICT has truly become an important enabler for improving the sustainability of firms in all sectors. For example, the use of advanced video conferencing allows firms to significantly reduce the expenses and ecological footprint associated with travel. ICT firms are discovering this to be a major opportunity to provide more innovative services, as well as to help their clients to achieve their sustainability goals. In this respect, many ICT providers are creating specific software suites to help firms collect and report data on their sustainability performance on a more accurate and regular basis.

While the *Report* deals with some of the questions raised above, this chapter presents the methodology and framework for the NRI 2009–2010, and maps out the world's current networked readiness according to the latest findings of the Index.

Benchmarking ICT progress of nations and societies

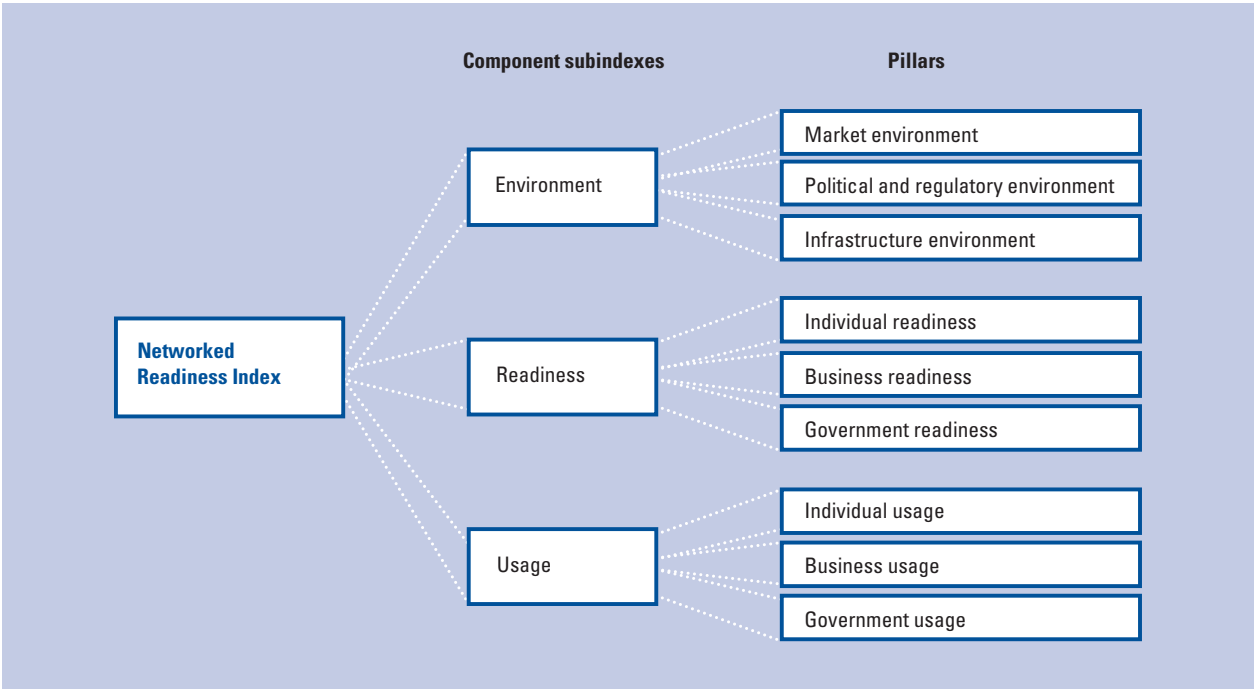
Nine years ago, when the NRI was first conceived, the global context was quite different. The world was in the midst of the Internet boom. There was much hype (and little scepticism) about the role of technology in development and economic change. Stories abounded of the Internet being used for the benefit of corporations and society at large. In the midst of the excitement surrounding the Internet, it was difficult to differentiate the trees from the forest. While there was a lot of anecdotal evidence about the benefits of technology, there were little hard data for evidence-based decision making with regard to technology policy. Leaders from both public and private sectors were left wanting for comprehensible roadmaps to better leverage technology in their national competitiveness strategies.

The publication of the first edition of the GITR in 2001 was an attempt to provide conceptual and academic guidance to senior decision makers on the design of technology policies and actions to enhance overall competitiveness and development. Central to the GITR was the creation of a theoretical model, the networked readiness framework, to identify the factors enabling the different national stakeholders—individuals, businesses, the government—to fully benefit from ICT. The networked readiness framework was grounded in academic research and benefited from prior studies in the management literature and also ongoing similar work by other institutions and multilateral agencies.[4] Each edition of the GITR over the last nine years has included a multi-dimensional assessment, based on the above framework and resulting NRI, of the use of technology for competitiveness and development in an expanding number of economies (up from 75 in the 2001–02 edition to 133 this year). This has lead to the creation of a valuable database of technology metrics, providing unique insight for research as well as for decision makers in the adoption of concrete policy decisions. A holistic approach has been central to the success of the GITR. While the numerical analyses of the NRI have proven to be very useful for identifying overall trends and have offered evidence for policy directions (such as supporting the conclusion that greater competition in the ICT sector does lead to lower prices and increased usage of ICT), the essays included every year on specific topics and on selected country experiences with ICT have provided important insight into the industry and showcased best practices in networked readiness to be emulated by other countries.

The networked readiness framework 2009–10: Theoretical underpinnings and methodology

The theoretical framework underlying the NRI 2009–2010 was introduced in the 2002–03 edition of the *Report* and has remained stable ever since, allowing for meaningful comparisons over time. The above notwithstanding, the actual variables included in the Index have experienced some variation over the years, given the dynamic trends in the technology landscape and the need to update the NRI accordingly.[5] For example, because mobile telephony has become increas-

Figure 1: The Networked Readiness Index 2009–2010: The framework



ingly important in recent years as a key networked readiness enabler, more variables related to that element have been included in the Index.

Also, time-sensitive variables that have not been recently updated by relevant international institutions may need to be dropped in any given year. As detailed below, there have been some modifications in the number and nature of variables included in the NRI this year to accommodate for the changes in the data computation methodology of the International Telecommunication Union (ITU) and prepare for the evolution envisaged for the networked readiness framework over the next few years (see Box 1).

The framework assesses the extent to which different economies benefit from latest ICT advances, based on three main principles, as follows:

1. **Environment is a crucial enabler of networked readiness.** The successful leveraging of ICT is strongly influenced by the overall environment provided for innovation and ICT use. In this sense, efforts made by the government and other relevant actors to put in place policies for a supportive market and regulatory environment are considered beneficial.

2. **A multi-stakeholder effort is key.** Although the government has a natural leadership role to play when it comes to establishing an ICT and innovation friendly environment, a joint effort from all the main societal actors—namely, the government, businesses, and civil society—is needed to achieve optimal networked readiness. This is amply supported by the field research conducted over the years in preparation for the country case studies featured in various editions of the GITR. The recent development history of some of the most networked economies in the world, be they Estonia, Israel, Korea, or Singapore, shows that the alliance between a farsighted government and an actively engaged private sector on the definition and implementation of a common ICT vision has been extremely powerful.

3. **ICT readiness facilitates ICT usage.** Preparation and willingness to use ICT is a critical determinant of effective ICT usage by all parts of a society. An economy whose stakeholders are more ready and show a greater interest toward ICT advances will be likely to use it more effectively and extensively. This link between enablers and usage is a key lesson learned from prior research in the management literature, where all models of Total Quality Management made an explicit distinction between "Enablers" and "Results."[6]

Figure 1 depicts the networked readiness framework, together with its three dimensions: environment,

Box 1: The networked readiness framework going forward

Nearly a decade since the publication of the first GITR, we have recently undertaken a thorough review of the networked readiness framework. This review has been triggered by the following three observations about changes in the context of ICT use:

Blurring boundaries. The boundaries of the ICT sector are shifting, and this change has become accentuated over the last few years as there is increasing convergence of technologies and digital media. For example, the boundaries between "traditional" ICT sectors and the consumer electronics sectors are blurring as devices such as television sets now routinely incorporate Internet access as a standard feature. The same is true for the software and entertainment sectors, as movies and other types of content are increasingly placed, processed, and shared on digital media. Thus there is a need to take a broader, more future orientated definition of ICT and not be limited to traditional notions of hardware and software.

Beyond access. For much of the first part of the last decade, the focus was on providing access to ICT for all. The digital divide in the world—primarily between developed and emerging economies—was the major challenge to overcome. Although the problem of access has not disappeared, it is fair to say that the issue of how to make the best use of access to ICT is increasingly becoming the key one. This is partially caused by the rapid spread of mobile telephony across the globe, the decreasing cost of Internet access via residential and public connections, and the emergence of lower-cost access devices such as mobile telephones and cheap personal computers. Thus, for example, it is not surprising to see that topics such e-skills have gained in importance in recent years.

Broader goals. ICT has become omnipresent and an integral part of our lives—both professional and personal—over the last few years. Hence, it is not surprising that questions are being raised about the broader goals toward which technology should be used in society and within organizations in both the public and private sectors. It is not good enough for organizations to use technology to reduce costs—they have to be able to use ICT to enhance innovation in all aspects of what they do. Governments have to move beyond providing online services (traditional e-government boundaries) to provide more effective governance to their citizens. While individual citizens will increase their use of the Internet, ICT has to be deployed to create cohesive and harmonious societies.

In line with the above observations, we feel the need to evolve the focus of the networked readiness framework so that it is better aligned with the realities underlying technological trends and also reflective of the broader goals that we think ICT should have in serving businesses, governments, and society over the coming years. The networked readiness framework has proven to be comprehensive and robust over the last decade and we believe that the above trends can be incorporated within the framework in the near future, as follows:

1. By adapting the variables used to measure the subcomponents of the networked readiness framework. This is particularly needed so that the usage component will reflect the broader goals as outlined above and the environment component will reflect the shifting boundaries of the ICT sector (for example, including specific variables to reflect the media and entertainment sectors).

2. By changing the titles of the usage pillars to more accurately reflect the goals of ICT usage, as follows:

   - Individual usage → Cohesive society
   - Business usage → Business innovation
   - Government usage → Effective governance

Given our unique experience in conducting longitudinal studies of the ICT sector, we do understand that it will take us a few years to fully capture the above changes within the networked readiness framework and the NRI. Data definition and availability remain a challenge, especially when the ambition is to cover over 130 economies. However, we have started the process of change with this edition of the networked readiness framework, for example, by including variables related to creative industries exports (variable 8.05). Data availability along the new directions outlined above remains poor and we intend to put more effort into strengthening data collection on the above elements over the next couple of years. We have chosen not to change the labels on the subcomponents of the networked readiness framework for the time being, as we could not obtain adequate data on many of the desired new dimensions. However, we believe that it is useful now to outline our thoughts about the future evolution of the networked readiness framework and seek out readers' feedback and collaboration in the process.[1]

Note

1 Any specific comments on the suggested directions for the future Networked Readiness Index should be addressed to the co-editors of the *Report:* Soumitra Dutta (soumitra.dutta@insead.edu) and Irene Mia (Irene.Mia@weforum.org).

readiness, and usage. The environment component is in turn broken down along market, regulatory, and infrastructure lines, while the readiness and usage components are along the lines of the three main stakeholders (i.e., individuals, businesses, and government).

The networked readiness framework translates into the NRI, composed by three subindexes, gauging the environment for ICT, as well as the main stakeholders' readiness, and usage, with a total of 9 pillars and 68 variables, as follows:

1. Environment subindex
   - — Market environment
   - — Political and regulatory environment
   - — Infrastructure environment

2. Readiness subindex
   - — Individual readiness
   - — Business readiness
   - — Government readiness

3. Usage subindex
   - — Individual usage
   - — Business usage
   - — Government usage

The final NRI score is a simple average of the three composing subindex scores, while each subindex's score is a simple average of those of the composing pillars, the underlying assumption being that all Index components give a similar contribution to national networked readiness. The Technical Appendix at the end of this chapter includes detailed information on the composition and computation of the NRI 2009–2010.

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

Environment subindex

The environment subindex measures the extent to which the market, regulatory, and infrastructure environment of a given country is conducive to innovation and ICT development. It includes a total of 30 variables grouped into three different pillars, relating to the market, regulatory, and hard and soft infrastructure dimensions.

The *market environment pillar* (11 variables) gauges the quality of the business environment for ICT development and diffusion in any given economy, taking into account dimensions such as the availability of appropriate financing sources (notably venture capital) and the extent of business sophistication (as captured by cluster development), together with the ease of doing business (including the presence of red tape and fiscal charges) and the freedom of exchanging information over the Internet (proxied by the freedom of the press).

The *political and regulatory environment pillar* (10 variables) captures the degree to which the national legal framework facilitates innovation and ICT development. In this sense, general aspects having to do with the protection afforded to property rights, the independence of the judiciary, and the efficiency of the law-making process are taken into account. ICT-specific features, such as the development of ICT laws and the extent to which intellectual property—key to generating innovation—is protected, are also considered, along with the level of competition in Internet, international long distance, and mobile telephone services.

The *infrastructure environment pillar* (9 variables) assesses the quality of the national ICT-related infrastructure, both in its hard elements (namely the number of telephone lines and secure Internet servers, electricity production, Internet bandwidth, and accessibility of digital content) and softer, human resources, ones. In particular, to capture the human infrastructure in a given economy, quantitative measures such as tertiary enrollment rates and education expenditure are combined with a qualitative assessment of the scientific research institutions and the availability of scientists and engineers.

Readiness subindex

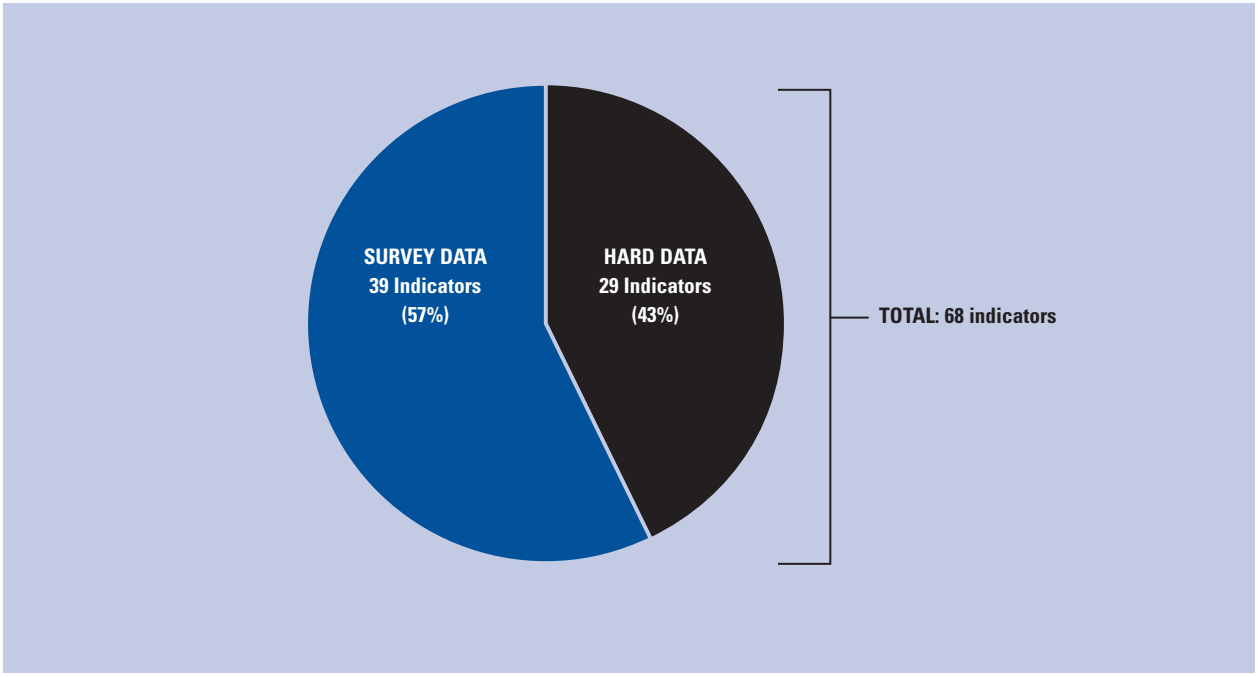
The readiness subindex assesses the preparation and interest of the three stakeholders to use technology, particularly ICT, in their day-to-day activities and transactions. With a total of 21 variables, this subindex gauges the main aspects of individual and business readiness (including the existence of appropriate human skills for using ICT and ICT affordability) as well as of government readiness (among these indicators is the prioritization of ICT in the national agenda).

The *individual readiness pillar* (8 variables) measures citizens' preparedness to use ICT through a comprehensive selection of indicators, including the quality of the educational system (notably math and science education), Internet access in schools, and residential telephone connection charges and monthly subscription costs, together with fixed broadband, mobile cellular, and fixed telephone lines tariffs.

The *business readiness pillar* (10 variables) provides insight on the degree to which firms are inclined and ready to incorporate ICT into their operations and processes. Elements taken into consideration are the quality of on-the-job training; spending on research and development (R&D); collaboration between academia and the industry, key to fostering applied innovation and intrinsic to solid clusters; the quality of suppliers in the economy; and the affordability of ICT for business.

Last but not least, the *government readiness pillar* (3 variables) represents an attempt to capture government's vision and prioritization of ICT in the national agenda and competitiveness strategies, including the extent to which public procurement of high-tech products are used as a tool to promote efficiency and innovation.

Figure 2: Hard and Survey data composition of the NRI 2009–2010



Usage subindex

The last component of the NRI measures the actual ICT usage by an economy's main stakeholders, focusing in particular on the impact of ICT in terms of efficiency and productivity gains, with a total of 17 variables.

The *individual usage pillar* (5 variables) measures ICT penetration and diffusion at the individual level, using indicators that present the number of mobile and broadband Internet subscribers, Internet users, personal computers (PCs), and Internet access in schools.

The *business usage pillar* (7 variables) captures the capacity of the business sector to absorb and generate innovation and technology by factoring in variables such as the prevalence of foreign licensing, the capacity for innovation (including the number of utility patents per 100 population, high-tech exports, and creative industry exports as a percentage of total exports of these industries), as well as the extent to which businesses use the Internet in their daily transactions and operations.

The *government usage pillar* (5 variables), in turn, analyzes the implementation of the vision captured by the government readiness pillar described above as well as the actual usage of ICT by the government. Government's success in promoting ICT penetration, e-participation, and the development and quality of e-government services are assessed, as well as the government's own ICT usage and the extent to which this has led to productivity and efficiency gains, among other factors.

Computation methodology and data

In line with past editions of the *Report* and the Forum's competitiveness methodology, the NRI 2009–2010 is composed of a mixture of hard and survey data capturing both quantitative and qualitative determinants of an economy's networked readiness. In this regard, as shown in Figure 2, 29 out of 68 (43 percent) of the variables composing the NRI are hard, quantitative data, collected from international organizations such as the ITU, the World Bank, and the United Nations. International sources ensure the validation and comparability of data across countries.

The remaining 39 variables gauge dimensions that are more qualitative in nature or for which hard data are not available for a large enough number of countries, but are nonetheless key in fully capturing national networked readiness. These data come from the Executive Opinion Survey (the Survey), which the Forum administers annually to over 13,000 business leaders in all the economies included in the GITR.[7] For dimensions relating to the development of ICT legislation, the quality of education, or the government's vision for ICT, the Survey represents an invaluable source of information.

The NRI's coverage every year depends on the Survey coverage and hard data availability. This year, the *Report* includes 133 economies, one less than last year, because Moldova could not be included in the 2009 Survey.

In terms of the NRI composition, as mentioned above, a number of changes have been made since last

year, notably as a consequence of the changes the ITU has made in its computation methodology for ICT access costs and in preparation for the future developments envisaged for the networked readiness framework and outlined in Box 1. Below we detail the changes by pillar:

1. *Market environment.* The variables on utility patents per million inhabitants and high-tech exports as a percentage of total exports have been moved to the business readiness pillar to reflect business innovation and to prepare for the transition to the new framework. Accessibility of digital content has also been moved to the infrastructure pillar because of the blurring boundaries between different media and ICT sectors. Finally, variables 1.06 and 1.07 on taxation and variables 1.08 and 1.09 on the ease of starting a business have been included in the NRI computation as two single indicators. In both cases, the underlying variables are given half-weight.

2. *Political and regulatory environment.* The variable on the efficiency of the legal framework has been replaced by two distinct variables (i.e., efficiency of the legal framework in settling disputes and efficiency of the legal framework in challenging regulations), given that the original Survey question was split into two in the 2009 Survey to better capture the two concepts. In calculating the NRI, the two questions have been combined into one composite indicator. In addition, a new hard data variable assessing the level of competition in Internet, international long distance, and mobile telephone services has been introduced. Since this indicator also captures competition levels in Internet services, the Survey variable on quality of competition in the ISP sector has been dropped. Finally, similar to this year's treatment of variables 1.08 and 1.09, variables 2.08 and 2.09 on contract enforcement have been combined in one single indicator in the NRI computation.

3. *Infrastructure environment.* As mentioned above, the variable on the accessibility of digital content has been added here, along with the measure of Internet bandwidth, which has been moved from the individual usage pillar.

4. *Individual readiness.* The collection of data related to high-speed monthly subscription, lowest cost of broadband, and cost of mobile telephone calls have been discontinued by the ITU. These variables have been replaced by the ITU's new price basket variables that capture fixed broadband, mobile cellular, and fixed telephone lines tariffs. All these cost variables are valued at purchasing power parity (PPP) to account for differences in the cost of living across countries. To ensure comparability, the residential telephone connection charges and residential monthly telephone subscriptions (now combined in a composite indicator) are also valued at PPP. In the past, cost measures were normalized using monthly or annual GDP per capita. Although the new price basket indicators capture ICT affordability better than before, their coverage is not yet complete and excludes 15 of the countries covered in the NRI this year. Finally, the variable on Internet access in schools has been moved to individual usage, as it is more closely related to the usage of technology than to readiness.

5. *Business readiness.* As above, business telephone connection charges and business monthly telephone subscription (now combined into a composite indicator) are also valued at PPP. The variable on the availability of new telephone lines for business has also been moved to this pillar from business usage because it fits in better with the readiness dimension. In addition, the variable on supplier quantity has been dropped this year, as it is highly correlated with variable 7.04 (local supplier quality).

6. *Government readiness.* The E-Government Readiness Index variable is no longer used. One of its components, the Government Online Service Index, is now used in the government usage pillar to replace the Survey question on availability of online services.

7. *Individual usage.* As mentioned above, the measure of Internet bandwidth has been moved to the infrastructure pillar.

8. *Business usage.* As indicated above, the variable related to the availability of new telephone lines has been moved to the business readiness pillar, and the variables for utility patents per million inhabitants and high-tech exports as a percentage of total exports are moved to this pillar from the market environment pillar, in order to better capture business's innovation potential and ICT usage. In the same spirit, a new variable on creative industries exports (capturing an economy's share of the world's total exports of creative industries products such as art crafts, music, and book production) has been added.

9. *Government usage.* The Survey question on the availability of online services has been replaced by the Government Online Service Index, which captures with much more precision and sophistication the development of e-government services.

More details on the variables included in the Index and their computation methodology can be found in the Technical Appendix at the end of this chapter and in

the Technical Notes and Sources section at the end of the *Report*.

The NRI rankings for 2009–10

This section details the results of the NRI 2009–2010 and provides a general overview of the current state of networked readiness both for the top 10 performing countries and by region: Europe, Asia and the Pacific, Latin America and the Caribbean, and sub-Saharan Africa and Middle East and North Africa (MENA).[8]

Table 1 displays the NRI rankings and scores for 2009–10, with 2008–09 comparisons, together with an indication of the income group to which each economy belongs and its rank within that group (see Box 2 for an analysis of the rankings by income group). Tables 2 through 4 show the rankings and scores for the three subindexes and nine pillars composing the NRI.

Tables 5 and 6, in turn, complement the information provided by Tables 1 through 4 with some detailed analysis on the most networked economies in the world, by looking respectively at the best three performers per pillar in the current NRI rankings and the evolution of the top 10 rankings since 2001–02.

Top 10

As shown in Table 1, the Nordic countries continue to feature prominently in the NRI rankings this year, with four of them among the top 10 and the fifth one, Iceland, ranked at a satisfactory 12th place. This highlights the region's impressive prowess when it comes to ICT. In the nine years of the NRI's existence, a Nordic nation has topped the rankings no less than five times.

A runner-up in the last three editions, **Sweden** overtakes Denmark as the world's most networked economy for the first time since the Index's inception. The country's showing is outstanding across the board: 1st, 4th, and 3rd for environment, readiness, and usage, respectively. This highlights the role of an ICT-conducive environment as a precondition for national stakeholders to fully leverage technology. Indeed, Sweden displays the best and second-best infrastructure and regulatory environments in the world, with comprehensive and efficient hard infrastructure, top-class human resources and education infrastructure, and an extremely friendly regulatory framework ensuring full protection of intellectual property (2nd) and providing for comprehensive ICT laws (4th). The market environment is also assessed as being very ICT-friendly at 5th place, notwithstanding very high taxation levels with a perceived distortive impact (111th for the extent and effect of taxation and 102nd for total tax rates). The three stakeholders show an important degree of propensity and capacity to use ICT, notably businesses (3rd) and individuals (6th), thanks to affordable ICT costs and top-class education and research fundamentals, among other factors. This provides the ideal context for extensive ICT usage, especially by citizens (1st for individual usage) with among the highest penetration rates in the world for PCs (4th) and Internet and broadband Internet (both 2nd), as well as mobile telephony (29th, with 118.3 subscriptions per 100 population). The extremely sophisticated and innovative Swedish business sector is also benefitting fully from ICT in its activities and operations, ranking 1st in the world for the extent of business Internet usage.[9]

Gaining two positions, **Singapore** places 2nd as a result of one of the most impressive development strategies based on ICT and innovation and a successful coherent multi-stakeholder effort in its implementation. The city-state ranks 1st in three of the nine pillars of the NRI (political and regulatory environment, individual readiness, and government readiness) and 2nd in government usage, reflecting the remarkable vision and role of the government in driving ICT penetration and leveraging ICT for economic and social modernization and increased competitiveness.[10] Like Sweden, Singapore appears in the top 10 in eight pillars. The government continues to spearhead ICT diffusion and development with yet another set of initiatives launched in 2006: the Intelligent Nation 2015 10-year master plan.

After topping the rankings for three consecutive years, **Denmark** loses its networked readiness primacy, sliding to 3rd position, with what remains nonetheless one of the most solid performances within the 133 economies covered. Denmark ranks 2nd for the quality of its environment and readiness, but scores lower in terms of ICT usage (11th). The country features among the top 10 in all pillars but one (17th in business usage). The conducive environment, coupled with an effective ICT vision and prioritization by the government (5th and 8th in government readiness and usage, respectively),[11] provide a unique basis for ICT development and innovation. Denmark continues to display among the highest ICT penetration rates in the world (4th for individual usage), with notably widespread Internet (4th) and broadband Internet (3rd) usage. Other notable competitive advantages are to be found in more general aspects, such as the well-functioning and developed internal market, which provided the national high-tech industry with a large domestic demand in its early stage; the top-notch education and research system (6th for the quality of the educational system); and the taste and talent of Danish citizens and businesses for developing, pioneering, and using new technologies and applications.

Over the years, **Switzerland** (4th) has evolved into an innovation powerhouse. Ranked 16th among 75 countries in the first NRI edition in 2001–02, the country has been consistently ranked in the top five for the last four editions. Unlike most of the NRI best performers, the government does not seem to play a leading role in ICT promotion and diffusion as compared to the other two stakeholders: Switzerland ranks

Box 2: The NRI 2009–2010 and its rankings by income group

This year sees an important innovation in the way we report the NRI results. In the spirit of making comparisons more relevant and the NRI findings more tailored to each economy included in the *Report*, its income group and rank within that group is shown next to its general rank and score in Table 1. This adds to the regional analysis, which already puts the general results into a more specific context. We hope that this will make the NRI results even more understandable and relevant for policy-makers, business leaders, and all other national stakeholders interested in enhancing their economy's networked readiness. It will also help them identify relevant peers' best practices from which to learn.

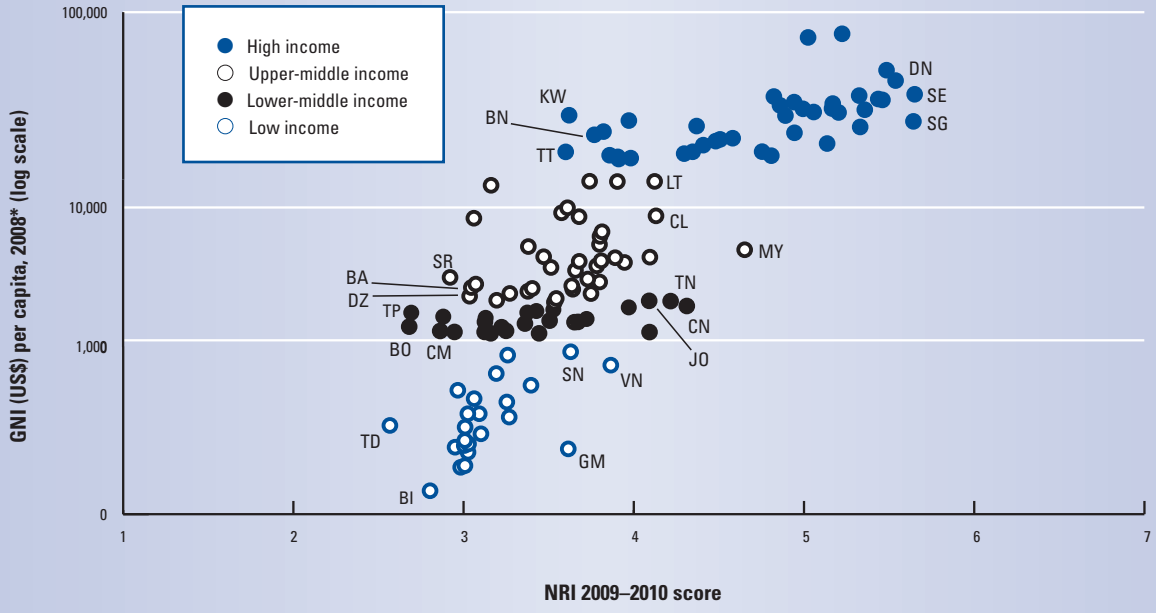
Figure A provides a graphic representation of NRI performances (captured by the 2009–10 NRI scores) according to income groups, with an indication of the top and bottom three performers for each group.[1] As highlighted in the table, Vietnam (3.87, 54th), Senegal (3.63, 75th), and Gambia (3.61, 77th) top the rankings for the low-income group, with Chad (2.57, 133rd) and Burundi (2.80, 129th) as laggards. Best performers in the lower-middle-income category are China (4.31, 37th), Tunisia (4.22, 39th), and Jordan (4.09, 44th), while worst are Bolivia (2.68th, 131st), Timor-Leste (2.69, 130th), and Cameroon (2.86, 128th). The upper-middle-income group is led by Malaysia (4.65, 27th), Chile (4.13, 40th), and Lithuania (4.12, 41st), while Suriname (2.92, 126th), Algeria (3.05, 113th), and Bosnia and Herzegovina (3.07, 110th) close the rankings. Finally, the high-income group is dominated by Sweden (5.65, 1st), Singapore (5.64, 2nd), and Denmark (5.54, 3rd), with Trinidad and Tobago (3.60, 79th), Kuwait (3.62, 76th), and Brunei (3.77, 63rd) trailing behind.

Figure A shows that, although NRI performance seems to be broadly correlated with income levels (i.e., the richer the country, the higher its score in the NRI), there are a number of economies that display higher levels of networked readiness than their income level would suggest. Some examples of this are third-best performer Gambia in the low-income group, with higher NRI scores than the majority of its richer peers in the group; China and Tunisia, which top the NRI rankings in the lower-middle cohort with a lower GNI per capita than laggard Algeria; best upper-middle group performer Malaysia, with a lower income than 2nd and 3rd ranked Lithuania and Chile as well as a large number of other countries in the group; Singapore, which is ranked 2nd within the high-income group and worldwide, with a much lower GNI per capita than Sweden and Denmark as well as a number of lower-ranked peer countries, such as Norway, Luxemburg, and Switzerland, among others.

Note

1 In classifying by income group, we have used the World Bank's classification of countries based on GNI (US$) per capita. The four groups are: low-income countries (under US$976), lower-middle-income countries (between US$976 and 3,855), upper-middle-income countries (between US$3,856 and 11,905), and high-income countries (above US$11,905).

Figure A: NRI performance by income group, 2009–10



Source: World Bank, *World Development Indicators Online Database* (consulted on January 15, 2010); World Economic Forum.
Note: Country labels identify top and bottom three countries in each income group; these are BA = Bosnia and Herzegovina, DZ = Algeria, BO = Bolivia, BN = Brunei Darussalam, BI = Burundi, CM = Cameroon, TD = Chad, CL = Chile, CN = China, DN = Denmark, GM = Gambia, JO = Jordan, KW = Kuwait, LT = Lithuania, MY = Malaysia, SN = Senegal, SG = Singapore, SR = Suriname, SE = Sweden, TP = Timor-Leste, TT = Trinidad and Tobago, TN = Tunisia, and VN = Vietnam. Not all countries are represented because of limited availability of income data.
* Or most recent year available. World Bank's Atlas method. Dollar amounts on the axis correspond to the lower threshold of each income group.

Table 1: The Networked Readiness Index 2009–2010 and 2008–2009 comparison

	NRI 2009–2010				NRI 2008–2009	
Country/Economy	Rank	Score	Rank within income group*		Rank	Score
Sweden	**1**	**5.65**	**HI**	**1**	2	5.84
Singapore	2	5.64	HI	2	4	5.67
Denmark	3	5.54	HI	3	1	5.85
Switzerland	4	5.48	HI	4	5	5.58
United States	5	5.46	HI	5	3	5.68
Finland	6	5.44	HI	6	6	5.53
Canada	7	5.36	HI	7	10	5.41
Hong Kong SAR	8	5.33	HI	8	12	5.30
Netherlands	9	5.32	HI	9	9	5.48
Norway	10	5.22	HI	10	8	5.49
Taiwan, China	11	5.20	HI	11	13	5.30
Iceland	12	5.20	HI	12	7	5.50
United Kingdom	13	5.17	HI	13	15	5.27
Germany	14	5.16	HI	14	20	5.17
Korea, Rep.	15	5.14	HI	15	11	5.37
Australia	16	5.06	HI	16	14	5.29
Luxembourg	17	5.02	HI	17	21	5.10
France	18	4.99	HI	18	19	5.17
New Zealand	19	4.94	HI	19	22	5.04
Austria	20	4.94	HI	20	16	5.22
Japan	21	4.89	HI	21	17	5.19
Belgium	22	4.86	HI	22	24	5.02
United Arab Emirates	23	4.85	HI	23	27	4.76
Ireland	24	4.82	HI	24	23	5.03
Estonia	25	4.81	HI	25	18	5.19
Malta	26	4.75	HI	26	26	4.79
Malaysia	**27**	**4.65**	**UM**	**1**	28	4.76
Israel	28	4.58	HI	27	25	4.98
Bahrain	29	4.58	HI	28	37	4.38
Qatar	30	4.53	HI	29	29	4.68
Slovenia	31	4.51	HI	30	31	4.57
Cyprus	32	4.48	HI	31	33	4.52
Portugal	33	4.41	HI	32	30	4.63
Spain	34	4.37	HI	33	34	4.50
Barbados	35	4.36	HI	34	36	4.38
Czech Republic	36	4.35	HI	35	32	4.53
China	**37**	**4.31**	**LM**	**1**	46	4.15
Saudi Arabia	38	4.30	HI	36	40	4.28
Tunisia	39	4.22	LM	2	38	4.34
Chile	40	4.13	UM	2	39	4.32
Lithuania	41	4.12	UM	3	35	4.40
Montenegro	42	4.10	UM	4	71	3.79
India	43	4.09	LM	3	54	4.03
Jordan	44	4.09	LM	4	44	4.19
Puerto Rico	45	4.07	HI	37	42	4.23
Hungary	46	3.98	HI	38	41	4.28
Thailand	47	3.97	LM	5	47	4.14
Italy	48	3.97	HI	39	45	4.16
Costa Rica	49	3.95	UM	5	56	3.99
Oman	50	3.91	HI	40	50	4.08
Croatia	51	3.91	HI	41	49	4.09
Latvia	52	3.90	UM	6	48	4.10
Mauritius	53	3.89	UM	7	51	4.07
Vietnam	**54**	**3.87**	**LO**	**1**	70	3.79
Slovak Republic	55	3.86	HI	42	43	4.19
Greece	56	3.82	HI	43	55	4.00
Uruguay	57	3.81	UM	8	65	3.85
Panama	58	3.81	UM	9	66	3.84
Romania	59	3.80	UM	10	58	3.97
Colombia	60	3.80	UM	11	64	3.87
Brazil	61	3.80	UM	12	59	3.94
South Africa	62	3.78	UM	13	52	4.07
Brunei Darussalam	63	3.77	HI	44	63	3.87
Azerbaijan	64	3.75	LM	6	60	3.93
Poland	65	3.74	UM	14	69	3.80
Jamaica	66	3.73	UM	15	53	4.03
Indonesia	67	3.72	LM	7	83	3.62

(Cont'd.)

Table 1: The Networked Readiness Index 2009–2010 and 2008–2009 comparison *(cont'd.)*

	NRI 2009–2010				NRI 2008–2009	
Country/Economy	Rank	Score	Rank within income group*		Rank	Score
Kazakhstan	68	3.68	UM	16	73	3.79
Turkey	69	3.68	UM	17	61	3.91
Egypt	70	3.67	LM	8	76	3.76
Bulgaria	71	3.66	UM	18	68	3.80
Sri Lanka	72	3.65	LM	9	72	3.79
Macedonia, FYR	73	3.64	UM	19	79	3.67
Dominican Republic	74	3.64	UM	20	75	3.76
Senegal	75	3.63	LO	2	80	3.67
Kuwait	76	3.62	HI	45	57	3.98
Gambia, The	77	3.61	LO	3	91	3.44
Mexico	78	3.61	UM	21	67	3.84
Trinidad and Tobago	79	3.60	HI	46	81	3.67
Russian Federation	80	3.58	UM	22	74	3.77
El Salvador	81	3.55	LM	10	78	3.69
Ukraine	82	3.53	LM	11	62	3.88
Guatemala	83	3.53	LM	12	82	3.64
Serbia	84	3.51	UM	23	84	3.62
Philippines	85	3.51	LM	13	85	3.60
Botswana	86	3.47	UM	24	77	3.72
Pakistan	87	3.44	LM	14	98	3.31
Morocco	88	3.43	LM	15	86	3.59
Namibia	89	3.40	UM	25	92	3.44
Kenya	90	3.40	LO	4	97	3.35
Argentina	91	3.38	UM	26	87	3.58
Peru	92	3.38	UM	27	89	3.47
Georgia	93	3.38	LM	16	88	3.48
Mongolia	94	3.36	LM	17	93	3.43
Albania	95	3.27	LM	18	105	3.23
Mali	96	3.27	LO	5	107	3.18
Zambia	97	3.26	LO	6	102	3.26
Ghana	98	3.25	LO	7	103	3.25
Nigeria	99	3.25	LM	19	90	3.45
Guyana	100	3.22	LM	20	100	3.29
Armenia	101	3.20	LM	21	114	3.06
Mauritania	102	3.19	LO	8	109	3.12
Libya	103	3.16	UM	28	101	3.28
Côte d'Ivoire	104	3.16	LM	22	111	3.12
Syria	105	3.13	LM	23	94	3.41
Honduras	106	3.13	LM	24	95	3.41
Lesotho	107	3.12	LM	25	118	3.02
Burkina Faso	108	3.10	LO	9	113	3.07
Tajikistan	109	3.09	LO	10	104	3.25
Bosnia and Herzegovina	110	3.07	UM	29	106	3.23
Benin	111	3.06	LO	11	121	2.96
Venezuela	112	3.06	UM	30	96	3.39
Algeria	113	3.05	UM	31	108	3.14
Ecuador	114	3.04	LM	26	116	3.03
Uganda	115	3.03	LO	12	120	2.98
Mozambique	116	3.03	LO	13	124	2.91
Cambodia	117	3.03	LO	14	126	2.89
Bangladesh	118	3.01	LO	15	130	2.70
Malawi	119	3.01	LO	16	110	3.12
Tanzania	120	3.01	LO	17	119	3.01
Madagascar	121	3.00	LO	18	112	3.09
Ethiopia	122	2.98	LO	19	129	2.80
Kyrgyz Republic	123	2.97	LO	20	115	3.04
Nepal	124	2.95	LO	21	127	2.85
Nicaragua	125	2.95	LM	27	125	2.90
Suriname	126	2.92	UM	32	117	3.03
Paraguay	127	2.88	LM	28	122	2.93
Cameroon	128	2.86	LM	29	123	2.93
Burundi	129	2.80	LO	22	131	2.63
Timor-Leste	130	2.69	LM	30	133	2.47
Bolivia	131	2.68	LM	31	128	2.82
Zimbabwe	132	2.67	LO	23	132	2.49
Chad	133	2.57	LO	24	134	2.44

* Income groups: HI = high income; UM = upper-middle income; LM = lower-middle income; LO = low income. The highest-ranked economy of each income group appears in bold blue typeface. Country classification by income group is from the World Bank (situation as of December 2009).

Table 2: Environment subindex

ENVIRONMENT SUBINDEX			Market environment		Political and regulatory environment		Infrastructure environment	
Rank	Country/Economy	Score	Rank	Score	Rank	Score	Rank	Score
1	Sweden	5.85	5	5.40	2	6.11	1	6.04
2	Denmark	5.67	10	5.30	5	5.97	3	5.74
3	Norway	5.60	8	5.32	8	5.90	4	5.58
4	Switzerland	5.58	3	5.47	9	5.89	7	5.39
5	Finland	5.56	6	5.38	6	5.95	8	5.36
6	Canada	5.48	7	5.35	13	5.66	6	5.44
7	Iceland	5.47	21	5.00	14	5.65	2	5.75
8	Netherlands	5.45	11	5.25	10	5.79	9	5.32
9	Singapore	5.44	2	5.49	1	6.33	21	4.51
10	United States	5.41	9	5.32	19	5.40	5	5.51
11	New Zealand	5.36	18	5.09	3	6.10	13	4.89
12	United Kingdom	5.35	17	5.10	16	5.63	10	5.31
13	Luxembourg	5.33	4	5.40	4	5.99	19	4.59
14	Australia	5.31	14	5.12	7	5.93	12	4.90
15	Hong Kong SAR	5.23	1	5.69	17	5.63	23	4.36
16	Germany	5.19	22	5.00	11	5.77	14	4.80
17	Austria	5.08	24	4.97	12	5.72	20	4.53
18	Ireland	5.08	26	4.95	15	5.64	18	4.64
19	France	5.04	30	4.84	18	5.51	15	4.77
20	Belgium	4.91	25	4.95	24	5.04	16	4.72
21	Taiwan, China	4.86	13	5.15	44	4.53	11	4.91
22	Japan	4.86	28	4.91	20	5.38	25	4.29
23	Estonia	4.77	20	5.02	23	5.10	26	4.21
24	United Arab Emirates	4.68	12	5.23	29	4.92	31	3.90
25	Cyprus	4.66	16	5.10	28	4.94	30	3.93
26	Israel	4.65	23	4.98	43	4.53	22	4.43
27	Korea, Rep.	4.63	43	4.53	38	4.72	17	4.65
28	Malta	4.61	47	4.49	22	5.15	27	4.21
29	Qatar	4.61	19	5.05	27	4.97	37	3.80
30	Slovenia	4.55	36	4.67	41	4.65	24	4.33
31	Barbados	4.50	51	4.44	26	4.99	28	4.06
32	Portugal	4.45	38	4.66	34	4.83	32	3.86
33	Bahrain	4.45	15	5.11	37	4.72	44	3.52
34	Spain	4.39	46	4.50	40	4.65	29	4.01
35	Chile	4.37	27	4.92	32	4.89	50	3.30
36	Puerto Rico	4.37	37	4.66	39	4.68	39	3.76
37	Malaysia	4.37	32	4.78	25	5.04	51	3.29
38	Saudi Arabia	4.34	33	4.76	35	4.79	48	3.45
39	South Africa	4.31	29	4.90	21	5.16	72	2.86
40	Czech Republic	4.27	44	4.52	50	4.44	34	3.85
41	Jordan	4.18	41	4.55	33	4.88	60	3.10
42	Mauritius	4.12	31	4.81	31	4.89	84	2.67
43	Montenegro	4.07	71	4.14	56	4.27	36	3.80
44	Lithuania	4.06	66	4.19	55	4.33	41	3.68
45	Hungary	4.04	80	4.07	59	4.19	33	3.86
46	Slovak Republic	4.02	45	4.51	58	4.24	49	3.31
47	Tunisia	4.02	55	4.26	42	4.57	53	3.22
48	Latvia	4.02	62	4.21	53	4.36	47	3.48
49	Greece	4.01	78	4.07	62	4.16	38	3.78
50	Thailand	3.99	42	4.55	51	4.39	64	3.03
51	Panama	3.98	39	4.66	65	4.07	55	3.21
52	Oman	3.98	34	4.70	49	4.45	77	2.79
53	India	3.96	35	4.67	46	4.52	83	2.70
54	Namibia	3.93	49	4.45	36	4.77	92	2.58
55	Italy	3.86	81	4.04	84	3.83	40	3.70
56	Croatia	3.86	91	3.91	67	4.05	42	3.61
57	China	3.85	72	4.13	47	4.52	70	2.89
58	Romania	3.80	79	4.07	64	4.11	54	3.22
59	Turkey	3.79	64	4.19	63	4.13	62	3.06
60	Kuwait	3.78	50	4.45	88	3.77	59	3.10
61	Bulgaria	3.77	88	3.94	104	3.53	35	3.85
62	Jamaica	3.77	56	4.25	57	4.25	74	2.81
63	Azerbaijan	3.77	59	4.21	54	4.33	78	2.75
64	Uruguay	3.75	96	3.80	52	4.36	61	3.10
65	Botswana	3.75	65	4.19	45	4.52	96	2.55
66	Indonesia	3.74	40	4.57	60	4.17	100	2.48
67	Poland	3.74	67	4.17	103	3.54	45	3.51
68	Trinidad and Tobago	3.73	53	4.36	80	3.88	66	2.96
69	Vietnam	3.72	85	3.98	48	4.46	80	2.72
70	Egypt	3.71	54	4.33	71	4.00	75	2.80
71	Costa Rica	3.70	63	4.20	93	3.73	56	3.17
72	Gambia, The	3.69	82	4.04	30	4.92	120	2.11
73	Mexico	3.68	73	4.13	70	4.01	67	2.91
74	Brazil	3.67	87	3.97	73	3.99	63	3.05
75	Morocco	3.64	69	4.16	61	4.17	90	2.60
76	El Salvador	3.60	48	4.46	76	3.92	103	2.42
77	Macedonia, FYR	3.60	83	4.03	87	3.79	65	2.97
78	Dominican Republic	3.59	77	4.08	68	4.05	87	2.65
79	Brunei Darussalam	3.58	92	3.87	72	4.00	71	2.87
80	Kazakhstan	3.58	93	3.86	89	3.77	58	3.10
81	Colombia	3.57	90	3.93	77	3.92	73	2.86
82	Senegal	3.54	61	4.21	82	3.85	94	2.56
83	Georgia	3.54	57	4.22	83	3.85	97	2.53
84	Sri Lanka	3.53	60	4.21	90	3.76	89	2.60
85	Ukraine	3.52	112	3.65	107	3.43	46	3.48
86	Russian Federation	3.50	116	3.57	109	3.40	43	3.54
87	Guatemala	3.48	52	4.39	100	3.56	98	2.50
88	Peru	3.48	58	4.22	92	3.74	101	2.47
89	Ghana	3.46	75	4.10	74	3.98	110	2.30
90	Serbia	3.45	114	3.61	99	3.58	57	3.16
91	Kenya	3.44	84	3.99	94	3.71	88	2.63
92	Zambia	3.42	74	4.10	66	4.06	123	2.09
93	Malawi	3.36	89	3.94	69	4.04	119	2.11
94	Mongolia	3.36	104	3.73	102	3.54	76	2.80
95	Philippines	3.35	86	3.98	91	3.74	107	2.34
96	Lesotho	3.34	101	3.75	86	3.81	102	2.45
97	Nigeria	3.33	70	4.15	85	3.82	127	2.01
98	Pakistan	3.32	68	4.17	97	3.61	115	2.19
99	Argentina	3.31	126	3.34	110	3.38	52	3.23
100	Burkina Faso	3.30	105	3.72	75	3.93	111	2.25
101	Mali	3.29	98	3.78	79	3.89	114	2.20
102	Uganda	3.25	110	3.66	81	3.86	112	2.22
103	Tanzania	3.23	99	3.76	78	3.92	126	2.02
104	Guyana	3.21	100	3.75	119	3.22	85	2.66
105	Albania	3.20	106	3.72	95	3.69	113	2.20
106	Kyrgyz Republic	3.20	121	3.41	106	3.47	81	2.72
107	Benin	3.17	103	3.74	98	3.59	116	2.19
108	Armenia	3.17	118	3.50	113	3.29	82	2.72
109	Honduras	3.16	76	4.09	128	2.98	106	2.40
110	Libya	3.13	124	3.39	125	3.09	68	2.90
111	Mauritania	3.13	97	3.80	96	3.65	131	1.93
112	Nicaragua	3.10	109	3.67	105	3.49	118	2.16
113	Syria	3.10	115	3.61	114	3.28	105	2.40
114	Mozambique	3.09	111	3.66	101	3.56	124	2.05
115	Tajikistan	3.08	127	3.34	111	3.34	95	2.55
116	Paraguay	3.07	95	3.84	130	2.88	99	2.48
117	Côte d'Ivoire	3.05	113	3.62	124	3.11	104	2.42
118	Bosnia and Herzegovina	3.04	125	3.34	126	3.06	79	2.73
119	Madagascar	3.04	102	3.74	116	3.27	121	2.10
120	Algeria	3.01	128	3.17	121	3.20	86	2.66
121	Cambodia	3.01	107	3.68	108	3.42	132	1.91
122	Bangladesh	2.99	94	3.86	123	3.12	128	2.00
123	Nepal	2.96	108	3.68	115	3.27	130	1.93
124	Ecuador	2.96	122	3.41	112	3.31	117	2.16
125	Timor-Leste	2.91	120	3.42	132	2.72	91	2.59
126	Cameroon	2.91	119	3.43	117	3.25	125	2.05
127	Ethiopia	2.90	117	3.54	120	3.21	129	1.94
128	Venezuela	2.90	132	2.77	127	3.03	69	2.89
129	Suriname	2.86	123	3.40	129	2.88	109	2.31
130	Zimbabwe	2.85	131	2.96	118	3.25	108	2.33
131	Burundi	2.76	129	2.99	122	3.20	122	2.10
132	Bolivia	2.75	130	2.99	133	2.69	93	2.56
133	Chad	2.41	133	2.77	131	2.74	133	1.72

(Cont'd.)

Table 3: Readiness subindex

READINESS SUBINDEX			Individual readiness		Business readiness		Government readiness	
Rank	Country/Economy	Score	Rank	Score	Rank	Score	Rank	Score
1	Singapore	5.94	1	6.11	5	5.59	1	6.12
2	Denmark	5.64	4	5.76	2	5.80	5	5.37
3	Finland	5.60	3	5.82	4	5.73	9	5.26
4	Sweden	5.56	6	5.73	3	5.77	12	5.17
5	United Arab Emirates	5.53	5	5.74	18	5.10	2	5.75
6	Switzerland	5.42	13	5.47	1	5.92	23	4.87
7	United States	5.29	19	5.32	8	5.45	13	5.10
8	Iceland	5.28	8	5.69	16	5.13	18	5.02
9	Hong Kong SAR	5.25	2	5.94	27	4.90	21	4.92
10	Taiwan, China	5.22	22	5.28	17	5.10	8	5.28
11	Malaysia	5.19	11	5.48	26	4.91	11	5.19
12	Qatar	5.18	27	5.18	32	4.80	3	5.54
13	Canada	5.16	16	5.42	11	5.29	27	4.77
14	Netherlands	5.15	14	5.47	7	5.51	44	4.49
15	Malta	5.14	15	5.46	42	4.46	4	5.49
16	Tunisia	5.13	12	5.47	37	4.61	7	5.32
17	Norway	5.13	20	5.31	15	5.18	22	4.89
18	Germany	5.11	24	5.24	6	5.56	42	4.52
19	China	5.10	9	5.50	34	4.72	14	5.09
20	Luxembourg	5.09	25	5.22	30	4.82	10	5.23
21	Korea, Rep.	5.07	29	5.17	20	4.98	15	5.07
22	India	5.07	7	5.69	23	4.93	35	4.58
23	Belgium	5.01	18	5.33	9	5.42	55	4.28
24	Estonia	4.98	32	5.11	33	4.76	16	5.05
25	Australia	4.97	31	5.16	21	4.97	28	4.77
26	France	4.92	45	4.92	12	5.26	37	4.57
27	Ireland	4.91	28	5.18	10	5.30	58	4.24
28	Austria	4.90	49	4.89	14	5.20	33	4.61
29	New Zealand	4.87	34	5.07	25	4.92	32	4.64
30	Saudi Arabia	4.87	46	4.92	28	4.89	25	4.80
31	Cyprus	4.84	17	5.35	40	4.51	31	4.67
32	Costa Rica	4.83	10	5.49	39	4.53	46	4.46
33	United Kingdom	4.81	42	4.94	22	4.94	39	4.55
34	Bahrain	4.80	21	5.30	72	4.08	17	5.02
35	Slovenia	4.78	35	5.05	31	4.82	47	4.46
36	Japan	4.77	68	4.55	13	5.22	38	4.55
37	Vietnam	4.70	43	4.93	52	4.33	24	4.85
38	Czech Republic	4.70	53	4.76	24	4.93	48	4.42
39	Portugal	4.69	84	4.09	36	4.63	6	5.34
40	Jordan	4.67	30	5.17	73	4.06	26	4.77
41	Montenegro	4.64	26	5.20	50	4.37	51	4.34
42	Barbados	4.61	40	4.99	61	4.23	34	4.61
43	Indonesia	4.53	23	5.26	65	4.18	64	4.14
44	Sri Lanka	4.49	47	4.90	77	4.00	36	4.57
45	Mauritius	4.48	44	4.92	68	4.14	50	4.39
46	Thailand	4.48	38	5.00	54	4.31	65	4.14
47	Senegal	4.43	74	4.38	48	4.38	41	4.52
48	Oman	4.42	87	4.07	62	4.22	19	4.97
49	Colombia	4.42	62	4.65	53	4.31	54	4.31
50	Israel	4.41	108	3.75	19	5.07	49	4.41
51	Brunei Darussalam	4.39	76	4.34	71	4.08	29	4.75
52	Gambia, The	4.37	101	3.85	57	4.30	20	4.95
53	Chile	4.35	85	4.09	41	4.48	45	4.48
54	Spain	4.34	81	4.16	29	4.84	72	4.02
55	Romania	4.34	37	5.01	64	4.20	94	3.79
56	Jamaica	4.32	54	4.75	60	4.25	74	3.98
57	Azerbaijan	4.31	106	3.80	44	4.42	30	4.72
58	Uruguay	4.30	70	4.49	66	4.16	57	4.25
59	Pakistan	4.30	39	4.99	70	4.08	90	3.82
60	Panama	4.27	58	4.69	80	3.97	63	4.15
61	Lithuania	4.25	64	4.63	58	4.27	85	3.86
62	Brazil	4.19	99	3.89	38	4.60	68	4.09
63	Croatia	4.19	75	4.36	56	4.30	80	3.92
64	Italy	4.19	51	4.80	45	4.41	120	3.36
65	Egypt	4.19	71	4.47	95	3.78	53	4.32
66	Serbia	4.18	33	5.08	99	3.75	95	3.71
67	Latvia	4.18	50	4.86	69	4.13	112	3.55
68	Puerto Rico	4.17	79	4.19	35	4.68	100	3.65
69	Poland	4.17	67	4.57	46	4.39	113	3.54
70	Trinidad and Tobago	4.17	41	4.96	91	3.84	96	3.69
71	Dominican Republic	4.16	89	4.04	84	3.92	43	4.51
72	Greece	4.14	65	4.60	74	4.03	93	3.80
73	Russian Federation	4.12	60	4.69	78	3.99	99	3.67
74	Kazakhstan	4.10	95	3.94	67	4.15	60	4.22
75	Macedonia, FYR	4.09	86	4.09	82	3.95	59	4.23
76	Ukraine	4.09	36	5.03	98	3.75	118	3.48
77	El Salvador	4.08	77	4.28	75	4.02	77	3.95
78	Guatemala	4.08	69	4.50	63	4.21	116	3.53
79	Philippines	4.06	57	4.70	86	3.89	106	3.60
80	Guyana	4.05	56	4.74	92	3.83	110	3.58
81	Kenya	4.01	114	3.62	55	4.30	66	4.12
82	Kuwait	4.00	48	4.89	107	3.58	115	3.53
83	Mali	3.99	98	3.89	109	3.56	40	4.53
84	South Africa	3.99	115	3.59	43	4.44	78	3.95
85	Hungary	3.98	92	3.98	49	4.38	107	3.59
86	Botswana	3.97	96	3.93	105	3.66	52	4.33
87	Ghana	3.96	73	4.38	106	3.65	84	3.86
88	Syria	3.95	59	4.69	110	3.56	105	3.61
89	Slovak Republic	3.95	102	3.82	47	4.39	102	3.63
90	Turkey	3.94	94	3.96	79	3.98	83	3.87
91	Armenia	3.89	52	4.76	120	3.34	111	3.57
92	Bulgaria	3.87	82	4.13	93	3.81	98	3.68
93	Algeria	3.87	66	4.58	102	3.68	121	3.34
94	Nigeria	3.86	116	3.59	51	4.36	101	3.64
95	Côte d'Ivoire	3.85	112	3.69	76	4.02	86	3.85
96	Ethiopia	3.85	90	3.99	108	3.56	73	3.99
97	Argentina	3.84	72	4.44	59	4.26	128	2.83
98	Zambia	3.84	110	3.75	83	3.94	87	3.85
99	Mexico	3.83	109	3.75	85	3.90	88	3.84
100	Bangladesh	3.82	61	4.69	127	3.25	117	3.52
101	Mauritania	3.81	118	3.53	100	3.69	61	4.21
102	Peru	3.78	97	3.90	87	3.89	114	3.54
103	Albania	3.76	88	4.06	129	3.24	76	3.97
104	Namibia	3.75	107	3.77	94	3.80	97	3.68
105	Georgia	3.75	93	3.96	116	3.48	92	3.80
106	Morocco	3.75	117	3.56	89	3.86	89	3.82
107	Nepal	3.73	55	4.74	122	3.29	123	3.15
108	Mongolia	3.71	104	3.82	123	3.29	71	4.02
109	Cambodia	3.69	111	3.71	112	3.54	91	3.82
110	Lesotho	3.67	100	3.88	111	3.54	109	3.58
111	Libya	3.64	103	3.82	130	3.24	82	3.87
112	Burkina Faso	3.64	130	2.79	90	3.86	56	4.27
113	Suriname	3.64	78	4.27	88	3.87	130	2.77
114	Benin	3.63	122	3.48	119	3.36	69	4.04
115	Mozambique	3.63	125	2.94	96	3.78	62	4.16
116	Bosnia and Herzegovina	3.62	63	4.63	117	3.43	129	2.78
117	Venezuela	3.59	83	4.10	103	3.67	126	3.00
118	Madagascar	3.59	131	2.76	81	3.96	70	4.04
119	Tajikistan	3.57	124	2.98	97	3.75	75	3.97
120	Burundi	3.57	105	3.81	124	3.29	104	3.61
121	Ecuador	3.55	80	4.19	118	3.41	125	3.04
122	Honduras	3.53	123	3.47	113	3.53	108	3.58
123	Tanzania	3.49	126	2.88	101	3.69	81	3.90
124	Uganda	3.46	133	2.61	104	3.66	67	4.10
125	Malawi	3.38	132	2.69	114	3.52	79	3.93
126	Nicaragua	3.34	113	3.64	125	3.27	124	3.11
127	Cameroon	3.31	128	2.81	115	3.52	103	3.62
128	Paraguay	3.25	91	3.98	132	3.08	132	2.69
129	Kyrgyz Republic	3.21	120	3.53	126	3.25	127	2.86
130	Chad	3.15	127	2.81	128	3.24	119	3.39
131	Zimbabwe	3.15	119	3.53	131	3.16	131	2.75
132	Bolivia	3.09	121	3.52	121	3.31	133	2.46
133	Timor-Leste	3.02	129	2.80	133	2.96	122	3.28

(Cont'd.)

Table 4: Usage subindex

USAGE SUBINDEX			Individual usage		Business usage		Government usage	
Rank	Country/Economy	Score	Rank	Score	Rank	Score	Rank	Score
1	Korea, Rep.	5.71	13	5.43	5	5.48	1	6.20
2	United States	5.69	16	5.28	1	6.10	4	5.69
3	Sweden	5.55	1	6.43	13	5.08	14	5.14
4	Singapore	5.55	9	5.63	9	5.16	2	5.85
5	Taiwan, China	5.53	14	5.35	6	5.47	3	5.78
6	Hong Kong SAR	5.51	7	5.73	7	5.33	7	5.48
7	Switzerland	5.45	3	6.13	2	5.82	34	4.41
8	Canada	5.43	12	5.50	8	5.19	6	5.59
9	Netherlands	5.36	2	6.24	14	4.91	17	4.94
10	United Kingdom	5.35	8	5.72	11	5.11	11	5.21
11	Denmark	5.30	4	5.86	17	4.62	8	5.42
12	Germany	5.20	15	5.30	4	5.49	20	4.80
13	Finland	5.14	10	5.60	10	5.14	23	4.68
14	Japan	5.04	26	4.84	3	5.52	22	4.77
15	France	5.03	22	5.02	12	5.10	16	4.97
16	Norway	4.94	11	5.60	24	4.07	13	5.17
17	Australia	4.89	20	5.16	30	3.91	5	5.60
18	Iceland	4.86	6	5.77	19	4.54	40	4.29
19	Austria	4.85	18	5.27	20	4.50	21	4.78
20	Israel	4.69	25	4.91	15	4.74	36	4.40
21	Estonia	4.67	19	5.18	40	3.52	9	5.33
22	Belgium	4.66	24	4.92	18	4.55	27	4.52
23	Luxembourg	4.65	5	5.82	28	3.94	41	4.19
24	New Zealand	4.60	23	5.00	36	3.68	15	5.12
25	Malta	4.51	27	4.73	27	3.97	19	4.83
26	Ireland	4.49	28	4.71	21	4.34	35	4.41
27	Bahrain	4.48	21	5.05	60	3.10	10	5.29
28	Malaysia	4.39	46	3.65	22	4.34	12	5.18
29	Spain	4.38	35	4.35	31	3.87	18	4.92
30	United Arab Emirates	4.34	29	4.69	32	3.86	29	4.47
31	Slovenia	4.20	30	4.60	41	3.42	26	4.56
32	Portugal	4.08	37	4.14	39	3.52	24	4.59
33	Czech Republic	4.07	31	4.56	29	3.92	58	3.72
34	Lithuania	4.05	32	4.50	48	3.21	31	4.45
35	Barbados	3.99	17	5.27	58	3.12	67	3.58
36	China	3.99	71	2.79	16	4.73	30	4.45
37	Cyprus	3.94	38	4.13	43	3.34	37	4.35
38	Hungary	3.92	34	4.36	38	3.56	54	3.84
39	Italy	3.86	36	4.22	25	4.06	87	3.31
40	Qatar	3.80	43	3.84	56	3.12	33	4.44
41	Saudi Arabia	3.68	42	3.96	49	3.20	52	3.89
42	Chile	3.67	53	3.24	51	3.19	25	4.59
43	Croatia	3.67	39	4.08	63	3.04	53	3.89
44	Puerto Rico	3.67	62	2.96	23	4.16	51	3.89
45	Slovak Republic	3.61	33	4.44	50	3.20	95	3.17
46	Montenegro	3.58	41	3.97	45	3.30	76	3.45
47	Brazil	3.53	61	2.97	37	3.62	45	4.00
48	Latvia	3.51	40	4.02	68	2.91	62	3.61
49	Tunisia	3.50	66	2.85	55	3.13	28	4.52
50	Thailand	3.44	67	2.84	33	3.80	60	3.68
51	Jordan	3.43	68	2.82	57	3.12	38	4.35
52	Colombia	3.41	63	2.92	77	2.85	32	4.45
53	Uruguay	3.39	51	3.40	86	2.78	47	3.99
54	Kazakhstan	3.36	57	3.01	88	2.76	39	4.30
55	Oman	3.33	56	3.04	67	2.92	44	4.04
56	Brunei Darussalam	3.33	50	3.42	85	2.80	56	3.78
57	Bulgaria	3.33	47	3.59	87	2.76	61	3.63
58	Mexico	3.32	76	2.67	42	3.39	50	3.90
59	Poland	3.32	45	3.75	53	3.15	105	3.04
60	Greece	3.31	48	3.52	73	2.87	70	3.55
61	Costa Rica	3.31	79	2.63	34	3.74	69	3.55
62	Turkey	3.31	55	3.04	54	3.15	57	3.73
63	Romania	3.27	49	3.43	72	2.89	75	3.49
64	India	3.25	109	1.83	26	3.97	48	3.95
65	Macedonia, FYR	3.24	44	3.75	125	2.37	66	3.59
66	Panama	3.18	64	2.89	75	2.85	55	3.79
67	Vietnam	3.17	75	2.70	46	3.25	68	3.56
68	Azerbaijan	3.17	77	2.66	70	2.90	49	3.95
69	Dominican Republic	3.16	78	2.65	82	2.82	46	4.00
70	Egypt	3.12	100	2.04	52	3.16	42	4.15
71	Russian Federation	3.11	52	3.39	71	2.89	107	3.03
72	Philippines	3.10	88	2.29	35	3.70	85	3.32
73	Jamaica	3.10	54	3.13	91	2.75	82	3.41
74	Kuwait	3.09	59	3.00	79	2.84	81	3.42
75	Mauritius	3.06	70	2.80	66	2.94	77	3.45
76	South Africa	3.05	89	2.29	44	3.33	71	3.53
77	Guatemala	3.02	85	2.42	62	3.04	63	3.61
78	Mongolia	3.02	86	2.38	104	2.54	43	4.13
79	Ukraine	2.99	74	2.72	78	2.85	80	3.42
80	Argentina	2.98	58	3.01	76	2.85	102	3.09
81	El Salvador	2.95	84	2.50	90	2.75	65	3.60
82	Sri Lanka	2.94	101	2.03	61	3.09	59	3.69
83	Senegal	2.92	96	2.12	64	3.03	64	3.61
84	Serbia	2.91	60	3.00	93	2.70	106	3.03
85	Trinidad and Tobago	2.90	65	2.87	100	2.60	93	3.23
86	Indonesia	2.90	92	2.17	47	3.21	86	3.31
87	Morocco	2.90	83	2.56	74	2.86	92	3.27
88	Peru	2.88	81	2.56	96	2.66	83	3.41
89	Albania	2.86	80	2.61	106	2.54	79	3.42
90	Georgia	2.84	73	2.72	111	2.49	88	3.31
91	Gambia, The	2.79	97	2.10	89	2.75	72	3.53
92	Kenya	2.73	111	1.80	69	2.91	74	3.50
93	Libya	2.72	103	1.93	59	3.11	100	3.12
94	Pakistan	2.71	102	2.00	80	2.83	91	3.29
95	Honduras	2.70	90	2.24	92	2.71	97	3.14
96	Venezuela	2.70	72	2.72	112	2.49	118	2.88
97	Botswana	2.69	95	2.13	97	2.63	90	3.31
98	Mauritania	2.64	108	1.84	94	2.68	84	3.40
99	Tajikistan	2.63	104	1.92	65	3.03	114	2.95
100	Ecuador	2.60	82	2.56	124	2.40	120	2.85
101	Côte d'Ivoire	2.58	114	1.72	84	2.80	94	3.22
102	Nigeria	2.56	105	1.91	83	2.82	113	2.95
103	Bosnia and Herzegovina	2.55	69	2.80	117	2.45	131	2.41
104	Namibia	2.53	98	2.08	81	2.83	122	2.67
105	Armenia	2.52	87	2.32	113	2.48	121	2.77
106	Mali	2.52	122	1.53	108	2.51	73	3.51
107	Zambia	2.52	118	1.57	105	2.54	78	3.45
108	Kyrgyz Republic	2.48	99	2.08	130	2.31	104	3.06
109	Guyana	2.41	106	1.88	118	2.45	117	2.90
110	Nicaragua	2.40	110	1.83	122	2.41	110	2.97
111	Madagascar	2.39	123	1.50	103	2.55	101	3.11
112	Benin	2.39	116	1.60	119	2.44	99	3.12
113	Uganda	2.38	117	1.59	109	2.50	103	3.06
114	Cambodia	2.38	121	1.54	101	2.60	109	3.01
115	Lesotho	2.37	119	1.57	98	2.62	116	2.92
116	Cameroon	2.37	115	1.61	107	2.53	111	2.96
117	Burkina Faso	2.36	128	1.33	116	2.45	89	3.31
118	Mozambique	2.36	126	1.44	110	2.49	96	3.15
119	Syria	2.34	112	1.78	95	2.67	126	2.58
120	Ghana	2.34	113	1.76	123	2.40	119	2.86
121	Paraguay	2.32	91	2.17	131	2.25	130	2.55
122	Tanzania	2.30	124	1.47	114	2.46	112	2.96
123	Malawi	2.28	129	1.30	120	2.42	98	3.14
124	Suriname	2.26	94	2.13	128	2.32	132	2.33
125	Algeria	2.26	93	2.14	133	2.06	128	2.58
126	Bangladesh	2.22	127	1.35	126	2.36	115	2.93
127	Bolivia	2.20	107	1.85	132	2.14	123	2.63
128	Ethiopia	2.20	132	1.26	127	2.32	108	3.03
129	Nepal	2.16	125	1.46	121	2.41	124	2.60
130	Timor-Leste	2.15	131	1.27	99	2.62	129	2.56
131	Chad	2.14	130	1.27	102	2.56	125	2.60
132	Burundi	2.08	133	1.21	115	2.46	127	2.58
133	Zimbabwe	2.01	120	1.55	129	2.31	133	2.17

(Cont'd.)

23rd and 34th in terms of government readiness and usage, respectively—its two lowest showings among the nine pillars. Businesses appear to be at the forefront of ICT readiness and diffusion, as suggested by the outstanding marks the business sector gets for its readiness (1st) and usage (2nd). Switzerland also offers an extremely conducive environment for ICT development (4th), with an extensive availability of quality soft and hard infrastructure, favorable regulations, and excellent market environment. Among the country's relative competitive weaknesses, telephony costs remain very high by international standards, even when accounting for differences in costs of living. As an example, Switzerland ranks 84th and 62nd for mobile cellular and fixed telephones tariffs, respectively.

Down two positions from last year, the **United States** places 5th. The country has not been able to regain the 1st position, earned for the last time in 2005. Yet its performance remains excellent in many ways. The country boasts a very conducive ICT environment (10th) thanks to intensive competition, excellent infrastructure, and top-notch education. The country ranks 2nd in ICT usage, with businesses (1st) and the government (4th) fully leveraging ICT. Individual usage is somewhat less satisfactory at 16th, mainly as a result of a comparatively low mobile subscription penetration rate (72nd, with some 86.8 mobile telephone subscriptions per 100 population). The enabling environment and widespread usage contribute to making the United States one of the world's most innovative countries, as reflected by its impressive 250.1 utility patents per million population (3rd). Yet some aspects of the US performance show room for improvement. Total taxes amount to 46 percent of corporate profits (85th) and the burden of government regulation remains high (53rd), while the quality of the general regulatory framework is fairly poor at 19th, with low marks for the effectiveness of law making (37th), the protection of property rights (30th), and the independence of the judiciary (26th), among other indicators.

Finland ranks 6th for the third consecutive year. The country obtains excellent marks in both the environment subindex (5th) and readiness subindex (3rd), while results in the usage component (13th) are slightly weaker—a pattern observed across all the Nordic countries.

Following its return to the top 10 last year, **Canada** continues its progression and now ranks 7th. Internet use is pervasive (11th, with 75.4 users per 100 population), and the country is second to none when it comes to PCs, with almost one computer per inhabitant. On a less positive note, with 66.4 subscriptions per 100 population (93rd), Canada's mobile telephony penetration rate remains by far the lowest among all advanced economies. This is attributable in part to the relatively high costs of mobile telephony (56th for mobile cellular tariffs).

Another of Asia's star economies, **Hong Kong SAR** (8th) improves four ranks and enters the top 10 for the second time after an incursion in 2004–05. The country displays the most conducive market environment for ICT in the world, owing to its developed financial sector, little taxation, and limited red tape. In this pillar, however, one observes a continuous deterioration in the assessment of the freedom of the press (51st, one of the lowest-ranked indicators). Hong Kong excels in individual readiness (2nd behind Singapore) and individual usage, thanks to one of the densest levels of ICT diffusion in the world. Also impressive is the government's use of ICT (7th). However, the unavailability of certain indicators makes comparisons with peers difficult. By contrast, ICT is not perceived to be a major priority for the government going forward (21st in the government readiness pillar).

The **Netherlands** (9th) remains firmly anchored within the top 10 for the fourth consecutive year. The country comes 2nd in the individual usage pillar, thanks to very high penetration rates. Mobile telephony has become universal, with more than one subscriber per inhabitant. Internet penetration is the 3rd highest in the world, with 86.5 users per 100 population, over a third of whom have broadband access (4th). It is therefore it is not a surprise that the country boasts the world's largest Internet bandwidth, equivalent to 78 kilobits per second per inhabitant. Last but not least, there are about 91 PCs per 100 population (3rd).

Fairly stable at 10th, **Norway** delivers a convincing performance, led by an extremely conducive ICT environment (3rd), notably in its infrastructure component (4th). Also individuals enjoy outstanding levels of ICT penetration (11th for individual usage), with among the highest in the world Internet usage (i.e., 6th for both Internet users and Broadband Internet subscribers).

Tables 5 and 6 provide some additional insight on the most successful economies in leveraging ICT this year, by respectively looking at the top three performers in each of the nine pillars composing the NRI, and at the evolution of the top 10 economies since 2001.

Table 5 highlights a number of features:

1. In eight of the nine pillars, the top spot belongs to a member of the overall top 10, the only exception being Korea, which ranks 15th overall and leads the government usage pillar.

2. As a sign of its outstanding performance, Singapore tops three pillars and ranks five times in the top 3, while Sweden ranks first in two pillars and four times in the top 3. No other country tops more than one pillar.

3. Presence in the top 10 gives an indication of the consistency and strength of a country's perform-

Table 5: Composition of the top 3 by pillar and presence in the top 10

Country/Economy	Overall NRI	Market environment	Political and regulatory environment	Infrastructure environment	Individual readiness	Business readiness	Government readiness	Individual usage	Business usage	Government usage	No. of times in top 10	No. of times in top 3
Sweden	1	—	2	1	—	3	—	1	—	—	6	4
Singapore	2	2	1	—	1	—	1	—	—	2	8	5
Denmark	3	—	—	3	—	2	—	—	—	—	8	2
Switzerland	4	3	—	—	—	1	—	3	2	—	6	4
United States	5	—	—	—	—	—	—	—	1	—	5	1
Finland	6	—	—	—	3	—	—	—	—	—	8	1
Canada	7	—	—	—	—	—	—	—	—	—	4	—
Hong Kong SAR	8	1	—	—	2	—	—	—	—	—	5	2
Netherlands	9	—	—	—	—	—	—	2	—	—	4	1
Norway	10	—	—	—	—	—	—	—	—	—	3	—
Taiwan, China	11	—	—	—	—	—	—	—	—	3	3	1
Iceland	12	—	—	2	—	—	—	—	—	—	3	1
Korea, Rep.	15	—	—	—	—	—	—	—	—	1	2	1
New Zealand	19	—	3	—	—	—	—	—	—	—	1	1
Japan	21	—	—	—	—	—	—	—	3	—	1	1
United Arab Emirates	23	—	—	—	—	—	2	—	—	—	2	1
Qatar	30	—	—	—	—	—	3	—	—	—	1	1

Table 6: Performance of the top 10 economies since 2001–02

Country/Economy	2009–10	2008–09	2007–08	2006–07	2005–06	2004–05	2003–04	2002–03	2001–02
Coverage	133	134	127	122	115	104	102	82	75
Sweden	1	2	2	2	8	6	4	4	4
Singapore	2	4	5	3	2	1	2	3	8
Denmark	3	1	1	1	3	4	5	8	7
Switzerland	4	5	3	5	9	9	7	13	16
United States	5	3	4	7	1	5	1	2	1
Finland	6	6	6	4	5	3	3	1	3
Canada	7	10	13	11	6	10	6	6	12
Hong Kong SAR	8	12	11	12	11	7	18	18	13
Netherlands	9	9	7	6	12	16	13	11	6
Norway	10	8	10	10	13	13	8	17	5
Iceland	11	7	8	8	4	2	10	5	2

Note: Top three ranks in each edition are in blue typeface.

ance. Singapore, Denmark and Finland appear *eight* times in the top 10, Switzerland and Sweden six times.

4. United Arab Emirates and Qatar, placing 2nd and 3rd in government readiness, just behind Singapore, are the two lowest-ranked countries to appear in the top 3 of any pillar.

As shown in Table 6, in the nine editions of the NRI, the top spot in the overall rankings has always been occupied by a member of the current top 10. Denmark and the United States each topped the rankings three times. Sweden is the current leader, while Finland and Singapore were number 1 in 2002–03 and 2004–05, respectively. In fact, since 2001–02, the top 3 places have been shared among just 11 countries. Iceland is the only country outside the current top 10 that has ever been ranked among the top 3 (2nd in the inaugural edition). Finally, Switzerland (4th) has realized the most impressive progression over the years. Ranked 16th in 2001, the country has been a member of the top 5 since 2006–07.

Box 3 presents the main findings of an analysis across time aimed at identifying the countries that have progressed the most in the nine years since the NRI's inception.

Europe

Europe remains one of the most networked regions of the world, with Sweden topping the NRI rankings for the first time and 11 other economies featuring among the top 20 best performers, namely Denmark (3rd), Switzerland (4th), Finland (6th), the Netherlands (9th), Norway (10th), **Iceland** (12th), **Germany** (14th), the **United Kingdom** (13th), **Luxembourg** (17th), **France** (18th), and **Austria** (20th).

The **Nordic countries** keep leveraging ICT to the fullest in their national competitiveness strategies, building on a number of enabling common factors that have allowed them to feature consistently among the best performers since the NRI's inception (see Table 6). Among these factors, one can cite an ICT-conducive market, regulatory, and infrastructure environment; a consistent focus on education as a key competitiveness lever, which resulted in top-class educational and research systems; a strong culture for innovation both at the private and public levels; and, last but not least, the central role given to ICT in the government's agenda, as an enabler of efficiency and sustained growth, coupled with a constant effort to promote ICT diffusion. As a result of the above, Nordic countries can boast extremely high ICT penetration rates and sophisticated businesses successfully competing in the international markets with their high-tech and innovative products.

These strengths represent solid foundations for these countries' continued competitiveness going forward. They may prove particularly crucial for Iceland in the design and implementation of its recovery plan in the wake of the near economic collapse experienced by the country in late 2008.

The **EU15** economies present a more mixed picture, with different degrees of ICT prowess displayed throughout the region.[12] While Sweden, Denmark, Finland, the Netherlands, Norway, Germany, the United Kingdom, Austria, France, **Belgium** (22nd), and **Ireland** (24th), among other countries, continue to be at the forefront of networked readiness and fully leverage ICT for the enhanced competitiveness of their economies, **Greece** (56th) and, to a lesser extent, **Italy** (48th) trail behind because of a number of similar weaknesses. In particular, in both countries the market and regulatory

Box 3: Tracking countries' evolution in networked readiness over time

Table A provides the updated results of an analysis of country performance in the Networked Readiness Index (NRI) based on decile rankings.[1] A decile ranking attributes ranks based on scores while taking into account the number of countries in the sample.[2] This allows a comparison of countries' performances over time in the presence of varying sample sizes, as is the case for the GITR, whose country coverage has fluctuated since its first edition, increasing from 75 countries to 133 this year. For a country to be ranked 50th among 75 countries is not the same as being ranked 50th out of 133.[3]

In Table A, for each economy we report the edition of the NRI when that economy was included for the first time, along with its rank and corresponding decile rank at that time; its 2009–10 rank and corresponding decile rank; and the difference between the two decile ranks, as an indication of the economy's dynamism.

The most dynamic region according to our analysis appears to be Asia, which hosts the economies that have progressed the most since their first inclusion in the NRI. China has gone from rank 64th out of 75 countries (9th decile) in 2001–02 to 37th out of 133 (3rd decile)—a giant leap across six deciles. Over the same period, Vietnam and India have gone up five and four decile ranks, respectively. Sri Lanka (up three decile ranks), Indonesia, Malaysia, and Thailand (all up two decile ranks) also contribute to the region's dynamism.

In Europe, Romania was among the worst performers in 2001–02 (65th out of 75 countries). It now belongs to the top half of the ranking—a gain of four decile ranks. In the Middle East, Jordan has gone up from 7th to 4th decile.

In Africa, Mauritius (53th) has progressed three decile ranks and now outperforms South Africa (57th). Gambia (77th) has achieved a similar performance in just seven editions, moving from 9th decile in 2003–04 to 6th decile today.

In Latin America, three countries stand out, having improved three decile ranks since 2001–02: Colombia, Guatemala, and Jamaica. Despite their dynamism, all these countries remain far below the leading positions in the rankings.

The closer to the top, the more static the ranking becomes. Switzerland is the only country initially ranked lower than the 2nd decile to have reached the 1st decile. Estonia, France, and Luxembourg are the only countries initially ranked beyond the 3rd decile that now belong to the 2nd decile. The seven countries ranked in the top decile in 2001–02, namely Denmark, Finland, Iceland, the Netherlands, Norway, Sweden, and the United States, still appear in the top decile of this year's ranking. Only two of these, Norway and the Netherlands, ranked in a lower decile at some point during this nine-year period.

Less successful stories include Tanzania (120th, 10th decile), which has dropped three decile ranks in the course of seven editions. Argentina (5th to 7th decile) and Venezuela

(Cont'd.)

Table A: Evolution in decile rankings since first inclusion

Country	Region*	First inclusion Edition	First inclusion Rank	First inclusion Decile	NRI 2009–2010 Rank	NRI 2009–2010 Decile	Decile diff.
Albania	CEE	05–06	106	10	95	8	2
Algeria	AF	03–04	87	9	113	9	—
Argentina	WH	01–02	32	5	91	7	–2
Armenia	CIS	05–06	86	8	101	8	—
Australia	AE	01–02	14	2	16	2	—
Austria	AE	01–02	9	2	20	2	—
Azerbaijan	CIS	05–06	73	7	64	5	2
Bahrain	ME	04–05	33	4	29	3	1
Bangladesh	DA	01–02	73	10	118	9	1
Barbados	WH	06–07	40	4	35	3	1
Belgium	AE	01–02	18	3	22	2	1
Benin	AF	05–06	108	10	111	9	1
Bolivia	WH	01–02	67	9	131	10	–1
Bosnia and Herzegovina	CEE	04–05	89	9	110	9	—
Botswana	AF	02–03	44	6	86	7	–1
Brazil	WH	01–02	38	6	61	5	1
Bulgaria	CEE	01–02	53	8	71	6	2
Burkina Faso	AF	06–07	99	9	108	9	—
Burundi	AF	06–07	121	10	129	10	—
Cambodia	DA	05–06	104	10	117	9	1
Cameroon	AF	03–04	83	9	128	10	–1
Canada	AE	01–02	12	2	7	1	1
Chad	AF	03–04	102	10	133	10	—
Chile	WH	01–02	34	5	40	4	1
China	DA	01–02	64	9	37	3	6
Colombia	WH	01–02	57	8	60	5	3
Costa Rica	WH	01–02	45	6	49	4	2
Croatia	CEE	02–03	48	6	51	4	2
Cyprus	AE	04–05	37	4	32	3	1
Czech Republic	CEE	01–02	28	4	36	3	1
Denmark	AE	01–02	7	1	3	1	—
Dominican Republic	WH	01–02	47	7	74	6	1
Ecuador	WH	01–02	71	10	114	9	1
Egypt	ME	01–02	60	8	70	6	2
El Salvador	WH	01–02	55	8	81	7	1
Estonia	CEE	01–02	23	4	25	2	2
Ethiopia	AF	03–04	101	10	122	10	—
Finland	AE	01–02	3	1	6	1	—
France	AE	01–02	24	4	18	2	2
Gambia, The	AF	03–04	82	9	77	6	3
Georgia	CIS	04–05	91	9	93	7	2
Germany	AE	01–02	17	3	14	2	1
Ghana	AF	03–04	74	8	98	8	—
Greece	AE	01–02	31	5	56	5	—
Guatemala	WH	01–02	68	10	83	7	3
Guyana	WH	05–06	111	10	100	8	2
Honduras	WH	01–02	72	10	106	8	2
Hong Kong SAR	AE	01–02	13	2	8	1	1
Hungary	CEE	01–02	30	4	46	4	—
Iceland	AE	01–02	2	1	12	1	—
India	DA	01–02	54	8	43	4	4
Indonesia	DA	01–02	59	8	67	6	2
Ireland	AE	01–02	19	3	24	2	1
Israel	AE	01–02	22	3	28	3	—
Italy	AE	01–02	25	4	48	4	—
Jamaica	WH	01–02	56	8	66	5	3
Japan	AE	01–02	21	3	21	2	1
Jordan	ME	01–02	49	7	44	4	3
Kazakhstan	CIS	05–06	60	6	68	6	—
Kenya	AF	03–04	84	9	90	7	2
Korea, Rep.	AE	01–02	20	3	15	2	1
Kuwait	ME	05–06	46	4	76	6	–2
Kyrgyz Republic	CIS	05–06	103	9	123	10	–1
Latvia	CEE	01–02	39	6	52	4	2
Lesotho	AF	06–07	116	10	107	9	1
Libya	ME	07–08	105	9	103	8	1
Lithuania	CEE	01–02	42	6	41	4	2
Luxembourg	AE	02–03	27	4	17	2	2
Macedonia, FYR	CEE	03–04	75	8	73	6	2
Madagascar	AF	03–04	92	10	121	10	—
Malawi	AF	04–05	93	9	119	9	—
Malaysia	DA	01–02	36	5	27	3	2
Mali	AF	03–04	96	10	96	8	2
Malta	CEE	03–04	27	3	26	2	1
Mauritania	AF	06–07	87	8	102	8	—
Mauritius	AF	01–02	51	7	53	4	3
Mexico	WH	01–02	44	6	78	6	—
Mongolia	CIS	05–06	92	8	94	8	—
Morocco	AF	02–03	52	7	88	7	—
Mozambique	AF	03–04	97	10	116	9	1
Namibia	AF	02–03	53	7	89	7	—
Nepal	DA	06–07	108	9	124	10	–1
Netherlands	AE	01–02	6	1	9	1	—
New Zealand	AE	01–02	11	2	19	2	—
Nicaragua	WH	01–02	69	10	125	10	—
Nigeria	AF	01–02	75	10	99	8	2
Norway	AE	01–02	5	1	10	1	—
Oman	ME	07–08	53	5	50	4	1
Pakistan	DA	03–04	76	8	87	7	1
Panama	WH	01–02	48	7	58	5	2
Paraguay	WH	01–02	63	9	127	10	–1
Peru	WH	01–02	52	7	92	7	—
Philippines	DA	01–02	58	8	85	7	1
Poland	CEE	01–02	35	5	65	5	—
Portugal	AE	01–02	27	4	33	3	1
Puerto Rico	WH	07–08	39	4	45	4	—
Qatar	ME	05–06	39	4	30	3	1
Romania	CEE	01–02	65	9	59	5	4
Russian Federation	CIS	01–02	61	9	80	7	2
Saudi Arabia	ME	07–08	48	4	38	3	1
Senegal	AF	03–04	81	8	75	6	2
Singapore	AE	01–02	8	2	2	1	1
Slovak Republic	CEE	01–02	33	5	55	5	—
Slovenia	AE	01–02	29	4	31	3	1
South Africa	AF	01–02	40	6	62	5	1
Spain	AE	01–02	26	4	34	3	1
Sri Lanka	DA	01–02	62	9	72	6	3
Suriname	WH	06–07	110	10	126	10	—
Sweden	AE	01–02	4	1	1	1	—
Switzerland	AE	01–02	16	3	4	1	2
Syria	ME	07–08	110	9	105	8	1
Taiwan, China	AE	01–02	15	2	11	1	1
Tajikistan	CIS	05–06	93	9	109	9	—
Tanzania	AF	03–04	71	7	120	10	–3
Thailand	DA	01–02	43	6	47	4	2
Trinidad and Tobago	WH	01–02	46	7	79	6	1
Tunisia	AF	02–03	34	5	39	3	2
Turkey	CEE	01–02	41	6	69	6	—
Uganda	AF	03–04	80	8	115	9	–1
Ukraine	CIS	01–02	66	9	82	7	2
United Arab Emirates	ME	04–05	23	3	23	2	1
United Kingdom	AE	01–02	10	2	13	1	1
United States	AE	01–02	1	1	5	1	—
Uruguay	WH	01–02	37	5	57	5	—
Venezuela	WH	01–02	50	7	112	9	–2
Vietnam	DA	01–02	74	10	54	5	5
Zambia	AF	03–04	85	9	97	8	1
Zimbabwe	AF	01–02	70	10	132	10	—

Note: * Abbreviations: Advanced Economies (AE); Africa (AF); Central and Eastern Europe (CEE); CIS and Mongolia (CIS); Middle East (ME); Western Hemisphere (WH). See text for details. Countries added in, or after, the 2008–2009 edition are not reported.

Box 3: Tracking countries' evolution in networked readiness over time *(cont'd.)*

(7th to 9th) have both lost two decile positions since 2001–02. Meanwhile, Greece and Italy, two EU members, have not managed to improve by a single decile despite the nearly twofold increase in country coverage.

Note

1 This analysis was conducted for the first time two years ago and updated last year.

2 For each edition of the NRI, the overall ranking was divided into 10 segments called *deciles,* each with an equal count of ranks. The 1st and 10th deciles comprise the economies that rank the highest and the lowest, respectively. The 1st decile includes ranks 1 through 6 in the 2001–02 edition, and ranks 1 through 13 in the 2009–10 edition. Similarly, the 10th decile includes ranks 68 through 75 in 2001–02 and ranks 120 through 133 in 2009–10. Based on this approach, the 50th rank corresponds to the 7th decile in 2001–02 and to the 4th decile in 2009–10.

3 The decile ranking approach presents one caveat: countries that were included after the first edition of the NRI in 2001 are, in majority, from the developing world. Admittedly, their performance tends to be worse than that of incumbent countries. This means that it is enough for an incumbent country to maintain its rank to automatically progress in the decile ranking. However, there are several cases of incumbent countries losing ground to incoming countries and, as a result, stagnating or even dropping in the decile rankings, as detailed above.

environment does not seem to be very conducive to ICT and innovation development,[13] with little priority given by the two governments to ICT usage and diffusion in their overall strategy (93rd and 120th for government readiness and 70th and 87th for government usage for Greece and Italy, respectively). Chapters 2.1 and 2.2, respectively, provide interesting accounts of **Spain** (34th) and Ireland's innovation and ICT diffusion strategies of recent years.

Although losing some ground since last year (down seven places), **Estonia** (25th) continues to lead the **EU accession 12,**[14] with a solid networked readiness performance notwithstanding the economic turmoil prompted by the recent major global economic crisis. Since regaining independence in the early 1990s, Estonia has successfully leveraged ICT, and its revolutionary power, to transform itself into a very competitive and networked market economy in less than two decades, with top-class and widespread e-services for the benefit of its citizens. This has been achieved thanks to a visionary leadership and a consistent focus on innovation and ICT penetration as key levers of the general competitiveness strategy.[15]

Slovenia (31st), the **Czech Republic** (36th), and, to a lesser extent, **Lithuania** (41st) follow closely, with satisfactory levels of networked readiness. **Poland** (65th) and **Bulgaria** (71st) remain the laggards in the region. In particular, while Poland posts a remarkable four-place improvement from last year, Bulgaria appears to be losing some ground in networked readiness, with a three-place fall from 2008–09. The country continues to display important flaws in the quality of its market (88th) and regulatory (104th) environment, high ICT access costs (e.g., it is ranked 111th for its mobile telephone tariffs), and inadequate ICT prioritization and use by the government (98th and 61st for government readiness and usage, respectively). Poland suffers from similar weaknesses in its networked readiness landscape: although ICT usage has registered an important improvement (up 22 places), at 105th it remains disappointing, while government readiness is poorly assessed at 113th.

Turkey continues the downward trend observed in the last few years, with another eight-position drop to 69th place. The country can count on a fairly ICT friendly environment (59th) and on moderately high levels of ICT usage (62nd), especially by businesses (54th); however, the overall readiness of the country remains problematic at 90th, with especially low levels of individual readiness (94th). A stronger government vision and leadership in ICT diffusion would no doubt help the country in regaining ground and better leverage ICT for increased growth and development. Currently the government gets rather low marks both for its readiness (83rd) and use (57th).

Russia drops six positions to 80th place, with a deteriorating performance especially in the environment component (from 62nd in 2008–09 to 86th this year). Russia's showing appears quite mixed, with important elements of strength not able to completely offset the worrisome shortcomings highlighted by the NRI. A fairly ICT-conducive infrastructure (43rd), supported by good education and research bases and a fairly satisfactory individual readiness and usage (60th and 52nd), coexists with a bleak market (116th) and regulatory (109th) environment for ICT. There is also an almost nonexistent focus on ICT in the government's agenda, reflected in particularly poor marks for government readiness and usage (99th and 107th, respectively).

Asia and the Pacific

Home to two-thirds of the world's population, the Asia and Pacific region presents a very mixed picture in terms of economic, political, and social performances. This diversity is also reflected in the NRI assessment. The region spans the entire rankings from second-best Singapore to third-to-last Timor-Leste. It hosts some of the most successful and most dynamic economies when

it comes to networked readiness. Singapore and Hong Kong are top 10 regulars, with Taiwan not too far behind. Malaysia (upper-middle income), China (lower-middle income), and Vietnam (low income) each top their respective income group (see Box 2); China, Vietnam, and India are also the countries progressing the most in the NRI rankings since 2001 (see Box 3). According to the ITU, in 2008 there were more mobile phone subscriptions in China (641 million) than in the entire European Union (609 million), while India (347 million subscriptions) surpassed the United States (271 million) in 2007, thanks to an annual growth of 65 percent in the past decade.

Following closely the best two performers in the region Singapore (2nd) and Hong Kong (8th), **Taiwan** (11th) posts a strong performance largely in line with last year, with high ICT penetration rates—notably with respect to PCs, with over 80 computers per 100 population (5th). Taiwan remains one of the world's most prolific innovators, achieving the highest number of utility patents per million population (279.25) in the world. Furthermore, nearly half of Taiwanese exports are high-tech products. As in Singapore and Hong Kong, the government has played a pivotal role in pushing the ICT agenda. Taiwan ranks 8th in terms of government readiness and 3rd for government usage. On a less positive note, its low rank in the political and regulatory environment pillar (44th) is a concern: Taiwan ranks no higher than 23rd on any of the nine indicators composing the pillar, and as low as 120th for the number of procedures required to enforce a contract.

Korea drops four places to 15th, with a worsening performance in most NRI indicators but nonetheless a convincing showing. The country continues to display outstanding levels of ICT usage by individuals (13th) and businesses (5th). Dense penetration of mobile telephony, Internet, and PCs; one of the world's best rates of patenting (155.97 per million population, corresponding to a 5th rank); and high-tech exports (6th) contribute to this excellent result. Last but not least, the country tops the government usage pillar, with the best-developed e-government services and most extensive e-participation in the world according to the United Nations. On the other hand, the environment for ICT development is assessed comparatively poorly at 29th, with particularly middling marks in its market (43rd) and regulatory (38th) components.

Australia is fairly stable at 16th, with its best showing in the market environment pillar (14th), thanks to intense competition and ICT-friendly regulations, among other indicators. The performance is more mixed when it comes to individual (31st) and business (21st) readiness, notably due to high telephony costs (76th and 82nd for mobile cellular and fixed telephone tariffs, respectively). On the other hand, business (30th) and, to a lesser extent, individual (20th) usage could be improved. This contrasts with the good results obtained in the government usage pillar (5th).

Similar to neighboring Australia, **New Zealand**'s good networked performance (19th) rests on the conduciveness of its environment for ICT (11th), although the pillar's overall rank conceals a very mixed assessment. While variables such as ease of creating a business (1st), contract enforcement, ICT regulations, judiciary independence, and property rights get excellent marks (i.e., rank 15 or better), availability of financing, taxation, and cluster development are assessed much more poorly. Government usage is another area of strength at 15th, with a remarkable 35-place leap in government success in ICT promotion (59th), partly because of the high priority given to ICT and innovation in the country's recent stimulus package. Among the relative weaknesses, ICT readiness (29th) and usage (24th) show some margin for improvement. In particular, the country's readiness is penalized by high residential monthly telephone subscription (125th), mobile cellular tariffs (92nd), business monthly telephone subscription (107th), limited government procurements of advanced technology (57th), and ICT focus in the government vision of the future (31st), among other elements.

Despite losing some ground in networked readiness this year, **Japan** (21st) remains one of the world's most innovative countries when measured in terms of utility patents per million habitants (263.35, 2nd). The country's satisfactory performance is largely driven by its sophisticated and innovative business sector, with world-class clusters (1st) and intense business competition (8th). Business readiness is excellent (13th) and business usage outstanding (3rd). On the other hand, the government's showing appears much weaker. Public institutions are perceived as lacking efficiency, the time to start a business is lengthy and procedures numerous, and taxation is high (105th), limiting the incentive to work and invest (101st). Moreover, both government readiness (38th) and usage (22nd) are fairly limited. Also undermining ICT diffusion are the costly communication tariffs, notably for mobile telephony (106th). If not addressed promptly, these shortcomings may start hurting Japan's capacity to innovate going forward.

At 27th, **Malaysia** is the highest-ranked nation not to belong to the group of high-income countries (see Box 2). The government seems to be clearly leading the way, with outstanding marks for its readiness (11th) and usage (12th). These two results boost Malaysia's showing in the readiness component (11th) and government usage pillar (12th). Malaysia posts a less convincing showing in its infrastructure environment (51st) and its level of individual usage (46th).

Leading the BRIC economies, **China** continues its progression in the NRI rankings, leapfrogging another nine places to 37th position. As mentioned in Box 3, China is the country that has progressed the most since 2001–02. It also tops the lower-middle-income country

group, ahead of Tunisia and Jordan. It is interesting to note that the gap among the BRIC economies in terms of networked readiness seem to be widening,[16] with 43 places now between China and lowest-ranked BRIC, Russia (80th). China is the biggest exporter of products from creative industries when measured as a share of total world exports in these products (18.19 percent), and a major exporter of high-tech products (27.62 of GDP, 8th). Moreover, China ranks an impressive 9th in the individual readiness pillar. Yet there remains considerable room for improvement in a number of dimensions, notably in the environment component (57th), displaying overregulated markets, high taxation (123rd), and poor financial market sophistication (78th), among other indicators. Also key to ICT penetration and optimal use, both hard and soft infrastructure (70th) suffers from serious shortcomings. While it could do a lot more to make the environment more ICT-conducive, the government has declared ICT to be one of its priorities and already makes extensive use of ICT. China ranks an impressive 14th with respect to government readiness and 30th for government usage. Chapter 2.4 explores the sustainability of ICT development, focusing on the Internet in particular, in the country.

Significant improvements across the board help in lifting **India**'s position from 54th to 43rd. In particular, India benefits from the new method of computing telecommunication costs, which boosts the performance in the Individual readiness pillar (7th). Business readiness also remains high (23rd), and India has improved in the market environment pillar (35th, up from 50th). However, India is unlikely to pursue its fast-paced rise in the rankings unless it addresses some critical shortcomings having to do partly with the sheer size of its market. Infrastructure at 83rd remains inadequate to support optimal ICT usage in the country, notably given an insufficient number of telephone lines (3.21 per 100 population, 106th), few secure Internet servers (98th), poor Internet bandwidth (107th), and low tertiary education enrollment rates (11.85 percent, 100th). This is reflected in dismal ICT penetration rates (109th for individual usage), notably for mobile telephony (29.36 per 100 population, 116th), PCs (3.18 per 100 population, 93rd), Internet (4.38 per 100 population, 113th), and broadband Internet (0.45 per 100 population, 96th).

Vietnam realizes a remarkable 16-place leap forward to 54th rank, featuring for the first time in the top half of the NRI rankings. Vietnam has advanced five decile ranks since 2001–02. Compared with last year, Vietnam improves in all nine pillars and on 45 of the 68 indicators of the Index. Given its stage of development, Vietnam's performance in the readiness component (37th) is quite remarkable. Vietnam ranks 24th in the government readiness pillar, as a manifestation of the government's increasing focus on ICT. Over the last decade, the government has prioritized and taken initiatives to boost the development of ICT, particularly in software production, Internet infrastructure, IT education promotion, and human resources development. Yet usage by the government itself remains limited (68th).

Indonesia ranks 67th, significantly improving from last year. Asia's third-largest economy delivers a mixed performance, with rankings in the different pillars ranging from a 23rd place in individual readiness to a mediocre 100th position in the infrastructure environment.

Sri Lanka (72nd, unchanged), the **Philippines** (85th, unchanged), and **Mongolia** (94th, down one) deliver performances in line with last year, while **Pakistan** (87th) improves by some 11 places. **Bangladesh** (118th) and **Timor-Leste** (130th), at the bottom of the rankings, continue to lag the rest of the region by a wide margin.

Within the **Commonwealth of Independent States** (CIS), **Azerbaijan** (64th) leads the way. It is now the only CIS member in the top half of the overall NRI rankings. **Kazakhstan** (68th), up five positions, follows closely. Russia (80th, see the Europe section) and **Ukraine** (82nd), once a CIS frontrunner, both drop significantly, allowing **Armenia** (101st) to narrow the gap. **Kyrgyz Republic** falls eight places from last year, and at 123rd is now among the worst performers, while former CIS member **Georgia** ranks 93rd.

Latin America and the Caribbean

Similar to previous years, the networked readiness landscape of Latin America and the Caribbean, as assessed by the NRI, appears fairly varied, with a number of countries leveraging the latest ICT advances and consolidating progress in that direction, while others are progressing less. Moreover, the region's networked readiness shows a large margin for improvement if it is to catch up with best practices elsewhere: no Latin American or Caribbean economy features in the top 20 and only four are to be found in the top 50, namely **Barbados** (35th), **Chile** (40th), **Puerto Rico** (45th), and **Costa Rica** (49th).

The tiny Caribbean island of **Barbados,** at 35th, leads the region for the second year consecutively, after having overtaken long-standing best performer Chile in 2008–09. Among the country's many competitive advantages, one can cite its ICT-friendly environment (31st), notably in its regulatory (26th) and infrastructure (28th) components, coupled with remarkable levels of individual usage (17th) and, to a lesser extent, readiness (40th). Also ICT seems to be moving increasingly to the heart of the government's agenda and vision for future competitiveness: Barbados not only ranks 34th for government readiness, but the assessment for government usage has been substantially improving over the past two years, moving up from 87th in 2007–08 to 67th this year. On a less positive note, businesses continue to be the weakest link among the three stakeholders, with relatively poor levels of preparation (61st for business readiness) and ICT usage (58th). In particular, there are

large margins for improvement in companies' investment in R&D (67th) and innovation potential (90th for utility patents and 83rd for creative industry exports).

Chile is fairly stable at 40th, confirming its ICT prowess in the region, especially for factors that relate to government readiness (45th) and usage (25th). ICT diffusion has been consistently prioritized by the government over the last 15 years or so, with an extremely ICT-conducive market and regulatory environment (27th and 32nd, respectively) and the adoption and successful implementation of one of the first digital agendas in the region, resulting in first-class e-government services (18th), among other features.[17] However, the country's individual readiness remains a problem at 85th, because of the quality of the educational system, notably in math and science (116th), coupled with high access costs for fixed lines (94th and 127th for residential telephone connection charges and residential monthly telephone subscription charges, respectively, and 78th for fixed telephone lines tariffs), broadband (85th for fixed broadband tariffs), and, to a lesser extent, mobile telephony (68th for mobile cellular tariffs).

Puerto Rico follows at 45th, with strong competitive strengths in the quality of its environment (36th) as well as in the readiness (35th) and usage (23rd) of its sophisticated business sector. Indeed, businesses seem the stakeholder leveraging ICT advances the most in the island, more than individuals (79th and 62nd for their readiness and usage, respectively) and the government (100th and 51st for its readiness and usage, respectively). In particular, the apparent lack of focus on ICT in the government agenda (102nd for government prioritization of ICT and 108th for the importance of ICT in the government vision of the future) is a reason for concern going forward.

Costa Rica continues the upward trend it started in 2007–08, climbing another seven places to 49th, with improvements across the board (10, 7, and 10 places up in the environment (71st), readiness (32nd), and usage (61st) subindexes, respectively). The country's networked readiness rests on a remarkable propensity to use ICT by all national stakeholders (10th, 39th, and 46th for individual, businesses, and government, respectively) together with satisfactory levels of business usage (34th). Moreover, the government appears to be placing increasing importance on ICT diffusion in its national strategy and using ICT more efficiently, as confirmed by the improving marks for government readiness over the last two years (from 66th in 2007–08 to 46th this year). However, the environment (71st), notably in its regulatory component (93rd), together with individual and government usage (79th and 69th, respectively) continue to be shortcomings toward a broader ICT use by all Costa Ricans.

Brazil's performance is fairly unchanged at 61st this year, with a solid showing driven mainly by businesses and the government. Both stakeholders display rather satisfactory levels of ICT readiness (38th and 68th for business and government readiness, respectively) and use ICT extensively in their transactions, operations, and service provision (37th and 45th for business and government usage, respectively). The business sector is at the forefront of leveraging ICT advances (26th for extent of business Internet use, among other indicators), thanks to its R&D investment (29th for company spending on R&D) and innovation potential (28th for capacity of innovation), among other factors. Brazil is also home of some of the most efficient and advanced e-government services worldwide (53rd for the development of government online services).[18] On the other hand, Brazil's market (87th) and regulatory (73rd) environment needs to be upgraded and made friendlier to ICT by reducing red tape and improving intellectual property protection as well as educational and training standards. The poor quality of the educational system (123rd), notably in math and science (103rd), coupled with the high cost of access to ICT (e.g., Brazil ranks 118th for mobile telephone tariffs) reflect in the country's low levels of individual readiness (99th) and in middling ICT penetration (61st for individual usage).

Uruguay moves up eight positions to 57th, with relevant advances across the board—9, 3, and 11 places up respectively in the environment (64th), readiness (58th), and usage (53rd) components. Despite a poor market environment (96th) and inadequate business usage (86th), the country can count on a fairly ICT-conducive regulatory and infrastructure environment (52nd and 61st, respectively), on a government with a clear vision on the importance of ICT for overall competitiveness (39th for government prioritization of ICT), and on relatively high levels of ICT penetration in civil society (51st for individual usage). In particular, government readiness is ranked a rather satisfactory 57th, improving 11 places from 2007–08. Uruguayan authorities have become more and more aware of the key role ICT can play in improving service provision and overall competitiveness. A good example of this is the country's Education Connect initiative, by which the government provided every single schoolchild in the country with a "One Laptop per Child" computer and distributed 18,000 computers to teachers across the country by late 2009. This initiative aims at dramatically improving traditional, computer, and Internet literacy rates as well as educational standards, ultimately contributing to a more competitive economy.[19]

Panama (58th), **Colombia** (60th), and **Jamaica** (66th) follow closely, with Panama and Colombia notably posting promising eight- and four-place improvements, respectively, from last year.

Losing further ground from last year (down 11 places), **Mexico,** at 78th, continues to suffer from a number of flaws obstructing a more comprehensive use of technology for increased competitiveness. Among these, one can cite the country's overregulated markets and poor regulatory (70th) and infrastructure (67th)

environments and its weak educational standards (127th for the quality of science and math education and 115th for the quality of the educational system), which, together with high ICT access costs, translate into inadequate levels of individual readiness (109th) and usage (76th). On a more positive note, business usage is rather satisfactory (42nd), and the government displays a satisfactory degree of ICT usage (50th), also providing citizens with well-developed e-government services (38th), among other factors.

Argentina drops four places to 91st, with a mixed assessment pointing to important competitive strengths that do not seem to fully compensate for the elements of weaknesses still troubling the country. With respect to the former, Argentina can count on a rather conducive infrastructure environment (52nd) and good levels of business readiness (59th) and individual usage (58th). However, the serious flaws in the market (126th) and regulatory (110th) environments and the low prioritization of ICT in the government's national agenda (128th and 102nd for government readiness and usage, respectively) remain worrisome features in the country's networked readiness landscape.

Honduras (106th), **Venezuela** (112th), **Ecuador** (114th), **Nicaragua** (125th), **Paraguay** (127th), and **Bolivia** (131st) close the rankings for the region. These countries continue to lag behind the best regional performers, as well as most of the world, in networked readiness. Overregulated markets, poor education and research standards, and high ICT access costs are some of the shortcomings preventing these countries from increasingly leveraging ICT in their general competitiveness and development strategies.

Sub-Saharan Africa and Middle East and North Africa (MENA)

As in past editions of the *Report,* most of the countries in sub-Saharan Africa trail behind the rest of the world in network readiness, with only **Mauritius** (53rd) and **South Africa** (62nd) featuring in the top half of the NRI rankings. Indeed, although some countries realize encouraging improvements over last year, most of the region continues to appear in the bottom part of the rankings.

With a fairly stable 53rd rank, **Mauritius** confirms its ICT prowess and leadership in the region. The country displays a first-class market environment (31st) characterized by a non-distortive tax system (6th for the extent and effect of taxation) and ease for starting a business, with an average of six days (12th) and five procedures (22nd). The political and regulatory environment (31st) is also assessed as being conducive to ICT development, with favorable laws relating to ICT (52nd) and a high level of competition (1st) among Internet and telephony providers. With regard to ICT usage, the three main stakeholders show an even performance (70th for individuals, 66th for business, and 77th for government), with margin for improvement. However, ICT technologies are prioritized to a large extent by the government (26th), which identifies them as an important factor for its vision of the future (53rd). Furthermore, the country's individual and government readiness are also satisfactory, ranking 44th and 50th, respectively. On a more negative note, the infrastructure environment (84th) remains a reason for concern, especially in elements such as the accessibility to digital content (80th), the availability of scientists and engineers (107th), and tertiary education enrollment (97th, corresponding to a dismal 13.96 percent).

South Africa seems to be losing some ground this year, dropping 10 places to 62nd. The environment component (39th) continues to be one of the main strengths of the country, particularly in its regulatory (21st) and market (29th) components, thanks to strong intellectual property protection (24th), favorable laws relating to ICT (31st), and world-class financial market sophistication (6th), among other elements. Despite the weak individual preparation and uptake of ICT (115th and 89th for individual readiness and usage, respectively), South Africa's remarkable business readiness (43rd) benefits from extensive company spending on R&D (35th) and close university-industry collaboration (25th). Likewise, business usage is rather extensive (44th) with a remarkable prevalence of foreign technology licensing (22nd) and technology absorption (33rd) as well as capacity for innovation (36th). As for the government, if its prioritization of ICT is still low (78th), its ICT usage appears slightly better (71st), with fairly extensive e-participation (60th) and presence of ICT in public offices (52nd).

Senegal is up five positions to 75th, placing above **Botswana** (86th) and **Nigeria** (99th). The country's main competitive advantages are to be found in its overall readiness (47th) and in its business and government usage, both ranked 64th.

The rest of the region lags behind at the bottom of the rankings, with some mixed developments with respect to last year's performance. Although a few countries seem to have strengthened their networked readiness, notably **Kenya** (90th, up seven positions), **Zambia** (97th, up five positions), **Lesotho** (107th, up 11 positions), **Côte d'Ivoire** (104th, up seven positions), some others are stable or have lost further ground vis-à-vis the rest of the world. **Malawi** (119th, down nine positions), **Madagascar** (121st, down nine places), and **Cameroon** (128th, down five places) belong to this latter category.

At 39th, **Tunisia** once again leads North Africa, with a slightly weaker showing than last year. The country's outstanding individual readiness (12th) is driven by low residential connection telephone charges and monthly telephone subscription, ranked 18th and 6th, respectively. On a similar note, ICT seems to have a central role in the government agenda (7th for government readiness),

as confirmed by the top-class marks obtained by the country in ICT prioritization (7th). This translates into extensive government usage (28th) with a high degree of success in ICT promotion (6th) and well-developed e-government services (29th), among other factors. Chapter 2.3 relates the steps and policies that the Tunisian government implemented to boost the country's networked readiness and overall competitiveness in recent years.

With the exception of **Egypt,** improving six positions from 76th to 70th, all other countries in the region either remain rather stable or fall in the rankings. This is the case for **Libya** dropping from 101st to 103rd, **Morocco** going from 86th to 88th, and **Algeria** from 108th to 113th.

On a more positive note, by and large the Middle East continues to progress in networked readiness, reflecting the accelerated ICT uptake by most countries in the region and their increasing prioritization of ICT as a key tool for economic diversification, increased competitiveness, and modernization.

The **United Arab Emirates** improves four positions to 23rd place, overtaking for the first time traditional best regional performer Israel (28th). The country's impressive performance in recent years has been driven by a strong and consistent government focus on ICT (2nd and 29th for government readiness and usage, respectively) as a key factor for its vision for the future (2nd). The government has not only been quite successful in promoting ICT diffusion (2nd), but is widely using it to improve its efficiency (2nd), albeit government online services and e-participation remain low (91st and 77th, respectively). Among the country's many other strengths, one can cite its outstanding individual preparation and ICT usage (5th and 29th, respectively) together with its ICT-conducive market environment (12th).

Israel drops three positions to 28th place, losing its supremacy in the region for the first time since the NRI's inception. Notwithstanding this slightly deteriorating performance, Israel continues to display extremely conducive market (23rd) and infrastructure (22th) environments, notably with widespread availability of venture capital (14th), top-class scientific research institutions (3rd), and an extensive availability of scientists and engineers (16th). Moreover, the business sector remains at the forefront of ICT readiness (19th) and usage (25th), displaying an outstanding innovation potential, with excellent marks for utility patents (4th, corresponding to 166.57 patents per million inhabitants) as well as creative industry and high-tech exports (36th and 35th, respectively). The above confirms the country's role as one of the world's ICT powerhouses, the result of a coherent and effective government development strategy that turned resource-poor small Israel into a global ICT player in less than three decades.[20] By contrast, government readiness (49th, down 33 places) and usage (36th, down 12 places) seem to be weakening from 2008–09. The same can be said for individual readiness (108th), with, in particular, a significantly worsening perception of the quality of math and science education (103rd, down 37 places) and of the general educational system (98th, down 53 places).

Bahrain (29th) consolidates the impressive upward trend started last year, with another eight-place improvement and a performance driven by an extremely ICT- and business-friendly market environment (15th) and high individual readiness (21st), as well as outstanding government readiness (17th) and usage (10th), including top-class e-government services (8th) and widespread e-participation (11th).

Qatar's rank is fairly unchanged at 30th. Similar to the United Arab Emirates, the country's remarkable ICT prowess rests on the government's effective leadership in ICT diffusion as a central enabler of enhanced competitiveness. Government readiness and usage are ranked 3rd and 33rd, respectively. Strong ICT prioritization (3rd), as a central element of the vision for the future (5th), has promoted ICT diffusion (4th) and significantly improved government efficiency (3rd), among other indicators. Also notable is the degree of individual readiness (27th) and usage (43rd), with more than universal mobile telephone access (16th, corresponding to 131.39 per 100 people), comprehensive Internet access in schools (15th), and top-quality math and science education (3rd).

While **Oman** is stable at 50th, **Saudi Arabia** moves up two places to 38th, building on its impressive eight-place jump from 2007–08 to 2008–09, with important improvements in individual readiness (46th, up 33 places) and, to a lesser extent, in the market (33rd, up five places) and regulatory (35th, up seven places) environments.

On a more negative note, **Kuwait** (76th) and **Syria** (105th) lose 19 and 11 positions, respectively, this year.

Conclusions

The recent major economic crisis has underlined the importance of solid competitiveness fundamentals for countries to grow in a sustainable manner going forward. The capacity to adopt and pioneer new technologies—among them ICT—has proven to be key for developed economies to maintain their competitive edge and support their growth potential in the long term, as well as for middle-income and developing countries to ease structural transformations in their economies and societies, increase efficiency, and leapfrog to higher development stages. ICT is crucial in promoting economic sustainability. The same is true for social and environmental sustainability: ICT has a major responsibility and role to play in this arena, both as an industry in itself and as an enabling infrastructure.

More and more governments across the globe have recognized the revolutionary power of ICT as a driver

of sustainable economic growth and an enabler of better living conditions for their citizens. They have increasingly put ICT in a prominent position in their general competitiveness strategies and national agendas.

The GITR series and the NRI have contributed over almost a decade to raising awareness about the importance of ICT as a central tool in the design of policies aimed at increasing development and competitiveness. Not only has the NRI allowed countries to track
their improvements in networked readiness over time, but it has also provided diagnostics on weaknesses to be addressed and strengths on which to build. Furthermore, the showcasing of best practices at the international level has offered additional insights into the determinants of networked readiness as well as relevant examples to emulate in the development of national roadmaps toward increased growth and competitiveness.

We are proud of the guidance that the NRI and the *Report* series may have offered to decision makers and all relevant stakeholders across the world. We hope this year's edition will once again provide a useful instrument and will contribute to focusing attention on the important role of ICT in building a better, fairer, and more sustainable world.

Notes

1 IMF 2009.

2 Jiménez 2010.

3 This statement has a caveat: the NRI used in the first 2001–02 edition of the *Report* is not strictly comparable with the one developed by INSEAD in 2002, which has been used since then as the main methodological framework in the GITR series. For more information on the 2001–02 theoretical framework, see Kirkman et al. 2002.

4 For a detailed review of the literature and thinking behind the Networked Readiness framework developed by INSEAD and introduced in 2002–03, see Dutta and Jain 2003.

5 Until 2005–06, NRI variables were selected using factor analytical techniques from a larger set of possible variables. Although this was a technically rigorous approach, it reduced the ability to easily explain the underlying logic for including specific variables and to make strict comparisons over time. As a consequence, starting with the 2006–07 edition, expert opinion has played a predominant role in selecting the variables, obviously with the benefit of previous experience in identifying appropriate variables for computing the NRI, thus aligning the NRI's to the Forum's general competitiveness methodology. The treatment of missing variables has also changed: whereas until 2005–06, they were estimated using analytical techniques such as regression and clustering, beginning in 2006–07 they are indicated with "n/a" and not taken in consideration in the calculation of the specific pillar to which they belong. Moreover, the scale used to compute the NRI and the variables that compose it has been aligned to the Forum's (increasing) 1–7 scale, changing with respect to the scale used previously for a couple of years (i.e., positive and negative scores around a standardized mean of 0). For more information on the earlier computation methodology and changes introduced in 2006–07, see Dutta and Jain 2006 and Mia and Dutta 2007.

6 See EFQM at http://ww1.efqm.org/en/Home/aboutEFQM/Ourmodels/TheEFQMExcellenceModel/tabid/170/Default.aspx.

7 The NRI 2009–2010 uses the results of the 2008 and 2009 Surveys. For more details on the Survey methodology, see Browne and Geiger 2009.

8 North America as a region is not dealt with as such in this chapter. The United States' and Canada's performances are detailed in the top 10 section, and Mexico is included for analysis purposes in the Latin America and the Caribbean section.

9 This is shown by the excellent marks the country gets for the variables related to innovation capacity: Sweden ranks 4th for the capacity of innovation of its firms, generates 115.22 utility patents per million population (8th), accounts for 1.21 percent of total world creative industries (18th), and 11.94 percent of its total exports are high-tech products (24th).

10 For a more detailed analysis of Singapore's ICT success story, see Ng et al. 2008.

11 The Danish government's focus on ICT is reflected in the early liberalization of the telecommunications sector in 1996, well ahead of most of its fellow members of the European Union. This also contributed to the development of a world-class local high-tech industry, whose exports accounted in 2007 for 11.20 percent of total exports, corresponding to 26th place.

12 The EU15 comprises the countries that joined the European Union before the last two accession rounds in 2004 and 2007: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

13 Italy and Greece rank 78th and 81st, respectively, for the quality of their market environment and 62nd and 84th for that of their political and regulatory environments.

14 The EU accession countries are Bulgaria, the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, and Slovenia.

15 For a more in-depth analysis of Estonia's recent development story and the role of ICT, see Dutta 2007.

16 A similar trend, though not as pronounced, is observed in our general assessment of competitiveness. In the *Global Competitiveness Index 2009–2010,* China ranks 29th, India 49th, Brazil 56th, and Russia 63rd. For more information, see Sala-í-Martin et al. 2009.

17 For a full account of Chile's ICT strategy, see Alvarez Voullième et al. 2005.

18 For a detailed overview of Brazil's recent achievements in terms of e-government services and strategy going forward in that area, see Magalhães et al. 2009.

19 See http://uruguay.suite101.com/article.cfm/uruguay_one_laptop_per_child for more information on the Education Connect initiative.

20 For an overview of Israel's recent development story, see Lopez-Claros and Mia 2006.

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Technical Appendix: Composition and computation of the Networked Readiness Index 2009–2010

This appendix presents the structure of the Networked Readiness Index (NRI). The NRI separates environmental factors from ICT readiness and usage, and is composed of three subindexes. Each subindex is divided into three pillars. The 68 variables (or *indicators*) used in the computation of the NRI are then distributed among the nine pillars.[a] The numbering of the variables matches the numbering of the Data Tables found at the end of the *Report*. The number preceding the period indicates to which pillar the variable belongs (e.g., variable **1.**01 belongs to the first pillar; variable **9**.02 belongs to the ninth pillar). The hard data indicators used in the NRI are normalized on a 1-to-7 scale in order to align them with the Executive Opinion Survey's results.[b] The Technical Notes and Sources at the end of this *Report* provide detailed information on all the hard data indicators.

NETWORKED READINESS INDEX

Networked Readiness Index = 1/3 Environment subindex + 1/3 Readiness subindex + 1/3 Usage subindex

Environment subindex

Environment subindex = 1/3 Market environment + 1/3 Political and regulatory environment + 1/3 Infrastructure environment

1st pillar: Market environment
- 1.01 Venture capital availability
- 1.02 Financial market sophistication
- 1.03 Availability of latest technologies
- 1.04 State of cluster development
- 1.05 Burden of government regulation
- 1.06 Extent and effect of taxation[c]
- 1.07 Total tax rate (hard data)[c]
- 1.08 Time required to start a business (hard data)[d]
- 1.09 Number of procedures required to start a business (hard data)[d]
- 1.10 Intensity of local competition
- 1.11 Freedom of the press

2nd pillar: Political and regulatory environment
- 2.01 Effectiveness of law-making bodies
- 2.02 Laws relating to ICT
- 2.03 Judicial independence
- 2.04 Intellectual property protection
- 2.05 Efficiency of legal framework in settling disputes[e]
- 2.06 Efficiency of legal framework in challenging regulations[e]
- 2.07 Property rights
- 2.08 Number of procedures to enforce a contract (hard data)[f]
- 2.09 Time to enforce a contract (hard data)[f]
- 2.10 Level of competition index (hard data)

3rd pillar: Infrastructure environment
- 3.01 Number of telephone lines (hard data)
- 3.02 Secure Internet servers (hard data)
- 3.03 Electricity production (hard data)
- 3.04 Availability of scientists and engineers
- 3.05 Quality of scientific research institutions
- 3.06 Tertiary enrollment (hard data)
- 3.07 Education expenditure (hard data)
- 3.08 Accessibility of digital content
- 3.09 Internet bandwidth (hard data)

Readiness subindex

Readiness subindex = 1/3 Individual readiness + 1/3 Business readiness + 1/3 Government readiness

4th pillar: Individual readiness
- 4.01 Quality of math and science education
- 4.02 Quality of the educational system
- 4.03 Buyer sophistication
- 4.04 Residential telephone connection charge (hard data)[g]
- 4.05 Residential monthly telephone subscription (hard data)[g]
- 4.06 Fixed broadband tariffs (hard data)
- 4.07 Mobile cellular tariffs (hard data)
- 4.08 Fixed telephone lines tariffs (hard data)

5th pillar: Business readiness
- 5.01 Extent of staff training
- 5.02 Local availability of specialized research and training services
- 5.03 Quality of management schools
- 5.04 Company spending on R&D
- 5.05 University-industry collaboration in R&D
- 5.06 Business telephone connection charge (hard data)[h]
- 5.07 Business monthly telephone subscription (hard data)[h]
- 5.08 Local supplier quality
- 5.09 Computer, communications, and other services imports (hard data)
- 5.10 Availability of new telephone lines

6th pillar: Government readiness
- 6.01 Government prioritization of ICT
- 6.02 Government procurement of advanced technology products
- 6.03 Importance of ICT to government vision of the future

Technical Appendix: Composition and computation of the Networked Readiness Index 2009–2010` *(cont'd.)*

Usage subindex

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

7th pillar: Individual usage

7.01 Mobile telephone subscriptions (hard data)
7.02 Personal computers (hard data)
7.03 Broadband Internet subscribers (hard data)
7.04 Internet users (hard data)
7.05 Internet access in schools

8th pillar: Business usage

8.01 Prevalence of foreign technology licensing
8.02 Firm-level technology absorption
8.03 Capacity for innovation
8.04 Extent of business Internet use
8.05 Creative industries exports (hard data)
8.06 Utility patents (hard data)
8.07 High-tech exports (hard data)

9th pillar: Government usage

9.01 Government success in ICT promotion
9.02 Government Online Service Index (hard data)
9.03 ICT use and government efficiency
9.04 Presence of ICT in government agencies
9.05 E-Participation Index (hard data)

Notes

a The computation of the NRI is based on successive aggregations of scores, from the variables level (i.e., the lowest level) to the overall NRI score (i.e., the highest level). For example, the score a country achieves in the 3rd pillar, *Infrastructure environment*, accounts for one-third of the *Environment subindex*. Similarly, the *Usage subindex* accounts for one-third of the overall NRI score.

b The standard formula for converting hard data is the following:

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

The *sample minimum* and *sample maximum* are, respectively, the lowest and highest country scores in the sample of economies covered by the NRI. In some instances, adjustments were made to account for extreme outliers. For those hard data variables for which a higher value indicates a worse outcome (e.g., total tax rate, time to enforce a contract), we rely on a normalization formula that, in addition to converting the series to a 1-to-7 scale, reverses it, so that 1 and 7 still correspond to the worst and best possible outcomes, respectively:

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

c Variables 1.06 and 1.07 combine to form one single variable.

d Variables 1.08 and 1.09 combine to form one single variable.

e Variables 2.05 and 2.06 combine to form one single variable.

f Variables 2.08 and 2.09 combine to form one single variable.

g Variables 4.04 and 4.05 combine to form one single variable.

h Variables 5.06 and 5.07 combine to form one single variable.

CHAPTER 1.2

ICT and the Sustainable Competitiveness of Cities

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"The city belongs to the 21st century more than the nation," asserted Saskia Sassen over 10 years ago.[1] Now, for the first time in history, more than half of the world's population live in urban areas. Large cities in emerging countries are not only replicating many features of those in advanced countries but, as they become global, they have as much in common with advanced-country cities as they do with the rest of their own countries.

As cities increasingly play in a global arena, they are being driven to develop sustainable competitiveness strategies and—with knowledge and productivity as key factors of 21st-century competitiveness—high-speed networks and the technologies that revolve around them have become crucial for attracting and retaining citizens and businesses. This supra-national role of cities in the context of globalization, however, does not mean that their focus is primarily external. Cities also play a critical role as national hubs for all kinds of economic and cultural activity.

The spread of information and communication technologies (ICT) has made this role even more powerful as cities—much more quickly than towns or rural areas—reach the critical mass required to achieve the network effects that underpin technology adoption. Cities can therefore not only become more competitive through the advanced use of ICT, but they also serve as anchors for national competitiveness strategies that incorporate the power of broadband networks.

The aim of this chapter is threefold. First, we aim to review the role of cities in light of ICT evolution. Second, we explore different situations with regard to connectivity that we observe in cities across the world. Third, we propose a framework for city leaders to identify gaps in ICT use and chart a course forward in order to take advantage of the opportunities that ICT and networks offer for enhancing sustainable competitiveness.

City roles and trajectories

Cities have been acting as hubs of commerce for millennia. They were a natural point of exchange for goods produced in the hinterland; for goods brought from the outside; and, gradually, for goods produced in the city itself. Cities then became places where skill development and employment creation concentrated—first in industry and then in services.

The rise and impact of ICT has allowed cities to evolve into a more complex type of hub—one that spreads familiarization with new technologies and provides the opportunity to expand connectivity to surrounding areas. This connectivity, in turn, expands the array of options for non-urban inhabitants to relate with the city.

The global economy—increasingly a knowledge economy—is now relying to a large extent on a network of cities that are connected in a way that is distinctly different from the way nations are connected. This

highly structured urban cross-border geography links global cities that possess competitive (strategic) advantage.[2] This advantage is comparable to that provided in the past by good natural harbors. ICT has made it possible for key cities to be connected in new ways, with the creation of a global web whose constituent cities become global through their participation in these networks.

Some had thought that ICT would erode the advantages that cities had traditionally gained from agglomeration economies,[3] but this has proved not to be the case. In *The Cybercities Reader,* Stephen Graham and contributors explore—and explode—the fallacy of the "death of distance."[4] They show, instead, that complementarities have emerged and that ICT and urbanization can have mutually reinforcing effects. This is particularly true for broadband networks that are quickly becoming part of the basic infrastructure (alongside power, water, and transportation) and central to competitiveness.

As a result, global cities have gained in importance and power relative to nation-states. Especially within emerging countries, such gains could lead to growing disparities between large cities and the rest of the country—including an expanding gap between the early technology adoption of the large cities and the lagging adoption elsewhere. But this gap should not be seen as a permanent source of an urban-rural digital divide. In contrast to other types of infrastructure, the characteristics of network technology allow national governments to take advantage of the cities' natural role as spearheads of technology adoption and to integrate their role as hubs into a countrywide broadband connectivity strategy.

Insights into this evolution can be derived from the notion of *fusion space* used by William Mitchell.[5] Network technologies are producing architectural space in which digital technology enables new and socially valuable combinations of activities. This fusion of physical and virtual space occurs in cities and affects their role as centers of gravity for both ICT demand and supply concentrations.

Furthermore, large cities seem to have evolved in even more complex ways that are challenging the notion of city boundaries. Increasingly—and not least because of the options that ICT offers—metropolitan areas and their surrounding geographies have become a continuum of density without natural boundaries.[6] Local authorities and urban demarcations are also becoming separated, with all kinds of policy implications for the governance of metropolitan areas and their relationship with national institutions.

The competitiveness of cities, therefore, is a high-stakes game in which not only a city's leaders and inhabitants play. The stakes are also high for the peri-urban and rural areas that are under the influence of the city in its role as intra-national hub. And national competitiveness is, in good measure, linked to the ability of cities to become sustainably competitive on a global scale.

Cities and technology adoption

Cities have long been a natural spearhead for technology adoption. This is because of their advantages, including their critical mass of capacity (skills and support services), as well as their concentration of purchasing power and their better connections with the outside world—incidentally, this was often the reason why cities emerged where they did.

Cities' role as spearhead is likely to be particularly powerful with regard to ICT and especially Internet-based applications, for the following reasons:

- Agglomeration economies make it most viable for service providers to introduce and then expand connectivity in metropolitan areas, starting with businesses and high-income households and then spreading across the whole area.

- Legacy telecommunications networks offer an easy point of entry (although in some cases incumbent protection can turn the legacy into a hurdle).

- Fiber optics is considered one of the top four innovations of the last quarter of the 20th century (the others being the Internet, the mobile phone, and the personal computer),[7] and could well become another source of advantage for cities.

- Extensive infrastructure networks (from power lines and sewers to municipal buildings) offer potential for piggy-back network development, both wired and wireless.

Finally, we know from recent surveys of Internet usage in emerging-country cities that familiarity with the Internet is high there and growing—well ahead of the national averages.[8] The use of online services is expanding rapidly as city households become regular users of the Internet, and large segments of the population are experiencing the Internet and developing high expectations for future access to services online.

This is the context that we must keep in mind as we explore the role of ICT networks in cities in more specific ways. We attempt to extract from global experience guidance for efforts to enhance city competitiveness, particularly in emerging countries. We do this by drawing from three recent studies sponsored by Cisco: a survey of broadband penetration, an analysis of broadband quality, and an extensive assessment (still in progress) of how municipal governments can promote ICT use in cities and within city operations.

In this chapter we draw from these three studies to focus on 21 cities across the world, covering a considerable range of geographies, population size, and income levels (see Table 1). The insights derived from these cities are compelling and suggestive of broad applicability, but the sample is not quite large enough for definitive

Table 1: Basic characteristics of sample cities

Income	Large (up to 7 million people)	Very large
Higher income	Amsterdam Austin Sydney Warsaw Prague Toronto	London Moscow Seoul
Lower income (under US$20,000 per capita)	Budapest Casablanca Johannesburg St Petersburg	Bogota Buenos Aires Cairo Istanbul Lima Mexico City Rio de Janeiro São Paulo

Source: United Nations statistics on urban agglomerations and authors' estimates.

conclusions (particularly as Chinese or Indian cities have not yet been included).

Broadband penetration

The findings of a 2009 survey of Internet service providers in these major cities across the world allow us to explore the progress of broadband connectivity, the differences across and within cities, and the challenges and opportunities ahead.[9] The survey results provide an empirical basis for reflecting on factors behind the differences and on the potential policy implications. Mirroring the importance of that threshold for connectivity, the survey focused on connectivity at download speeds of at least 1 megabyte per second (MB/s) and, thus, provides one of the first systematic windows into real broadband at the city level. By looking separately at lines going to households and businesses (or institutions), the survey also allows us to construct true household penetration indicators (a much better basis for analysis and comparisons than the conventional apples-and-oranges broadband lines/population ratios).

The results validate conclusions derived from the academic literature, provide confirmation of the velocity of adoption under some conditions, and offer valuable leads with regard to factors behind the accelerated reach of broadband. The fact that a city such as St Petersburg has broadband connectivity penetration rates closer to the levels of London or Sydney than to the Russian average also appears to underscore the relevance of the global city notion as regards ICT.

On the validation front, the results underscore the role of cities as spearheads of technology adoption: broadband penetration differences between large cities and the rest of their country tend to be much greater in emerging than in advanced economies. In this sense, one can highlight the following:

- Broadband penetration in London, Sydney, and Toronto, for instance, is not significantly higher than broadband penetration overall in Australia, England, or Canada. And even in Amsterdam and Seoul—two of the best-connected cities in the world—the differences with national averages are of around 20 percent (or just a few percentage points of penetration).

- Broadband penetration levels in emerging-country cities, on the other hand, are significantly higher—in most cases at least 50 percent higher—than national averages. Outside of the cities many connections show up in the broadband statistics but fall well below the 1-MB/s level (one-third of the so-called broadband lines in Brazil and close to half of those in Argentina, for instance, have speeds below that threshold).

- Finally, city penetration averages in emerging markets are brought down by the effect of slums and other types of low-income and low-infrastructure fringes. As illustrated in Figure 1, disparities in penetration *within* cities are generally much greater in emerging than advanced-economy cities. This has to be kept in mind when looking at citywide averages.

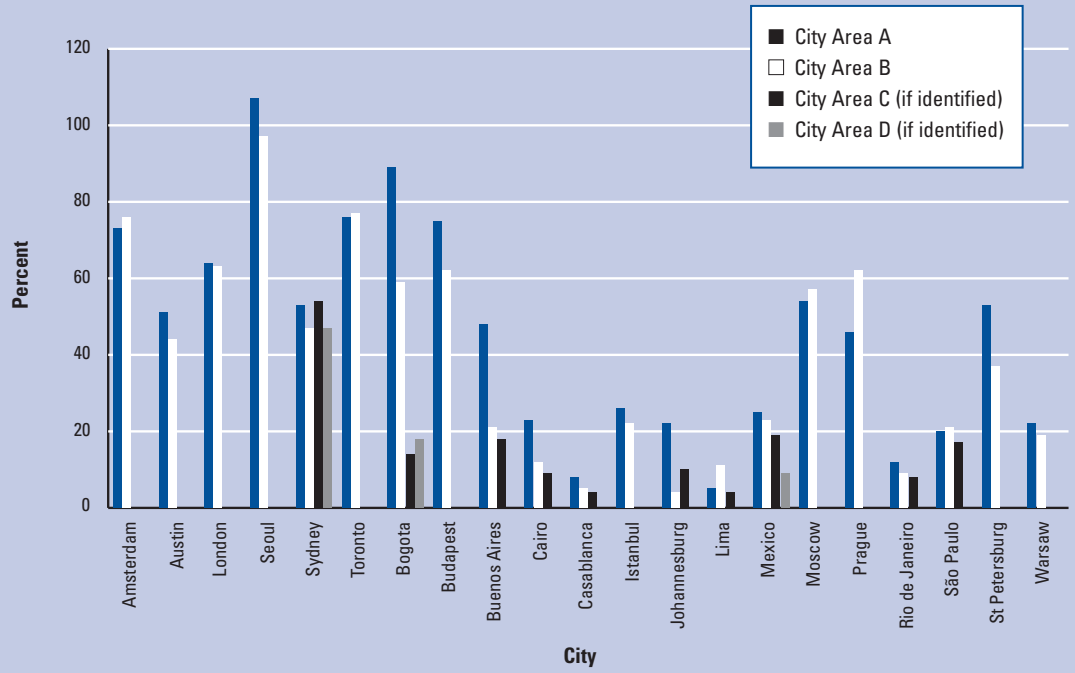
Broadband, of course, is not just one more feature of ICT. The widespread availability of high-speed connectivity represents a critical threshold in the evolution of ICT and opens the door for major ripple effects affecting business productivity, dynamic innovation, and social interaction. Although productivity impacts are mostly related to the use of broadband in businesses, social interaction has much to do with the connectivity of households—and new levels of innovation are enabled by the connectivity that cuts across business and home lines.

Intriguing significant differences in the availability of high-speed connectivity exist across cities. Cities in advanced economies have a consistently large majority (85 percent or more) of broadband connections serving households. But for cities in emerging economies, this share varies widely—in cities such as Casablanca, Istanbul, and Johannesburg, half or more of the broadband lines serve businesses. The hypothesis that at lower levels of penetration the proportion of broadband lines going to businesses will be higher is not confirmed more generally, however—Rio, São Paulo, and Buenos Aires, for instance, have close to 90 percent of lines going to households.

Broadband quality

The quality of broadband connections depends on more than download speed.[10] Upload speed and latency also affect the quality of broadband connections significantly. These factors were explored in a recent study of broadband quality (see Box 1).

Figure 1: Broadband penetration in households across different city areas



Source: IDC/Cisco Survey, 2009.

Box 1: Broadband quality: A key enabler of economic development

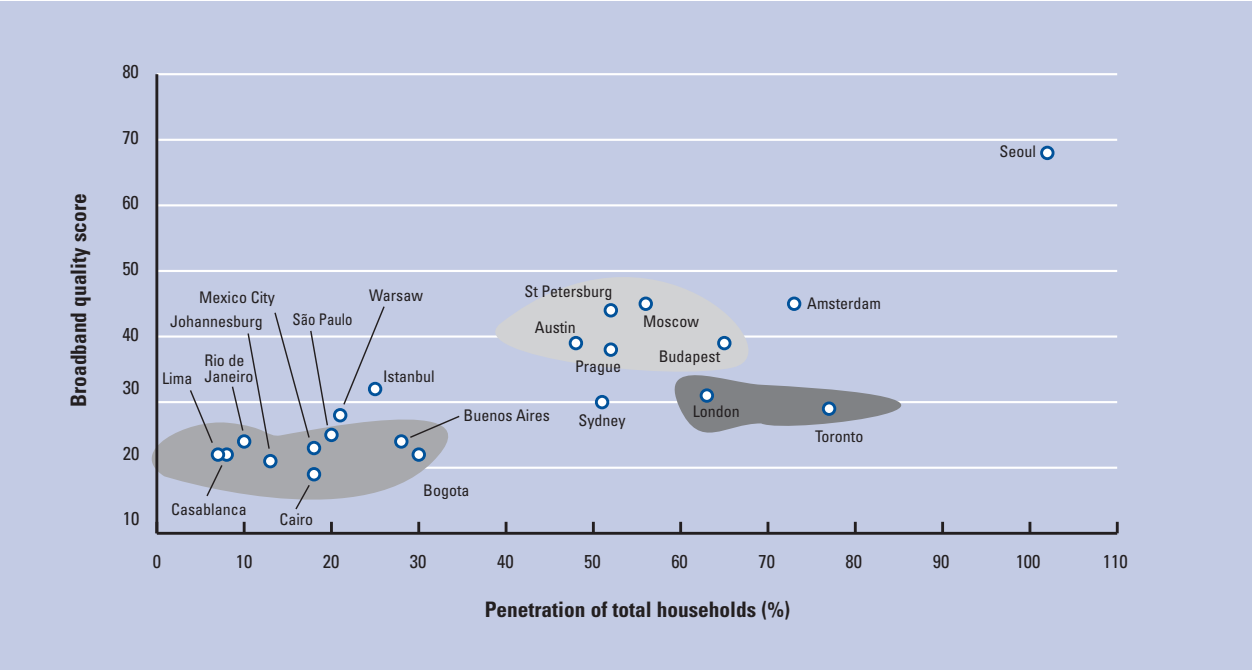
Until recently, the analysis of broadband was focused only on penetration. As bandwidth-intensive applications, such as video, become pervasive, the broadband gap is being redefined as a quality divide. Citizens and enterprises with low broadband quality will be limited in what they can do on the Internet and, therefore, in their capability to extract economic benefit from it.

The universities of Oviedo and Oxford, sponsored by Cisco, have developed the broadband quality score (BQS)—an index that combines actual measurement of download, upload, and latency to gauge the quality of a nation´s broadband connections. The 2009 BQS includes an analysis of broadband quality in more than 240 cities worldwide. The results of the survey, carried out in mid 2009, show that global broadband quality has improved remarkably in just one year, with 62 of the 66 countries reporting progress; 39 countries now have a BQS above the threshold required to deliver a consistent quality of experience with today's most common Web applications (which, the study concluded, requires speeds of 3.75 MB/s download and 1 MB/s upload, and 95 millisecond latency). Nine countries—Korea, Rep., Japan, Sweden, Lithuania, Bulgaria, Latvia, the Netherlands, Denmark, and Romania—were found to have the broadband quality required for future Web applications (requiring speeds of 11.25 MB/s download and 5 MB/s upload, and 65 millisecond latency).

The study shows there is still a tremendous gap between the broadband leaders and the broadband laggards. But those lowest down the scale, particularly in emerging economies, have a tremendous opportunity to leapfrog. Indeed, emerging economies such as Lithuania, Latvia, Romania, and Bulgaria have entered the "ready for tomorrow" category in this year´s study as a result of their investments in fiber optics and upgraded cable networks.

The broadband quality study has established key differences between the impact of broadband penetration and broadband quality on socioeconomic factors. For instance, broadband quality is associated with the knowledge economy and with increased diffusion of ICT, and citizens in countries with the highest broadband quality enjoy the highest usage of the Web, suggesting that broadband quality triggers a positive network effect. In order for a country or city to reap the full benefits of broadband and become a true broadband leader, it must consider both broadband quality *and* penetration in its national broadband agenda.

Figure 2: Broadband penetration vs. quality



Source: Oxford/Oviedo Broadband Quality Score 2009 Report; IDC/Cisco Survey, 2009.

Table 2: Broadband quality level of cities and their implications

Broadband quality level	Cities in sample
Ready for tomorrow's applications	Seoul
Ample room for today's applications	Amsterdam, Austin, Budapest, Moscow, Prague, St Petersburg
Meeting the needs of today's applications	Istanbul, London, Sydney, Toronto, Warsaw
Below the threshold of today's applications	Bogota, Buenos Aires, Cairo, Casablanca, Johannesburg, Lima, Mexico City, Rio de Janeiro, São Paulo

Source: Oxford/Oviedo Broadband Quality Score Study, 2009.

The study constructed a broadband quality score (BQS) on the basis of a survey of connectivity covering 66 countries. [11] This survey allows the quality of broadband in a country or city to be classified with respect to the requirements of different types of applications. From the BQS it is also possible to show how cities fare in terms of their readiness for current and evolving applications, as illustrated by Table 2.

Typical applications of today include Web browsing, social networking, music downloads, basic video streaming, video chatting, standard definition Internet protocol television (IPTV), and enterprise-class home offices. Tomorrow's applications are the ones that will bring the full benefits of Web 2.0 and ubiquitous connectivity—offering new levels of productivity and creativity through collaboration and new experiences by blending in all media. They include consumer *telepresence,* high-definition video streaming, and high-speed sharing of large files ranging from family videos to complex working documents. Although we describe these as "tomorrow's applications," all of these services are already available and in use today—low broadband is simply preventing them from reaching their mass market potential in many countries and cities.

The combination of findings from broadband penetration and quality surveys generates additional insights. Mapping our cities along the axes of broadband penetration and broadband quality allows us to explore how cities vary in terms of breadth and depth of broadband connectivity (see Figure 2). The combination of high penetration and high quality, as in Seoul and Amsterdam, suggests that these cities are ready to take off with the

benefits of Web 2.0 (as long as they can maintain the quality as penetration keeps expanding). One of the factors behind high penetration and quality appears to be the structure of the market—the degree of diversity in technology platforms (asymmetric digital subscriber line [ADSL], cable, etc.) in particular. The countries and cities with highest penetration and best quality of broadband tend to have more diverse market structures.

High penetration and low-to-medium quality is not an uncommon combination, and it generally indicates rapid broadband deployment using existing copper infrastructure that is now stretching the limits of network capacity (as appears to be the case of London and Toronto, for instance). High quality and low penetration is a rare combination that can reflect small city "niches" and is not present in our sample. Finally, low penetration and quality—which affects a number of cities in our sample—indicates the signi-ficant challenge in taking advantage of the opportunity of broadband connectivity. An interesting leapfrogging phenomenon is reflected in cities such as Budapest, Moscow, Prague, and St Petersburg, where limited legacy networks paradoxically created the impetus for investing in network technology that allows for better broadband quality.

ICT environment and use

As we noted above, the global city phenomenon raises the competitiveness stakes. What does it take to make a city competitive in the global arena? What can city leaders (be they in government, business, or civil society organizations) do to improve their city's competitiveness—and sustain it? We believe that a large part of the answer has to do with ICT—and, more specifically, with networks.

The purpose of the assessment exercise underway is to provide an overview of the ways in which municipal governments influence the ICT environment in their cities and to explore in detail how they use ICT in city operations. The assessment uses the framework developed for the purpose by Cisco (and a survey instrument designed with help from Illuminas Global PLC).

This framework was specifically designed to explore the environment and use of ICT in cities and to provide a diagnostic perspective in enough detail that it can guide the formulation of action plans. The first stage of the assessment has already allowed us to establish best practice boundaries. In the second stage, individual cities can be benchmarked against both the frontier of possibilities and existing best practice so that avenues for progress—or opportunity gaps—can be identified.

Cities, of course, operate under an umbrella of national policies, regulations, infrastructures, and capabilities. A chapter in *The Global Information Technology Report (GITR) 2007–2008* explored the importance of the balance between the "ecosystem" (policies and regulations affecting ICT directly, as well as the business and innovation environments) and investments in infrastructure and capabilities. A chapter in *The GITR 2008–2009* then proposed an approach for developing national *net strategies,* many aspects of which are also relevant for cities.[12] The complementary framework we propose here is specifically focused on cities.

Before going into the specifics of the ICT environment and use framework, it is worth stepping back and thinking about how competitiveness and ICT relate to three major goals that most city leaders have in mind:

- **Economic growth and job creation.** This is one of the main aims of competitiveness improvements—which attract investment and generate a virtuous circle that takes advantage of the potential agglomeration economies. Basic infrastructure is a key competitiveness factor. As broadband becomes the basic infrastructure factor for the knowledge economy (with a significant impact on total factor productivity), it also moves to the center of the competitiveness strategies of cities.

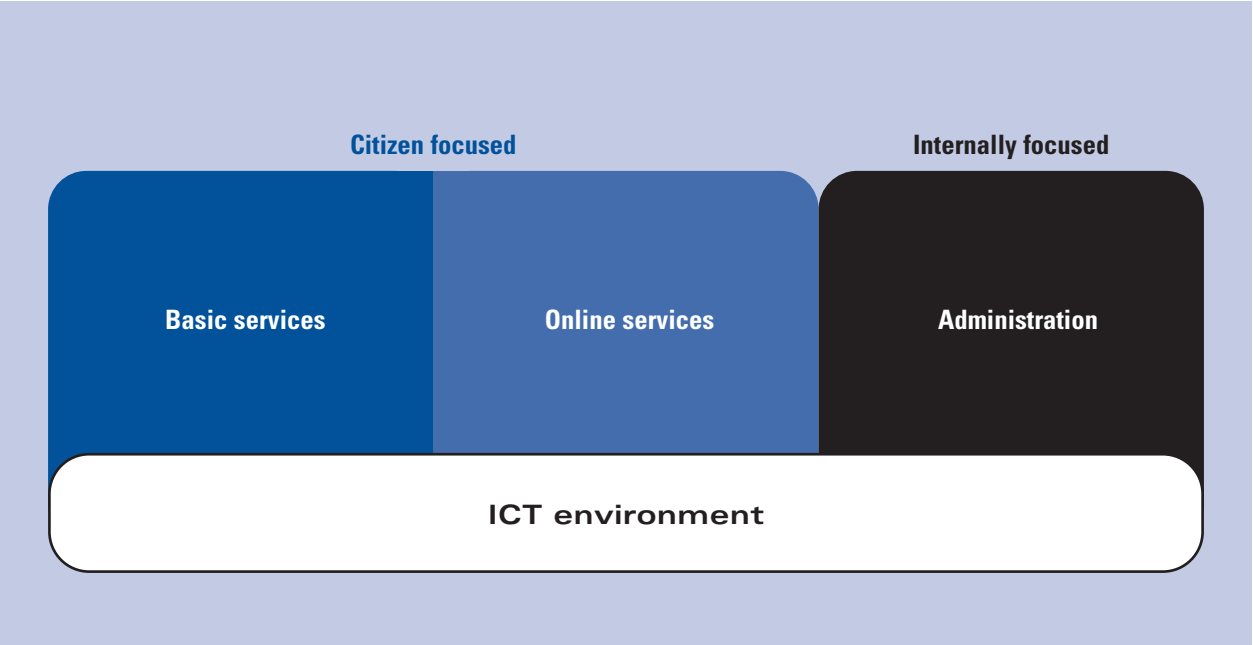
- **Social welfare.** As information about city conditions flows, and as people across the world become more mobile, the performance of a city in terms of services offered to its citizens is a major determinant of whether the city is seen as an attractive place to live and work—hence able to draw and retain talented people, which is another major competitiveness factor. ICT can be used to achieve dramatic improvements in efficiency and effectiveness in the provision of services, as well as to reduce the transaction costs in the city-citizen relationship—at both the economic and political levels.

- **Environmental sustainability.** Increasingly a concern for citizens and businesses, the choices made by a city and their impact on the environment are also becoming a crucial factor of long-term competitiveness. ICT offerings are more and more able to address environmental sustainability concerns in ways that can also be aligned with social and economic goals. This win-win approach is the focus of efforts in many cities across the world. Pilot programs and information sharing, among other things, are being promoted by a collaborative effort among the Massachusetts Institute of Technology (MIT), Cisco, and global cities that focuses on the use of ICT to launch a new wave of innovation in urban development affecting the flow of people, knowledge, traffic, and energy.[13]

Conventional discussions of competitiveness have focused mostly on factors in the economic and social spheres, but increasingly factors from the "green" sphere are taking center stage and should now be considered an integral part of sustainable competitiveness.

Because city governments and other local authorities in metropolitan areas are increasingly expected to

Figure 3: ICT environment and use: Framework for cities



focus on environmental sustainability, there is a growing role for ICT in pursuit of green, or sustainable, goals. Interventions in this regard include environmentally conscious activities that range from direct action, such as congestion taxes enabled by sensors, to indirect measures that facilitate remote work options. They also include efficiency and social inclusion measures that can make a considerable contribution to the sustainability of programs and initiatives.

ICT environment and use: Framework for cities

The framework we are proposing is designed to be used by city authorities—and city leaders more broadly—to explore ICT use in cities. The framework considers not only the use of ICT in the daily life of city operations and services but also the role that city authorities and other leaders can play to promote the use of ICT more widely—as an important tool for competitiveness (Figure 3).

City organizations and administrations come in very different shapes and sizes. They range from geographically integrated structures covering whole metropolitan areas (as in São Paulo) to mosaics (as in London, with its 33 boroughs) and from centralized operations (as in Rio) to compartmentalized activities that rely on relatively independent service-specific authorities (as in Sydney). For integrated city government operations, the whole framework will be of relevance, while specialized agencies will be mainly interested in some of the components.

The framework consists of four components reflecting the different aspects of the roles that municipal governments play. One component focuses on the influence that these governments can have over how the ICT environment evolves in the city—hence affecting service providers as well as ICT usage by businesses and households. Another component concerns the use of ICT in the city's internal administration. The other two components cover different types of service interactions between the city and its constituents.

The framework was not designed, however, only to provide a conceptual guide to the potential of ICT in cities. We have also used it to develop a survey instrument to explore in some detail specific types of ICT usage, thus allowing us to establish both a possibility frontier on the basis of currently available technology along with a real-life composite best practice drawn from the six cities in our sample (Amsterdam, Austin, London, Seoul, Sydney, Toronto), chosen because of their advanced adoption of ICT. We can then conduct the survey in any other city across the world and benchmark individual city performance against the composite best practice to identify opportunity gaps. The structure of the survey and the establishment of best practice in each of its component areas thus provide a useful overview of the potential of ICT for improving city competitiveness and citizen welfare. The sections below describe the four areas of the framework and illustrate the ICT usage frontier and best practice. Examples of

the components are included at the level of detail used for the survey.

ICT environment

The basic question to be addressed about the ICT environment in a city is how to ensure ICT policies and infrastructure (such that the availability and adoption of network technology and Web-based applications and content) become a source of competitive advantage for business and individuals based in that city.

The indirect—nonetheless crucial—role that municipal governments can play with respect to the environment for the adoption and use of ICT in their city comprises a wide range of possible interventions. Although many policies affecting ICT will be national or federal ones, there are city-level policies and regulations that can hinder ICT adoption. Eliminating these hindrances provides a "low-hanging fruit" for competitiveness improvements. More proactive interventions, including infrastructure-related investments, training, and programs that promote technology adoption are also being implemented successfully by cities across the world. It is noteworthy that some interventions (for example, providing access to infrastructure that could be shared in some form—such as sewers being used as conduits for fiber cables) entail virtually no cost to the city.

One possible indicator of the need for interventions is the structure of the market with respect to technology platforms. Cross-country evidence suggests that both broadband penetration and broadband quality are positively correlated with technological diversity. The differences across our sample of cities are striking in this regard: Figure 4 shows that cities such as Amsterdam, Seoul, and St Petersburg have significant diversity, while cities such as Istanbul and Lima have virtually none.

In addition to the potential for improving competitiveness through interventions that create a more conducive environment for ICT adoption, major gains can be obtained from using ICT in city operations, both internally and in relation to citizens and local businesses. These are also important competitiveness factors, as they allow the city to attract and retain businesses and people.

A city pushing the frontier of current best practice would, for instance:

- have an explicit strategy, integrated with national policies and initiatives, to ensure that broadband connectivity is available throughout the city at an affordable cost through private and public investments, or a combination of both, as appropriate;
- monitor market structure and use the role of the city as a major customer for ICT services to promote competition, if needed;
- eliminate hurdles to entry for new service providers, offer tax or financial incentives to expand networks, and provide access to city infrastructure where shared access is viable; and
- offer training programs to develop the ICT and Internet skills of the population, either as a public service or in public-private partnership.

ICT use: Basic services

This area of the framework covers services that have high visibility in the city streets and that are a key part of how the public perceives the management performance of the city authorities. The services range from water, sanitation, transportation, and traffic management to public safety and emergency services and (in the case of cities with such responsibilities) health and education.

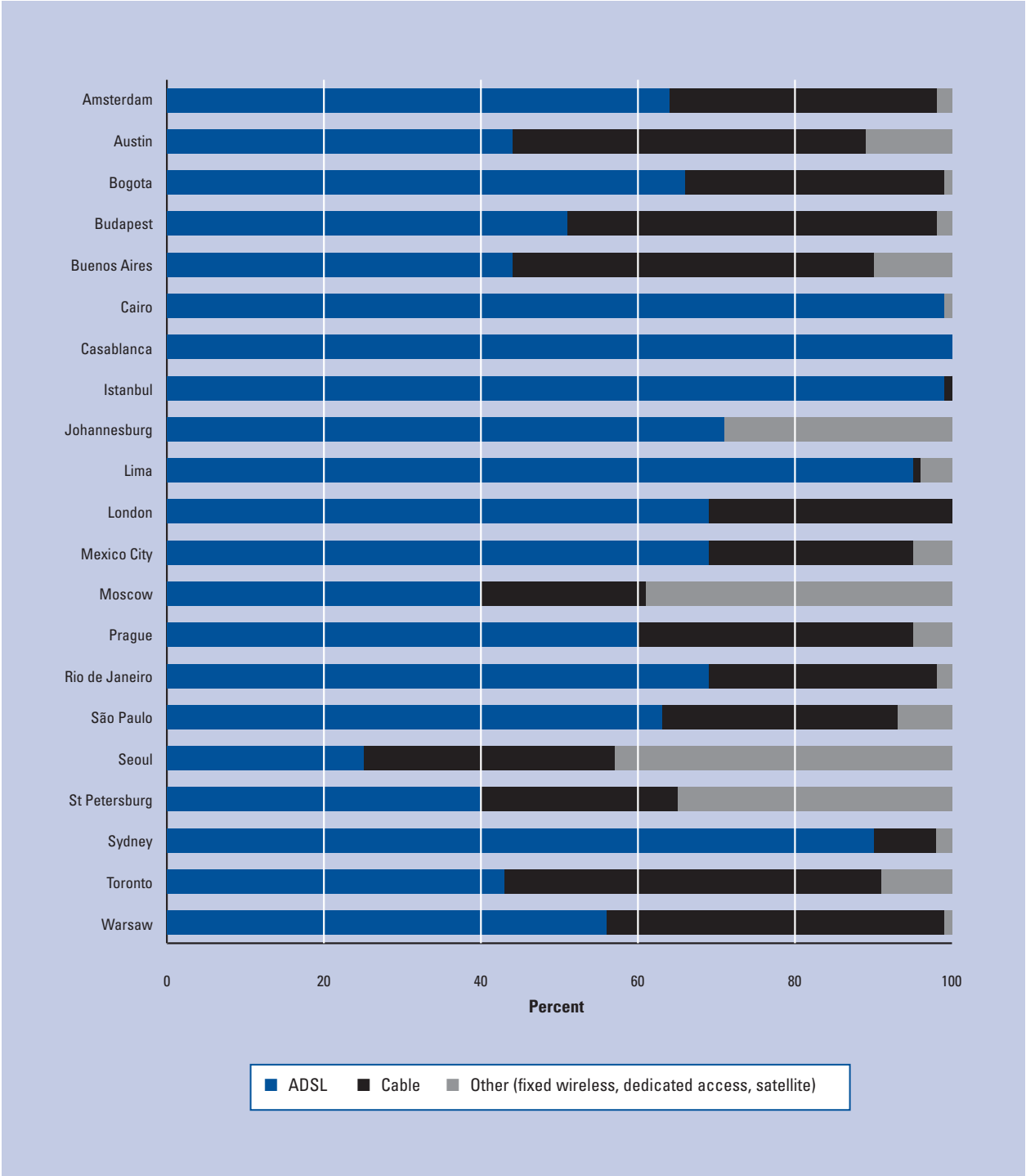
The key question here concerns how ICT can contribute to improving efficiency and effectiveness in the delivery of existing services. As the experience from best practice suggests, networks can offer important improvement to the delivery of individual services and connect the delivery of related services in a seamless way. The resulting reduction of equipment redundancy caused by multiple networks would lead to a potential savings that could be quite high.

Deploying ICT tools in basic services also has great promise for improving environmental sustainability, as a number of pioneering programs have demonstrated.[14] At the frontier of current technology, they include a wide range of options—from the electronic sensing of human activities that can result in fast and appropriate response to emergencies to extended tracking and control loops that can be used to dramatically improve supply and removal cycles for chains involving basic components of city life such as water and sanitation. More developments, including the Internet of Things, are constantly pushing this frontier as network technology makes it possible to use ubiquitous intelligence to pursue continuing improvements in the efficient and sustainable management of scarce resources.

A city at the frontier of current possibilities would, for instance:

- deploy Web 2.0 tools and rely on mashups (combined functionalities) to leverage potential synergies across services;
- utilize traffic control systems that are networked and use sensors that monitor flows and allow citizens access to real-time optimal routing systems, and that rely on networked digital traffic enforcement cameras and use wireless vehicle tracking for automatic tolls and congestions charges, among others;

Figure 4: Market share by technology platform (by city)



Source: IDC/Cisco Survey, 2009.

- deploy automated demand-response systems (in cases such as power blackouts) and smart grid technologies that allow utilities to integrate and balance renewable and other energy supplies;
- implement network-based dispatch services that enable real-time transit communications and provide online access to continuously updated information on public transport routes and timetables;
- employ wireless and networked digital surveillance cameras and integrated, interoperable communication devices for coordinated multi-agency response to emergencies;
- use networked lighting and temperature controls to reduce overall energy usage in municipal government buildings;

- maintain real-time monitoring systems providing details on the city's carbon footprint; and

- establish networked work centers that allow employees to work remotely, reducing overall commuting needs and traffic into the city.

ICT use: Online services

Citizens in many parts of the world have already experienced the benefits of Web-based services—first as information became available on many aspects of city life, and then as they were able to achieve painlessly online what used to require traveling to city offices and standing in lines. Web 2.0 tools offer great potential for further expanding the breadth and depth of online interactions between city administrators and citizens in a wide variety of areas including, for instance, employment services, education, permits and licensing, information portals, payment mechanisms, and other transactions. Many of these tools can also serve to promote collaboration with and among citizens.

A city at the frontier of current possibilities would, for instance:

- have online options to access information and communicate with all city government departments and municipal agencies;

- offer a one-stop portal that directs users to all available online resources and a single contact point to guide citizens to the appropriate service;

- make it possible for most transactions (permit requests, payments, etc.) to be completed online; and

- engage with citizens and local business to create applications, to tap city information resources, and to develop new services.

ICT use: Internal administration

The final area of the framework considers how technology can be used in internal city operations. This is no different from the back-office operations of any other large institution or corporation and includes data and voice networks, data centers, call centers, and office information technology infrastructure such as servers and wireless access points. The potential of new network technology is great in this regard too: it can lead to improving the returns on existing ICT assets as well as leapfrogging to cost-saving architectures and enhancing the quality of operations through new levels of interagency collaboration.

A city at the frontier of current possibilities would, for instance:

- implement an integrated strategy for ICT and coordinate implementation of plans across city departments and municipal agencies;

- rely on an organizational structure reflecting the value of integration around a common platform—including central coordination of ICT budgeting and investment decisions;

- ensure widespread access by employees to broadband, Internet protocol voice services, unified communications/conferencing systems, virtual private network for remote access, shared online work spaces, and collaboration tools; and

- rely on an integrated citywide network capable of combining voice, data, and video.

Summary diagnostics

The broadest insights can be derived from an overall perspective on the strategic response by authorities in a city to the opportunity of ICT, as illustrated in Figure 5. We can do this by mapping the answers to questions on internal and external approaches to ICT adoption, which can then provide a useful starting point for reconsidering strategic direction. At this high level, we can envisage four types of situations:

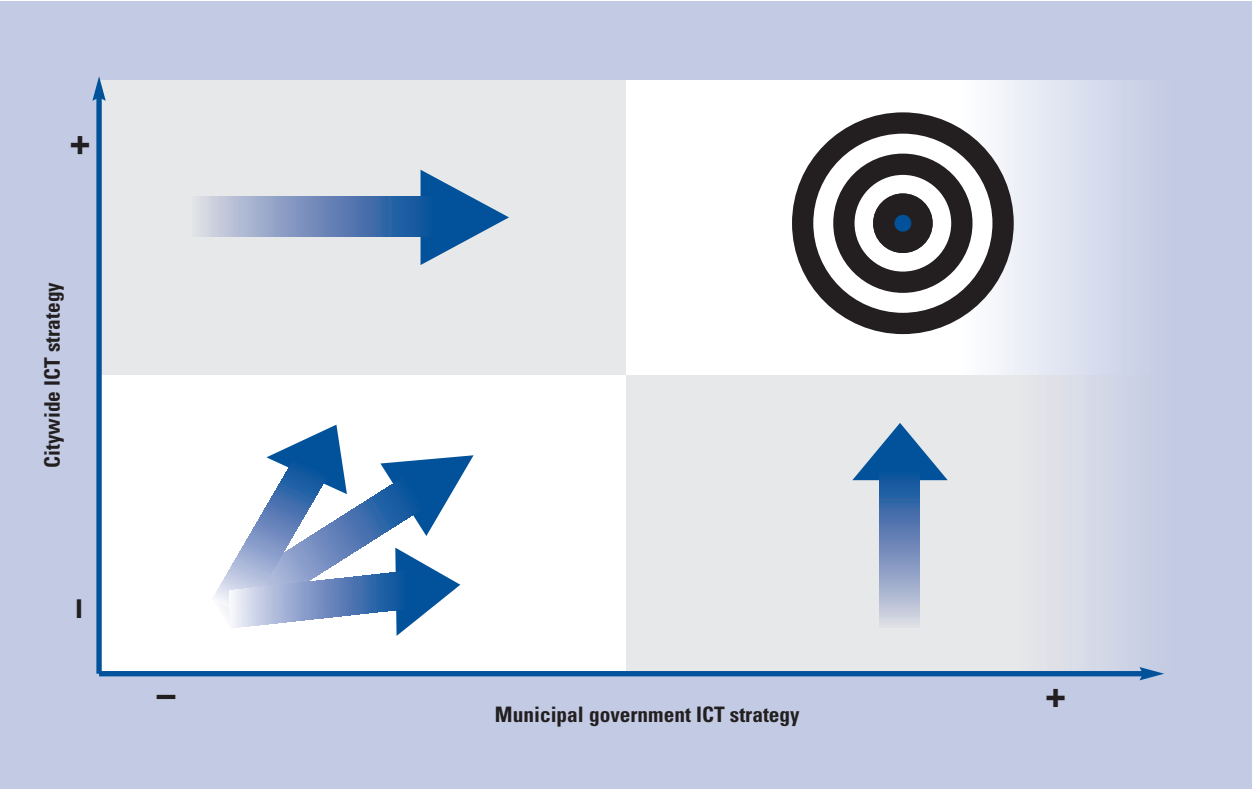
- A city with clear, far-sighted strategies for ICT adoption and broadband deployment internally and externally is a city hitting the bull's eye of competitiveness—poised to make the most from the potential of Web 2.0 connectivity and applications.

- A city that has a clear strategy for ICT adoption but lacks a clear strategy for its internal use in the day-to-day workings of the municipal government is likely to lay the foundation for ICT-driven competitiveness but miss the opportunity of a more efficient government.

- At the other end of the spectrum, a municipal government that is ICT advanced but has no strategy to promote or facilitate ICT adoption by businesses and citizens across the city strongly represents a missed opportunity because the benefits of ICT may be limited to the public sector while technology adoption in the city at large relies exclusively on private-sector leadership.

- Finally, a city lacking strategies for ICT adoption both internally and externally is likely to see its competitiveness hobbled by antiquated methods and technologies—it has a huge opportunity for improvement ahead through a combination of external and internal actions.

Figure 5: External and internal ICT strategies



The assessment, and the framework on which it is based, are designed to underpin a diagnostic discussion of a city's current situation at a level of detail sufficient to provide the basis for the formulation of action plans but that keeps the discussion at the strategic level—the technical details should come later. An overview is obtained by considering the summary ratings for the different items under each of the four areas of the ICT framework. We can also add a measure of quality-adjusted broadband penetration (from the surveys mentioned earlier) to complete a diagnostic pentagon.

The result of this assessment for any city can then be compared with the possibility frontier reflected in the outer edge of the pentagon. It can also be compared with a composite best-practice contour, derived from the best ratings among the six advanced cities (shown by the bold line in Figure 6). This benchmarking allows us to provide a picture of a city's current situation. Comparing a city's contour with the best-practice composite and the current technology possibility frontier clearly indicates the opportunity gaps a city faces and, hence, the avenues for improvement it could consider pursuing.

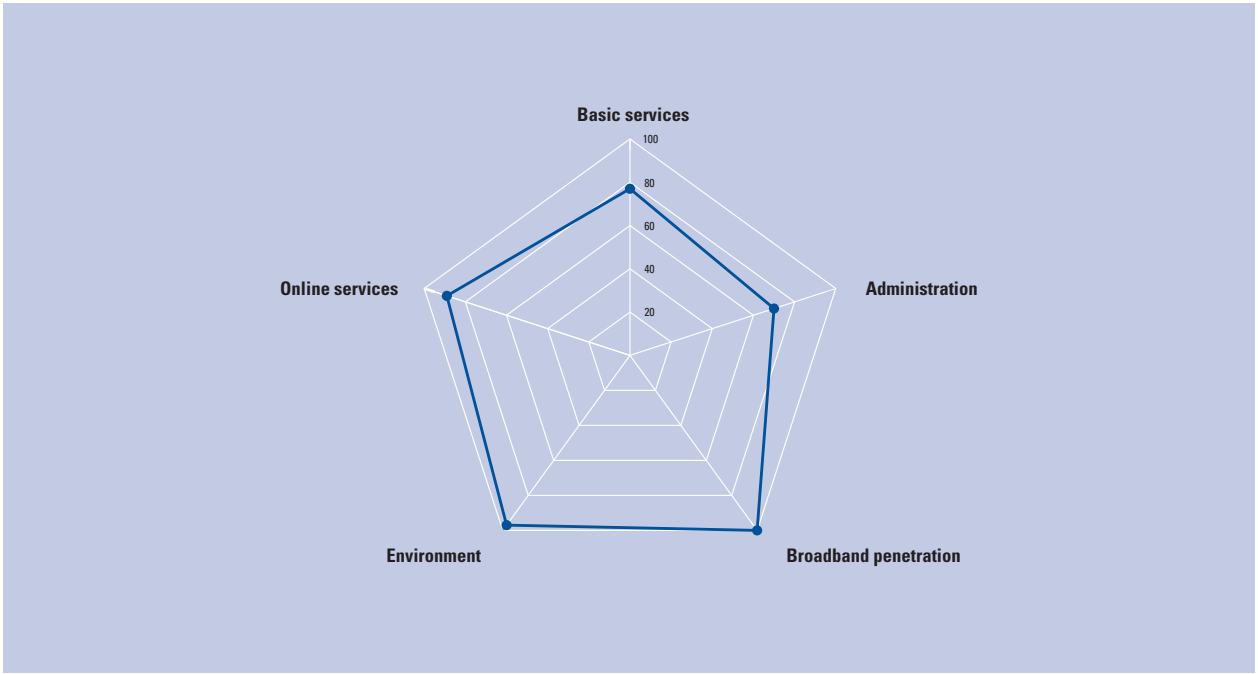
Comparing the composite best-practice contour with the possibility frontier makes it clear that there are significant opportunity gaps even for the relatively advanced cities, and this is without considering progress in technology and applications that will continue to push that frontier. The gaps appear to be wider for the myriad ICT opportunities available to improve the efficiency of basic services and internal administration. In emerging-market cities, the gaps will generally be larger across the board.

The analysis of ICT opportunity gaps in any given city can then be pursued at a greater level of detail, using the 20 different ratings given to areas under each of the four components to come up with summary ratings for environment, administration, and basic and online services. This analysis will serve as a basis from which municipal authorities and city leaders can formulate a strategy and develop specific action plans to leverage the potential for competitive sustainability that ICT has to offer—including efficiency improvements, greater responsiveness to citizen demands (for example, by addressing service bottlenecks), and inclusive connectivity linked to the city's social goals.

Conclusions

As Castells puts it: "Technology does not determine society: it is society."[15] Wealth and knowledge generation depend on the ability to organize in a way that allows the benefits offered by technology to be realized. Networked society can thus be seen as resulting from interaction between a new technological paradigm—high-speed networks that represent a revolution for

Figure 6: City ICT diagnostic pentagon



Source: Authors' survey of city officials.
Note: The bold line reflects composite best practice from the six advanced cities.

information flows and communications—and the social organization of an increasingly urban world.

In this chapter we have seen how the advantages of cities and those of ICT can be mutually reinforcing and how they can also serve as a platform from which to promote national progress. Looking at the broadband situation in 21 cities across the world, we have observed a range of situations in terms of the quantity and quality of their connectivity. Finally, we have proposed a framework to assess ICT use. A preliminary application has produced results that indicate large gaps between current practice and the potential that the Web 2.0 paradigm offers for cities at all stages of development.

Cities that seize the moment of this change in the technological paradigm stand to benefit enormously, particularly as the global economic map is 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.

Notes

1 Quoted in Harris 1997, p. 1.

2 Sassen 2001, 2006.

3 Glaeser and Gottlieb 2009 include a useful review of the urban economics literature, including research on different sources of agglomeration economies.

4 Graham 2004.

5 See, for instance, Mitchell 2005.

6 World Bank 2009.

7 As noted in Lemelson-MIT and CNN (http://web.mit.edu/invent/n-pressreleases/n-press-05CNN.html).

8 Pepper et al. 2009, p. 40, Box 1.

9 This survey was conducted by IDC (unpublished) for Cisco Systems.

10 In the previous section, we focused on the 1 MB/s download speed threshold because statistics showing broadband penetration of the basis of lower thresholds have very limited usefulness nowadays. However, as the discussion shifts to broadband quality, other thresholds become relevant.

11 Available at http://www.sbs.ox.ac.uk/newsandevents/Documents/Broadband%20Quality%20Study%202009%20Press%20Presentation%20 (final).pdf.

12 Morrison et al. 2008 and Pepper et al. 2009.

13 See http://www.connectedurbandevelopment.org/.

14 See, for instance, the analysis and illustrations in Mitchell and Casalegno 2009.

15 Castells 2006.

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CHAPTER 1.3

Creating Profitable Competitive Advantage by Driving Sustainability

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Is managing sustainability performance voluntary? Not if a business wants to be competitive. Not only do 80 percent of Global Fortune 250 companies disclose their sustainability performance, but an increasing number of companies in every industry are using sustainable business practices to improve operating margins and attract customers. In addition, each year investors are placing US$5 trillion in socially responsible investment funds.

By *sustainability* we are not speaking of corporate philanthropy; we define sustainability as increasing short- and long-term profitability by holistically managing social, environmental, and economic risks and opportunities. In other words, we never lose sight of the financial aspect and profitability of a sustainability initiative and are proactive in using sustainability to gain competitive advantage. This chapter aims to help C-level executives and strategists understand how to create profitable competitive advantage by driving sustainability in their organizations, particularly through automation in setting goals, gathering data, monitoring activity, and reporting results. We offer a management guideline to steer through the massive transformation companies are facing.

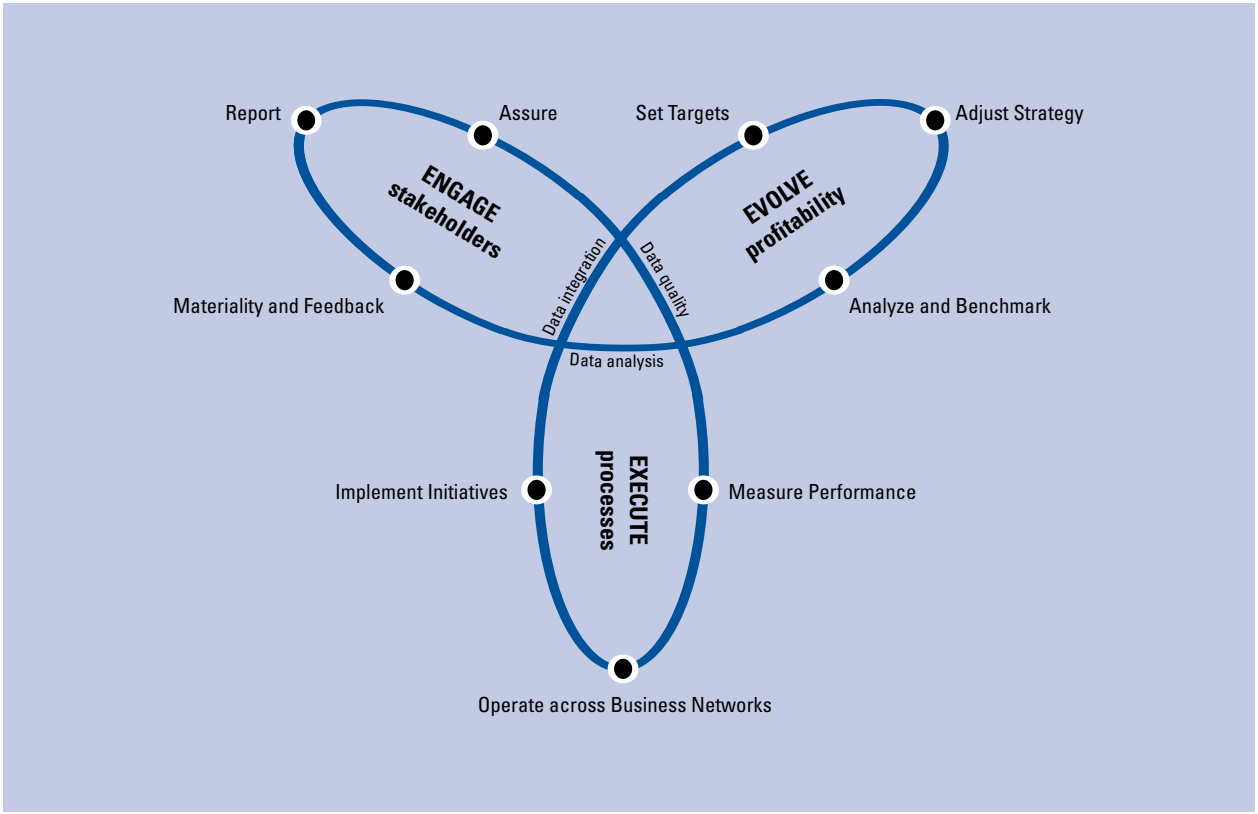
Sustainability: The third global transformation powered by business applications

Business application technology has the power to drive global transformations. It has progressed from mere record keeping to being the key to worldwide, irreversible, and fundamental change. The first major transformation advanced by business applications was 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. Companies could manufacture products in one market and sell them in another without having to locate offices in either. In time, it became impossible to compete without taking advantage of globalization and the ability to automate processes on a global scale.

The second major transformation fueled by business applications was the Internet. New types of applications drove significant change through disintermediation, putting more power than ever into the hands of consumers. The new paradigm created giants such as Google, Amazon, and eBay and is now changing the very way business applications are consumed by delivering them as services in themselves. The transformative power of business applications has run so deep that it touches the way we all work, the way we communicate, and the way we consume. Today, companies' competitiveness relies on their ability to tap into the connective power of the Internet.

The third major transformation fueled by business applications has just started. It is about holistically

Figure 1: The sustainability roadmap: Risks and opportunities



managing the economic, environmental, and social implications of business—what we call *sustainability*. Sustainability is already changing our lives, bringing with it new business models, new winners, new losers, together with completely new ways to operate. Today, chief executive officers are just waking up to this reality, and most struggle to implement a sustainability strategy. However, as with globalization and e-commerce, incorporating sustainability into their business strategy and using business applications to drive this transformation is essential for companies to be competitive.

The business roadmap to sustainability: The role of information technology

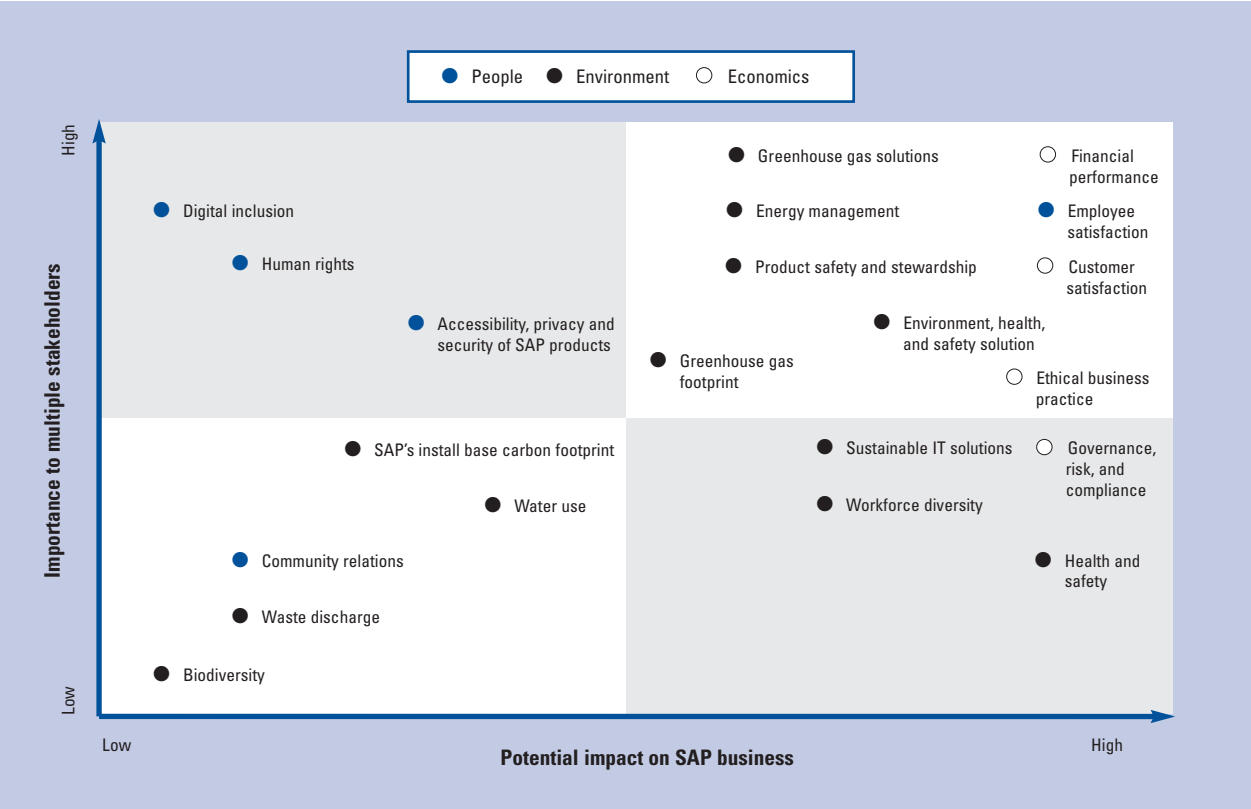
The roadmap to sustainability, which SAP formulated after helping many companies become more sustainable, consists of three major stages, as detailed in Figure 1: engaging with stakeholders, evolving profitability, and executing processes in a sustainable way. These stages exist in an ongoing loop of improved performance that continually optimizes an organization's sustainability and its ability to respond to new conditions and innovation. The rest of this chapter will analyze each stage of the roadmap, starting with Materiality and Feedback (in the Engage Stakeholders loop).

Materiality and Feedback

The first step to transforming business is to understand the need for transformation. Understanding comes in part from soliciting feedback from *stakeholders*—defined as everyone who is impacted by the organization and its actions. This includes customers, partners, suppliers, employees, and investors as well as local communities and businesses, government institutions, nongovernmental organizations, and interest groups.

In most cases, an organization must actively collect input from stakeholders; the process of gathering feedback can come in many forms, from organized surveys and stakeholder panels to insight picked up by listening to conversations in social networks. Other input may come automatically—for example, from government institutions in the form of laws and regulations, or from interest groups in the form of advocacy. The job of the organization is to collect and digest the feedback into a "materiality matrix" that identifies what has the highest potential impact on stakeholders, the maturity of the issue as it effects the organization, and how the issue

Figure 2: SAP materiality analysis



impacts its business (see Figure 2 for a graphical representation of the materiality matrix for SAP).

While there are many sustainability issues (such as reducing carbon footprint, women in management, human rights, and supply chain optimization), in this chapter we use the issue of reducing an organization's carbon footprint to explain the workings of the sustainability roadmap in detail. With the issue of reducing the carbon footprint as its priority, in the Materiality and Feedback stage, the organization would ask how important the issue is to its business. Is it important to the employees being recruited? Are investors looking at carbon as a critical liability? Will the company be exposed to the risk of pending regulation in a carbon-constrained economy?

In addition, the materiality question would be considered from two points of view:

1. the ability to maintain operations, which includes protecting brand reputation, lowering the cost of compliance with regulations and ensuring low-cost operations in the context of increased energy prices; and
2. the opportunity or risk for a product line. Can a new product line appeal to consumers because it helps them reduce their carbon footprint or because the product itself has a low-carbon footprint? And how do the company's products compare with those of the competition?

Finally, to determine sustainability priorities, a company must look at the level of maturity of the issue, placing priority on those that are more mature: the more mature an issue, the less time there is to respond.

Answering these questions with the help of stakeholder feedback will assist in formulating a strong position on sustainability priorities. The point of materiality assessment is that sustainability is a corporate governance issue that involves external factors. A carbon-intense company, for example, can discuss diversity, community development, and employee welfare, but if climate change is not also included, the company has failed the materiality test. The goal is to identify the major cost or opportunity ahead and come to a conclusion about the organization's net contribution to a sustainable development.

Business applications such as strategy performance management solutions can simplify the Materiality and Feedback process by helping to ensure that all data are included, modeling various scenarios to account for risks and opportunities, and mapping data and scenarios into a plan of action. In addition, advances in business intelligence solutions can mine sentiments in social media networks to make corporations more sensitive to changes in stakeholder attitude and perception, and collaboration technologies can help dispersed stakeholders share insight and best practices.

Ensure data quality and strengthen profitability

Doing the work associated with the next loop of the sustainability roadmap helps organizations expose weaknesses in their data quality and processes and establish a strong foundation for sustainability performance moving forward.

Analyze and Benchmark

Once the sustainability initiative has been modeled, analyzed, and vetted, the current state of the company's execution must be benchmarked against its priorities. If the priority is carbon reduction, for example, the organization would establish its current carbon emissions rate. This process involves four steps:

1. Review of systems, processes, and internal controls for the collection and aggregation of the qualitative and quantitative information needed to establish the benchmark. One needs to know the quality of data to be confident in one's calculation.

2. Collection of the information from enterprise systems. Most of the benchmarking information needed to establish SAP's carbon benchmark, for example—with the exception of employee commuting information, which were the object of a specific survey—resided within the company's enterprise software systems. With strong business applications, an organization should have data such as utility bills, flight information, and even company car fuel expenditures down to the employee level. In addition, business applications can help integrate this information to make it more useful. Although spreadsheets on utility bills and car fleets may provide a reasonable rate of carbon emission, they would convey nothing about the opportunities for cost reduction and optimization. To get that information, one needs integration of data—to be able to mine it and see, for example, that 10 percent of employees are producing 80 percent of carbon emissions. Although this stage is benchmarking, to optimize performance later on, a high level of granularity of data will be needed.

3. When measuring carbon, one would have to provide data at the granularity of the three agreed-upon scopes of emissions. Scope 1 measures how much emissions a company produces in its own assets, such as in the corporate car fleet. Scope 2 relates to energy the company consumes, for example from a utility. Scope 3 relates to supply chain emissions. At SAP, Scope 3 includes business travel and employee commuting other than with a company car. An important design principle for Scope 3 is deciding what emissions sources to report. The dialogue involves understanding the impact in one's value chain.

4. Finally, knowing peers' benchmarks will help an organization inform its targets. Initiatives exposing data can help. One such initiative is the consortium of Accenture, Microsoft, and SAP that was formed to support the Carbon Disclosure Project expose its wealth of voluntarily reported carbon data along multiple dimensions, including geography, industry, and even carbon intensity per dollar of revenue.

The process of mining information and analyzing processes provides another opportunity as well, by revealing areas in which processes are weak and there is potential for improvement.

A recent study conducted by a leading beverage company examined the carbon footprint, grove to glass, of its orange juice production.[1] The survey revealed that the biggest element affecting the total carbon footprint of the juice over its production life cycle was not distribution, cooling, or packaging, but fertilizer. Fertilizer production and application accounted for 58 percent of the greenhouse gas emissions in the product's life cycle. The company found that if it helped farmers use fertilizer more responsibly, it could reduce both its product carbon footprint and production cost.

Clearly, analysis is critical and the resulting insight can be very fruitful, and yet this is the step in which most organizations fumble. Many companies miss the opportunity to create an overarching management system to identify risks and opportunities and maximize sustainability investment. Others are hampered by information and data spread across many people and systems. The result is a proliferation of manually intensive and error-prone spreadsheets. One role that business applications can play is to help organizations set up a system to automate processes that drive sustainability, extract operational data from these processes, translate the information into financial impact for the organization, and use this insight to fine-tune operations.

Adjust Strategy

The next step is to ensure that overall goals and objectives for the organization are aligned with sustainability goals. For example, an electronics company with a supply chain strategy that focuses on cost reduction might adjust its strategy to consider the toxicity of materials that suppliers provide, labor conditions (including the use of child labor), and where raw materials are sourced (such as conflict metals from Congo). Modeling tools can help identify cost-effective approaches that factor in tradeoffs.

In terms of carbon reduction, there are two main possible adjustments to strategy: efficiency (for example, avoiding or reducing usage, including limiting the amount of air travel) and capital investment (for example, purchasing solar panels to tap into renewable energy). These efforts are already difficult for many companies to model consistently, and they become far more complex in asset-intensive industries that are considering complex tradeoffs with regard to production and logistics requirements. Business software can help to establish the business case for capital expenditures, including return on investment.

The goal of the Adjust Strategy is to align sustainability with overall enterprise management and build it into the core strategic business plan. To do so, the following questions should be asked:

1. What is the enterprise doing as an exemplar of sustainability to improve its own internal operations? Carbon, for example, is a proxy for inefficiency of energy use. Therefore, reducing carbon emissions is an important contributor to corporate financial well-being.

2. What sustainability-driven products or solutions could increase or maintain revenues and profitability? For instance, unless SAP builds sustainability management into its software, it will not be able to sell software to a large part of the market in five years, similar to the way no company will buy software that does not support all currencies or the Internet today. This constraint is true for all industries and must be addressed: new compliance measures and supply chain weaknesses will continue to challenge companies, as will balancing resource productivity and the need to gain competitive advantage with more sustainable products.

Set Targets

The final step in strengthening data quality is target-setting, which involves establishing key performance indicators, assigning responsibility, and cascading budgets. If the carbon emissions of a particular enterprise must be reduced by 50 percent in 12 years, for example, how should that 12-year target be translated into annual targets? How should the targets be assigned geographically? How should they be assigned by the bottom line? And what are the implications of each of those assignments?

For example, for a target of reducing energy usage in facilities by 10 percent, responsibility could be assigned to the facilities management area, ensuring that there are sufficient people and a large enough budget to support reduction projects. Another target could be to reduce greenhouse gas emissions by 20 percent by purchasing more renewable energy. The budget would be allocated at a high level in this step, but specific projects would be created under the next step to support the actual initiatives.

When SAP set its carbon-reduction target, software was used to run thresholds. Thirteen sources of carbon were identified and a tool was created that could slide back and forth and ascertain the ultimate combination of these 13 sources to get to a 50 percent reduction in carbon. Integral to the process, the impact on profitability was factored in, since the company would not want to set a target that jeopardizes its financial success.

Execute processes, analyze data, and adjust

The next loop of the sustainability roadmap helps organizations to bridge strategy and execution. It involves cascading sustainability strategies into tactical projects, implementing these projects across the enterprise, measuring performance, and identifying ways to optimize processes within and beyond the boundaries of the corporation.

Implement Initiatives

With a sustainability target and business plan in place, broader budgets can be cascaded into specific initiatives, and teams can devise tactical projects or initiatives to deliver targeted results. Using the carbon reduction example, let us assume that the goal is to cut carbon emissions by 50 percent in 12 years. This year's aim is to cut these emissions by 5 percent; in order to achieve this goal, profitable initiatives must be identified. First, a price for carbon is assumed; this may be a price set voluntarily or the actual price of carbon in a regulated area such as the European Union. The next step is to identify projects that may help achieve the target and determine the cost for each ton of carbon reduction. Finally, the information is used to create an abatement curve. As long as the cost for carbon reduction is negative (indicating a savings) or below the cost of buying a carbon offset, the project is worth pursuing.

Business applications can help to conduct this exercise in a repeatable and consistent manner, to determine the cost of each new project, and to understand whether or not the target will be met. For example, the SAP® Carbon Impact on-demand solution includes financial models for reduction projects that are critical to identifying opportunities for improvement. When

the project goes live, a strong business intelligence system can forecast carbon emissions by month and conduct what-if analyses to drive the right scenario. In addition, carbon-management software can help to more clearly measure, mitigate, and monetize greenhouse gas emissions and other environmental impacts across internal operations and the supply chain.

Operate across Business Networks

A sustainable supply network is the cornerstone of any corporate sustainability strategy, and the creation of a sustainable supply network requires re-evaluation of a company's supply chain with an emphasis on improving environmental and social performance. With carbon labeling, for example, to produce a mobile phone or music device and carbon label it at the point of sale, that carbon information must be found from the point of the extraction of material out of the mine to the shop floor and then the store. To do so, information must be obtained from many suppliers and aggregated at the point of sale. The issue is not located only within the company when the entire supply chain impacts the issue—a vertical view does not mean much in a global economy.

Business applications are critical here, because if one is offering low-carbon products, one needs to be able to prove that the stock-keeping unit going out the door is truly low-carbon. Software solutions help with supply chain complexities and with tools that can model the supply chain; capture data from sensors, data historians, and quality systems; calculate and model the production processes; monitor calculated parameters against permit limits, triggering events, and inspections; and account for sustainability measurements and currency, such as emissions and credits.

In addition, business applications can help optimize the production processes and supply chain to reduce carbon, either tactically or through strategic design. For example, business intelligence software can give visibility into energy usage at the asset level and make recommendations on how to optimize the production as well as how to optimize the network design. It can also assess whether the right decisions are being made in terms of sourcing parts and raw materials and assembling products. Every one of the processes within the organization and across the network should have some form of sustainability embedded in it, and technology can help to automate the process of optimization.

Measure Performance

The same level of internal measurement that is used for financials, sales forecasts, and research and development forecasts is required for sustainability. When the financial books of an enterprise are closed, its sustainability books should be closed as well—on a quarterly basis at least—to have a good understanding of carbon in terms of output and financial liability for assets because of that output.

When actual performance deviates from targets, areas of deviation can pinpoint where changes can bring about the greatest improvement in sustainability and organizational performance. Business applications can address the complexities of measuring sustainability performance at a system level: software tools can provide information and data on how to better configure the various elements of a system to optimize its overall performance in a cost-effective manner. In addition, performance management solutions can help to automatically collect data on key performance indicators from a variety of sources and move beyond labor-intensive and error-prone manual data collection and spreadsheet-based reporting.

Integrate information and engage stakeholders

The final loop of the sustainability roadmap helps organizations to bring their sustainability process full circle, re-engaging with stakeholders to report on the progress of initiatives.

Assure

The next step, assurance, is the process of verifying that an organization's sustainability systems are in place and that they are delivering against targets. Although internal audits can be conducted, working with an independent third party increases stakeholders' trust in the veracity of the report and in the credibility of the organization.

If a software is used to manage a sustainability initiative, assurance becomes much easier since without the system in place there is little credibility when the organization will be asked to prove everything it claims. If one of the stakeholders is a regulatory body, assurance will need to come in a specific form, such as reporting to a sustainability standard and providing evidence to substantiate reporting. Essentially, if one cannot prove a claim, one cannot put the claim in the report. With strong information technology (IT) systems and holistic management of the process, claims become easier to prove. In addition, the cost of assurance should drop dramatically if a system that automates the process is in place.

Finally, embedding business analytics in a report can provide a level of engagement and inclusiveness with stakeholders by offering them not only a finished report but also a dataset that they can interrogate. A deeper level of assurance occurs when stakeholders can slice data and see the views they need, ask questions, and strengthen their assessment.

Report

With the validation of a neutral third party, the final step is to publish a sustainability report for stakeholders. As with gathering feedback, in most cases this will

require outreach and a strong effort to publicize the report. Publishing the report helps the organization not only to report back to stakeholders who provided initial feedback on the sustainability initiative but also to attract a larger group of stakeholders, including new partners and customers who value sustainability.

The Global Reporting Initiative is a standard for sustainability reporting, providing a framework for sustainability that outlays the main elements or indicators that should be taken into account. The degree to which a company addresses the indicators and overall framework results in a grade.

The challenge in reporting is to increase transparency and to offer more data more frequently and more closely tied to results. In addition, the goal is to engage readers and allow them to view top issues relevant to them as well as to feel involved in communicating and influencing strategies. Business applications can help collect the data, make them auditable, and expose the data to the public in a way that is relevant to them. In particular, it is important to let the reader slice-and-dice data to his/her requirements.

For example, SAP allows individuals to look at carbon emission data in the aggregate for the corporation or by geography, by absolute value or per employee, by scope or by source. Additionally, SAP highlights target reductions by scope and provides a description of the initiatives underway to meet these targets.

Using the model outlined in this chapter, in 2009 SAP reduced its worldwide CO_2 emissions by 16 percent, to 425 kilotons, down from 505 kilotons in 2008. This reduction was well ahead of the company's 2009 target and represented a significant achievement. In addition, the reduction equated to a monetary savings of approximately 90 million euros. A key tool in this effort was the SAP® Carbon Impact solution, which allowed the company to calculate and report numbers much faster than ever before.

Although we used carbon to walk through the sustainability roadmap, the same processes apply to any sustainability issue. Everything we did for carbon, for example, could be done for energy management, clean water, or gender diversity. Instead of carbon-reduction targets, goals might be making sure the best talent is available to a company and improving the productivity of its workforce.

Conclusion

Real and tangible forces are driving the need for sustainability. The beauty of the challenge is that business applications can help us solve the problems we face by automating and driving processes more sustainably, helping to extract operational data from processes and even helping companies engage feedback from stakeholders.

According to research conducted by The Aberdeen Group,[2] companies that execute sustainability strategies incorporating C-level oversight as well as real-time visibility and enterprise-wide information management enabled by IT are reporting a 24 percent reduction in energy consumption, 30 percent reduction in emissions, and 19 percent out-performance of corporate operating margin goals.

Moving forward, creators of business applications will aim for improvement in several areas to support more efficient sustainability management. These include effective cap-and-trade management systems. By 2020, financial analysts predict a carbon-trading market valued at US$1 trillion a year.[3] Managing greenhouse gas certificate trading effectively avoids penalties and costs, but companies have the potential to do more. By effectively managing certificates and optimizing decisions around production, energy usage, and external investments, companies can capture potential revenues.

In addition, key performance indicators and dashboards will continue to evolve, with tools specifically designed to help set those indicators, defining and tracking programs, and supporting management decisions.

Finally, new tools will help companies to publish sustainability reports in an auditable way for both external and internal stakeholders. Different stakeholders require different standards and sometimes different methodologies. In cases in which financial institutions are focusing on "carbon risks," for example, certification institutions will look for a much more detailed picture and governments will push companies to meet reduction targets.

What we should expect moving forward is for sustainability to 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. Just think of how business applications powered globalization and the Internet. The same will happen with sustainability. Get ready!

Notes

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CHAPTER 1.4

The Role of Metrics in Sustainability

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> Our planet has enough to cater to all our needs but not enough to cater to our greed.
>
> —*Mohandas K. Gandhi*

Gandhi's gentle but stunning indictment of humans holds even more true today than when it was made, over half a century ago. Ironically, during this interim alone, human activity has extensively altered the ecosystem and its capacity to sustain life, human well-being, and economic and social development. While economic progress has brought greater prosperity to some people around the world, it has made the poor poorer by depleting and destroying our natural resources.

The world woke up to the fact of global warming and climate change approximately two decades ago, but it is only in the last decade that theory could be supported by hard data. It was also a decade ago that many countries became part of an international treaty—the United Nations Framework Convention on Climate Change—to reduce global warming. Unfortunately, the Kyoto Protocol, which imposed legally binding measures on countries to reduce greenhouse gas (GHG) emissions to an average of 5 percent below the 1990 levels throughout the 2008–12 period, has now been put on the back burner.

The recently concluded 15th Conference of the Parties in Copenhagen (COP15) on global climate change has also dashed hopes of serious commitment from industrialized nations to reduce carbon emissions. The three-page accord that US President Barack Obama negotiated with the leaders of Brazil, China, India, and South Africa and then presented to the conference on the final day of the summit did not meet even the modest expectations that leaders set for this meeting. At the end of the day, there was no binding international treaty to seal the provisions of the accord.

The plan also failed to commit either the industrialized nations or the developing nations to firm targets for mid-term or long-term reductions in GHG emissions. Still, what the accord significantly does is to codify the commitments of individual nations to act on their own to tackle global warming.

"For the first time in history, all major economies have come together to accept their responsibility to take action to confront the threat of climate change," said President Obama at Copenhagen. He was echoing what an editorial shared by 56 newspapers across 45 countries had stated on December 7, 2009, the day the summit commenced. The editorial had said, "Climate change affects everyone, and must be solved by everyone. The science is complex but the facts are clear. The world needs to take steps to limit temperature rises to 2C, an aim that will require global emissions to peak and begin falling within the next 5–10 years. A bigger rise of 3–4C—the smallest increase we can prudently expect to follow inaction—would parch continents, turning

farmland into desert. Half of all species could become extinct, untold millions of people would be displaced, whole nations drowned by the sea."[1]

Just months before, the World Bank's *Global Monitoring Report 2009* noted that the year's global financial crisis has endangered the attainment of the United Nations' Millennium Development Goals (MDGs) by 2015. The report, which assesses the impact of the crisis on developing countries, their growth, poverty reduction, and other MDGs, also sees value in leveraging the private sector to attain human development goals.[2]

Whether governments and politicians come to a final agreement or not, the private sector must set its own goals and measure its own contributions toward mitigating global warming. In this chapter we will cover some examples of how corporations are not only working to develop their own infrastructure but also involving employees who, in turn, are part of the larger society, to spread awareness and contribute toward the greater common good.

The role of the private sector

Increasingly, the world will be looking to the private sector to help find sustainable growth solutions. As the economy picks up again, the private sector will be called upon to take a proactive role, not only in providing solutions but also helping in:

- reducing environmental degradation;
- reducing GHG emissions and carbon emissions;
- improving energy efficiency, using renewable sources of energy, and building energy-efficient buildings;
- saving scarce natural water resources through sustainable rainwater harvesting and recycling water programs; and
- adopting effective waste management methods.

Even as the world introspects about the environmental impact of its technological and consumption choices, technology still plays a crucial role in creating a sustainable response to climate change and global warming. Technology will assess emission levels of CO_2 and other toxic substances into the atmosphere. Technology will measure success rates, tell us where we stand, and what the ideal state is to be in. For instance, technology will enable the computerization of processes, which will enable governments and private organizations to reduce their paper consumption and their carbon footprints. Using video conferencing facilities will help reduce travel and GHG emissions. Cloud computing, grid computing, and one keystroke are some other technology measures that technology companies are working on providing sustainable solutions to their clients.

Reporting data: Another driver to adopt sustainability

For the private sector, running businesses in a sustainable manner will become paramount, as will bringing data to the table to support their claims. More and more organizations will be called upon to disclose their performance on the triple bottom-line principle of economic, environmental, and social issues and publish an annual sustainability report where the metrics they use to measure the effectiveness of their programs will become vital.

Help is at hand for those in the private sector who have not yet started reporting on their sustainability. The Global Reporting Initiative (GRI) started by the nonprofit Ceres in 1997–98 has now grown into a global body for benchmarking the framework for sustainability reporting.[3] 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 GRI guidelines have made it easier for organizations to measure whether their operations are sustainable or not according to economic, environmental, and social parameters, through quantitative and non-qualitative analysis.

The wake-up call has been sounded for the private sector to build their businesses without impacting the ecosystem. Companies have begun to work on reducing the depletion of natural resources in a variety of ways, based on the assumption that one can contribute to saving the planet's resources by getting that much more out of every unit of energy, water, natural minerals, and all other resources that one borrows from nature. And, following the logic of Peter Drucker's statement "You can only manage what you can measure,"[4] companies are measuring metrics on sustainability from multiple dimensions such as energy efficiency, e-waste disposal, individual carbon footprints incurred by paper usage, commuting to work, business travel, and so on.

How companies affect the environment

Companies can affect the environment in a number of different ways. Several of these are identified and considered in this section.

Carbon emissions

Carbon emissions from various operations are one of the biggest concerns of today, and all major corporations around the world are setting targets for carbon reduction. Below are the sources of carbon emissions specific to the ICT industry:

- Electricity: Power consumption is one of the major sources of carbon emissions as, globally, a major portion of power generation comes from coal. In order to reduce that footprint, companies are adopting a strategy of conserving electricity; improving the efficiency of appliances, equipment, machinery and buildings; and sourcing clean energy from renewable technologies such as wind, mini hydro, and solar. Detailed strategies undertaken globally are discussed in detail in the energy conservation strategy section.

- Business travel: Travel for business mainly consists of air travel, and corporations globally are encouraging the use of video conferencing and telepresence. This is a difficult challenge as it requires behavioral change, not only among employees but also among customers and partners.

- Employee commute: Another area is employee commute, for which companies are providing buses and public transport. If using personal transport, employees are encouraged to carpool. Special privileges, such as reserved parking slots and reduced fees, are given to carpoolers.

Freshwater consumption

Freshwater sources are limited. We are consuming available water resources so quickly that we may see a major challenge in maintaining the availability of potable water. In this regard, companies are also adopting water management practices so that they receive the same or better services with less water and with less expensive infrastructure. The focus is on improving radically the efficiency of water use and integration of water supply, rainwater, wastewater treatment, and storm water management systems to meet long-term goals of becoming water sustainable.

Integrated water management strategies are built upon the principle of the three Rs: reduce, reuse, and recycle. The following activities have been undertaken by several companies:

Reduce

Reduction in the amount of water used by companies is achieved by:

- recalibrating hydropneumatic pump controls and adding multiple variable frequency drives (VFDs);

- deploying sensor-based low-flow faucets and restricting the flow to 4–6 liters per minute;

- installing low-flow shower heads, with a reduced flow of 9 liters per minute, in the employee care center buildings;

- installing low-flow, dual-flush systems in toilets;

- replacing regular faucets in kitchens with controlled faucets;

- installing dishwashing machines in food courts;

- reducing the water used for mopping floors; and

- planting native trees that require less water to grow.

Reuse

Rainwater harvesting is now the key criterion for designing and planning all large campuses at eco-friendly companies, as rainwater is pure and can be used after very little treatment.

For instance, water reservoirs in the form of ponds and lakes are currently being planned for campuses of Infosys in Hyderabad, India. A detailed hydrology study helps ascertain the gullies along which the water will flow, the surface runoff, recharge locations, and the optimum location for both on-surface and subsurface reservoirs.

The ponds and lakes are sized after studying the multi-year rainfall pattern, the nature of the subsurface strata, and the amount of evaporation losses. During master planning, a detailed slope analysis is carried out to ascertain the optimum locations for planning the gully plugs and contour bunds. These structures slow down the velocity of rainwater after a flash rainfall and thereby control erosion. This reduces the amount of silt entering the reservoirs. Also, the bunds help in increasing the soil moisture of the surrounding area, which helps in supporting the green cover on the surface.

Recycle

Many companies are recycling used water and utilizing it for irrigation. Water consumption for landscaping can be reduced by limiting grass coverage and planting trees appropriate to the area, which often need less water. Innovative technologies such as drip irrigation at the root zone level for watering trees and shrubs, and the use of sprinkler systems, predominantly operated at night to reduce evaporation losses, also help in reducing water consumption for landscaping purposes. The recycled water thus saved can be used for flushing purposes in toilets.

Preserving biodiversity

Biodiversity is the foundation of life on Earth and one of the pillars of sustainable development. The conservation and preservation of biodiversity is an essential element of any campus strategy. A number of companies are now attempting to transplant all trees that have to be moved for development.

To make sure that the message is disseminated among all employees and to convey their commitment to the environment, senior managers, including the boards of directors, of some companies plant trees during important occasions such as a company's annual strategic planning meeting.

Waste management

As urbanization continues, the management of solid waste is becoming a major public health and environmental concern.

Several companies have taken a number of steps to reduce resources usage. Top suppliers of hardware have been urged to use environmentally friendly packaging material, which they are encouraged to take back after the delivery of goods.

At several companies, solid waste is segregated at its source and disposed of as follows: paper waste goes for recycling, food waste is sent to piggeries, hazardous waste and e-waste are given to authorized vendors approved by local and central pollution control boards (PCBs), and biomedical waste is sent to vendors authorized by the local PCB. Several manufacturers across the world have taken initiatives that, delightfully, also lead to cost savings.

- For instance, Walmart Stores have reduced their annual shipping container use by 500 units, avoiding the consumption of 1,000 barrels of oil and 3,800 trees while netting US$2.4 million in cost savings.

- Dow Chemical Company, the second largest chemical manufacturer in the world, is attacking the problem in different ways simultaneously: by reducing water usage, utilizing seed oils to produce polyurethane foam, using sugarcane to produce polyethylene in Brazil, and developing high-tech epoxy resins made from bio-diesel waste. It has calculated that these steps have led to efficiency and cost savings of more than US$5 billion.

- *The Houston Business Journal* reported that Dial Corporation, manufacturer of personal care and household cleaning products, developed a more environmentally responsible detergent that simultaneously conserves water and lowers manufacturing and transportation costs.

Energy efficiency: One of the most important trends in the current scenario

Improvements in energy efficiency are being realized on different fronts by companies adopting green methods. Organizations are tackling equipment performance with a vengeance. Optimized power management configuration is being rolled out onto thousands of desktops. Considering an average power consumption of 10 watts (W) per hour by a desktop and a monitor in sleep mode, as against 110W per hour during normal operations, this configuration change can bring about an estimated 20 percent reduction in power demand by, say, 50,000 desktops. Further, consolidation of core infrastructure servers such as dynamic host configuration protocol servers and file servers, among others, can help reduce the power demand of these servers by as much as 80 percent.

Data center performance

Data centers and server rooms hosting network equipment, servers, and storage devices are large consumers of energy in the information technology (IT) landscape. Companies are standardizing on eco-friendly data center and server room design, incorporating power and cooling best practices and restructuring existing data centers and server rooms. Review of rack design and placement based on thermodynamics simulation and study is in progress. Opportunities for further consolidation and virtualization of servers and other infrastructure in data centers and server rooms are being explored. For several green companies, the plan is to shift from the current model of dedicated computing infrastructure to a shared, secure, and virtualized environment.

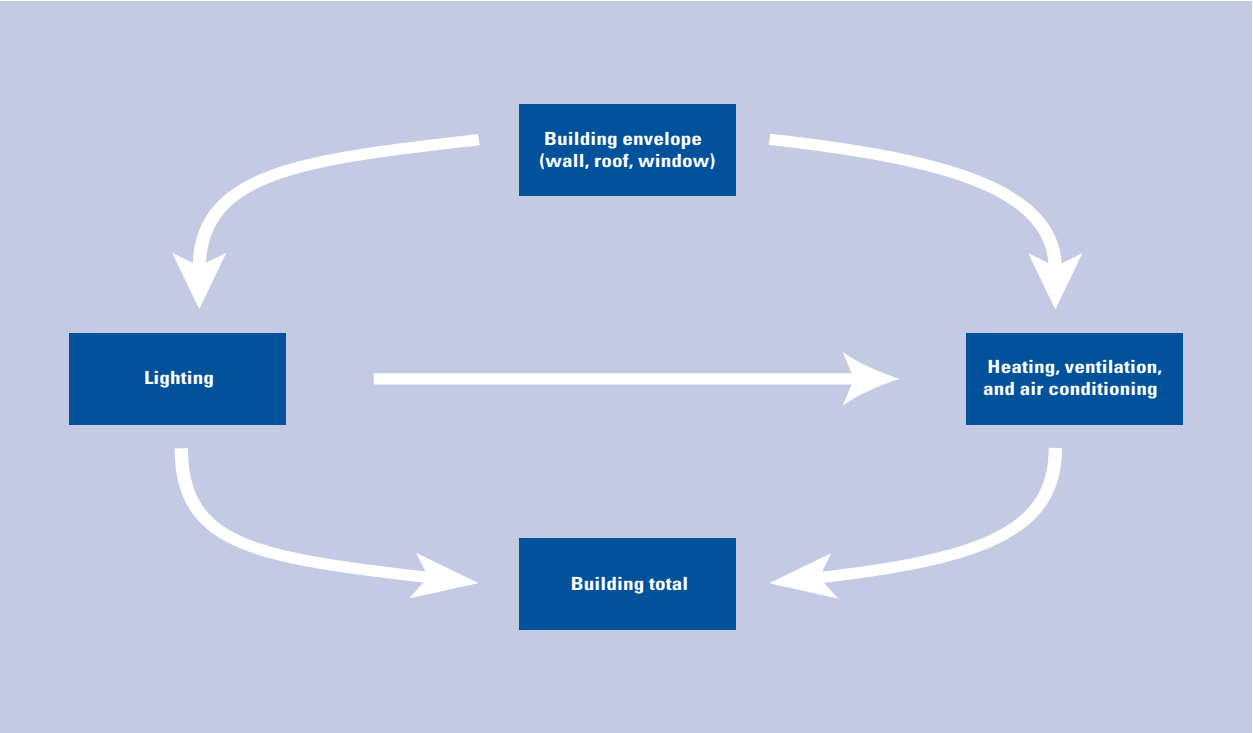
Computers

Computers are a major heat source in buildings and contribute more significantly than lighting systems to heat loads. Computers using about 100W to 150W can be replaced by more efficient computers. The new computers consume just 70W during working conditions. This results in a significant capacity reduction of the cooling system.

Green buildings

A major step toward sustainability at Infosys has been the implementation of an aggressive plan laid out in 2008 to design all new buildings as "green buildings." Accordingly, all buildings under construction follow green building principles and are optimized for energy performance and occupant comfort. Since buildings and their use are the largest consumers of energy worldwide, there has been a strong focus on the research and development of green buildings. High-performance buildings offer tremendous opportunities to enhance economic performance, gain competitive advantages, improve human well-being and productivity, and reduce humanity's environmental impact.

Figure 1: Design optimization process



Recently, conscious efforts have been made in the private sector to measure data accurately at a more granular level. This exercise has provided deep insights into areas where further improvements can be made in the efficiency of current operations.

There are several aspects of a green building that can provide significant energy savings. Every new building designed should incorporate the following design optimization processes (see Figure 1):

- optimize the building envelope to minimize the heat entering the building;
- minimize internal heat loads such as lighting, equipment (e.g., computers), and fresh air treatment. These two steps will reduce the requirement for air-conditioning; and
- improve further, after minimizing all the heat loads, by efficient system design and operation sequence.

The building envelope in a green building optimizes the building design process for energy efficiency. The kind of envelope (or exterior surface) used determines the amount of heat and daylight entering the building. This, in turn, affects the design of the lighting system and the air-conditioning system for the building, both of which are major energy consumers.

Building envelope optimization is realized by designing efficient walls, roofs, and windows. Hourly simulation software can be used to model the buildings, predicting different scenarios of daylight, glare at different times of the day, and heat gains into the building. This is an iterative process, performed with various combinations of glass and shading, to get the best combination that will bring in maximum daylight and at the same time reduce heat and glare entering the building. 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.

Insulation is used for walls and roof for thermal resistance, so that the heat coming into the building is minimized. At Infosys's Software Development Block-5 (SDB-5) building in its Mysore Development Center, the walls (cavity wall with 50 millimeters [mm] extruded polystyrene insulation) have a thermal resistance five times higher than the regular brick walls of conventional buildings. This means the heat ingress through the walls is five times less. Similarly, the insulated roof (RCC roof with 75mm extruded polystyrene over-deck insulation) provides resistance eight times that of a conventional RCC roof. The air-conditioning requirement has been reduced from 622 tonnage of refrigeration (TR) to 530 TR because of the efficient envelope, and thus the electrical load and energy consumption of the building fell correspondingly.

The next major heat source is fresh air provided to the building's air-conditioning system. About 85 percent

of the air in the air-conditioning system is re-circulated; the remaining 15 percent is fresh air added continuously into the system to maintain good indoor air quality within the building. But adding this 15 percent fresh air means exhausting cool air from the office and bringing in outside air at much higher temperature and humidity. This loss of energy can be prevented with energy recovery wheels, which can transfer heat from the outside air to the cool exhaust air, thereby recovering cooling energy from the exhaust air. Examples of measures of efficient equipment in the air-conditioning system are:

- Premium ultra high-efficiency chillers with a coefficient of performance of 6.6. This coefficient exceeds the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard recommended efficiency of 6.1. These chillers also have a low pressure drop, which reduces the pumping energy in the system.

- The cooling tower is sized at 1.4 times the chiller capacity, as against conventional practice of 1.25 times. This increases the physical size and cost of the cooling tower but saves energy in the air-conditioning system.

- The air handling units (AHUs) that supply air inside the building can be selected for high-efficiency and low-velocity of air, which will reduce the fan sizes required. This will also result in a larger physical size of the AHUs but will significantly save energy in the air-conditioning system.

- All equipment, including chillers, pumps, cooling tower fans, AHUs, and so on, can be equipped with VFDs, which reduces/increases the speed according to the designated requirements.

- Variable air volume boxes can be used throughout a building to control air flow based on the office space temperature. This is very useful during varying occupancy or other loads such as solar, lighting, and computers. The result is reduced energy consumption in the AHUs because any reduction in the speed of motor caused by a VFD reduces the motor consumption exponentially.

- High-efficiency pumps, motors, and fans can be selected for a building.

Efficient design of the air-conditioning system includes the following:

- The use of a variable speed primary loop chilled water pumping system instead of the traditional 2-loop chilled water system.

- The use of variable speed fans on the cooling tower and a variable speed condenser water loop.

- The use of a low-pressure piping system and air distribution system.

- A building automation monitors and controls all the building systems and maintains best operation practices.

Table 1 shows the incremental improvement in energy efficiency with each efficiency measure for Infosys's SDB-5 Mysore.

It is evident from Table 1 that Infosys has achieved a significant reduction in the final efficient building over the conventional building. Specific benefits are that:

- the air conditioning requirement is 36 percent lower than a conventional building of the same size and functionality;

- energy consumption is 45 percent lower than a conventional building of the same size and functionality; and

- peak electrical demand is 43 percent lower than a conventional building of the same size and functionality.

The building surpasses the ASHRAE baseline building energy efficiency by an estimated 35 percent, thereby scoring most of the points in the energy credit of the Leadership in Energy and Environmental Design green building rating system.

These design elements exemplify that efficient design is not complex and expensive, but requires logical reasoning, an integrated approach, intelligent thought, and apt selection of technology.

Involving people

An organization's ecological footprint is nothing but the sum total of the footprints of each individual working in the company. Thus involving employees in their individual capacities becomes paramount. With this reasoning, many companies have started "ecogroups" that comprise volunteers who want to work in the area of environment and educate others to change their personal habits.

My Ecological Footprints

In order to increase awareness among employees and lead them toward sustainable living, an initiative entitled My Ecological Footprints was launched at Infosys. The green initiative group first looked at what the company was doing in environmental areas and how each of the over 100,000 employees could contribute.

Table 1: Energy consumption for Infosys's SDB-5 Mysore

Element	Chiller capacity required (TR)	Annual energy consumption (kWh)	Maximum electrical load (kW)
Conventional building envelope	622	3,244,284	1,052
Efficient building envelope	530	3,030,908	968
Efficient lighting design	510	2,713,390	882
Efficient computers	486	2,358,776	778
Variable air volume system for air conditioning system	486	2,080,462	754
Heat recovery wheels for air conditioning system	400	2,015,430	662
Ultra high efficiency chiller	400	1,992,156	650
Efficient chiller water system design	400	1,960,898	640
High-efficiency cooling tower	400	1,946,532	632
Lighting controls	400	1,775,706	600
Efficient building standard	400	1,775,706	600

Source: Infosys project SDB-5 Mysore.

Then, the group decided to put metrics into every effort that goes on in the organization. The reasoning was that metrics help in capturing data on usage and wastage and promote user responsibility.

Finally, it set about showcasing every individual's contribution to the total environmental impact of the company. This would not only help to create a sense of responsibility among employees and bring about behavioral change, but would also create a sense of belonging and pride in being change agents.

Thus My Ecological Footprints came to be an employee's personal information page on the company's intranet. Data on how each employee has contributed and can contribute in changing the environment he or she lives in appear on a real-time basis. This information is provided to each employee. The objectives were clearly spelled out, as follows:

- The short-term objective was:
  - to educate each employee about his/her environmental impact.
- The long-term objectives were:
  - to incentivize, or bring in a credit-point mechanism,
  - to allow each business unit's average points to be compared with another's, spurring them to perform better—a development center's average could be calculated to compare with others;
  - to allow the company's average to be compared with those of rivals or peers; and
  - to reward best performers and share best practices.

Conclusion

Experts suggest that GHG emissions can be reduced by raising energy efficiency—designing better buildings, consuming less energy, and reducing waste and planting more trees, for example—so that the CO_2 in the atmosphere can be absorbed.

For the private sector, the journey has just begun. To achieve some of the environment goals of the Kyoto Protocol by 2012, as mentioned above, the private sector must become proactive and undertake measures to become sustainable businesses foremost and provide sustainable solutions to the world. If companies fail to do so, we will not only be failing our future generations, but might soon be looking for new planets on which to grow our food.

Notes

1 guardian.co.uk 2009.

2 World Bank/IMF 2009.

3 See http://www.globalreporting.org/Home.

4 Cohen 2008, p. 53.

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CHAPTER 1.5

Fostering the Economic and Social Benefits of ICT

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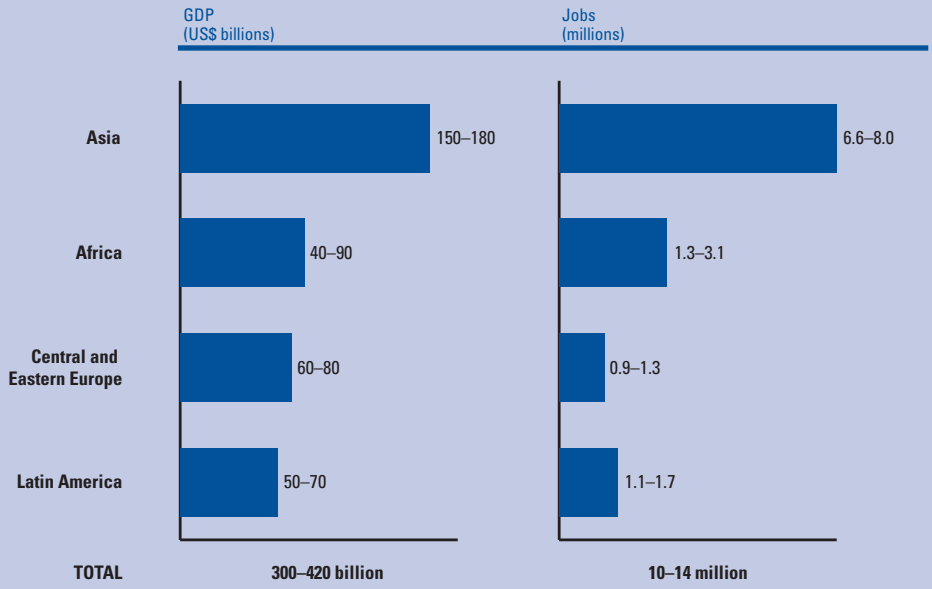
The ICT industry—including telecommunications operators, computer and software producers, electronic equipment manufacturers—is playing an increasingly important role in the global economy. It created approximately 5 percent of total GDP growth between 2003 and 2008, and it represented 5.4 percent of world's GDP in 2008. That share is expected to reach 8.7 percent by 2020.[1] Because of its size and the nature of its products, the industry has a notable role to play in encouraging economic growth and contributing to other social goods, including improving education and healthcare access and services. Furthermore, recent McKinsey research shows that the ICT industry can potentially contribute to reducing worldwide CO_2 emissions by 15 percent in 2020—an enormous contribution—but we will focus here on the economic and social contributions of the industry.[2]

ICT enables economic growth by broadening the reach of technologies such as high-speed Internet, mobile broadband, and computing; expanding these technologies itself creates growth, and the fact that technologies make it easier for people to interact and make workers more productive creates additional benefits. McKinsey estimates, for instance, that just one action—bringing mobile broadband levels in emerging markets up to those of more mature markets—could add between US$300 and US$420 billion to the world's GDP and 10 to 14 million direct and indirect jobs in areas such as equipment manufacturing and outsourcing/offshoring services (see Figure 1).

ICT's role in enabling economic growth has become more significant as governments are investing to stem the effects of the global financial crisis. As US President Barack Obama noted in January 2009, "Increased broadband spending, electronic medical records, green energy investments, and new computers for schools and libraries are all smart ways to keep America competitive while also creating new jobs and spending."[3] And UK Prime Minister Gordon Brown has likened his government's efforts to extend the country's digital infrastructure to "the roads and the bridges and the railways that were built in previous times to stimulate the economy."[4] They are far from alone—Korea, Rep. (Korea) has long been a leader in broadband investment, and today countries from Greece to Malaysia have committed large amounts of money to develop their ICT sectors.

Beyond economic benefits, the ICT industry is uniquely positioned to help build a more socially sustainable future. McKinsey's most recent consumer survey shows that the ICT industry is perceived to be among the top four industries in terms of its potential contribution to society behind only healthcare, agriculture, and utilities (Figure 2). The importance of ICT increased more than any other sector since 2006,[5] showing that consumers place growing importance on the industry as social contributor. And the recent crisis

Figure 1: Economic effects of leveling out mobile broadband penetration (top-down estimates)



Source: McKinsey & Company analysis.
Note: The figure shows absolute increases in each region. Assumptions are that mobile broadband reaches February 2009 levels of fixed broadband penetration in Western Europe (54 percent); an increase of 10 percent in broadband penetration leads to a 0.5 percent increase in GDP; employment elasticity of 0.5 percent.

has put even more pressure on all industries, ICT included. When one considers that no other industry in the world can reach out to over 4 billion mobile phone owners almost instantaneously,[6] or that 422 million households worldwide were connected to the Internet at the end of 2009,[7] this importance is hardly surprising.

Governments have also realized that ICT can offer social benefits, so they have started large programs to improve the level of health, education, and government services they offer to their citizens. For example, as we will explore later in greater depth, ICT is making an important contribution to health delivery: doctors can directly access their patients' medical records from anywhere.

Creating these economic and social benefits will require not only large investments and commitment from different stakeholders but also changes to existing regulatory frameworks, compromises between governments and industries, and strong public engagement. This chapter will detail how ICT drives growth, discuss the economic and social benefits it can create, and suggest some steps stakeholders should take to fully reap them.

Investing in ICT to drive economic sustainability

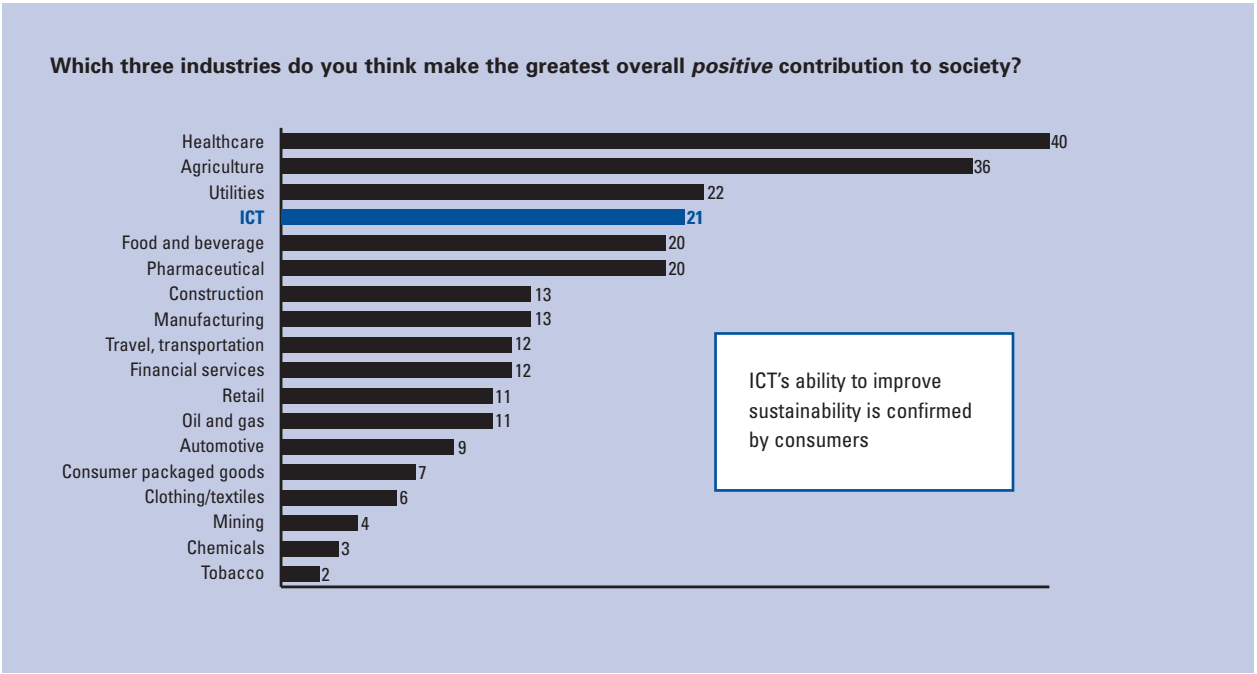
Countries have started to invest in ICT because they know that the sector can have a substantial positive impact on social and economic sustainability. Investing in ICT is a key driver of economic development for emerging and developed markets alike. Figure 3 shows the correlation between ICT readiness—the availability of broadband, computers, and software in a country—and competitiveness. The countries with the most-advanced ICT sectors present the highest levels of competitiveness, suggesting that having a country enabled by ICT improves the overall performance of its economy in the long run.

In fact, investing in ICT can help countries increase their annual GDP growth by 0.6–0.7 percent on average, on an annual basis, for each increase of 10 percent in household penetration, as several studies have shown (Figure 4).[8]

This impact is created by a combination of direct and indirect effects on the economy. Direct effects come from investments in infrastructure (by government and operators), increased availability and penetration of services, and increased employment in the ICT sector.

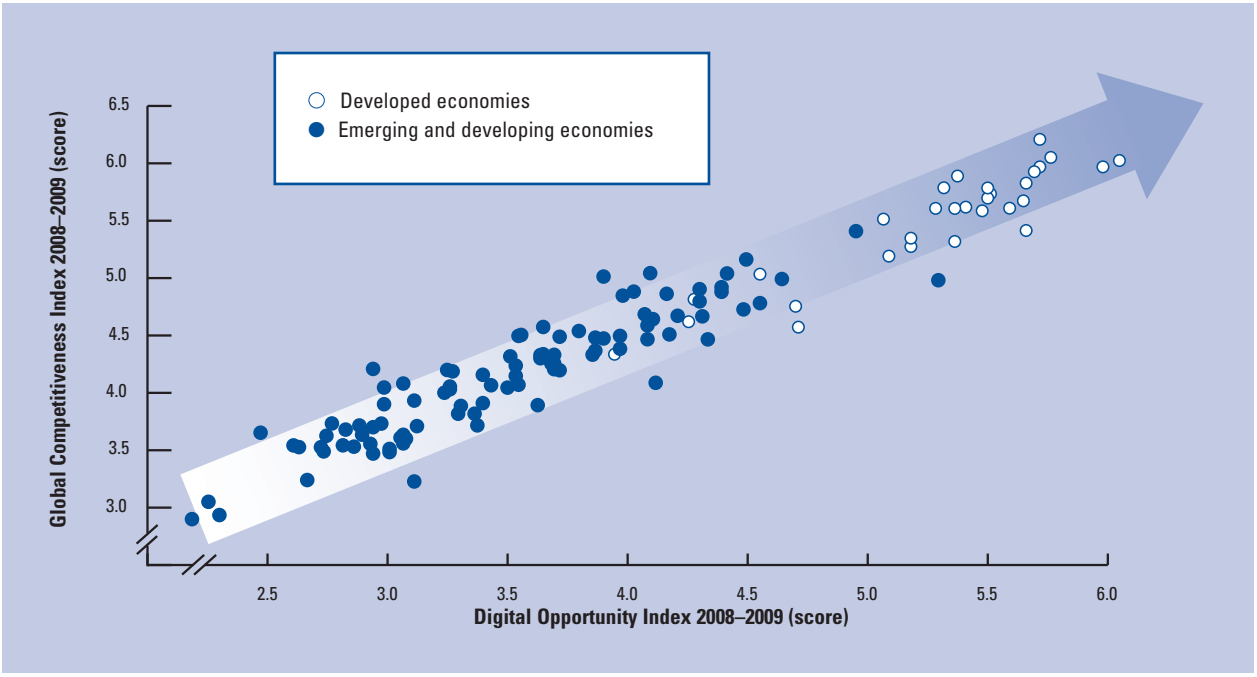
A good example of direct effects is seen in Korea, where growth in the ICT sector was 43 percent between 1999 and 2003; in the same period, it was negative in Japan, less than 1 percent in Malaysia, and 5 percent in Singapore.[9] Korea drove this growth by pushing forward a national vision to develop its ICT sector; this required a concerted effort between public and private parties and large subsidies from the state. The country invested more than US$700 million in subsidies between 1995 and 1997 to link around 15,000 institutions in 80 major areas of the country with high-speed fiber networks. It also provided low-interest loans with minimal paper work for individuals to acquire personal computers

Figure 2: Perceived ICT contribution to society (percent of respondents)



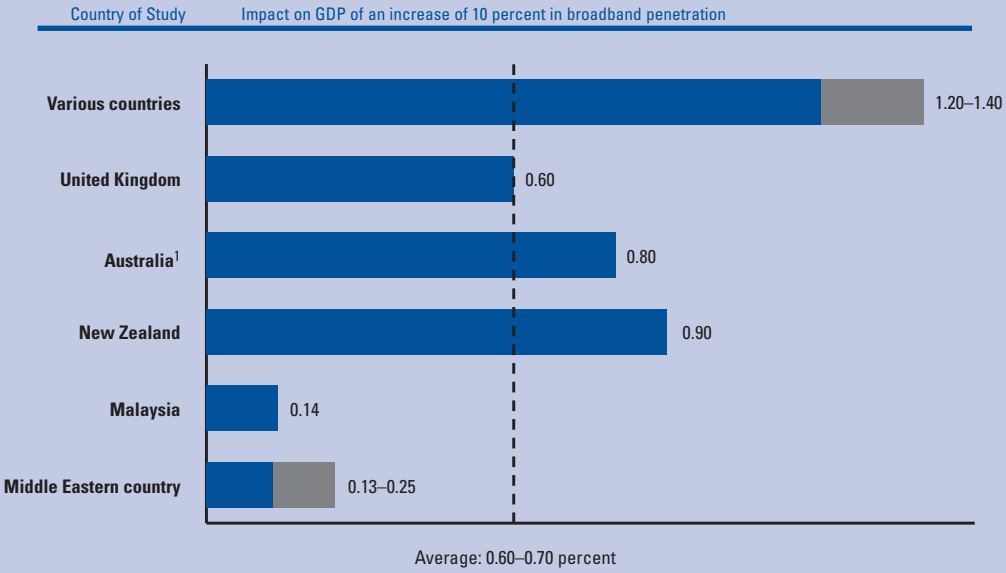
Source: September 2008 McKinsey survey of 4,787 consumers around the world.

Figure 3: ICT readiness vs. competitiveness



Source: World Economic Forum, Competitiveness Index 2008–2009; McKinsey, Digital Opportunity Index 2008–2009.
Note: The Global Competitiveness Index is a composite index of indicators relating to institutions, infrastructure, macroeconomic environment, health, education, market efficiency, technological readiness, business sophistication, and innovation. The Digital Opportunity Index is a composite index of indicators relating to coverage/access, tariffs, equipment penetration, and broadband adoption.

Figure 4: Investment in broadband and economic growth



Source: Qiang and Rossotto, 2009; CEBR, 2003; ACIL Tasman, 2004.
Note: Gray boxes refer to the range indicated.
[1] Tasmania region only.

(PCs) and budgets for the purchase of PCs for teachers and schools. The results are not only 99 percent broadband household penetration but also an ICT sector that is heavily entrenched in Korea's economy: it represents 17 percent of the country's GDP—making the largest contribution by any single sector—and it accounts for over 43 percent of total exports from the country.[10]

The direct effects of ICT can also be seen in bringing ICT services to remote, underserved areas. In this case, direct investments will bring job creation and extra spending that benefit the population in these areas. Telefónica, for example developed the Intégrame initiative in Peru, which aims at extending ICT services via public-private partnerships. As a result of these partnerships, mobile, landline, Internet access, and television services are now offered using wireless technology at better tariffs to 62,300 people in 180 locations throughout the country. Further, Intégrame has opened new markets for Telefónica and increased the speed of social and economic development through the inclusion of rural communities.[11]

ICT's indirect effects include productivity gains for businesses, increased foreign direct investments as a consequence of a country being ICT-enabled, the creation of innovative industry clusters such as knowledge cities, and higher exports of ICT services such as outsourcing.

The Indian Tobacco Company, an Indian conglomerate, illustrates ICT productivity gains for an economy. Their agri-business division, one of India's largest exporters of agricultural commodities, created e-Choupal in 2000 as a supply chain management system to reach farmers. These have traditionally sold their products through inefficient physical marketplaces where they are forced to take whatever price is offered because they have limited access to information on market prices. E-Choupal, a kiosk with computers and Internet access, is a virtual marketplace where farmers can sell their products (e.g., soy, tobacco, wheat, shrimp) directly to producers, without paying fees to traders or commissions to agents. The tool also provides information in local languages about the weather, market prices, and farming best practices, as well as general news. According to Mr Singh, a farmer in the northern state of Uttar Pradesh, annual incomes in Kurthia have risen from up to Rs50,000 (~€800) before e-Choupal to Rs100,000–Rs120,000 (~€1,600–1,900).[12]

E-Choupal has been useful not only for users but also for ICT, because it has created profitable direct access to farmers and raw materials without intermediary fees. As of 2009, e-Choupal had reached 4 million Indian farmers in 40,000 villages through 6,500 kiosks; the goal is to reach 10 million farmers by 2012.[13]

The social benefits of ICT

Beyond encouraging economic growth, the ICT industry is helping to achieve social sustainability by improving the way societies and governments provide education, healthcare, and services to citizens. Additionally, the ICT

industry is changing the way people interact with each other, creating longer-term and largely positive changes in a variety of areas.

ICT's impact on education

The ICT sector has already dramatically changed the way people study. A wide range of information is available free on the Internet—something that was unthinkable just 20 years ago. The use of email, websites, and virtual classrooms and libraries has proliferated, facilitating the sharing of information on a large scale.

Some countries have set specific initiatives to improve education through ICT. For instance, the deployment of the Jordan Education Initiative (JEI), a public-private partnership that aims to improve education in Jordan through the effective use of ICT, was launched in 2003 with the support of the World Economic Forum. Partnerships with multinational companies such as Microsoft and Cisco have enabled the equipment, with computer labs and broadband Internet, of 100 "Discovery Schools" around the country, along with the creation of e-learning curricula for 50,000 pupils and information technology (IT) training schemes for 3,200 teachers.[14] The performance of Jordan's students is higher in Discovery Schools than in other schools, and higher levels of education are key to reducing unemployment and poverty.

Another interesting example of an e-education program is in South Africa, a country with a 30 percent adult illiteracy rate. In partnerships with local communities, IBM has implemented labs in schools and associations that use a free Web-based program called Reading Companion. The program employs an innovative speech-recognition technology that listens, guides, and teaches children and adults to read English and improve their literacy skills.[15] For children, the software provides a solid grounding in reading, while it allows adults to gain literacy skills that will help them to search for a job and obtain a driver's license, among many other things. According to IBM, independent evaluations of the technology have shown that young students using the software tested significantly higher on word recognition and comprehension tasks. For adults, the software improved English pronunciation and reading skills, contributed to learning gains, and enabled greater comfort with technology. Access to Reading Companion will be expanded to over 1,000 schools in South Africa over the next three years.[16] In addition, more than 600 sites, schools, and nonprofit organizations are using Reading Companion in 22 countries.[17]

ICT's impact on healthcare

The use of ICT for health (e-health) has the potential to transform healthcare by efficiently connecting people and improving information sharing. Currently, e-health is predominantly seen in developed countries. But as the availability of ICT spreads rapidly in the developing world, there is an opportunity to expand healthcare access to areas where distance, poverty, and scarce resources are currently barriers to even basic care.

Thanks to ICT, doctors can access patients' medical records more easily, have immediate access to test results from a laboratory, and deliver prescriptions directly to pharmacists. Patients with heart problems can carry monitors, which alert their doctors if their conditions change yet allow them to continue with their daily lives as usual.

Denmark is a leading country in national healthcare information exchange, with the successful development of its national e-health plan. The healthcare portal was created in 2003 to enable patients to view their medical profiles and histories, renew their prescriptions, book appointments with doctors, and so on.[18] Healthcare professionals also have access to the same information and additional clinical knowledge. Through the careful use of IT, the Danish health system has saved money, improved efficiency, and laid the foundation for improvements in the quality of care.[19]

Another example is a major hospital chain in India, Apollo Hospitals. In collaboration with a leading provider of telecommunications and data communications systems, they are providing basic diagnostics (blood pressure), medical check-ups, and consultation via mobile services.[20] This project will enable the provision of affordable and accessible healthcare to millions of people in remote areas.

ICT's impact on government services

Early breakthroughs in e-government—such as the use of ICT to provide and improve public-sector services, transactions, and interactions—have enabled government organizations to deliver better services more efficiently. In many countries, more than 70 percent of taxpayers now file taxes electronically, for example, and many other transactions—ranging from renewing drivers' licenses and paying parking tickets to managing government benefits—can be conducted online. Citizens have a much easier and faster access to government services.

In Singapore, for example, citizens can buy replacement identity cards online by submitting digital passport-sized color photographs and scanned copies of existing identity cards. Also, when citizens are changing their residential address, they need to submit just one single report and all government agencies, educational institutions, and selected private companies will automatically be notified. A customer perception survey conducted by the Ministry of Finance and Infocomm in Singapore showed that, in 2008, 85 percent of respondents made transactions with government electronically, and 88 percent were satisfied, for four main reasons: it is easy to find information, it is user-friendly, the transaction is fast, and it is easy to complete.[21]

In Malta, to take another example, citizens can purchase online copies of personal documents for

themselves and family members (e.g., birth, marriage, and death certificates) dating back to the 1880s. Benefits for governments that are offering these types of services are huge. "As recent research shows," noted Eurochambres Secretary-General Arnaldo Abruzzini in November 2009, "electronic procedures will lead to more bidders and thus increased competition, which could create savings in the order of €150 billion EU-wide."[22]

Improving information access and communications

ICT is changing the way people access information (with Google and Wikipedia, for example) and interact with each other (through blogs, social networking sites, virtual reality sites, and so forth).

Social networking websites have changed the job recruitment rules. Today these sites are *the* places to find a job and recruit talent. A recent survey, conducted in May 2009, revealed that 72 percent of US companies plan to increase their use of social network recruiting. Ninety-five percent of companies used LinkedIn; Facebook use by companies grew from 36 percent in 2008 to 59 percent in 2009.[23] Interestingly, it also seems that employers are more satisfied with the quality of candidates from employee referrals and social networks than of those from job boards. From the candidate's point of view, a recent survey showed that today 6 percent of respondents found their last job via a social networking site—which is fairly high when one takes into account that these websites started to acquire a critical mass only a few years ago.[24] It seems likely that such sources for job hunting and recruiting will only grow in importance given their overall growth in use.

The latest presidential election in the United States heavily leveraged these types of social networking websites. Internet users could have a connection with then-Senator Obama on more than 15 social networking sites,[25] meaning that regardless of Internet users' preferences, all of them could connect with Obama's pages. For instance, on Facebook, the largest group of Obama's supporters is composed of 1 million people, the Obama MySpace page currently has 1.9 million friends,[26] and Obama has 3.1 million followers on Twitter.[27] He also created his own social network website, MyBarackObama.com, where 2 million profiles were created.[28] The large network created by online channels allowed Obama to reach out to people who had not been involved in politics before and would have not been involved otherwise.

The power of the change generated by social networks was also evident when a 25-year-old Moldovan woman put a message in Twitter after she and her six other friends were discussing doing something about the recent—and allegedly fraudulent—parliamentary elections. This message created a demonstration that raided the parliament and pushed the Moldovan president to order a recount of the recently held elections. Speaking about the power of Twitter, the woman said "we expected at the most a couple of hundred friends, friends of friends, and colleagues […] when we went to the square, there were 20,000 people waiting there. It was unbelievable."[29]

All these examples show new ways in which innovative ICT technologies are having a profound impact on the way people interact and communicate with each other. Many of these technologies will undoubtedly lead to new social benefits.

Unleashing the potential of ICT requires investments

The economic and social benefits of ICT are clear. However, this impact could be significantly increased if the penetration of ICT, including mobile phones, broadband, and PCs, was expanded. Figure 5 shows the coverage of these technologies in the different regions of the world. Developed countries have room to continue to expand their current penetration of these technologies, but also—and possibly more pressing—emerging economies need to close the gap with more advanced economies to reap the benefits of ICT. If they can, ICT will likely bring them even more significant benefits than it will to developed economies.

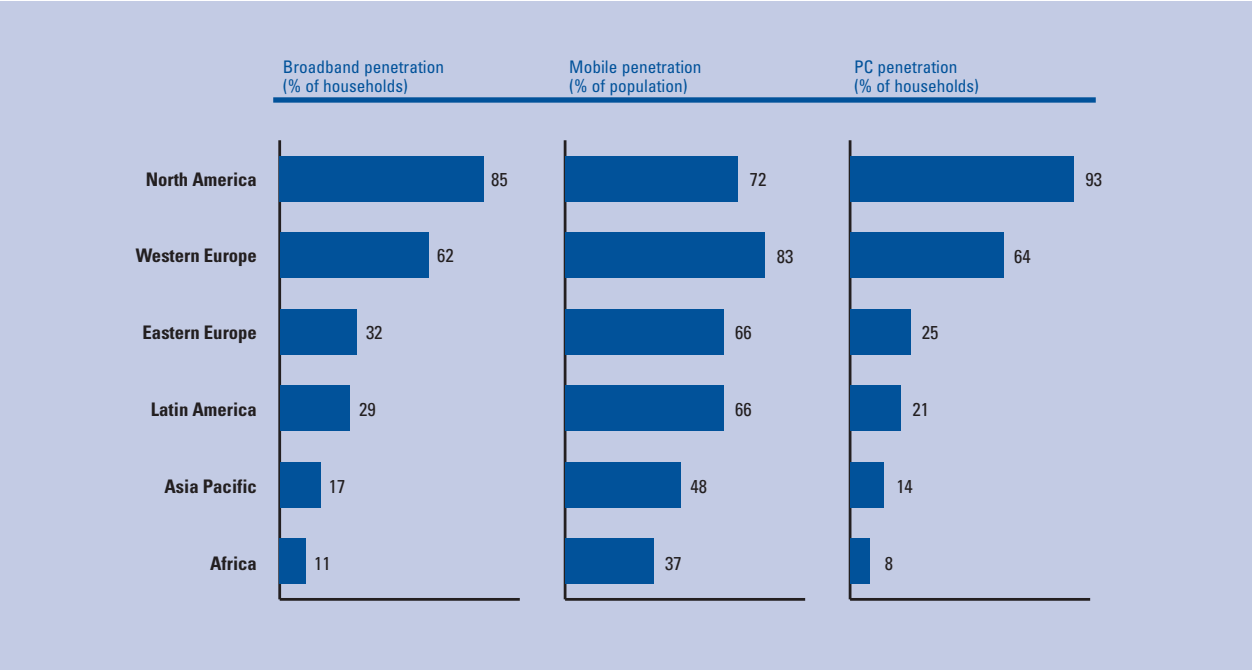
Increasing the penetration levels of high-speed broadband, mobile, and PCs wasin developed and developing countries will be extremely costly and is not likely to be profitable for ICT companies alone. For example, in the EU15 countries, McKinsey estimates that the capital investments required to bring high-speed, fixed broadband networks will be as much as €250–300 billion over the next couple of years.[30] But in this same region, the industry will generate some €250 billion in cash flows over the next five years.[31] That means that the industry would need to invest all available cash to build these networks, leaving nothing for maintenance or other types of network upgrades, or anything else. At its current investment rates, the industry would take some 15 years to roll out new networks. The situation is obviously even more unbalanced in emerging economies, where penetration levels are lower—and consequently the necessary investments would be higher—than in Europe.

The estimates above indicate that governments, at least in Europe, will need to invest large amounts of money to enable their countries with ICT. Making these investments work will require a concerted approach among all industry stakeholders.

All stakeholders need to adapt their strategies and cooperate

It is no easy task to align the interests of the various stakeholders when so much is at stake: ICT companies seek revenue, governments seek access to innovative services and tax revenues as well as economic growth,

Figure 5: ICT penetration rates, by region (2008)



Source: Pyramid Research data, Q3 2008; World Cellular Information Service (WCIS) online database, accessed October 2009.

and regulators seek consumer welfare and competition. Countries that manage to bring the different agendas together will see faster adoption of ICT and will be better positioned to benefit from it. Below there are some suggestions for each group.

Government's role: To build and support ICT strategies

Governments around the world are acknowledging, sooner or later, that the benefits of ICT are great and also that the business case is difficult for ICT companies. The main role of the government should be to help craft and 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. The best way to do this is by:

Creating a strong ICT vision and strategy

Governments around the world are realizing that having an ICT vision matters—they need to understand how their ICT sector can best enable other parts of their economies and social interests in order to convene industry stakeholders and align them to work toward that vision.

Governments in the most networked countries have done just that. Singapore, for instance, has a vision of becoming an information society by 2015. To do this, its government has put in place a strategy called *Singapore i2015,* which, according to Vivian Balakrishnan, Singapore's minister for communication, seeks to "double the value added of the ICT industry to $17 billion, to triple ICT exports to $40 billion, to quadruple software and IT services revenues to $24 billion, and finally to create of 80,000 new jobs, achieve a household broadband penetration rate of 90 percent and ensure that every household with school-going children will own a computer with connections to the Internet."[32]

The Singaporean government is working on stimulating the demand for ICT services by sponsoring a broad range of programs such as e-learning, e-health, and e-government. It is creating initiatives to put several sectors of its economy at the global technological forefront. The e-logistics program, for example, aims at orchestrating supply chain processes in the logistics industry, which includes the busiest port in the world in terms of tonnage, to increase manufacturing productivity in Singapore.

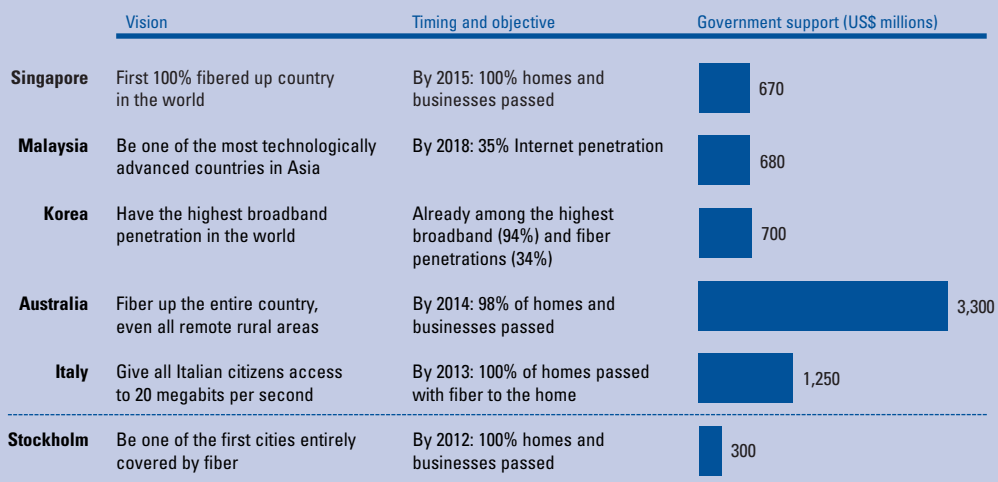
Supporting the ICT strategy financially

Initial government financial support to a country's ICT strategy is crucial since economic benefits and demand for some of the new services will necessarily be unclear for industry players. Many countries in the world have made significant investments in the past couple of years (Figure 6).

The industry's role: Deploying state-of-the-art networks and creating innovative products

The ICT industry—more specifically, ICT companies—should re-examine its potential and take advantage of its significance in order to create social, economic, and

Figure 6: Announced government support for ICT development



Source: McKinsey & Company analysis.

environmental benefits. This is not an industry that should be looking for profit alone; it is an industry that is part of the solution for many countries that face key challenges such as climate change or economic development for their people. Other industry stakeholders, such as governments and regulators, will start to expect more and more from the industry. Failing to participate in helping countries and people reap the benefits of ICT can actually put the industry's current business models at risk, if, for instance, unfavorable regulations were to be passed.

Industry stakeholders can do this by concentrating on what they do best: deploying state-of-the-art networks that all citizens can access and developing innovative products that help countries increase their social, economic, and environmental sustainability. If done strategically, many sustainability activities create financial value for the ICT industry. Other recent McKinsey research shows that these activities can create financial value along the four dimensions of value the market typically assesses: growth, return on capital, risk management, and management quality.[33]

The regulators' role: Creating the right incentives for industry to develop the ICT sector

Regulators and competition authorities will need to manage the way they design industry incentives carefully. They must allow the industry to generate enough profits to make their investments affordable while maintaining low enough prices to promote adopting the service. It is this wide service adoption that will enable most of the potential social and economic benefits.

The challenge for regulators is not an easy one. It can be illustrated by what is currently one of the hottest debates in the industry: the network neutrality debate. In this discussion, network operators (mobile and fixed) are trying to differentiate the way in which data are handled on their networks by giving higher or lower priority to different content. For example, if a content provider would like some types of services to reach the final customer faster (a video, for example), it would need to pay an extra fee. Network operators do not want companies using their expensive networks free of charge; content providers do not want to pay for the use of networks when they never had to pay for this before. Both groups have strong positions that offer benefit to society in different ways—faster networks versus more content availability. The way regulators resolve the issue will have significant effects on industry structure.

ICT is an increasingly important industry economically, and—because of the nature of its products and services—one that can create significant benefits for society as well. Increasing the reach of ICT creates economic growth and enables better healthcare, education, and government services, among many other social benefits. And all this can happen while ICT reduces its carbon emissions.

The key to reaping ICT's economic and social benefits is cooperation among the industry, regulators, and government policymakers. Government has a central

role to play: in countries that have succeeded with ICT investments, government has provided both a clear strategy and crucial initial funding. We hope that a better understanding of ICT benefits will encourage all stakeholders to work together on the next generation of ICT investment.

Notes

1 McKinsey analysis; data are from Global Insight, timeframe 2003–20.

2 The Climate Group 2008.

3 Obama 2009.

4 Brown made these remarks in an interview with The Observer in January, 2009. See Hinsliff 2009.

5 McKinsey consumer surveys in July 2006, September 2007, and September 2008.

6 ITU World Telecommunication/ICT Indicators Database, 2009.

7 Gartner 2009.

8 The impact of the ICT sector is likened to that of investing in high speed Internet access. See Qiang and Rossotto 2009; CEBR 2003, and ACIL Tasman 2004.

9 McKinsey analysis; data are from Global Insight, timeframe 1999–2003.

10 Ministry of Information and Communication (MIC) of Korea.

11 Telefónica website, Intégrame case study, available at http://www.telefonica.com/ext/rc08/atlasrc/cspages/site/casestudypopup-en-08073.html.

12 Yee 2008; see also http://www.echoupal.com/.

13 ITC Infotech's presentation to the German Global Compact Network, June 4, 2009, Berlin.

14 See http://www.weforum.org/en/initiatives/gei/Jordan%20Education%20Initiative/index.htm.

15 See IBM, Corporate Citizenship & Corporate Affairs, Grant Programs, available at http://www.ibm.com/ibm/ibmgives/grant/adult/ReadingCompanion.shtml.

16 See IBM 2008.

17 See IBM 2008.

18 See www.sundhed.dk.

19 Edwards 2006.

20 Ericsson website, www.ericsson.com/thecompany/press/releases/2008/06/1225191, Corporate Social Responsibility Report 2008.

21 According to the Infocomm Development Authority (IDA) of Singapore website (http://www.ida.gov.sg/Publications/20090717150535.aspx), the E-Government Customer Perception Survey was conducted in March 2009 with 1,200 respondents above the age of 15.

22 Vandystadt 2009.

23 "2009 Social Recruitment Survey Results," Jobvite survey, May 2009 in the United States with 438 respondents (human resources and talent management professionals). See http://recruiting.jobvite.com/2009-social-recruitment-survey.html.

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25 Vargas 2008.

26 MySpace website, as of January 2010.

27 Twitter website, as of January 2010.

28 Melber 2008.

29 Stack 2009.

30 McKinsey estimates, assuming 50 percent of homes passed with Fibre To The Home (FTTH) and 40 percent with Fiber to the Curb (FTTC); estimated upgrade cost for FTTH of €1,100–1,400 per household.

31 McKinsey estimates.

32 Balakrishnan, 2007.

33 Mirvis and Ryu 2009.

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CHAPTER 1.6

Unlocking Sustainability: Why the CIO Should Hold the Key

TERRENCE CLARK, CA

The causes, scope, and impact of global climate change understandably may be subject to a divergence of opinion, but it is now virtually impossible to deny that climatic changes are occurring. Likewise, it is no longer possible for organizations to ignore the significant environmental pressures facing them today. Volatile energy costs, limitations on available energy, imposed rules and legislated regulations, and a general desire for transparency into an enterprise's operations, including its supply chain, are all realities organizations must address. And they must do so while continuing to be responsive to the needs of stakeholders. Organizations must act to deal with all of these issues, lest they put themselves at risk of extinction.

However, to date, those actions all too often have proven to be reactive rather than forward-thinking, isolated rather than coordinated, department-centered rather than businesswide. An organization's response must be comprehensive and systematic to maximize resources and focus energies on successful outcomes for the business overall.

Current conditions create a perfect opportunity for information technology (IT) to step up and play a critical role in helping shape an organization's responses to the environmental challenges it faces. IT can do this by working in concert with business units and by using technology across the enterprise to help reduce costs, mitigate risks, and also uncover and seize new opportunities.

This chapter will explore the reasons why businesses are now beginning to be concerned with sustainability and the ways in which they are responding. It will focus on the role that IT can play in helping address sustainability challenges. It will demonstrate why IT should take a leadership role within the organization and not only attempt to make its own operations more sustainable, but—by providing technology—increase the sustainability of the entire organization.

Why does business care?

There are three main environmental pressures that are driving organizations to act today: cost cutting, regulatory compliance, and communication with shareholders.

Cost cutting

In the current economic situation, there is tremendous pressure to reduce costs in the organization and improve the bottom line as it struggles to grow the top line.

The volatility of energy prices is generating considerable concern in the offices of many chief executive officers (CEOs), chief financial officers, and chief operating officers. What happens to one's business if the price of a barrel of oil triples? Is the business prepared for it? Does it even know its current energy baseline? Where are the opportunities to reduce one's energy consumption? This unpredictable price of oil has led many organ-

izations to put in place energy programs—not only to gain control of energy consumption, but also to actively manage it, ultimately reducing costs.

In addition, the need to ensure the transparency of an organization's sustainability efforts is leading to a growing number of reporting requirements, a point discussed in more detail later in this chapter. These requirements are quickly becoming a part of doing business, and ignoring them is no longer an option. Tracking this information so as to report accurately and in a timely fashion can be quite costly. Organizations are looking for increased automation and greater efficiencies in managing these data to drive down the costs of reporting.

Regulatory compliance

In addition to its own internal policies, organizations are finding more and more that they have to operate within parameters prescribed from outside the organization. These exterior regulations are increasing in number around the world.

In Europe, the European Union (EU) Emission Trading System (EU ETS) has been active for a few years now. This is a cap-and-trade system affecting major polluters across Europe. The United Kingdom has gone beyond the restrictions imposed by the EU ETS and has expanded its regulatory reach through the upcoming UK Carbon Reduction Commitment Energy Efficiency Scheme, which will be targeting approximately 5,000 organizations in non-energy-intensive sectors.

Until recently, climate change efforts in the United States have been essentially voluntary, with the exception of a mixed practice of regulatory standards in a few states. However, there have been significant regulatory steps at the federal level in recent months. First, the Environmental Protection Agency (EPA) finalized its ruling on implementing a greenhouse gas registry for the largest Scope 1 emitters in the United States.[1] This was followed by the passage of a new energy bill by the US House of Representatives (known as the Waxman/Markey Bill),[2] and the US Senate, led by Senators Kerry and Boxer, is now formulating its own energy bill.[3] In October 2009, President Obama issued an Executive Order that included a mandate for all federal agencies to determine their carbon footprints and to establish reduction targets within a prescribed timeline.[4]

Other parts of the world are also taking action. In Australia, climate change has become a very political issue. The country has been hotly debating the creation of its own emissions trading scheme, called the Carbon Pollution Reduction Scheme.[5] China was the first major developing economy to issue a climate change action program; and more recently, in November 2009,[6] the Chinese government unveiled its goal of reducing the amount of greenhouse gases emitted per unit of GDP by 40–45 percent by 2020, using 2005 as its baseline.[7]

In addition to actions taken by each individual country, world leaders joined together in December 2009 in Copenhagen at the 15th Conference of the Parties (COP 15) to attempt to come up with a new global framework succeeding the Kyoto Protocol.

Communication with Stakeholders

Concerns over energy costs and regulation alone are enough to be on the agenda of C-level executives in an organization. However, even more factors are at play as stakeholders, both internal and external to the organization, play an increasingly active role. Energy, carbon, and sustainability issues are putting tremendous pressure on organizations today to do a better job communicating with key stakeholders. The dialogue must be bi-directional. An organization not only must provide visibility into its sustainability progress, but also must be responsive to the input from its stakeholders as it makes investment decisions in its sustainability program.

Governments

As just discussed, governments are taking a harder stance than ever before on the reduction of carbon emissions. Across the globe, governments are putting in place legislation attempting to alter the behavior of organizations' operations. These new regulations require organizations to track, audit, and report on carbon emissions and reductions.

Consumers

The role of consumers is changing. Consumers are showing a growing interest in more eco-friendly products and services. Although research shows they are not willing to pay more for such products and services, the expectations of consumers are nonetheless rising. They want to pay the same or less for products that perform just as well or better, and are also better for the environment. It is not just the end products that are influencing consumers today. They are also looking at the reputation and image of the organization in terms of environmental issues as a determinant factor in their buying decisions. The changing nature of the consumer stakeholder, if ignored, can either be a bane to an organization, or—if seen as an opportunity for change—can prove to be a boon.

Suppliers

The role of suppliers continues to be an important one for organizations, but now it is essential in a different way. Now it is an issue of transparency. In an effort to both minimize risk and identify opportunities, organizations at present need to have greater visibility into the operation of their suppliers. A telling example of this is Walmart's recent announcement of its plans to query each of its over 100,000 suppliers on what they are doing to address environmental issues in their operations.[8]

One of the major suppliers for most organizations is the utility company that provides them with their power. The value of energy cost savings for the organization has already been discussed, but there is another issue that some are facing: energy capacity limitations. An increasingly likely future scenario is that of an organization finding itself unable to secure the power necessary to meet its business demands. If this occurs, the organization has no choice but to become more efficient with its use of energy.

Investors

Investors are another stakeholder group asking for this new level of organizational transparency. For example, the Carbon Disclosure Project, a nongovernmental organization, requests information on a company's carbon footprint, energy usage, and climate change strategies.[9] This information is then being fed to Bloomberg and added to the profile of the organization, allowing investors to have insight into the carbon and climate change risks of the firms in their portfolios.

The above context does not take into account all stakeholders and their needs; among those not considered in this context are an organization's employees and its board of directors.

The increasing needs of these stakeholders result in rising demands on the organization—demands that must be met with action.

Organizations' perception and response: Risk and opportunity

The stakeholder pressures stemming from various environmental challenges facing organizations are clearly significant. Organizations must respond and take action. Whether an organization is focusing on reducing expenditures, mitigating risk, or seizing opportunities—or any combination of the above—it is taking action. It is important for the C-suite to understand that action can be more than just preventative measures resulting in a positive impact on the bottom line and minimizing exposure to risk or reducing expenses. Organizations can initiate measures that capitalize on the underlying opportunities inherent in the challenges, or those that may only become known as a result of tackling those challenges. They can look at ways in which they can differentiate themselves from the competition. GE's ecomagination line of environmentally friendly solutions, Procter & Gamble's Tide Coldwater product, and CA's own ecoSoftware offering are just a few examples of how organizations are looking for the upside to sustainability.[10] Are there new products and services that organizations can provide? Can they optimize their processes to prepare themselves for the coming low-carbon economy? What happens if they are not prepared and their competition is? Organizations taking proactive steps now will put themselves in the best position to succeed in the coming years as energy prices and demands rise, and regulations expand.

Environmental pressures on any organization are considerable and undeniable. Responding to these pressures brings costs and risks, to be sure, but it can also present opportunities for savings, growth, and improvement that organizations would be foolish to ignore.

Organizational response today: Siloed thinking

Now that organizations are beginning to understand these new environmental and sustainability challenges, they are in a position to figure out how best to address them. Since these issues are pervasive throughout an organization, it is clear that they cannot be effectively treated with a siloed mentality. Departments should not be left to their own devices to determine how to address these issues. If they are, they may very well do what is in the best interest of their department, even to the detriment of the enterprise. Instead, it is critical to put in place a systematic approach that cuts across the silos and ensures that the best choices *for the organization as a whole* are made, and not simply what benefits any department.

A telling example of the siloed mindset can be seen when looking at the conflict that exists between IT and facilities in many organizations. To illustrate, consider a recent discussion that CA had with an organization that has a very prominent corporate sustainability program. This program was strongly supported and directly endorsed by the board and the CEO. One of the mid-level managers within the IT department had an interesting reaction to a discussion about some of the newer technologies on the market that help reduce energy consumption and cost in data centers. He laughed, and then explained that while he understood the value that some new technologies could provide, his management would not support them because energy cost savings were not important to the IT department. The reason: the facilities department paid the energy bill!

Simply stated, despite the CEO-led sustainability program, energy cost savings were not something these IT managers cared about, since they were not paying the energy bill. On the flip side, it is not unusual for IT to express an interest in having access to information that facilities maintain within their building management systems, because such data might provide valuable insight to enhance their operations. Yet such cross-department communication rarely materializes.

The strategic role of IT

To address these issues in a systematic fashion, a single department in the organization needs to have the capability of driving change across the enterprise. The

department best suited to lead this effort is IT for three primary reasons.

- First and foremost, the IT department is already integrated into every part of the business and has the ability to cut across the silos. The IT department is pervasive across the business, has a touch point in all departments, and is therefore best suited to deal with the challenges cutting across the enterprise.

- Second, the IT department in almost all organizations is already looking into green IT technologies to optimize the energy consumption of its data centers. This optimization may or may not be for the purpose of energy cost reductions, as noted above; it may be because of energy capacity limits that are affecting the services being provided to the business, or it may be part of a plan to reduce the organization's carbon footprint. These efforts should give IT a basic understanding of how technology can help deal with issues around energy, carbon, and overall sustainability. This provides the IT department with an opportunity to leverage what it is currently learning in optimizing its own energy consumption itself and to apply that knowledge across the enterprise in new and innovative ways.

- Finally, the IT department has long been preaching its desire to improve its alignment with the business units. The current situation provides an optimal opportunity for IT to play a more strategic role for the organization, seeking to create a competitive advantage.

IT and business alignment

IT organizations now better understand that their primary purpose is to provide the business with high-quality and reliable services at the cheapest possible cost. IT also realizes that without the business, it would not even exist. And with outsourcing becoming more and more prevalent, IT needs to continue to find ways to show its importance to the business. This is often referred to as an attempt by IT to get a "seat at the table," with the chief information officer (CIO) being part of the core team that makes strategic decisions for the business. Energy, carbon, and sustainability challenges facing businesses today provide IT with a real and significant opportunity to play that strategic role.

Additionally, IT itself is often a large contributor when it comes to the organization's energy consumption and carbon footprint. Estimates have IT contributing to approximately 2 percent of all emissions worldwide. To put that figure into perspective, the worldwide aviation industry is also estimated to be responsible for 2 percent of those emissions.[11]

The EPA estimates that IT's impact will continue to grow in the next few years. At the current growth rate, in 2011, US data centers will account for 100 billion kilowatt hours (kWh), US$7.4 billion in electricity spending, and 2.5 percent of emissions in the United States. Clearly, then, IT is part of organizations' energy challenges, but it also can—and should be—part of the solution. IT should lead by example in addressing its own operations and be a model for guiding the entire enterprise.[12]

What can IT do?

The environmental challenges facing organizations are by no means insignificant, and they could be quite costly without technology. By taking an active role, IT can put itself in a key strategic position that ultimately will illustrate how it is truly aligned to the business of the organization. IT should coordinate with the business in identifying areas where technology can be applied to help the enterprise reduce expenditures, mitigate risk, and seize opportunities. To help cut costs, IT can provide technologies that improve energy management and automate manual processes. Carbon management and compliance-monitoring solutions can help the organization to mitigate risk. Beyond these preventative measures, IT can focus on capitalizing on opportunities. Therefore, technologies that give insight into the portfolio of opportunities and assist the organization to choose the right initiatives, to implement them, to validate the results, and to report fact-based information to stakeholders comprise an important part of any successful program. What follows is a twofold prescription plan for IT:

- Examine some of the measures that IT can implement to reduce the environmental impact of its operations—the 2 percent factor.

- Explore the more strategic role IT can play in addressing the energy, carbon, and sustainability issues across the organization.

IT helping itself

IT is one of the fastest-growing contributors to carbon emissions in the world. IT already is responsible for emitting approximately the same amount of carbon emissions as the airline industry, and its demands are growing fast.

A simple example shows how pervasive IT consumption can be. Take an application that is used every day at the work desk: email. Email is always there and is a critical ingredient in carrying out daily business activities efficiently and effectively. A closer examination allows us to understand some of the elements that go into making sure emails are sent and received each day. First you obviously have the power requirements for

your desktop or laptop used to run the email application. The application is only a client application and needs to communicate to a server. But how does the application do that? A network, which has its own power requirements, allows the client to communicate to the server. The server is located in one of the organization's data centers connected to a power distribution unit drawing power. For an application such as email, there is a sizable amount of data, which requires separate storage devices that also have power requirements. The equipment in the data center gives off a significant amount of heat and needs to be cooled to ensure there is no equipment failure. This cooling process, in turn, necessitates a tremendous amount of power consumption.

The aggregate amount of energy consumed in the process just delineated is sizable in and of itself, but IT support of email does not end there. For email to function properly, these correlated elements rely on a steady flow of power. What happens if there is a sudden problem with the power supply—a reduction or loss? The above systems will often be connected to uninterruptable power supply (UPS) devices that will prevent problems should a power issue occur. And, yes, the UPS devices themselves draw power as well. If there is a power outage, the UPS may communicate with a generator, telling it to become active. The generator will burn fuel to provide the power so that there is continuous service. The generator provides power long enough to move to the disaster recovery setup in another facility, which often is a mirror of what was just described.

Now consider the number and variety of applications in use on a daily basis, and one can begin to understand why IT has such a large impact on the environment.

Sustainable IT management is a reflection and demonstration of a company's true commitment to an overall economic and environmental focus. There are many steps the IT organization can take to make itself more efficient. Here are four key areas that organizations should investigate.

- **Virtualization management.** Utilization of equipment in many data centers is very poor. There is significant available computing power that simply is not being leveraged optimally. For example, in many organizations the servers in a data center have only 10–15 percent utilization, which is far from being optimal. As a result, there is a significant amount of optimization that can occur. Virtualization management is one way to improve efficiencies within the data center, allowing IT managers to maximize equipment utilization while reducing energy use and costs.

- **Power management for desktops.** There are opportunities beyond the data centers where IT can be more efficient within its operations. Power management of desktops is one example. There are many desktops at individual workstations throughout an organization. Companies implementing power management practices can set policies to remotely alter desktop and laptop power modes after a period of inactivity. For example, desktop power management programs could define a policy that would put a desktop system into standby mode or turn off monitors after a period of being idle.

- **Asset life cycle.** For many years, IT has been managing the life cycle of its hardware assets, including the physical components of computers and networks from acquisition through disposal. Historically, the primary goal has been to capture the financial information of the asset throughout its life cycle, allowing the organization to make better investment decisions. However, more recently the environmental impact of assets is also being evaluated during the procurement process. Additionally, proper disposal of the hardware equipment at the end of its life cycle is quickly becoming a requirement in and of itself. Regulations such as the EU's Waste Electrical and Electronic Equipment are aimed at eliminating e-waste.[13]

- **Operational energy management.** Organizations often have little discrete information about how energy is used within a data center, and they often cannot see details regarding how energy use changes in real time. With operational energy management, they can achieve this visibility with solutions that allow organizations to measure, monitor, and optimize their use of energy in data centers. Operational energy management is about making data centers more efficient. It is about enabling the systems to run with greater reliability and to meet business needs while drawing less power. It is about improving data center efficiency metrics such as the green grid's power usage effectiveness and data center infrastructure efficiency.

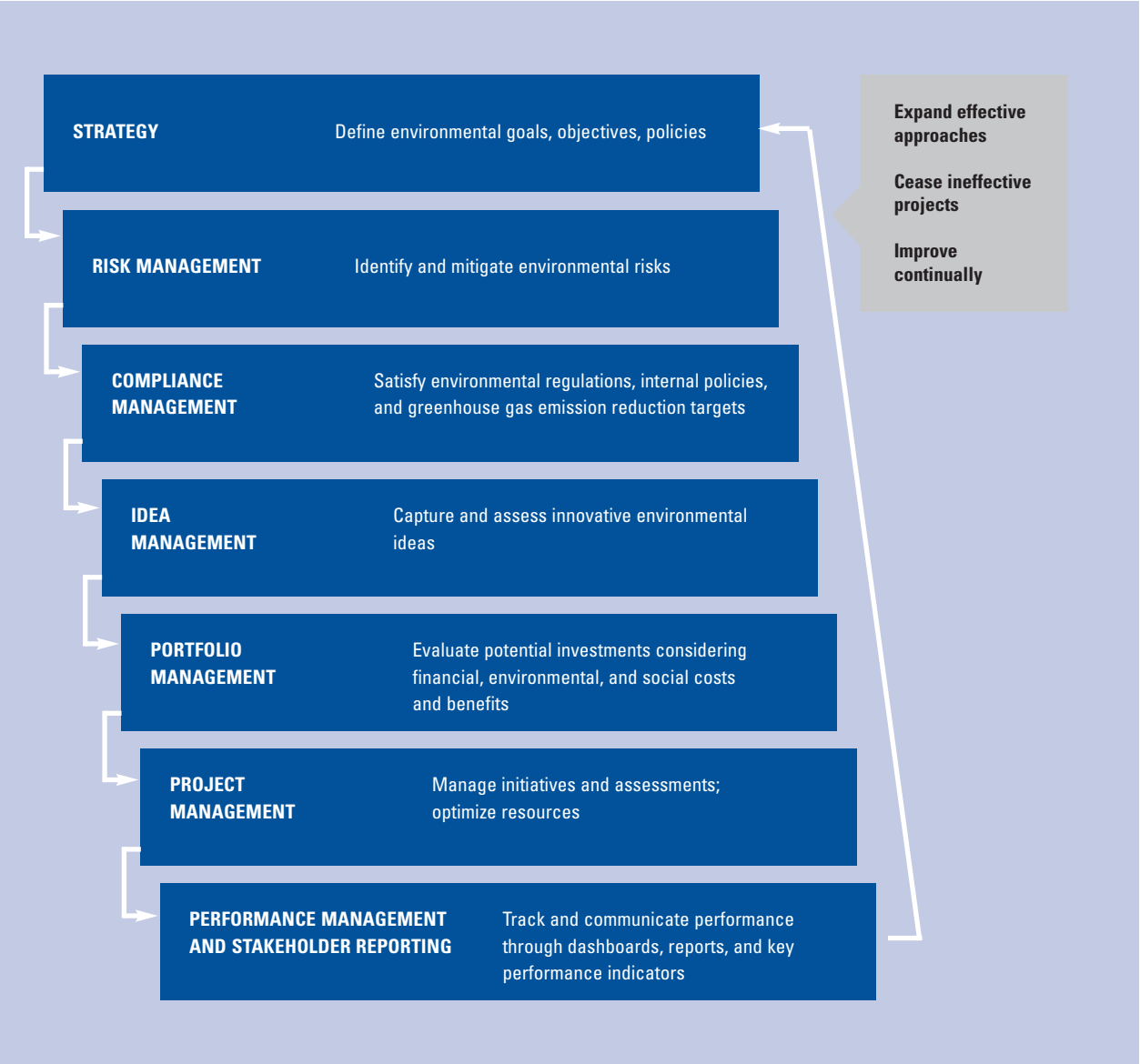
IT helping the enterprise

The previous section outlines some of the opportunities available for IT to utilize technology to help itself. But IT can play a much more strategic role for the organization by driving the implementation of technology enabling the enterprise to address its sustainability challenges.

While organizations are increasingly looking to formalize their sustainability programs, they are having a difficult time managing these programs manually because they cut across various departments. Effective sustainability management requires an organization to put a structured process around its program.

In this sense, a systematic approach to sustainability should include the following points (see Figure 1):

Figure 1: A systematic approach to sustainability



- **Strategy.** It is important to identify and articulate the sustainability objectives and goals of the organization. In addition, policies to help guide the organization toward meeting those goals and objectives should be adopted.

- **Risk management.** Organizations may face or be affected by many sustainability risks. It is important to perform risk identification, measurement, and mitigation.

- **Compliance management.** With compliance requirements increasing, an organization's ability to understand and test what it needs to do statutorily, or what it has voluntarily committed to do, can be a significant endeavor.

- **Idea management.** There are many measures an organization could choose to implement to help achieve its sustainability goals. It is important to engage stakeholders and capture ideas from different people within and outside the organization. These ideas should be subject to some basic categorization and review. The organization can then take the most relevant to evaluate in more detail as potential initiatives for implementation.

- **Portfolio management.** The subset of initiatives that come from idea management should be evalu-

ated more stringently by looking at their financial characteristics (such as return on investment, net present value, and break-even points), as well as the extent to which they align with the organization's own sustainability goals, as defined in the strategy phase. By performing this evaluation, the organization will make better investment decisions. Instead of choosing projects that simply "appear" to be sustainable or potentially impactful, it will make the right choices based on its sustainability goals and financial metrics.

- **Project management.** Tracking the performance of each sustainability initiative will help the overall program. The organization should identify an owner for each major project. It should adopt baseline metrics before the project begins, monitor the project, and review its outcomes. Often the cost-benefit analysis is done up front to help select the right initiative. However, once the initiative has been implemented there is no validation that the expected benefits were actually achieved. By using technology to monitor the before and after impacts of an initiative, a project manager can now have fact-based results that show the true benefits of the project.

- **Performance management and stakeholder reporting.** Monitoring overall performance and communicating the results to various stakeholders allow the organization to be transparent in its sustainability efforts. It can utilize key performance indicators and dashboards to illustrate its progress. This information will be extremely helpful for the organization in formulating its annual sustainability report or in responding to various disclosure requests from its stakeholders throughout the year.

A systematic approach to sustainability helps the organization to monitor the overall execution of its sustainability strategy. It can look to expand effective approaches and improve or cease initiatives that do not work or have limited impact against agreed upon goals, and thereby institute a process of continual improvement.

IT and sustainability

It is clear, then, that an organization must adopt a systematic approach to managing sustainability in order to maximize its sustainability program. IT can provide enabling technology to help ensure a consistent process leading to increased efficiencies and effectiveness across the organization, whether it is through improved data capture, analytics, or automation. There are key areas where IT can provide these capabilities to help the organization with its sustainability efforts, as follows:

- **Sustainability management.** Sustainability management technology helps the organization define its sustainability strategy and goals, and also assists it to select, run, and monitor a program that will deliver on those goals. It enables the organization to identify and mitigate its risks while monitoring compliance to regulations and internal policies. It helps an organization choose the right initiatives to meet the goals, and also to report on those initiatives much more quickly and efficiently.

- **Carbon management.** Carbon management technology measures, calculates, and reports on energy consumption and the associated greenhouse gas emissions across the enterprise. Although the current focal point is carbon, organizations are also looking for similar capabilities to help manage other natural resources such as water and waste. In tracking this information, it is also important to calculate and track the costs associated with energy use and the use of resources to help identify opportunities to reduce waste and cost.

- **Environmental assessments.** Often organizations struggle with deciding where to begin. One way to start is by performing environmental assessments. With Web-based questionnaires, organizations can efficiently and effectively capture relevant information to measure the environmental performance of its facilities, products, and suppliers. This will allow them to identify improvement opportunities more efficiently and effectively.

- **Value chain.** There is a growing movement to understand the total environmental impact of products and services. In order for an organization to do that, it needs to understand a product's impact up and down the supply chain. If an automobile manufacturer were to look at the environmental impact of only the manufacturing process in putting together a car, that company would be missing a major aspect of the overall environmental impact of that automobile. Technology can be applied to addressing this challenge.

- **Operational energy management beyond the data center.** As referenced earlier, gaining granular visibility into data center energy consumption in real time can improve efficiencies within IT. The same approach can extend beyond the data center and be applied across facilities and the enterprise. Organizations can quickly identify opportunities for energy efficiency gains, ultimately leading to sizable cost savings in their operations.

The importance of data collection and validation

IT for many years now has been capturing complex data through instrumentation, analyzing those data, and either providing information for users to take intelligent action, or—better yet—having the system take the action automatically. This increases the efficiency of the organization because the time spent collecting the data can be dramatically reduced.

Timely and accurate data collection becomes a must-have as organizations need to respond to the growing number of requests for sustainability program information. Some examples of the types of environmental activity that need to be tracked are:

- energy consumption
- energy costs
- carbon emissions
- water utilization
- waste stream
- key business activities
- details about the various sustainability projects implemented across the enterprise and their corresponding results
- information on suppliers

Capturing credible and auditable data in an efficient fashion is quickly becoming an imperative. Collecting this information automatically, or through a structured process, increases the quality of the data captured. With quality data, the organization is able not only to respond responsibly to any sustainability request, but also to increase its effectiveness through more informed decision making.

Conclusion

Whether the driver is addressing energy costs, energy capacity limitations, consumer pressures, environmental regulations, supply chain transparency, or an increasing need for investor disclosure, organizations today are faced with significant challenges. These challenges cut across the enterprise and require a systematic approach to address them efficiently, comprehensively, and successfully. IT has touch points 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 now is an opportune time for CIOs to seize the moment and take a leadership role. In so doing they will exhibit once again the true strategic value of IT for an enterprise.

Notes

1 US EPA 2009. Under the Final Mandatory Reporting Rule for Greenhouse Gases, suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions are required to submit annual reports to EPA.

2 US House of Representatives 2009.

3 Samuelsohn 2009.

4 The White House 2009.

5 de Wit 2009.

6 Fransen et al. 2009.

7 Watts 2009.

8 Walmart 2009.

9 Carbon Disclosure Project 2009.

10 GE's ecomagination product line is focused on balancing operational performance with real environmental benefits. Tide Coldwater is specially formulated for cold water conditions so users can save energy and money. CA's ecoSoftware is a software that allows an organization to manage energy, carbon, and sustainability.

11 Gartner 2007.

12 US EPA 2007.

13 EU 2009b.

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CHAPTER 1.7

The Evolving Science of Managing for Sustainability: Using ICT to Optimize Environmental and Economic Outcomes

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For households, businesses, and public-sector organizations of all types, the implications of managing energy, greenhouse gas emissions, and social responsibility are significant. First, there is the moral and regulatory imperative to operate in an environmentally responsible manner. Second, there are dramatic cost savings to be gained by reducing resource consumption and waste. And third, there are pressures from suppliers, customers, communities, and other stakeholders that place more and more importance on "green" practices.

In a contentious global debate full of finger-pointing, there seems to be consensus on only one key point: managing for sustainability is an important issue that requires action now, even if the world economy is in upheaval.

This chapter discusses the role of information and communication technologies (ICT) in driving sustainability efforts—for measuring the impacts of organizations' activities, reducing negative impacts, optimizing outcomes, and extending visibility deeper into an organization and across the greater value chain.

The good news is that existing analytic, performance management, and activity-based costing methodologies, which have already proven effective for other business problems, can bring new levels of intelligence to sustainability issues as well. Financial and operational leaders would do well to adopt and adapt best practices that are readily available with today's technologies.

This chapter presents current research that highlights the challenges and opportunities for those organizations undertaking a business strategy that requires careful management of greenhouse gas emissions, followed by a discussion on the current adoption of sustainability practices worldwide and how ICT enables organizations to be effective at each stage of the maturity curve.

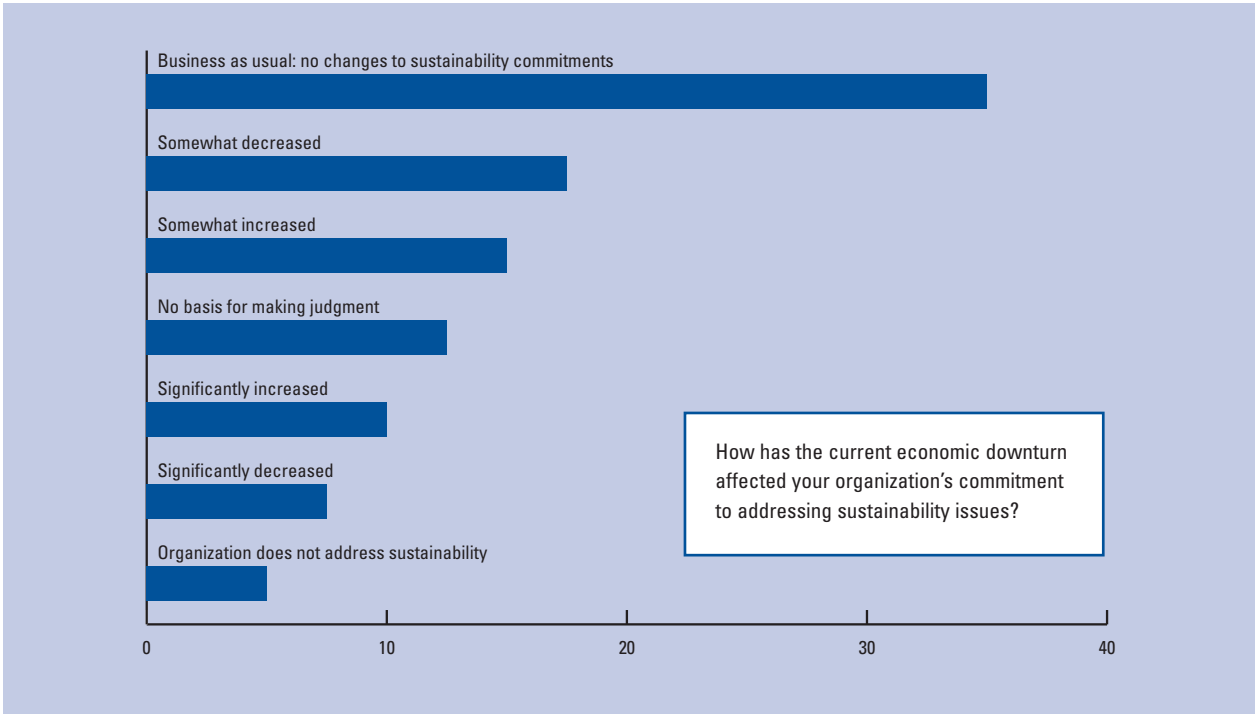
Emerging sustainable business priorities

In spite of current economic conditions, organizations have not curtailed their emphasis on sustainability initiatives, according to research, sponsored by SAS, conducted by the MIT Sloan Management Review (MIT SMR) and published by the Massachusetts Institute of Technology (MIT) in collaboration with the Boston Consulting Group.[1] In fact, many organizations have accelerated their efforts as they seek the cost and efficiency improvements that can be gained in the process. Fewer than 25 percent of respondents said their organizations had decreased commitment to sustainability during the downturn (see Figure 1).

The year-long MIT SMR study, comprising more than 1,500 surveys and 50 in-depth interviews with executives from around the world, focused on how organizations are acting on sustainability threats or

More case studies and white papers can be found at www.sas.com/gogreen.

Figure 1: Sustainability initiatives and the global economic downturn (% respondents)



Source: MIT SMR, 2009.

opportunities. In a separate but related study, the Economist Intelligence Unit (EIU) found that 87 percent of executives polled said that sustainability initiatives are very or somewhat important to their current business strategy (see Figure 2).[2]

The business case goes far beyond regulatory compliance and corporate conscience. Sustainable business practices pay off in financial and brand benefits.[3] For organizations that find the "green sweet spot," the results speak for themselves—and pay for themselves. For example, GE announced last year that its *ecomagination* program to reduce environmental impact generated a US$17 billion revenue stream and reduced costs by more than US$100 million dollars since 2005.[4] The US Army has said that 80 percent of its construction meets Leadership in Energy and Environmental Design (LEED) standards, which has reduced energy costs by 8 percent.[5]

For an example from another industry, BMW took the stance that it is responsible for its cars' environmental impact throughout the life cycle, from cradle to grave.[6] As a result, the auto maker is designing cars around recyclable components. At the end of the car's service life, it doesn't go into a trash heap. It goes back to BMW, and they recycle the parts. The company recovers and reuses valuable assets in the process of being environmentally responsible.

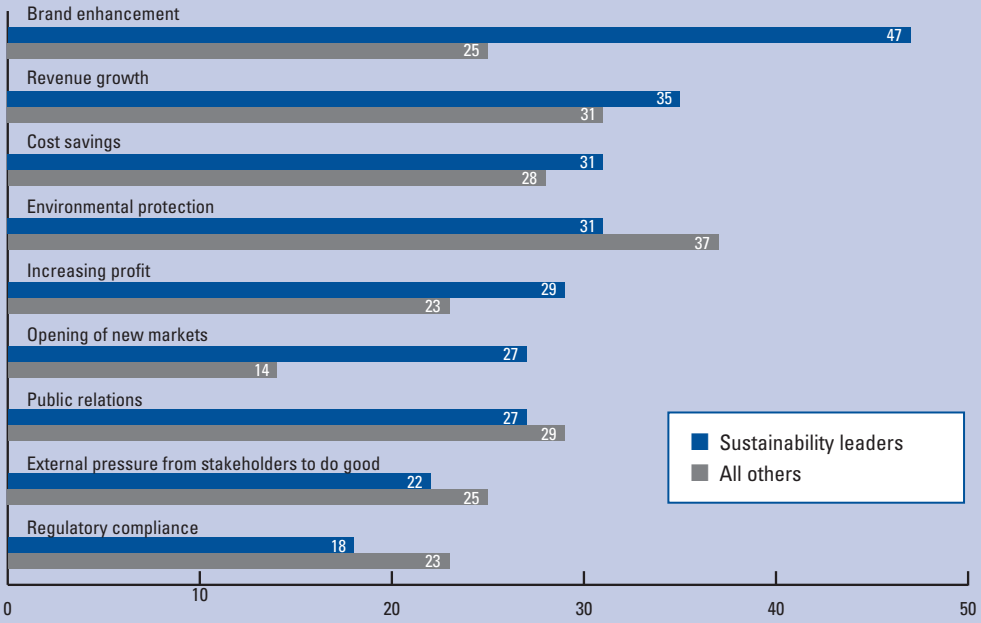
What organization would want to ignore the economic rewards associated with sustainability initiatives? Who would want to ignore the regulatory and reputational risks? Investments in these sustainable practices and technologies pay off in three ways: by reducing costs, by growing new markets, and by meeting the expectations of customers, government, and the public.

The barriers to managing for sustainability

> Accuracy of measurement and reporting is going to become paramount. Companies that can leapfrog from current practice to next practice in measuring and managing these factors have a chance to be hugely profitable.[7]

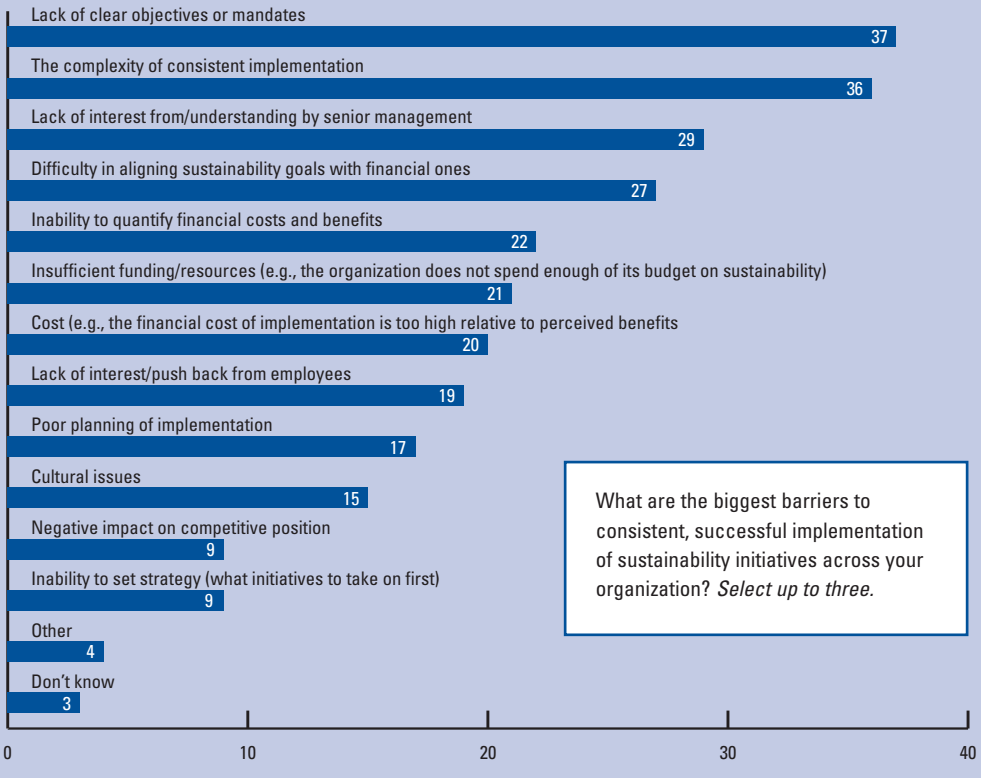
Even though there are many examples of organizations "doing well by doing good," there are great challenges that keep all organizations from achieving the same results. The MIT SMR research identified a number of primary barriers—as detailed in Figure 3—such as difficulty in articulating the business case for sustainability, lack of information on which to make decisions, and difficulty in aligning sustainability goals with financial ones. These issues were complicated by the need to forecast over longer horizons than usual, gauge system-wide effects, and plan in a time of high uncertainty.

Figure 2: Leading motivations for sustainability initiatives (% respondents)



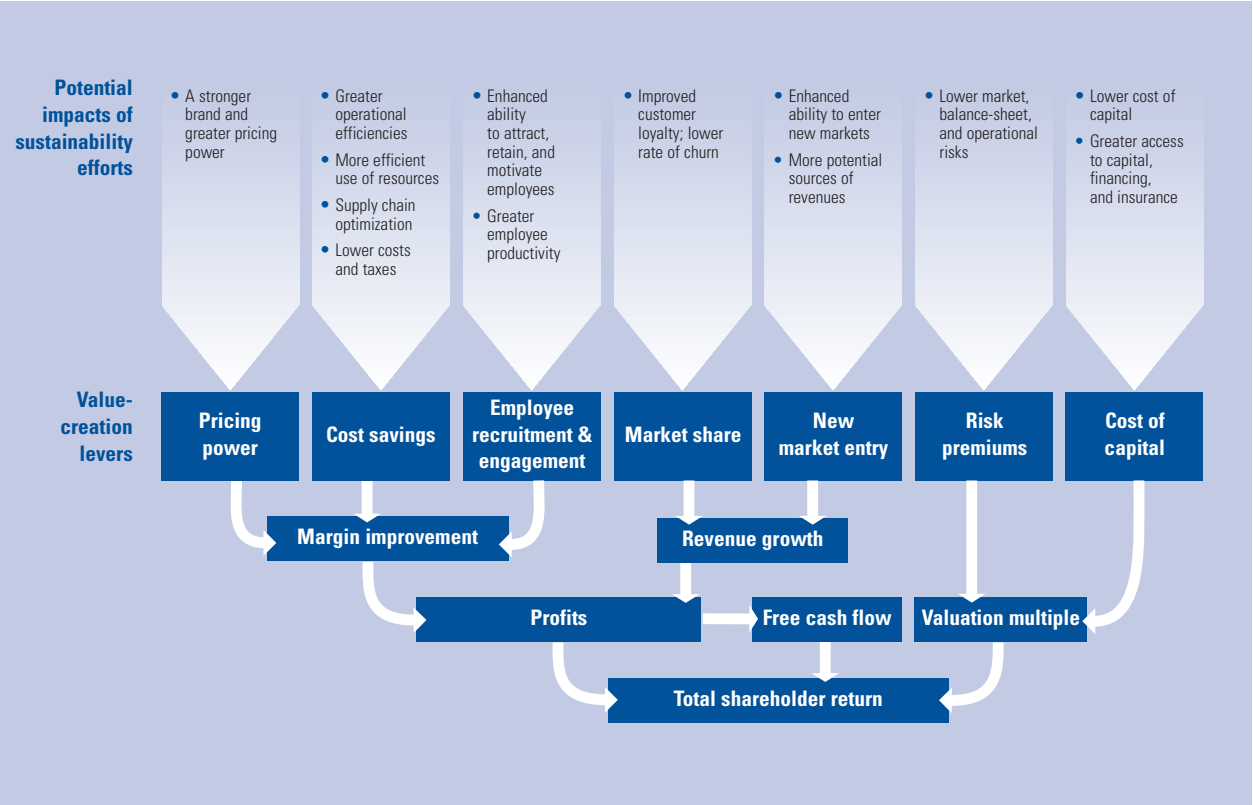
Source: EIU survey, September 2009.

Figure 3: Barriers to the implementation of sustainability initiatives (% respondents)



Source: MIT SMR, 2009.

Figure 4: Sustainability and value-creation levers



Executives in every industry agree that defining the business case is the single most important factor in success. One cannot effectively lobby for sustainability investments if one cannot prove the return on investment, one way or the other. In the EIU research, many executives cited lack of funding as a big obstacle. That is no surprise: the MIT SMR research suggests that 70 percent of organizations do not have a clear business case for action nor the information needed to make effective, data-driven decisions.

One way to begin building the business case for sustainable investments is to map out how sustainability efforts influence the value-creation levers specific to one's organization (Figure 4). Most survey respondents who considered themselves experts in sustainability, as well as most thought leaders, say their companies have found a compelling business case for sustainability-related investments—one reflecting multiple tangible and intangible costs and benefits. Mapping efforts to impacts can uncover the potential benefits, pinpoint where to invest and reveal ways the organization can differentiate itself.

For a retailer of consumer products, for instance, sustainability efforts can build a stronger brand that enhances the company's pricing power. In industries where intellectual capital is a primary asset, good corporate citizenship can help attract the best and brightest employees. For industries with high emissions or high consumption of scarce resources, efforts to reduce waste and carbon footprint can lead to higher profitability.

Mapping the paths of value creation is just the start. Good intentions must be translated into action. Among the various initiatives in which an organization can invest, which ones will have the best outcomes? Which ones should be prioritized because of their benefits—or for the risks they would avert?

Research from the EIU showed that many organizations are unable to evaluate their options.[8] The common denominator is lack of data. If one cannot accurately measure one's performance and predict the impact of an initiative, one cannot set objectives or make winning decisions.

Organizations that do not have an ICT infrastructure to collect, manage, analyze, act upon, and learn from sustainability initiatives will be paralyzed into inactivity. The leaders will be the ones with the strategic direction and practical tools to create long-term value for the organization and its stakeholders.

The emerging information science of managing for sustainability

Organizations worldwide have adopted ICT frameworks to help them measure, monitor, and mitigate the environmental impacts of their activities. The global green information technology (IT) market was estimated at US$789 billion in 2008 and is expected to grow at a compound annual growth rate of 6.89 percent, reaching US$1.257 trillion in 2015, according to Global Markets Direct.[9] That is a large enough force—financially and socially—to compel IT leaders to take notice.

And they do. According to Computerworld Research, nearly two-thirds of chief information officers (CIOs) say their companies are implementing processes to capture environmental metrics.[10] In an AMR Research survey, almost 90 percent of respondents said they believed environmental regulations affect business.[11]

Although there is a tremendous amount of buzz about managing for sustainability, a lot of uncertainty about what it is and how to measure for it remains. How does one benchmark an organization's current status in the industry? What metrics are meaningful to track, and how does one capture them? How does one identify, prioritize, and assess new initiatives? How can one predict which initiatives will have the best outcomes from both an environmental and a financial standpoint? How does one address continuing flux in carbon management standards and external reporting requirements?

Many organizations are still grappling with the far more fundamental question of how to locate and integrate the data that are required to even begin to address these issues. Leading organizations will be those that can accurately and consistently measure their performance, validate strategies, and effectively execute for success.

New approaches and analytical rigor for sustainability management

Greenhouse gas emissions, restricted resource consumption, ethical sourcing, and regulatory compliance are complex and interdependent issues that transcend the ICT systems most organizations have in place to manage their transactions and operations. To fully understand the sources, costs, and impacts of environmental initiatives, a broader perspective is required—one that is not delivered in spreadsheets.

Sustainability is a balancing act. The action that reduces environmental impact in one area might increase it in another. For example, outsourcing a process might reduce the organization's carbon footprint, but what does it do to overall environmental impact, given a greater transportation requirement?

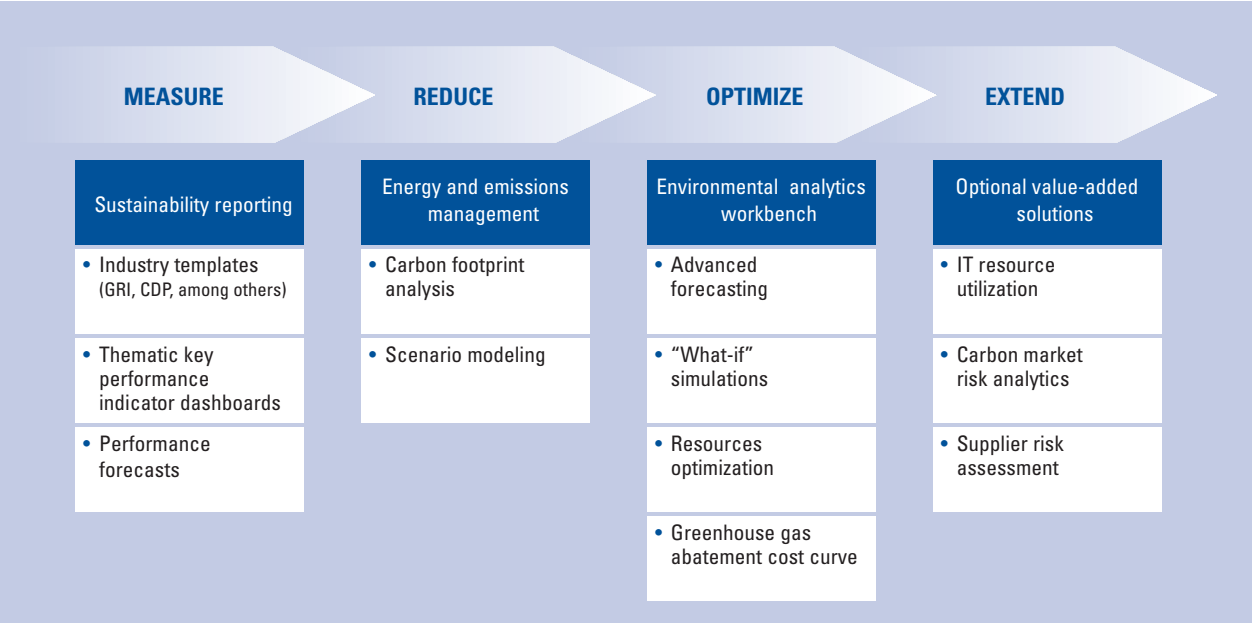
A holistic perspective is essential, providing a view of business processes in full context. It is not just about measuring and reporting discrete environmental indicators—such as kilowatts of electricity and gallons of water—but about understanding how the metrics affect each other, uncovering cause-and-effect relationships that would not be immediately apparent, and predicting the environmental impact of business decisions. This is not the domain of spreadsheets, siloed organizational structures, or isolated monitoring systems. Managing for sustainability requires a different kind of business intelligence framework and approach.

As organizations are recognizing the need to manage sustainability in a more systematic and data-driven way, ICT vendors are approaching the situation from different angles. Vendors of building automation, energy management, and IT infrastructure systems are expanding the quantity of data their systems can deliver and the types of trending they can report. Enterprise intelligence solutions are being developed to include prebuilt drivers and models for carbon management, Global Reporting Initiative (GRI) performance indicator reporting, greenhouse gas protocol tools and more. Startups and spin-off companies are developing new, pure-play solutions.

The various approaches have their merits and limitations, but ultimately, sustainability management is about more than equipment/infrastructure and more than a niche perspective. The ICT resources within an organization should mirror the very nature of sustainability issues themselves, being enterprise-wide, activity-based, and interdependent. That type of foundation requires the following integrated ICT functionality:

- a **data framework** that enables organizations to gather data about greenhouse gases and other sustainability metrics—and then allocate those values to different business processes, products or customers;
- a **multidimensional model** that evaluates the drivers of environmental impacts, the return on investment of business decisions, and the potential costs of action or inaction;
- **analytic strength** to identify the most meaningful metrics and bring descriptive and predictive insights into sustainability management modeling; and
- **Web-based graphical scorecard** and **executive dashboards** that bring to the surface performance information about key metrics and that drill down into detail, all mapped to overall business strategy and made available to contributors across the organization.

Figure 5: Integrated IT solution for sustainability management



The ICT maturity curve: Measure, reduce, optimize, and extend

Organizations are adopting technology along a maturity curve, gaining greater capabilities with each level of ICT sophistication, as follows:

- MEASURE—Sustainability reporting provides a single source of information about the organization's sustainability performance, leveraging pre-built key performance indicator templates that clarify performance in alignment with overall corporate strategy.

- REDUCE—Energy and emissions management tools can calculate and model carbon emissions based on global standards; establish and analyze inventories of emissions, water, and waste; use "what-if" modeling to evaluate alternative programs and reveal the costs and return on investment of various approaches.

- OPTIMIZE—Environmental analytics provide decision support for resource-intensive organizations, using sophisticated simulations and enhanced visualization/exploration tools to quantify the best-case scenarios.

- EXTEND—An extensible architecture enables organizations to integrate sustainability management with closely related solutions such as IT portfolio management, supplier management, and risk analysis. For instance, one could use sensitivity analysis to predict future value at risk under cap-and-trade scenarios, right-size the IT infrastructure to reduce energy consumption, and integrate with carbon trading platforms.

Organizations can start with the capabilities they need right now and then add new functionality incrementally over time. An integrated sustainability framework enables the alignment of initiatives and reporting across all lines of business—from the data center to office buildings and the water treatment facility (Figure 5).

MEASURE performance against industry standards

There is a growing body of accounting and reporting frameworks for organizations serious about managing for sustainability and contributing to the global dialogue. For example:

- The **Greenhouse Gas Protocol (GHG Protocol)** was developed a decade ago by the World Resources Institute (WRI) in collaboration with the World Business Council for Sustainable Development. This is the most widely used international accounting tool that enables government and business leaders to understand, quantify, and manage greenhouse gas emissions.

The GHG Protocol provides the accounting framework for nearly every greenhouse gas standard and program in the world—from the International Standards Organization to the Climate Registry—as well as hundreds of greenhouse gas inventories prepared by individual companies, including more than two-thirds of the Fortune 500. The scope of the protocol is being expanded and is expected to be final by December 2010.

- The **Carbon Disclosure Project** (CDP) was launched in 2000 as an independent, not-for-profit organization to create and maintain a global climate change reporting system. By 2009, more than 2,500 organizations in some 60 countries around the world were measuring and disclosing their greenhouse gas emissions and climate change strategies through this reporting framework. These data are made available for use by a wide audience, including institutional investors, corporations, policymakers and their advisors, public-sector organizations, government bodies, academics, and the public.

- The **Global Reporting Initiative** (GRI) *Sustainability Reporting Guidelines* provide a framework for reporting on economic, environmental, and social performance in a broader context. The GRI guidelines also address "soft" factors of responsible corporate performance, such as human rights, fair trade, and employment policies, in addition to standard environmental metrics, such as energy consumption and carbon emissions. The GRI acknowledges that not all organizations will be equipped to answer to every performance indicator—and that some indicators are not relevant to all sectors. But these guidelines start to foster consistency in the way organizations report on sustainability in the greater lens of corporate social responsibility.

Add to this list the guidelines and benchmarks set forth by The Green Grid, Uptime Institute, the EnergyStar program, and others. These reporting standards and frameworks go a long way toward establishing a common language that can be used among businesses, consultants, and government entities. But there is still much room for interpretation, and that means room for inconsistency—particularly when reporting across multiple systems and organizational entities.

With multiple reporting frameworks, there is always the risk of providing inconsistent data in different reports, an occurrence that erodes trust and casts the validity of one's business analysis into question. The potential for data inconsistency is significant, highlighting the need for a central data foundation for sustainability management.

Establish meaningful metrics

> There is a need to identify what is actually going to be meaningful to communicate to stakeholders through various types of reporting mechanisms and measurements, and at the same time, demonstrate that these measurements are going to have an impact on your business performance.[12]

Global reporting and accounting standards help establish consistency in the ways organizations communicate their sustainability programs. But how deeply should one delve to bring up environmental numbers? Where in the greater supply chain or product life cycle does accountability begin and end? What metrics are meaningful to one's industry, and how should they be calculated?

Today, data about sustainable performance—such as energy consumed in facilities, fleet fuel use, water consumption, greenhouse gas emissions, and natural gas usage—are tracked separately in multiple operational systems or rudimentary accounting files. The diversity of data formats and platforms makes it a challenge to establish metrics and processes for consistent measurement, especially with the increasing frequency of reporting.

ICT can pinpoint the measures that have a meaningful impact on achieving goals. With correlation analytics, organizations can determine the top causes of carbon emissions, waste, or water consumption and then establish performance measurement dashboards to monitor performance over time. Leaders can manage based on fact, not purely intuition.

Establish a trustworthy, central repository of sustainability data

Even if one agrees on reporting standards and metrics, are the data available? Who owns these data? If one can get suppliers and distributors to divulge them, can they be trusted? Has everybody calculated values the same way? Can the data from all those external sources be integrated for meaningful analyses?

These issues persist even in the most mature organizations. Historically, organizations have had trouble gaining the necessary enterprise-wide perspective—or even to assemble the highly diverse types of data required, from energy meter readings to real estate costs, fleet resources, and more.

In a typical organization, about 80 percent of monitored data points are tracked manually. Numbers are entered from paper into spreadsheets or Web forms, or must be re-keyed from incompatible operations systems into analysis systems. There are opportunities for human error or capricious data fabrication at every step of the way.

The challenge is to identify the gaps and then work out more automated methods in order to minimize the burden of data collection. Where automation is limited or nonexistent, there is too little trustworthy information.

Without ready access to meter information or activity and behavior information, it is hard to perform a baseline inventory. On the other hand, organizations that have built automated data collection strategies might encounter the opposite problem—too many data. A single building might have 1,000 data points being recorded at five-minute intervals. In that case, it is difficult just to separate signal from noise, to analyze huge data volumes and make decisions on it.

If there are not enough data, an organization could consider: upgrading to building automation systems that deliver energy data at a more granular level, partnering with energy providers to get electronic versions of energy bills, and using automated data-integration tools to bring diverse data types together into a consistent, analysis-ready data repository.

In a typical organization, more functional areas now use operational/transactional software systems to track inputs, outputs, costs, and activities. That means, generally, more data are available—they are just not all in one place. Automated data extract, transform, and load processes can integrate all those disparate data into a single repository. This trusted data resource then delivers clean, credible, analysis-ready data to support whichever reporting protocol(s) the organization has adopted—one agreed-upon version of the truth.

If there are too many data, the question becomes, how does one know how much is enough and when can one start to draw relevant conclusions from it?

Analytical techniques embedded in business intelligence systems make it easy to distinguish meaningful data points from outliers and distractions. For example, feeding data from equipment sensors or power monitoring systems into predictive analytical models can help separate the true problems from false positives, bring to the surface the highest-priority conditions, and help identify where action should be taken.

Ideally, that analysis would begin with at least 24 periods of data. This could be 24 weeks, months, or quarters. If one has that range of data about a particular asset, one can greatly improve the confidence in forecasting and predictive analysis about how that asset is going to perform in the future.

Carbon accounting is just the start. Any resource that is threatened or in short supply—such as water, rain forests, or landfill capacity—becomes an environmental parameter that will need to be tracked, reported, and efficiently managed.

REDUCE environmental impact by focusing on appropriate performance targets

The first step is to establish a performance baseline—one that contains enough granularity to understand the real sources of environmental impacts. Only with this baseline understanding of identified key metrics can appropriate reduction targets be set and the effects of mitigation activities be gauged.

Set goals

Once one has determined the baseline, one can set achievable goals for improvement. Where should those targets be set? Who should set them? What are the deadlines?

According to the MIT SMR research, few organizations have the right information to answer these questions with certainty. They may have data about the past, but not accurate projections of the future. An analytics-driven ICT solution plays a key role in providing trustworthy predictions of future performance. Organizations can ask "what if" to identify the best paths for improvement, balancing multiple variables and constraints.

Move beyond calculations and into modeling

Historically, businesses attempted to manage their monetary resources from a product-based perspective, only to find that the true costs of products, customers, or services were obscured by broad-based allocations. Traditional accounting methods did not reveal the *activities* that actually drove these expenses, so those things the businesses could actually change remained opaque.

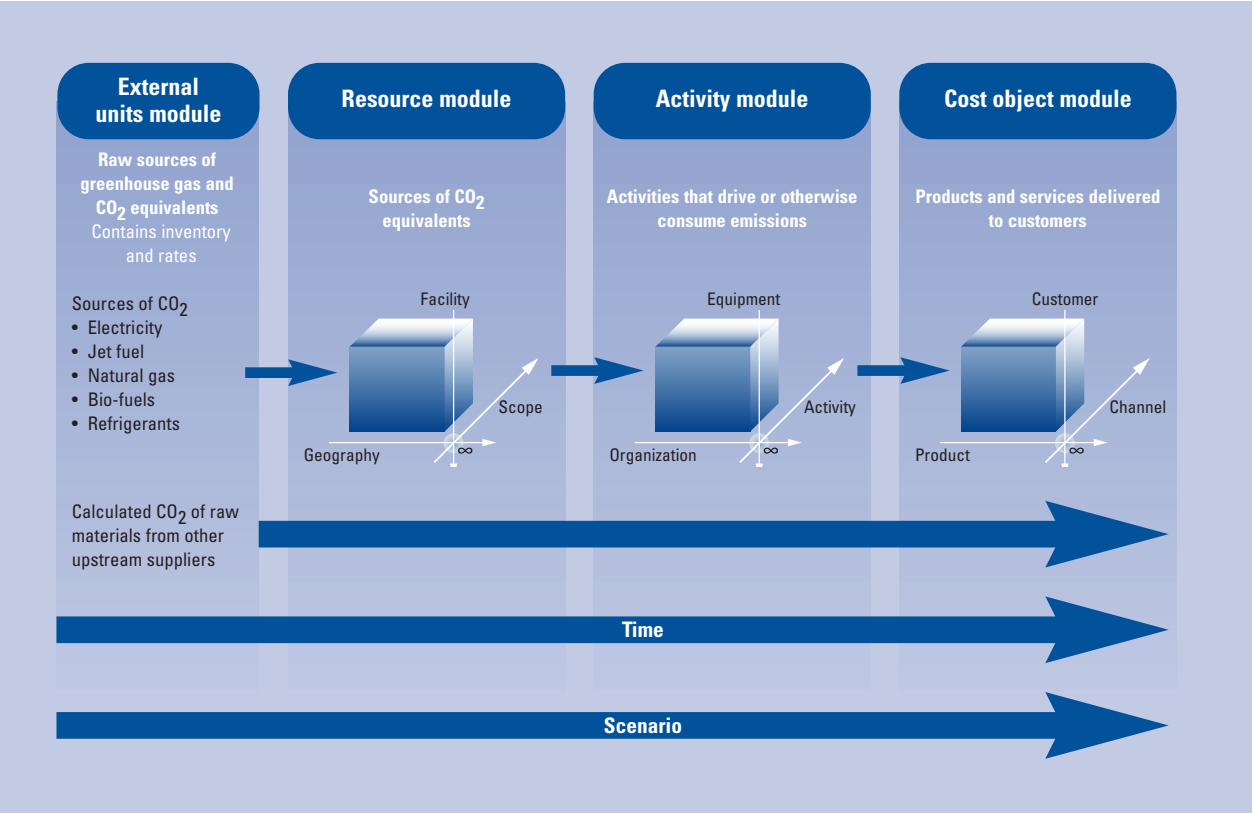
Spreadsheet-based applications designed to model these relationships proved difficult to manage, lacked transparency, and were not robust enough to handle the complexities and scale that occurred in a large-scale organization. From that pain came the dawn of enterprise-class *activity-based management* tools.

Traditional cost accounting systems do not accurately capture the environmental costs that companies incur. Costs such as charges for waste disposal, environmental permit fees, and utility bills are generally aggregated into overhead accounts and allocated with a broad brush across all products, processes, or facilities.

The beginnings of this same evolution are now being seen in the carbon management space. Organizations started calculating their carbon footprints using spreadsheets or niche applications, only to find the process cumbersome and error-prone, with little transparency into the calculations and limited insights. Spreadsheet-based tools can suffice for simplified compliance reporting, but the real benefits come from understanding one's sustainability performance in a way that enables an organization to predict future outcomes and model the impact of proposed changes.

Fortunately, the same principles that organizations have embraced for activity-based modeling lend great value to the field of sustainability management as well. Resources, whether economic or natural, are either created or consumed by the work activities of one's organization. Therefore, activity-based management can be applied to better understand the behaviors of water, energy, or emissions—just as it was used to understand the behavior of money.

Figure 6: Example of a model of greenhouse gas values: Carbon footprint modeling methodology



Note: In this example, greenhouse gas values are derived from electricity consumption figures, then assigned to buildings/equipment and modeled just as in a traditional ABM model.

As a simple example, to reduce the energy use of a building one must change the properties of the building itself or manage what goes on inside that building. To do this, one must understand how these activities affect the use of the building—activities that are not usually measured or metered independently.

An activity-based approach to carbon management would show the flow of emissions from assets to a given department and then further allocated to the different activities of that department (Figure 6). These assignments are based on a variety of drivers, such as square footage, airline miles, delivery service efficiency, and so on. Using this approach, any number of possibilities can be modeled according to the practical needs of the organization.

The point is to model to the level of detail required for management decisions and use the most practical drivers that represent actual work (and encourage certain performance), balanced with the level of effort required to collect the information. If department managers need to understand their role in the organization's overall carbon reduction goals, then a perfectly *exact* number is not necessary. They just need to see their proportion relative to their peers and how what they do affects the overall footprint. It is not enough to have just a consumption figure. Every kilowatt hour of electricity or carload of coal or gallon of fuel is associated with a business unit or product line that is unique to the asset using the energy. One has to understand the broader business context to be able to look at process optimization and improvements.

In short, *modeling,* not calculating, becomes therefore the new paradigm for decision making—something spreadsheets and similar tools have a difficult time doing. As Bras and Emblemsvåg explain in their book, *Activity-Based Cost and Environmental Management,* "... from an ABC [activity-based costing] method's point of view, [other natural resources are] simply 'just another currency,' and the principles remain unchanged."[13]

In the simplest terms, by replacing the "currency" of cost with other resources, we can gain the same kinds of insights about emissions, water, waste, or energy that have proven so invaluable in the cost-accounting world. Combine those resources with cost, and as one begins to model change, one will also see the financial impact of one's decisions, making it easier to prioritize and cost justify recommendations.

Calculations based on greenhouse gas inventories and other environmental metrics, although a noble first step, will yield limited new insights. To leap ahead and learn from the past, *modeling* should become a core practice behind any serious sustainability management strategy.

OPTIMIZE people, processes, and technology to get faster results

Just how much will videoconferencing, telecommuting, or hybrid vehicles in the company fleet reduce the output of greenhouse gases? To what degree will a change in materials or methods affect other processes and the bottom line? How does one factor supply chain practices into one's own carbon footprint? Which initiatives will have the best impact on the bottom line, factoring in all interdependencies?

To answer such questions, organizations need a combination of descriptive and predictive insight—the ability to track meaningful green indicators, validate strategies and costs before investing, identify causal relationships, and forecast outcomes. That sounds like a halcyon vision, but analytic science has made it possible.

With analytic intelligence, organizations can measure emissions and energy consumption throughout a value chain or product life cycle, ensure regulatory compliance, and build green strategies with proven return on investment. They can determine which resource conservation efforts or greenhouse gas reduction strategies will have the most impact—physically and financially.

In a recent survey of C-level executives conducted by BusinessWeek Research Services, almost half of respondents (48 percent) indicated that they believe business analytics can have an impact on their sustainability efforts. They had good reason for that belief. Among those who had already adopted business analytics methods, many had seen improvements in several areas surrounding sustainability management, including: optimizing financial planning and management (50 percent), managing change (49 percent), sustainable business growth (47 percent), answering high-impact questions (46 percent), and risk management (43 percent).[14]

EXTEND the scope and depth of sustainability management capabilities

Global reporting standards go a long way toward establishing a common language that can be used among businesses, consultants, and government entities. But there is still much room for interpretation, and that means room for inconsistency—particularly when reporting across multiple organizations in the supply chain.

For example, the GHG Protocol sets accounting standards for:

- *Scope 1* emissions that come directly from sources that are owned or controlled by the organization
- *Scope 2* emissions generated in the production of electricity consumed by the organization

However, the protocol addresses only *some Scope 3* emissions—those that are created as a consequence of the organization's activities, but from sources not owned or controlled by the organization. This is the realm of the supply chain and the extended product life cycle, including such factors as emissions from extraction and transportation of raw materials, waste disposal, and transport of finished products.

SAS is a stakeholder in the advisory process for Scope 3 and Product Lifecycle measurement standards. The standards are still being expanded and will more fully address supply chain issues in the future. In October 2009, Walmart awarded a US$420,000 grant to the WRI to create a set of accounting tools for companies to measure the carbon footprint of their supply chains. Technical committees and stakeholder communities are currently involved in building out the guidance for these new standards.

The announcement coincided with the beginning of the first phase of Walmart's Sustainability Index initiative. The retailer's top-tier suppliers in various product categories are now reporting the environmental impacts of their operations, such as greenhouse gas emissions, water, and waste data. Eventually, Walmart wants to collect data from all of its roughly 100,000 suppliers in order to rate the sustainability of consumer products.

If the organization structures its ICT systems on a common foundation with shared metadata, the sustainability management solution can be extended and enhanced through integration with other ICT solutions. For example, they can:

- integrate with risk analytic systems to understand the implications of trading carbon credits on a regulated market, and use sensitivity analysis to predict future value at risk if an emissions cap is in place;
- integrate with carbon trading platforms to understand the costs, risks, and benefits of carbon abatement initiatives in a dynamic context; and
- integrate with IT resource management software to gain visibility into the operational efficiency of the data center; and measure and predict the impact of projects that improve the utilization of IT resources—such as consolidation and virtualization—in order to reduce energy consumption and the data center's overall efficiency rating, in alignment with service-level agreements.

Conclusion

The world is on the cusp of a historic breakthrough in the application of ICT to address sustainability management

challenges. The risk of managing sustainability without support from ICT is great: wasted resources, lost revenue, and execution disengaged from strategy.

A resource is a resource, whether it is economic or natural. For managing greenhouse gases and other sustainability measures, organizations can adapt methods, skills, and technologies that have already been proven successful for financial analysis and scenario modeling.

As Esty and Winston so aptly wrote, "In a marketplace where other points of competitive differentiation, such as capital or labor costs, are flattening, the environmental advantage looms larger as a decisive element of business strategy."[15] By ignoring the impulse 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.

An effective ICT strategy exploits analytics to transform data into insight to support meaningful decisions. An analytics-driven information framework designed for sustainability enables an organization to:

- measure sustainability activities using industry-accepted methodologies and protocols;
- accurately report on environmental performance to shareholders and regulators; and
- improve performance on sustainability metrics via optimization, forecasting, and data mining analysis.

Imagine the possibilities. Organizations can measure emissions and resource consumption throughout a value chain or product life cycle, ensure regulatory compliance, and build green strategies with proven return on investment. They can determine which resource conservation efforts or greenhouse gas reduction strategies will have the most impact—physically and financially. And they can identify ways to promote (and profit from) more environmentally respectful goods and services.

Notes

1 MIT SMR 2009.

2 EIU 2009.

3 See EIU 2009, Figure 2.

4 Rogers 2009.

5 Environmental Leader 2008.

6 Recycling at BMW. http://www.bmw.com/com/en/owners/service/recycling.html.

7 From a Webcast panel discussion with Chris Perceval, Director of Corporate Relations, World Resources Institute, sponsored by BetterManagement and SAS, August 2009. See SAS 2009a.

8 EIU 2009.

9 Global Markets Direct 2009.

10 SAS 2008.

11 Stokes and O'Marah 2009.

12 From a Webcast panel discussion with Jonathan Estes, president of Strategic Measures, Inc., and author of *Smart Green*. See SAS 2009a.

13 Bras and Emblemsvåg 2001.

14 SAS 2009b.

15 Esty and Winston 2006.

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CHAPTER 1.8

Enabling Sustainable Digital Highways

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Julius Genachowski, chairman of the US Federal Communications Commission, aptly described the relevance of broadband as a vital asset with an impact that extends far beyond the telecommunications sector: "Broadband is the great infrastructure challenge of our generation. It is to us what railroads, electricity, highways, and telephones were to previous generations—a platform for commerce, for democratic engagement, and for helping address major national challenges."[1] Nationwide access to electricity and highways was a central focus of public policy in the 20th century. This century, timely, universal, and affordable access to broadband is emerging worldwide as a vital consideration for governments and the private sector. The creation of national broadband networks is crucial to sustainable economic development and social progress, in developed as well as emerging economies, and thus must move to the top of national strategic agendas.

Despite the pervasive recognition of broadband's benefits, a substantial majority of the world's households today lack access to an adequate connection. The sector's adherence to legacy policies, regulations, and business models is limiting timely and adequate investment in necessary infrastructure. Governments and private-sector operators must prepare to accept a fundamentally new set of principles and business models. Their acceptance will be imperative to breaking the deadlock that inhibits investment and secure access to broadband.

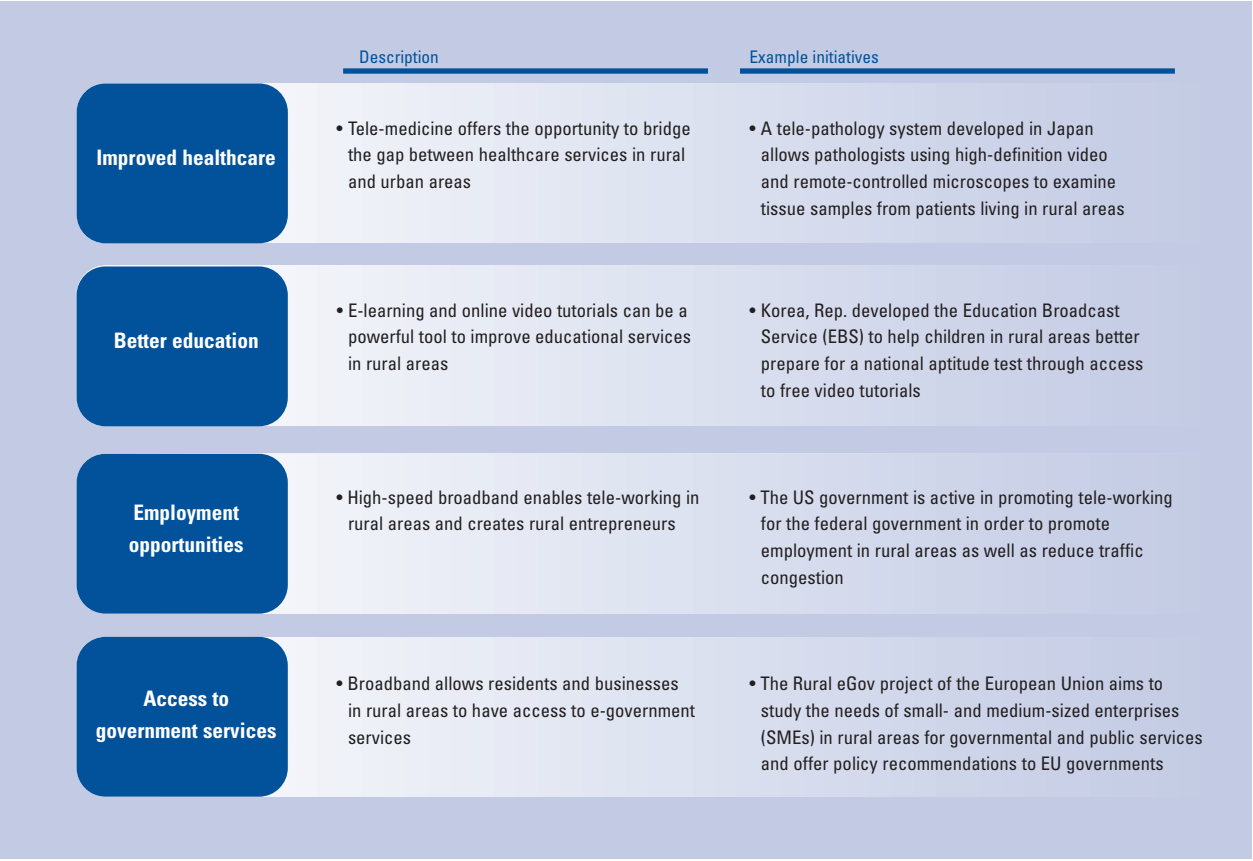
After exploring broadband's impact on economic and social development and the potential risks looming on the sector's sustainability, this chapter will outline a new approach to broadband, proposing a shift of paradigms for governments and private-sector operators.

The broadband dividend

Since the beginning of this decade, broadband has exhibited its profound impact across society. It has fundamentally transformed the way businesses, consumers, and governments operate. Just as countries with a young population benefit from a so-called demographic dividend, countries with higher broadband penetration have reaped rich broadband dividends across economic and social activities. For a society to realize the full potential of this asset, its broadband deployment has to be universal and affordable. It has to enable high-speed access, and it must happen in a timely manner.

Universality and affordability are vital to ensure that broadband is inclusive and can be used as a tool for public service, particularly in health, education, employment, and social integration. Governments have traditionally been unable to effectively serve rural and underprivileged communities, where public services are most needed. Widespread broadband deployment has proven to be a key transformation tool to address that issue and effect change in those communities. Broadband has enabled governments across the world to offer remote diagnostics

Figure 1: Public services and social inclusion through broadband



Source: Booz & Company database, 2009.

through e-health, bring quality education to underprivileged communities, widen employment opportunities, and provide more citizens with an opportunity to influence policies (see Figure 1).

Broadband's performance is also a key component of its effectiveness in transforming the way individuals and corporations cooperate and create. Broadband facilitates innovation and entrepreneurship. Booz & Company analyzed a group of 50 countries and found that countries within the top 10 percent of broadband penetration as a proportion of Internet penetration had much higher innovation efficiency than countries in the bottom tier of broadband-to-Internet ratio (see Figure 2). Countries with a higher proportion of broadband-to-Internet connections see greater innovation. Broadband stokes innovation and it does so exponentially—countries with 80 percent broadband penetration are more than twice as innovative as countries with 40 percent penetration.

Timeliness in deploying broadband yields further substantial benefits for countries. A Booz & Company analysis indicated that countries that perennially ranked in the top tier of broadband penetration recorded twice the rate of GDP growth of countries that consistently ranked in the bottom tier (see Figure 3). Additionally, boosting broadband penetration by 10 percent translated into a 1.5 percent increase in the country's labor productivity—a vital competitive advantage.

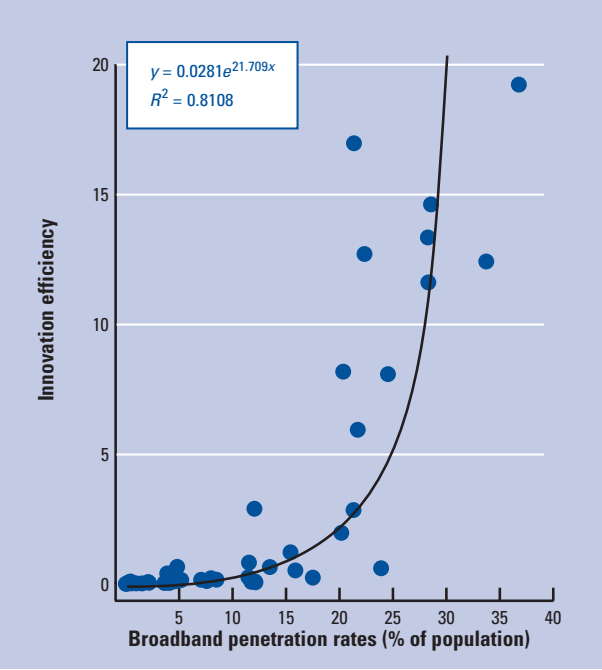
As leaders seek policy levers and new business models to navigate their way through the global economic recession, it is time for them to recognize that broadband is not solely a telecommunications sector issue but a matter of national importance. In developed nations, the rapid deployment of broadband at the national level can accelerate economic recovery, create new markets, and maintain countries' competitiveness with global peers. Emerging nations can also reap these benefits, as well as more fully integrate their citizens into society and their private sectors into the global economy. Because nations' economic and social progress depends increasingly on rapid and effective access to information, leaders in the public and private sectors cannot afford to let their digital infrastructure lag behind that of their global peers.

The risk to long-term sector sustainability

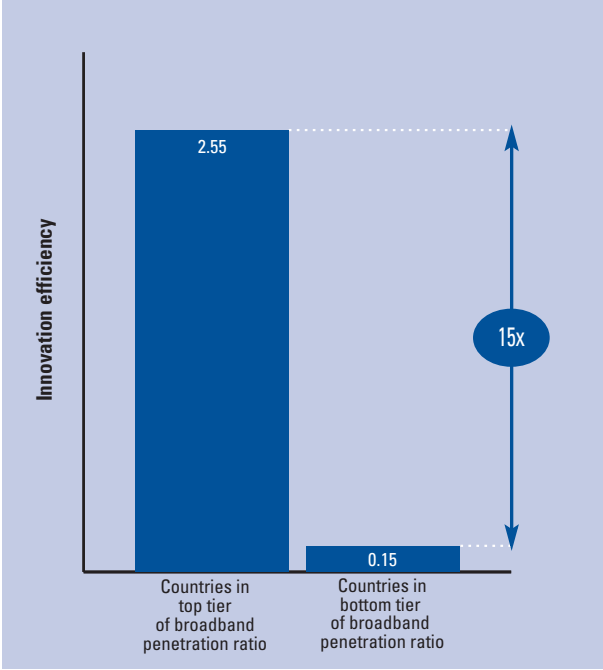
Despite widespread recognition of broadband's significant socioeconomic impact, more than 75 percent of the world's households are not connected to a broadband network. Even developed economies in Western Europe

Figure 2: Impact of broadband on innovation

2a: Innovation efficiency vs. broadband penetration



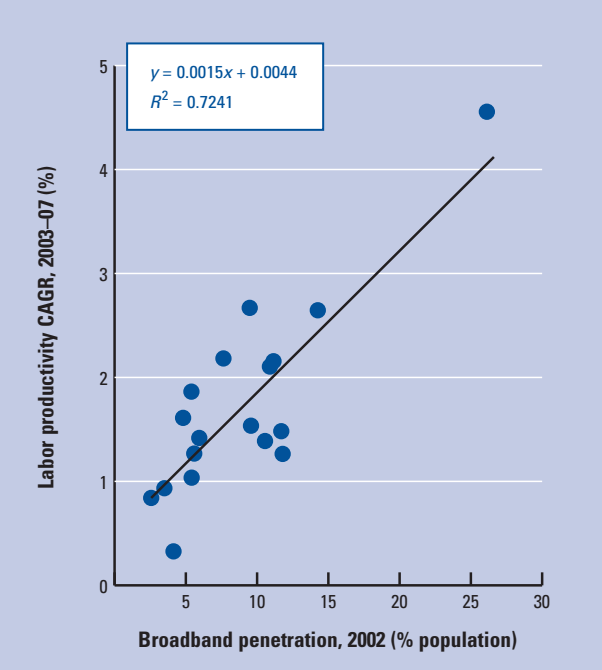
2b: Innovation efficiency vs. broadband penetration ratio



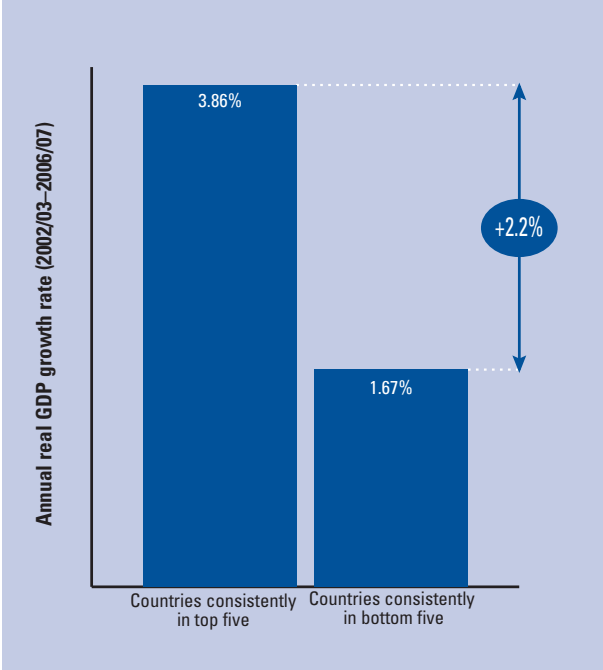
Source: EIU, 2009; ITU, 2009; Booz & Company analysis, 2009.
Note: *Innovation efficiency* is defined as the number of patents per million population divided by the EIU innovation input/enabler score for the country. Countries are grouped into deciles of broadband/Internet penetration levels, and averages per decile are used.

Figure 3: Impact of broadband penetration on different economic indicators

3a: Impact on labor productivity growth



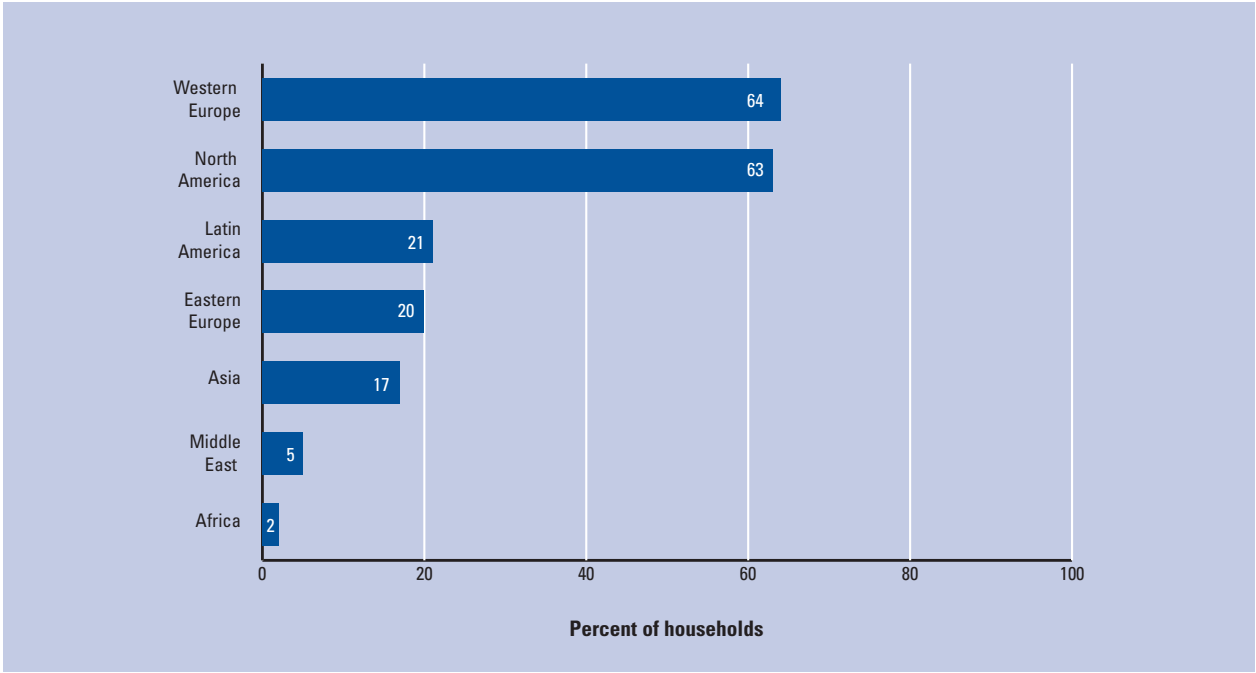
3b: Impact on annual real GDP growth



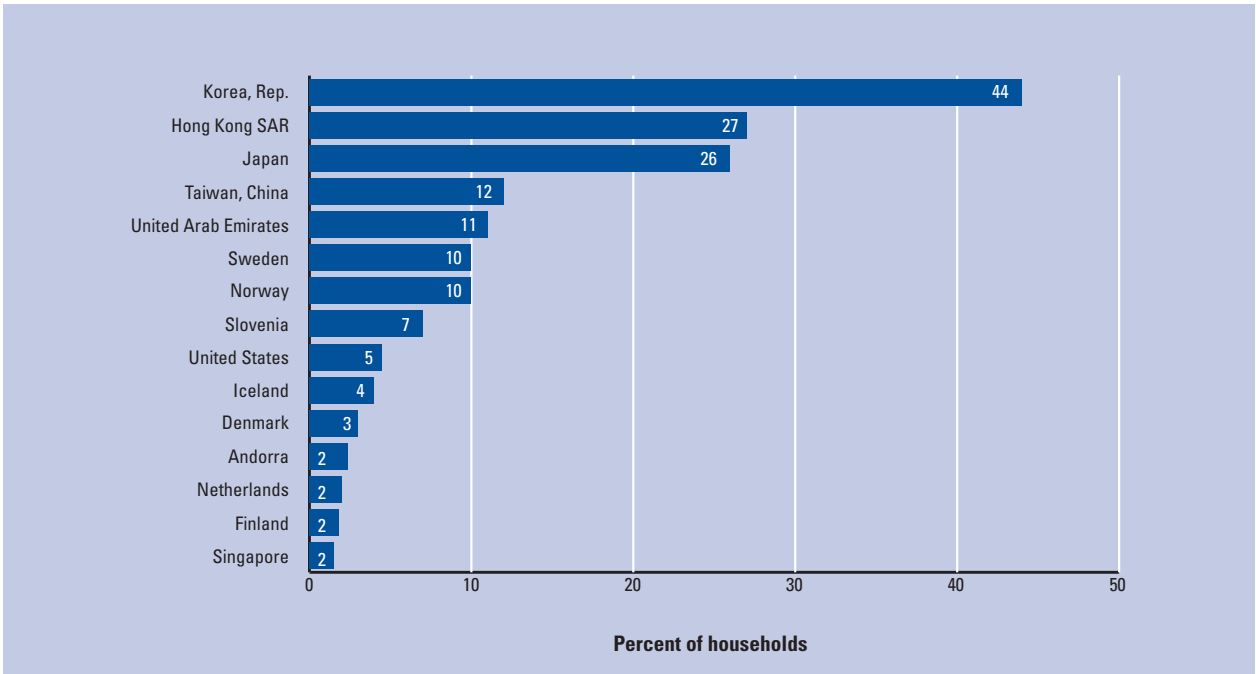
Source: OECD Labor Productivity Portal, 2008, http://www.oecd.org/topicstatsportal/0,3398,en_2825_30453906_1_1_1_1_1,00.html; Booz & Company analysis, 2009.

Figure 4: Speed and penetration levels

4a: First-generation broadband penetration (Q4 2008, by region)

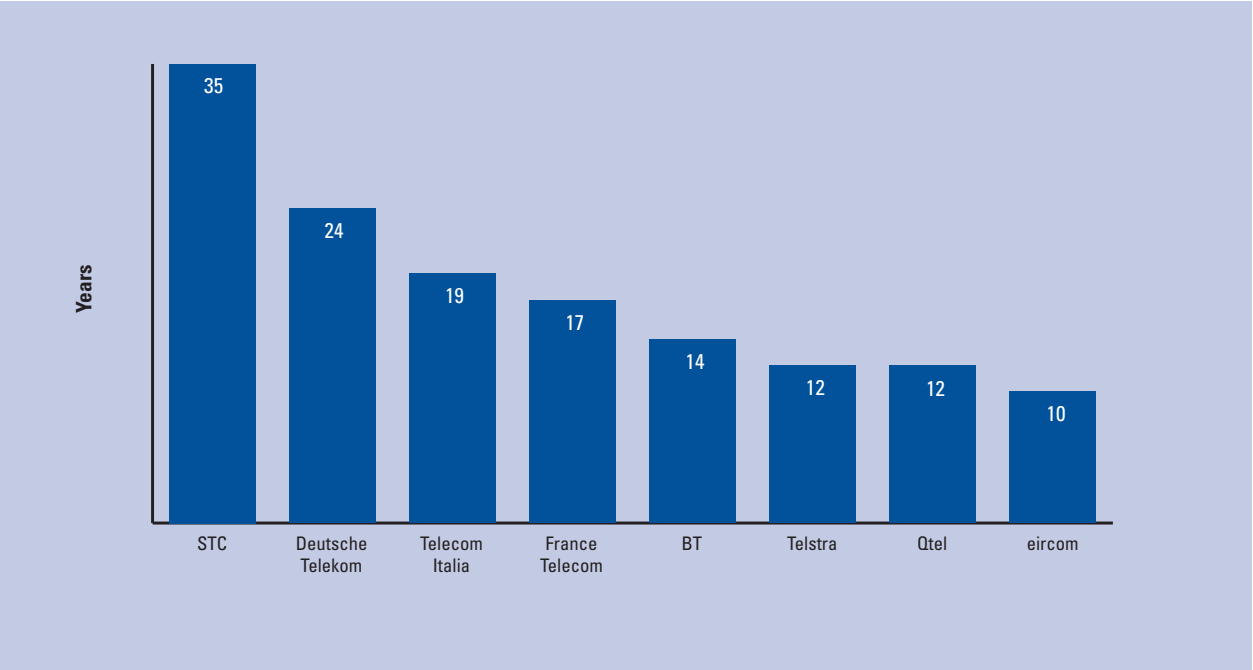


4b: Next-generation broadband penetration (fiber to the home/building) (Q4 2008, by country)



Source: Informa World Broadband Information Service, 2008; FTTH Council Global Rankings, 2008; Booz & Company analysis, 2009.

Figure 5: Number of years to deploy next-generation broadband network infrastructure based on current spending



Source: 2008 company annual reports; Booz & Company analysis, 2009.
Note: Next-generation national broadband network capital expenditure is calculated based on the number of households in each country and the cost of passing a household. The analysis assumes an average cost of US$1,500 per household and a capital expenditure/revenue ratio of 10 percent.

and North America have managed only to provide broadband access to two-thirds of their population. Despite the best efforts of governments and the private sector, the broadband digital divide persists as a significant challenge to inclusive and sustainable development, especially in emerging economies.

While governments focus on closing the digital divide, the chasm that separates nations with access to ultra-high-speed broadband connections from those without is opening. As businesses and consumers seek advanced, next-generation applications such as cloud computing and virtual world experiences, they need ultra-high-speed broadband connections. Consumers are clamoring for speeds at least 10 times faster than those currently offered in order to use those next-generation applications. In the future, even faster connections will be needed for the next wave of advanced services and applications, increasing significantly the investment required and hence the challenge of building a national broadband network. In providing faster services, the track record of even the most developed markets falls short. Only seven economies have penetration of ultra-high-speed broadband 10 percent or higher (see Figure 4).

Because there is such a long way to go to make broadband a universally available asset, all stakeholders will need to collaborate and solve crucial issues. Three key inhibitors are preventing governments and the private sector from collaborating to ensure adequate investments in national broadband infrastructure: the sheer magnitude of these investments, revenue prospects, and regulatory uncertainty.

Investments in national broadband infrastructure are significant, front-loaded, and irreversible (see Figure 5). As a result, investors are cautious, tempted to hold back on investments until they have sufficient clarity about their ability to make an adequate return on their investments. Uncertainty surrounding future broadband revenue streams and regulatory obligations are making it difficult for operators to gauge the level of investment risk. The emergence of powerful application and service providers is another key factor driving uncertainties around future broadband revenue streams for investors. These providers compete with operators for telecommunications service revenues and stand to profit from broadband—yet they do not have to build the network. This growing competition between operators and application providers marks a fundamental disruption to the sector's prevalent revenue model, in which operators

typically capture the bulk of the revenues generated by the access connection.

Finally, regulators have not established a clear framework targeted at broadband networks. The infrastructure-sharing models mandated by legacy networks may not be replicable for next-generation broadband. Regulatory authorities have developed a number of tools based on existing technical architecture: these tools include interconnect pricing controls based on per-minute rates and infrastructure-sharing mandates such as local loop unbundling derived from legacy copper-based network architectures. Furthermore, as the distinction between traditional service providers (i.e., operators) and application providers (such as Skype and Google) blurs, regulators need to develop new tools to regulate application providers, which neither are licensed nor have specific service obligations imposed on them in terms of access and quality. While regulators attempt to define a new regulatory regime, operators lack clarity and thus confidence in their ability to monetize their investments in national broadband infrastructure, further dampening interest.

The three inhibitors collectively are preventing adequate investments in the sector. This heightens the risk of a downward spiral in which the sector, devoid of long-term investments, stagnates in the short term, resulting in reduced innovation for the economy and risking the sector's long-term sustainability.

A fundamentally new approach

In order to break the gridlock that has stalled investment and ensure the future viability of the sector, governments and operators need to consider a new paradigm characterized by three attributes.

Broadband: A national imperative

Broadband must be recognized as a national imperative, not simply a telecommunications industry mandate. To date, most governments have considered broadband an important telecommunications service with revenue potential for the ICT sector, and have regulated the business from that perspective. However, given the economic and social benefits that broadband offers, it must be considered a national imperative—and driven accordingly. Governments must elevate broadband from merely another regulatory concern to a top issue on the national strategic agenda. This outlook on broadband will prompt policymakers to take a long-term view and develop consensus among all stakeholders, removing myopic short-term revenue and profitability pressures.

Some countries have already taken giant strides in recognizing broadband as an essential service. France's highest court declared in June 2009 that broadband is a human right, cementing its role as a national strategic issue. Finland did the same in October 2009 by making broadband a legal right.

A proactive public sector

The public sector needs to be proactive in securing universal broadband. Because national broadband networks have significant socioeconomic benefits, governments have a vested interest in their creation. Rolling out infrastructure at the national level, however, may not be the best fit for operators' strategies. Therefore, governments need to play an active role in the sector's development, despite the fact that this represents a significant shift away from the long-standing trend toward government disengagement and privatization.

Just as public-private partnerships (PPPs) have become the norm in the development of vital energy and transportation infrastructure, effective PPPs are needed as a model for the telecommunications sector in developing national broadband networks. Governments have several options to consider in establishing successful PPPs: subsidizing infrastructure, providing tax concessions to private operators, or triggering demand for broadband services. The ideal PPP model for any country hinges on the dynamics of the broadband ecosystem in that country.

New business models and investment risk spreading

New business models are imperative to spread investment risk. Under the traditional model of broadband access delivery, an end-to-end integrated telecommunications provider offered broadband services over its own infrastructure. The telecommunications provider invested across the value chain with attractive medium-term return prospects, despite market uncertainties and regulatory obligations. That vertically integrated model, however, may not be sustainable in the long term. It could fail to align the risks associated with large-scale infrastructure investments in a highly uncertain regulatory environment with traditionally expected returns. It also inhibits operators from pursuing new revenue opportunities in high-risk application and content ventures. An alternative new horizontal business model approach, which separates the layers of traditional service delivery and establishes three different plays, would allow risk to be more appropriately tied to rewards and ensure investment sustainability (see Figure 6).

The infrastructure business, the "PassiveCo" in the figure, would focus on deploying passive infrastructure across the country, leveraging economies of scale and functioning like an infrastructure utility business—similar to gas and water utilities. PassiveCo is likely to be a natural monopoly and would be heavily regulated.

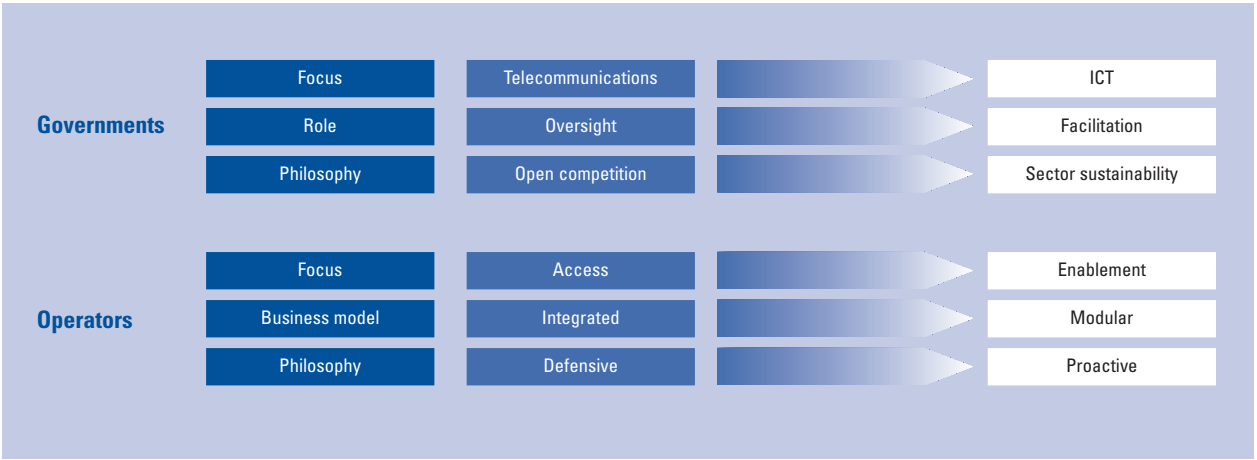
Businesses in the middle layer, "ActiveCos," would lease infrastructure from PassiveCo and add intelligent elements to provide differentiated services to both application providers and end users. ActiveCos would compete on their ability to provide high-quality network and enablement services to application and content providers as well as end users. These businesses would operate in a competitive market, with regulations on service levels, quality, and pricing.

Figure 6: Horizontal business models

	TYPICAL ELEMENTS	PROPORTION OF INVESTMENT	INTENSITY OF COMPETITION	TYPICAL PAYBACK PERIOD
ServiceCos	Applications and content	5%	High	1–2 years
ActiveCos	Switches and routers	25%	Medium	5–7 years
PassiveCo	Ducts and fiber	70%	Low	12–15 years

Source: Booz & Company analysis, 2009.

Figure 7: Stakeholders and their new roles



Source: Booz & Company analysis, 2009.

The top layer would have a number of "ServiceCos" operating in an extremely competitive and lightly regulated market consisting of multiple application and content providers. ServiceCo businesses would compete on their ability to develop deep market and customer understanding, deploy advanced marketing techniques, and innovate continuously.

Adopting horizontal business models yields significant benefits for the stakeholders. It enables traditional operators to reduce regulatory risks in the bottom layer, which incentivizes investment in infrastructure for the long term in return for low-risk, utility-like returns. Horizontal business models also broaden operators' return prospects in the top two layers by allowing them to compete in areas with higher risk profiles but potentially higher returns. Policymakers benefit from increased private-sector investments, accelerated broadband infrastructure deployment, greater innovation in applications and content, and further socioeconomic contributions from the sector.

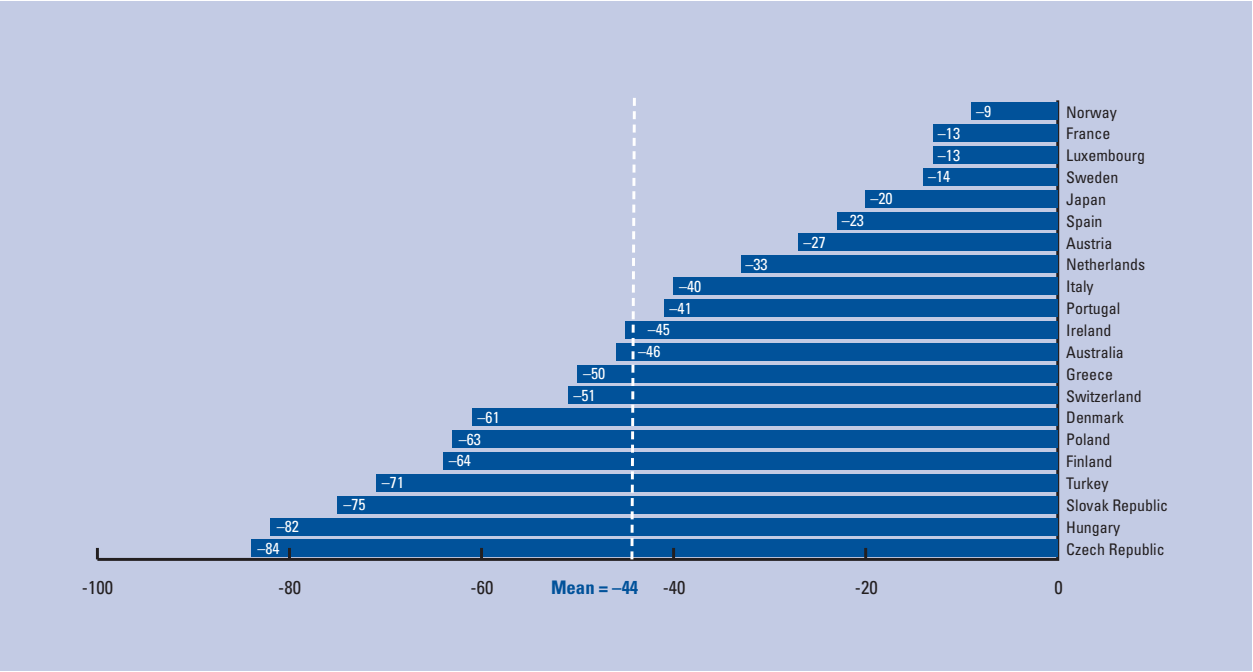
The legacy mindset challenge

To adapt to this new paradigm and spur the creation of national broadband networks, all stakeholders need to adapt their current thinking and accommodate essential changes in policy, regulations, and business models (see Figure 7).

Shifting the government mindset

For decades, the global trend has been to minimize the role of government in the telecommunications sector. Governments typically have migrated from owning incumbent networks to investing passively in them and finally to simply regulating them. As telecommunications

Figure 8: Broadband access price declines, selected countries (%, 2005–08)



Source: Booz & Company analysis, 2009.

regulators, governments have primarily focused on competition, which has been introduced as a mechanism to ensure market efficiency. Effective competition has indeed been a key enabler of rapid telecommunications growth in the past decade.

However, to address the three inhibitors to investment in national broadband, governments need to rethink their role and consider taking the bold steps necessary to facilitate investments and ensure the sector's long-term sustainability. Governments have played a major role in the development of vital infrastructure sectors—roads, bridges, and power plants. Policymakers now need to explore mechanisms to foster the development of national digital highways.

Governments created most telecommunications regulatory authorities based on the principle that the consumer had to be protected against the monopolistic activities of incumbent operators. For the past two decades, most regulatory authorities have pursued the singular strategy of preserving customer welfare by introducing competition in the various telecommunications markets—including mobile, fixed, Internet, broadband, and international. In cases where it was apparent that operators were too dominant to allow effective competition, policymakers established a range of regulatory measures to ensure competition efficacy and consumer welfare. These encompass breaking up incumbents (such as AT&T in the United States), ordering functional separation (BT in the United Kingdom), and mandating shared infrastructure (local loop unbundling across Europe).

A single-minded regulatory focus on introducing competition will not suffice to generate the magnitude of investment necessary to create national broadband networks. Instead, governments must seek a more balanced approach to regulation that ensures consumer welfare while simultaneously guarding the sector's efficiency and long-term sustainability.

Shifting the operator mindset

For operators, broadband revenues based on access charges have undergone a rapid decline (see Figure 8). Relying solely on these revenues neither supports the magnitude of investments needed in national broadband infrastructure nor provides operators with sustainable growth opportunities in the future. Operators need to diversify their revenue streams by seeking scale in their provision of access services and capturing a larger share of application and content providers' revenues.

Additionally, traditional vertically integrated models, which emphasize infrastructure expansion and management, impair operators' ability to compete in the new market structure by promoting a focus on these areas to the exclusion of others. Success in changing markets requires operators to alter their business and operating models from vertical integration to horizontal plays. Operators need to focus on building scale and cost efficiency in the utility-like infrastructure layer and offering reliability and affordability in the service layer, while

competing on innovation and speed in the application layer (refer to Figure 6).

Finally, operators need to be proactive in both adopting the new horizontal approach and engaging the government on suitable implementation approaches. Traditionally, operators have viewed regulatory initiatives with suspicion, since in the past regulatory moves have in some cases depressed incumbents' returns. Operators need to engage regulators to accelerate national broadband infrastructure deployment because this not only increases the potential market for operators but also provides the basis for sector sustainability.

Imperatives for the public sector

In order to broaden access to broadband service, governments need to consider adopting three immediate imperatives: establish a national broadband policy, define a new regulatory framework that supports operators' horizontal business models, and facilitate investments in the sector.

Establish a national broadband policy

As a necessary first step to enabling universal broadband access, governments need to establish a consistent, coherent, and shared national broadband vision, embedded in a national broadband policy. This policy not only must put forth a national aim for the speed and coverage of the broadband infrastructure, but also provide guidance on how regulators, operators, and application and content providers will work together in achieving that aim.

Several countries have already defined or are in the process of establishing a national broadband policy, with their different goals highlighting the varying levels of aspiration and government involvement. For instance, the United Kingdom's national broadband policy, Digital Britain, aims for every household to have a 2-megabyte per second (MB/s) connection in the next 10 years, supported by a long-term tax on broadband connections; Singapore is aiming for 100 MB/s for each household by 2015, supported by an immediate direct grant to the market.

Establishing a national broadband policy should involve an open dialogue with industry participants. This must include an objective assessment of the demand for broadband infrastructure: how widespread and immediate is the demand? To return to the Digital Britain example, the policy was established through an open consultation process. The Digital Britain Summit, a face-to-face, day-long meeting for key stakeholders, was followed by a series of "unconferences"—online forums that allowed the public to weigh in.

Once established, a common policy will serve as an important tool to continue the dialogue with key industry stakeholders and ensure that everyone remains aligned on goals. Governments intent on building national broadband infrastructures need to undertake this dialogue immediately.

Create a regulatory environment that supports horizontal business models

Existing regulatory frameworks emphasize competition via a series of mandates for vertically integrated incumbents. As the industry moves away from vertically integrated models to horizontal ones, regulatory tools need to be adapted and new ones developed to ensure consumer welfare and effective competition.

Regulators need to encourage the move toward horizontal business models by adapting existing regulatory regimes, especially at the infrastructure and service layers. Incumbent operators should be incentivized to open their network infrastructure, to put their knowledge and existing assets to the best use, and to keep the cost of national broadband infrastructure under control. At the same time, regulators could impose stringent sharing and ownership restrictions on infrastructure players, ensuring fair and equal access to all providers upstream. Regulators must also assess the need to grant exclusivities in the infrastructure layer, since competition at that level affects the ability of these entities to generate an adequate return on their investment.

Singapore's government, in establishing the horizontal model, licensed a new infrastructure player, accepting that it would become a natural monopoly. At the same time, the government mandated universal deployment by 2015 and banned effective control of the infrastructure provider by companies in the upper layer. Singtel, the incumbent, was allowed to be a part of the consortium that will operate the infrastructure player, as it committed to place all its passive infrastructure assets in a separate trust and to divest these completely by 2011.

Facilitate investments in the sector

Some governments recently have reversed past privatization efforts and have invested in the telecommunications sector, recognizing the significant benefits and national competitive advantages derived from broadband. These investments have ranged from direct investment in broadband companies, as in Australia, and grants to private-sector players as in Singapore, to end-user subsidies, as in Korea, Rep. (Korea) and Japan. In all, governments around the world have committed recently to investing more than US$24 billion in broadband network development (see Table 1).

Governments, in concert with the private sector, need to evaluate their role and the magnitude of investment required in the sector, while identifying the right investment mechanism.

Governments should also help stimulate demand for broadband services. The Korean government, for example, has done so by establishing education centers to train housewives to use the Internet. Egypt has launched a successful IT club initiative that provides fully equipped

Table 1: Government investment in broadband, selected countries

Country/region	Number of additional countries considering investment	Investment per capita (US$)	Total investment (US$ millions)
AMERICAS	**1**	**n/a**	**7,400**
Canada		5	193
United States		24	7,200
EUROPE	**0**	**n/a**	**8,900**
Austria		7	59
Estonia		92	69
France		61	3,770
Germany		2	200
Greece		92	1,030
Ireland		25	110
Italy		34	2,049
Portugal		100	1,060
Spain		35	1,420
United Kingdom		6	324
ASIA PACIFIC	**0**	**n/a**	**6,500**
Australia		159	3,300
Korea, Rep.		18	890
Malaysia		27	720
New Zealand		205	840
Singapore		154	710
MIDDLE EAST & AFRICA	**2**	**n/a**	**0**

Source: Booz & Company database, 2009.

computer labs and broadband access at schools, clubs, youth centers, and universities. Governments can also stimulate demand by ensuring that all public-service provisioning be handled over broadband networks.

The role of the private sector

In anticipation of policy and regulatory changes, private-sector operators need to take three proactive, immediate steps to better position themselves. Operators must open their infrastructure business, start building capabilities for double-sided business models, and capture further returns by sharpening their focus on application innovation.

Adopt open infrastructure plays

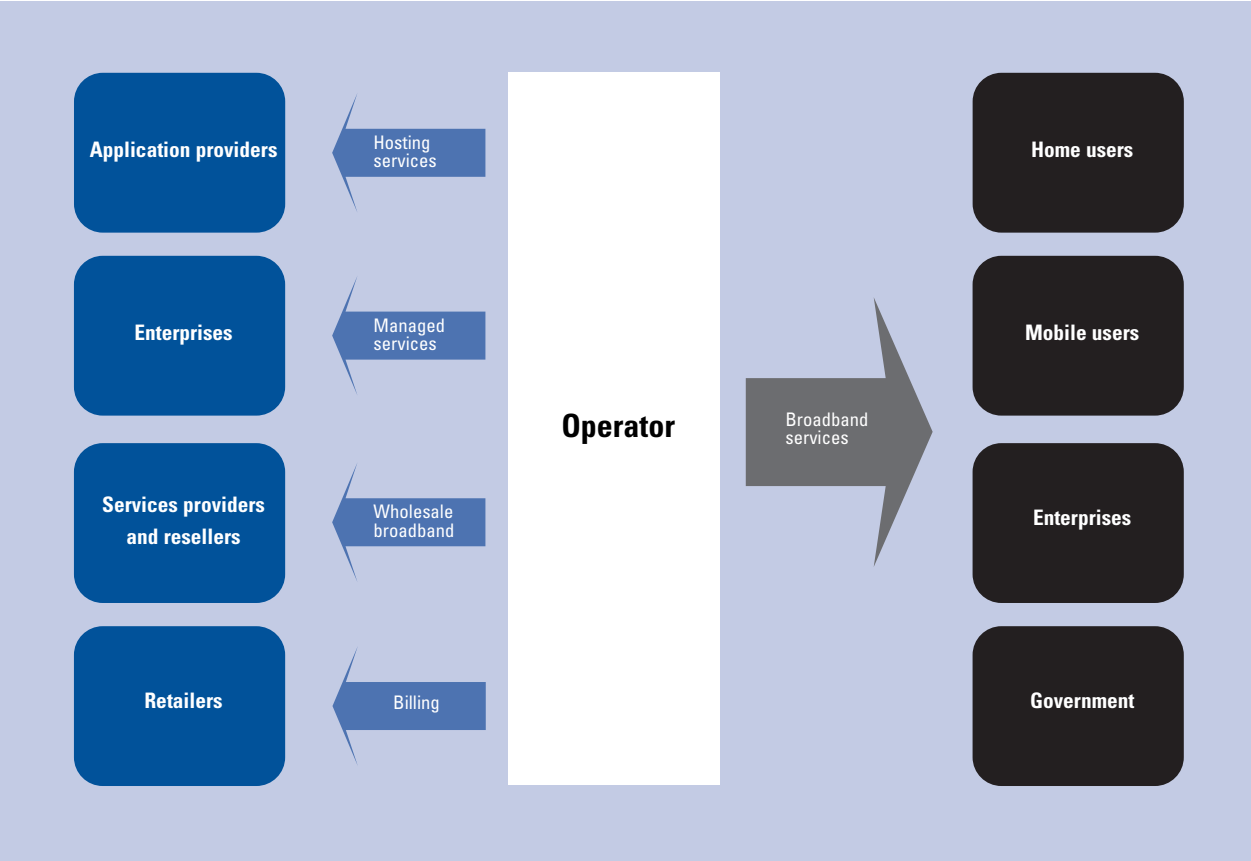
Operators have in the past resisted attempts by regulators to separate the infrastructure layer from the others, driven by concerns regarding loss of synergies and marketing power. However, the situation facing the sector today is different: the long-term sustainability of the sector is at risk unless vital investments in national broadband infrastructure are secured in a timely manner. Operators, facing a decline in their traditional revenue bases, are unable to capitalize on growth opportunities provided by broadband, since they alone do not have the incentive to undertake long-term investments under existing regulatory regimes.

If operators proactively evolve toward a horizontal model and adopt a more open approach to sharing infrastructure, up to considering separation if needed, they can reap significant benefits while strengthening the sector's future sustainability. These measures relax the regulatory obligations that have been imposed on operators by their current vertically integrated operating model. They reduce operators' costs for infrastructure deployment by allowing operators to share those costs with the government or with other private players. Finally, they enhance returns on infrastructure investment, driven by higher asset utilization and efficiency as well as the higher premium allotted to infrastructure companies by the investment community.

The separation undertaken by operators such as Openreach in the United Kingdom and Chorus in New Zealand helped reduce the regulatory pressure on the incumbents that own them. Governments in Australia, Greece, Malaysia, and Singapore have demonstrated their willingness to enter into PPPs with infrastructure players, while Canada, Japan, and Korea have provided incentives and tax subsidies to such players.

By cooperating with their governments and even proactively steering them in the direction of infrastruc-

Figure 9: New revenue streams for double-sided business model



Source: Barraclough et al., 2008; Booz & Company analysis, 2009.

ture plays, operators stand to reap considerable benefits. Singtel, for instance, worked closely with the Singapore government to establish a new horizontal model in the sector, bidding as a part of a winning consortium to operate the infrastructure entity. In doing so, Singtel monetized its existing passive assets, which would otherwise have been rendered redundant by the new infrastructure entity; it also benefited significantly from a subsidy of US$750 million in governmental grants, which is accelerating the creation of the universal broadband market and hence providing new growth opportunities for Singtel in the retail market. Similarly, BT acted quickly to accept the mechanisms to separate its infrastructure into a different business, Openreach, a move that ensured regulatory goodwill and led to reduced retail regulation. Telstra (in Australia), on the other hand, was reluctant to consider infrastructure separation, and may face a stricter regulatory environment as a result.

Pursue double-sided business models

Having opened the infrastructure layer, operators need to pursue growth opportunities outside of providing end-user access services. Building double-sided business models will allow operators to augment service revenues by selling enabling services to numerous application and service providers. Such enabling services could include hosting services, managed services, and transaction support services (see Figure 9).

Operators would need to leverage the assets and capabilities they built over the years of providing telecommunications services to end users. These include network management skills, ongoing financial relationships with clients, and the ability to operate large IT and network systems. Taking advantage of these assets would enable operators to pursue new growth opportunities in providing wholesale services, enabling transactional support to application providers (billing and location services), and providing managed and hosted services to enterprises and application providers.

Proactive operators are already testing double-sided business models. For example, the Spanish multinational Telefonica is building a cloud-computing service intended to host enterprise data and services while continuing to provide telecommunications services to its subscriber base. Recently, United Arab Emirates–based Etisalat announced a cloud service that allows companies to deploy IT services on a pay-per-use basis.

Sharpen focus on application innovation

Finally, having opened the infrastructure layer and built a double-sided business model, operators need to enhance their ability to innovate in and extract value from the application and content layer, which is likely to be the fastest-growing layer in a multilayer market. Competition in this layer would be intense and dominated by current application giants such as Google, Yahoo, and Facebook, all of which have high brand recognition and a larger user base than most national operators.

Operators need to undertake an objective and pragmatic assessment of their capabilities in this space and focus on niche areas where they are likely to succeed. For example, operators can take advantage of their ability to influence consumers' device and equipment purchases, as well as their ability to develop scalable and reliable services, to compete in niche markets such as Internet Protocol television, smart homes, and location-based advertising services. Emerging technologies such as telemetry and embedded radio-frequency identification could provide lucrative opportunities for operators, since these technologies require deep network understanding combined with smart customer insights—an area where operators are best positioned to compete.

Success in the application space would be contingent on an operator's ability to invest smartly, establish focused business units, and leverage its existing scale, as seen in the relatively successful efforts of Vodafone, Orange, and Telefonica.

Conclusion

Winston Churchill once said that if you build a present only in the image of the past, you will miss out entirely on the great challenges of the future.[2] As governments and private-sector operators strive to ensure universal and affordable broadband service, these words ring true for the profound shift that is required to enable these digital highways of the future.

Sustainable societies, in which all citizens have a voice, must provide the means for everyone's voices to be heard—and increasingly, those means are digital. As such, broadband is no longer a telecommunications sector issue that industry leaders should solve. Its relevance has transcended the industry and its impact reaches deeply into socioeconomic issues. Broadband thus mandates attention from policymakers and regulators as well as from the telecommunications industry. This is not an easy task for any of them. Ensuring broadband access requires radical shifts in thinking, shedding decades-old business models, changes in regulatory policy, and bold moves by government to spur development.

For all stakeholders, time is of the essence—and not only because consumers want faster service. The quicker a country can provide broadband, the quicker that country can reap a variety of economic benefits. It is important that governments and the private sector realize that access for all is key. Broadband is so vital that those nations that do not offer high-speed access to their populations will have a serious disadvantage in the global economy. This is true for all economies—developed as well as emerging nations. For developed nations, broadband is the key to accelerating economic recovery, creating business opportunities, and reinforcing competitiveness. For emerging economies, broadband does all that and more, accelerating inclusion in the global economy by democratizing business, culture, health, and education.

Government and industry leaders will need to demonstrate their foresight in this regard to maintain their competitiveness with global peers. Doing so will require them to fundamentally change the way they think about broadband access.

Notes

1 Julius Genachowski, August 6, 2009. Opening Remarks to a series of 22 staff workshops being held by the FCC.

2 Gordon Brown, Speech at the Digital Britain Summit. Available at http://interactive.bis.gov.uk/digitalbritain/wp-content/uploads/2009/04/digital-britain-summit-full-transcript3.pdf.

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CHAPTER 1.9

The Economic Consequences of the Diffusion of Cloud Computing

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Cloud computing is an emerging general purpose technology (GPT) that could provide a fundamental contribution to efficiency in the private and public sectors, as well as promote growth, competition, and business creation. It is an Internet-based technology through which information is stored in servers and provided as an on-demand service to clients. The impact of cloud computing on both households and companies will be substantial. On one side, consumers will be able to access all of their documents and data from any device (the home or work personal computer [PC], the mobile phone, or an Internet point, among others) as they already can for email services or social networks. On the other side, 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, as they already do for other inputs such as energy and electricity.[1] The former application will affect our lifestyles, but the latter will have a profound impact on the cost structure of all the industries using hardware and software,[2] and therefore it will have an indirect but crucial impact on business creation and on the macroeconomic performance of countries.

Cloud computing can exert a number of effects on the economy. For instance, it can enable huge cost savings and more efficiency in large areas of the public sector, including hospitals and healthcare (especially for providing information and technology to remote or poorer locations), education (especially for e-learning), and the activities of government agencies that experience periodic peaks in usage. Moreover, substantial positive externalities are expected because of energy savings: the improvement of energy efficiency may contribute to the reduction of total carbon emissions in a substantial way—information and communication technologies (ICT) is responsible for 2 percent of carbon emissions in Europe, of which 1.75 percent is due to the use of ICT products and services, and 0.25 percent to their production. The introduction of cloud computing can provide cost savings in the private sector as well: it can create multilateral network effects among businesses and increase productivity within businesses, and it can promote entry and innovation in all the sectors where ICT costs are relevant and are drastically reduced by the adoption of cloud computing. This last effect can be quite large in terms of consequences for the aggregate economy, and is the focus of the evaluation of the economic impact of cloud computing on the economy conducted in this chapter.

In a recent study, we estimated the economic impact of the diffusion of cloud computing in Europe through incentives to new business creation.[3] Starting from conservative assumptions about the cost-reduction process associated with the spread of cloud computing over five years, we obtained results showing that the diffusion 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 European Union (EU). The driving mechanism behind the positive contribution works through the incentives to create new firms, in particular SMEs. One of the main obstacles to enter new markets is represented by the high up-front costs of entry, often associated with physical and ICT capital spending. Cloud computing allows potential entrants to save on the fixed costs associated with hardware/software adoption and with general ICT investment, and turns part of this capital expenditure into operative expenditure—that is into variable costs. This reduces the constraints on entry and promotes business creation. The importance of such a mechanism is well known at the policy level, especially in Europe, where SMEs play a crucial role in the production structure.[4]

The next section will describe the development of cloud computing in greater detail and comment on the consequences of its diffusion for the economy. The following section will provide the results of our economic investigation on EU countries, and the last section will draw some policy implications and conclusions.

What is cloud computing and what will be its impact?

Cloud computing is an Internet-based technology through which information is stored in servers and provided as an on-demand service to clients, possibly jointly with the traditional form of access. It is probably going to develop along different concepts, focused on the provision of Infrastructure as a Service (IaaS, or renting virtual machines), Platform as a Service (PaaS, on which software applications can run), or Software as a Service (SaaS, or renting the full service, as for email). In preparation for its introduction, many hardware and software companies are investing to create new platforms able to attract customers "on the clouds." Cloud platforms provide services that facilitate the creation of applications in competition with, or as an alternative to, on-premises platforms—the traditional platforms based on an operating system, a group of infrastructure services, and a set of packaged and customized applications. The crucial difference between the two platforms is that, while on-premises platforms are designed to support consumer-scale or enterprise-scale applications, cloud platforms can potentially support multiple users at a wider scale, namely at Internet scale.[5]

The introduction of cloud computing is going to be gradual. Currently we are only in a phase of preparation, with a few pioneers offering services that can be regarded as belonging to cloud computing. These services are often derived from internal solutions (turning private clouds into public ones). Meanwhile, many large high-tech companies are building huge data centers loaded with hundreds of thousands of servers to be made available for customer needs in the near future. The first mover in the field has been Amazon, which has provided access to half a million developers by way of Amazon Web Services (initially developed for internal purposes). Through this cloud computing service, any small firm can start a Web-based business on its computer system, add extra virtual machines when needed, and shut them down when there is no demand. For this reason the utility is called Elastic Cloud Computing (Amazon EC2). Google is also investing huge amounts of funds in data centers. Already today Google provides word processing and spreadsheet applications online, while software and data are stored on the servers. Google App engine allows software developers to write applications that can be run for free on Google's servers. Even Google's search engine or mapping service can offer cloud application services: for instance, when Google Maps was launched, programmers easily found out how to combine the maps with other information to provide new services. Microsoft started later but has made high investments in the creation of new data centers. In January 2010, the leading software company launched a cloud platform called Windows Azure (introduced in a beta version in 2008) that is able to provide a number of new technologies: a Windows-based environment in the cloud to store data in Microsoft data centers and to run applications; an infrastructure for both on-premises and cloud applications (through .NET Services); a cloud-based database (through SQL Data Services, which can be used from different users and different locations); and an application tool to access Live Services, which allows for the synchronization and constant updating of data across systems into a "mesh" (for all the personal devices). Moreover, Windows Azure provides a browser-accessible portal for customers, who can create a hosting account to run applications or a storage account to store data in the cloud. They can be charged through subscriptions, per-use fees, or other methods. Another important player is Salesforce.com with its Force.com products. Also Oracle has introduced a cloud-based version of its database program and is merging with Sun Microsystems to prepare further expansion in the field. Finally, Yahoo! is developing server farms as well.

The battle for the clouds among these companies is going to reshape the ICT market structure, just as PC distribution did in the 1980s. However, the need for creating network effects in the development of a cloud platform will keep the margins low for a while and will maximize the speed of diffusion of cloud computing between firms at the global level. Therefore, in the long run, we expect a rather competitive situation on the supply side of cloud computing.

It is crucial to understand the economic impact of the introduction of this GPT.[6] The diffusion of cloud computing will certainly have a solid and pervasive impact on the global economy. The first and most relevant benefit of cloud computing is associated with

a generalized reduction of the fixed costs of entry and production by shifting fixed capital expenditure in ICT into operative costs; the size of the shift will depend on the size of demand and production. This generalized reduction of fixed costs contributes to reducing the barriers to entry, especially for SMEs—because infrastructure is owned by the provider, it does not need to be purchased for one-time or infrequent intensive computing tasks; this reduction also generates quick scalability and growth. The consequences to the endogenous structure of the markets with largest cost savings will be wide and will include the entry of new SMEs, a reduction of mark ups, and an increase in average and total production.[7]

In spite of the fact that the relative size of information technology (IT) cloud services will probably remain limited for the next few years, they are destined to increase and to have a significant macroeconomic impact, especially in terms of the creation of new SMEs and of employment. In times of global crisis, this could be an important contribution to promoting recovery and fostering growth. Cloud platforms and new data centers are creating a new level of infrastructure that global developers—especially SMEs that are so common in Europe—can exploit. This new infrastructure will open new investment and business opportunities currently blocked by the need for massive up-front investment. The new platforms will enable different business models, including pay-as-you-go subscriptions for computing, storage, and/or IT management functions; these models will in turn allow small firms to scale up or down to meet their demand needs.[8]

The economic impact of the expansion of this new GPT may be quite large, as was the case for the diffusion of telecommunications infrastructures in the 1970s and 1980s or the introduction of the Internet in the 1990s.[9] To evaluate the impact of cloud computing, we adopt a macroeconomic approach that emphasizes the effects of this innovation on the cost structure of the firms investing in ICT and consequently on their incentives to create and expand new business; on the market structure; on the level of competition in their sectors; and ultimately on the induced effects for aggregate production, employment, and other macroeconomic variables.[10] The methodology is based on a dynamic stochastic general equilibrium–calibrated model augmented with endogenous market structures and is in line with recent developments in the macroeconomic literature.[11] This model is perturbed with a realistic structural change to the cost structure in order to study the short- and long-term reactions of the economy.

Our experiment is focused on Europe, taking as a given the rest of the world (which is an additional conservative hypothesis).[12] Therefore, all our data are derived from official EU statistics (Eurostat): these data are mainly the number of firms, which is basically equivalent to the number of SMEs; employment; and GDP. We used data for most of the EU member countries and Norway, for which we had complete data. Moreover, we focused on a few aggregate sectors for which we have detailed and comparable EU statistics: manufacturing, wholesale and retail trade, hotels and restaurants, transport storage and communication, and real estate renting and business activities. These aggregate sectors cover the majority of firms in terms of number (more than 17 million firms) and provide much of the employment for the European countries (more than 113 million workers). They also include all the sectors where the effects emphasized in our analysis are relevant—namely, the manufacturing and service sectors—where the use of ICT capital and the role of entry costs and competition effects are more relevant. We ignored other aggregate private sectors (such as electricity, gas, and water supply) and the public sector, where we believe that these mechanisms are either weaker or absent, and sectors where comparable data were not available (such as part of the financial sector). Country-specific heterogeneity and sectoral differences were considered on the basis of statistics on the labor market and the entry/competitive conditions at the level of EU countries and their aggregate sectors.

A key factor for determining the impact of cloud computing is the size of fixed-cost savings. The business literature emphasizes large savings. Dubey and Wagle conjecture large reductions in the cost of ownership for typical business services, suggesting that this cost could be as much as 30 percent lower in the case of customer relationship management delivered through software as a service.[13] International Data Corporation (IDC) estimates a reduction of about 50 percent.[14] On the other hand, Carr suggests that about half of the capital expenditure of modern firms is ICT related, and therefore a large part of it may be eliminated and (partially) turned into operative expenditures.[15] Although this may be true in a number of sectors and for advanced companies, we prefer to adopt a more conservative assumption for our macroeconomic investigation.

One of the best reviews of the state of ICT in Europe is provided by the e-Business W@tch of the European Commission. The 2006 *e-Business Report* provides a comprehensive survey of ICT adoption and spending, showing that, of the total cost, 5 percent is spent on ICT. Since only part of the total cost corresponds to fixed costs of production, the average ICT budget must be more than 5 percent of the total fixed costs of production. Of course, only part of ICT spending represents fixed costs, and only a part of it will be cut even after the adoption of cloud computing as an alternative to a fully internal solution. For this reason, we decided to adopt a conservative assumption and consider a range of fixed-cost reduction of between 1 and 5 percent in the long run. Even the limited technological change resulting from cloud computing delivers substantial

effects at the macroeconomic level. Needless to say, larger shocks will be associated with wider effects.

The results for EU countries

In this section we report the results of our simulation of the introduction and diffusion of cloud computing in the European economy. We focus on the impact on GDP, business creation, and employment in the short term (after one year) and in the medium term (after five years). Two scenarios are considered: slow adoption corresponds to a sluggish 1 percent reduction in the fixed costs of entry and rapid adoption to a speedy 5 percent reduction in the fixed costs.[16]

The contribution of cloud computing to GDP growth can hardly be differentiated among countries and sectors, so we simply summarize our average estimates for the European countries. The estimate averages range between 0.05 percent growth in the short run under slow adoption and 0.3 percent in the medium run under fast adoption. Given the conservative assumptions on the size of the shock, these are remarkable contributions to GDP growth, and will be directly reflected in employment.

One should take the estimates on the impact on employment with care. Even if we consider country-specific factors related to labor market conditions, our basic simulations emphasize the impact in terms of hours worked. In terms of new jobs, the impact depends on a number of institutional and structural features of the labor markets and their country-specific regulation. Keeping this in mind, we found that the introduction of cloud computing could create, on average, about a million additional jobs in Europe. About two-thirds of this job creation is expected to occur in the six largest countries (the United Kingdom, Germany, France, Poland, Italy, and Spain), but also the other EU countries could enjoy a temporary increase in employment. Of course, this increase will vanish over time because the structural features of the economy lead employment toward its natural level, which is affected only in a small measure by the reduction of fixed costs. However, the short-run impact can be quite strong and, in a period of crisis such as the one forecasted for the forthcoming years, it can contribute to limiting the increase of the unemployment rate in a substantial way. Our estimates of the reduction of the unemployment rate in European countries from the introduction of cloud computing are around 0.5 to 0.6 percent in the short run and 0.2 to 3 percent in the medium run.

Before adding further details, it is worthwhile outlining the mechanism emphasized in our model. The gradual introduction of cloud computing reduces the fixed costs and increases incentives for entry into each sector. This increases current and future competition in each market and tends to reduce mark ups, thus increasing demand and therefore increasing production. The associated increase in labor demand induces an upward pressure on wages that, in turn, induces workers to work more (or new agents to enter the labor force). The current and expected increase in output affects consumption and savings behavior. In the short run, the demand for new business creation requires an increase in savings, which may result in a temporary negative impact on consumption. However, in the medium and long runs, the positive impact of cloud computing on output leads to an increase in consumption toward a higher steady-state level. Of course, a faster adoption exerts a larger impact on business creation and therefore on output and employment as well.

Given this overview of the results in terms of GDP and employment, we now present our results in terms of estimated new business creation. The largest impact is expected, in the medium run under fast adoption, to occur in the aggregate sectors of wholesale and retail trade (156,000 new firms) and of real estate and other business activities (with 144,000 new SMEs). Our empirical exercise shows a strong impact on the creation of new SMEs, of the magnitude of a few hundred thousand in the whole European Union (again, this is in addition to new SMEs created in a normal situation, without the introduction of cloud computing). The effect is permanent and tends to increase over time: the creation of new SMEs will not vanish, but will remain over time, making a permanent impact on the structure of the economy. Moreover, the effect is deeper in countries where the diffusion of SMEs is particularly strong or where ICT adoption has been generally rapid. In absolute terms, cloud computing is estimated to have the largest impact in Italy in terms of new businesses (with 81,000 new SMEs in the medium run under fast adoption), followed by Spain (plus 55,000), France (48,000), Germany (39,000), the United Kingdom (35,000), and Poland (32,000).

We have also examined the impact of cloud computing on employment in each country, distinguishing among aggregate sectors. In absolute terms, the largest impact is expected for the manufacturing sector and also for the sector under the label "hotels and restaurants."[17] According to our estimates, the United Kingdom will exhibit the greatest impact in terms of new workers (with 240,000 new workers in the short run under fast adoption), followed by Germany (160,000), France (100,000), Poland (94,000), Italy (76,000), and Spain (69,000). Overall, the results per country are affected by differences in labor market conditions that tend to influence the ability of the economy to react to a positive change through job creation, and also by differences in the regulatory framework and in the competitive conditions in the goods markets that create the conditions for rapid business creation.

Conclusions

Part of the positive effects of cloud computing will follow from the speed of adoption of the new technology. There are a number of factors that may slow down this adoption, such as a lack of understanding of the cloud by firms, systemic risk, security, privacy and interoperability issues, reliability, jurisdictional complexity, data governance, loss of IT control, and general status quo inertia. For this reason, our investigation suggests that policymakers should promote as rapid an adoption of cloud computing as possible. Concrete interventions include:

- international agreements in favor of unrestricted flow of data across borders (since data centers are located in different countries with different privacy laws, data portability remains a key issue for the diffusion of cloud computing);
- agreements between EU authorities and industry leaders on a minimum set of technological standards and process standards to be respected in the provision of cloud computing services—these agreements would guarantee data security and privacy and promote a healthy diffusion of the new technology;
- expansion of broadband capacity; and
- introduction of fiscal incentives for the adoption of cloud computing and a specific promotion in particularly dynamic sectors (for instance, governments could finance, up to a specified limit, the variable costs of computing for all the domestic and foreign firms that decide to adopt a cloud computing solution).

These policies may be studied in such a way as to optimize the process of adoption of the new technology and to strengthen the propagation of its benefits within the country. The benefits of cloud computing are many, and countries now have the opportunity to jump-start their economies by making policies that will enhance its adoption.

Notes

1 See Dubey and Wagle 2007 and Armbrust et al. 2009 for early reviews of the topic.

2 The positive association between ICT innovations and competition is well known, and policymakers recognize that it may work in both directions: on one side competitive sectors adopt ICT innovations earlier and become more productive; on the other side ICT adoption enhances competition. For instance, the *e-Business W@tch* of the European Commission (2008) notices that "while it seems obvious that increasing levels of competition can push companies to adopt and use ICT, the opposite might well also be the case. In fact, ICT and the usage of the internet have drastically impacted on certain sectors such as banking and reshaped the competitive scenario" (p. 42).

3 Etro 2009a.

4 Again, the *e-Business W@tch* of the European Commission (2008) emphasizes this aspect clearly: "SMEs form significant industry segments in the EU and account for the majority share in EU employment. Thus, they require specific policy attention. While their strength lies in the flexibility with which they can adjust to changing market conditions, their small size makes them less able to face high up-front costs" (p. 53).

5 In the business literature, cloud computing has been seen as a step in the commoditization of IT investments (Carr 2003); as the outcome of an evolution toward a utility business model in which computing capabilities are provided as a service (Rappa 2004); as the core element of the era of Web 2.0, in which Internet is used as a software platform (O'Reilly 2005); or simply as an application of the generativity power of the Internet (Zittrain 2007). See also IDC 2008.

6 For an introduction to innovation and growth theory, see Acemoglu 2009 and Aghion and Howitt 2009.

7 Moreover, cloud computing is going to introduce the possibility of (1) sharing resources (and costs) among a large pool of users, (2) allowing for centralization of infrastructures in areas with lower costs, and (3) allowing for peak-load capacity increases (generating efficiency improvements for systems that are often only 10–20 percent utilized). These features will lead to additional savings in energy and to greater environmental sustainability, whose measure, however, is subject to great uncertainty.

8 This mechanism is going to be crucial in Europe because of the large presence of SMEs and of the higher risk aversion of European entrepreneurs compared with their American counterparts (largely because of differences in the capital and credit markets and in the venture capital market). Reduction of the fixed costs may reduce the risk of failure and promote entry even more.

9 On the diffusion of telecommunications infrastructures, see Röller and Waverman 2001; on the introduction of the Internet, see Varian et al. 2002. These were econometric studies done after the introduction of these technologies took place. We rely on simulations because our analysis occurs before the introduction of the technology; of course, this makes our calculations subject to greater uncertainty.

10 Etro 2009a.

11 See Ghironi and Melitz 2005; Bilbiie et al. 2007, 2008a, b; Etro 2007; Colciago and Etro 2008; Etro and Colciago 2010. See Etro 2009b for a survey.

12 Taking into consideration the gains in the competitiveness of firms in other continents may increase the benefits of this technology and also increase the costs of a slower diffusion in Europe.

13 Dubey and Wagle 2007.

14 IDC 2008.

15 Carr 2003.

16 Further details can be found in Etro 2009a.

17 Overall, the impact of cloud computing on employment is more limited than its impact on business creation for a simple reason. One of the main advantages of cloud computing is an induced change in the market structure of many sectors, with the creation of more firms and an increase in the level of competitiveness; this increase in competitiveness is also associated with a reduction in prices. This change in the market structure, associated with larger efficiency, induces a re-allocation of jobs that does not greatly increase the number of workers. In this case we are talking about a few hundred additional workers (or a corresponding lower number of unemployed) at the European level. Our simulation emphasizes a slow reduction of the net impact on employment in the medium run compared with its impact in the short run. This is normal because the absolute impact on the labor force tends to vanish in the long run.

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CHAPTER 1.10

How Technology Will Drive the Transition to the Low-Carbon Economy: ICT and the Sustainability Imperative

GBS BINDRA, Logica plc

Governments, businesses, and societies are all scrambling for a more efficient and greener way to operate and grow. Supporting this pressing need is a growing consumer population and a proliferation of myriad innovative services. Together these trends promise to usher in unprecedented business models and changes to social behavior.

It is not easy to get society to behave green unless there is an underlying support system from both businesses and governments providing a personal impetus for this change. Information and communication technologies (ICT) lends itself easily to new models of profitable services so businesses will find it lucrative to innovate in this space. The creative use of technology, coupled with innovative business models and progressive policymaking, will play a critical role in delivering the carbon dioxide (CO_2) emissions cuts needed to meet global climate change targets. ICT companies can leverage their abilities in smart information management and create new services that positively influence human behavior to combat the climate challenge, thus benefiting company, society, and government in a triple win-win-win scenario.

This chapter will explore the impact of technology, innovative business models, and policymaking on environmental sustainability.

The economic opportunity triangle: Change in life, work, and play

We are on the threshold of a huge opportunity that will unfold over the next couple of decades. Spoken in the midst of the current challenging times, a statement like that may sound preposterous, but three distinct trends have emerged over the past few years, and we must not let the recession cloud their visibility.

The first trend is the likely addition of a huge number of consumers to the global marketplace. There are various estimates about the numbers; the top end of the estimates is upward of a billion over the next decade. These consumers will come mostly from the developing countries. As education, infrastructure, and healthcare progress in these countries, a vast number of people will take advantage of these improvements for better living standards. All of them will need shelter, food, transportation, communication, education, healthcare, entertainment, appliances, and a lot more. The infrastructure in their countries should also be developed to support the aspirations of these people. This trend provides a huge opportunity for companies in various industries, particularly in the ICT sector.

If we look at the composition of various segments of global output, we see that the services sector contributes significantly to the global economy. This is where the second trend manifests itself. The continuous addition of new consumers to the market has prompted the creation of more and new services and the modification of old services to cater to their needs and preferences. The

whole spectrum of sectors, ranging from insurance and retail to transportation and communication, has to constantly innovate and fine-tune its services. An example is the way in which mobile telephony services have grown exponentially over the past decade. Modern ICT is making computers, as we once knew them, disappear into objects. People, systems, and objects are beginning to collaborate in unforeseen ways as mobile connectivity becomes more and more ubiquitous. There are more mobile phones in the world today than there are cars, and the possibilities of services that can be delivered through a mobile phone have increased many fold. Industry sectors such as airlines, logistics, banking, insurance, and news agencies, to name only a few, have begun delivering a wide gamut of value-added services through mobile phones.

Collaboration is one of the biggest pillars of innovation in recent times. ICT makes collaboration possible by breaking down physical borders. It connects people, machines, economies, organizations, and governments in innovative ways. This trend is termed *pervasive collaboration*. Since this entire set of collaborative connections is underpinned by ICT, companies are presented with huge business opportunities for services innovation.

For as long as we can look back in history, mankind has derived well-being from burning things. Benefits and advances such warmth, light, and mobility have all been achieved through fire and burning. For the last 150 years, carbon has been fundamental to our economic prosperity and has played a huge role in our development. If the growth and development mentioned above continue with the same speed as they have over the past century, it will be disastrous for the environment. Resources such as coal and oil have powered the engines of growth in various industries over the past few decades without a thought to long-term sustainability. Cars were designed to deliver more power by guzzling more gasoline, power plants were designed without considering polluting factors, and factories were thrown up assuming an infinite availability and supply of raw materials. Many such lapses occurred in the course of development. This is where the third trend comes in. With the rise in awareness of the damage we are causing to the environment and to society at large, the focus on designing and consuming products of a sustainable nature is gaining acceptance. More than ever, people are willing to change their lifestyles if it contributes to a better world. In order to encourage this, the benefits of adopting sustainable, green products and services should reach the individuals that embrace them. In other words, it should be cheaper to be green than not to be. Measures could range from cheaper fuel prices or road taxes for "green drivers" to pay-as-you-drive types of insurance and carbon labeling of products and services that enable an individual to choose sustainability. Clearly, there is a need for newer business models within traditional industry sectors that cater to these newer needs. It is evident that these will be technology-intensive and that ICT companies will play a major role in delivering these solutions.

Each of the three trends above presents a huge opportunity in itself. However, when combined, the potential is immense and promises to forever change the way we live, work, and play. Each of these trends represents one leg of the economic opportunity triangle depicted in Figure 1. The three sides of the triangle—growth in the marketplace, pervasive collaboration, and transformation of the economy into a low-carbon/resource-efficient economy—together present the most significant economic opportunity of the next decade. This opportunity is supported and driven by both newer ways of doing business and people changing their behaviors. Over the next five years, green service offerings by the ICT industry are estimated to be worth US$1.2 trillion, according to a study by Insight Research Corp.[1]

Ushering in green behavior in society

Humans want to participate, to play a role, in what is going on around them. But they do not want to feel incompetent and helpless when they participate in society's good. There is a need for a good business model that understands and facilitates participatory problem solving, thereby easily invoking the desired behaviors and naturally motivating enlisted people to be a part of the solution. To successfully change behavior, the model should track and report on results—both individual and collective—in a concerted effort to create a sense of accomplishment; reporting should never be allowed to be perceived as the publication of a social defaulters list. Tracking (for example, the net reduction in greenhouse gas emissions from every car) and celebrating success should motivate others to participate actively rather than remain on the sidelines. A deep understanding of the "why" of human behavior is required before designing the "how" in all successful social changes.

Today, a facilitated, rapid transition toward a low-carbon economy is imperative if nations are to collectively address the challenges presented by climate change. For speedy mitigation of some of the most damaging impacts of climate change, a hitherto-unprecedented scale and pace of change is required. On this note, any model that should be seriously considered has to strongly align the needs of government and business while supporting the good of the taxpayers. Supportive regulatory and government policies should be at the core of business activity and operations, and these should help reward and drive social behaviors that work toward the desired de-carbonization effects.

Governments develop policies, legislation enshrines these policies in law, and strategies direct the body of policies and provide a framework for policy

Figure 1: The economic opportunity triangle

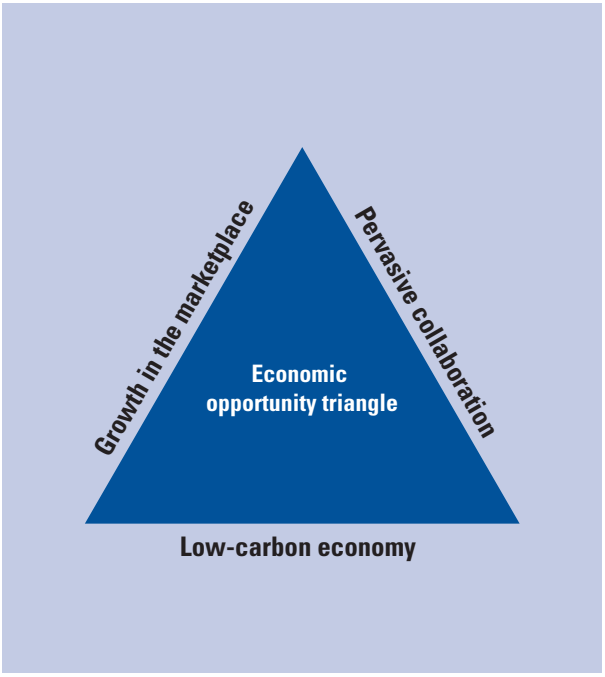


Figure 2: Collaborative ecosystem innovation

implementation. Individual policies themselves are rather meaningless when they are not based on an underlying national agenda. A strategic framework is necessary to help explain policy decisions and choices, and to give policies personality and direction. Many countries in the Asia-Pacific region have developed ambitious ICT strategies. In these countries, there are regulations and supervision mechanisms to ensure compliance. Policy statements and laws in themselves may not be sufficient to bring about the change that is sometimes necessary to transform business practices for the greatest possible diffusion of ICT.

Governmental vision and strategy for ICT should focus on people and not technology. For this to happen, it is important to develop both the ICT vision and the strategy with people in mind, and also to incorporate their input. National ICT policies and agendas can choose to be sector driven or to focus on broader issues and objectives, on benefits for society and the economy as a whole. Many ICT strategies in the past have adopted a sectoral approach to implementation. Although there are many types of strategies that various countries have adopted, an integrated approach to ICT development and deployment is most likely to yield success in human, social, and economic development over the long term.

Of special interest to ICT policy formulation are trade rules affecting telecommunications regulation and licensing. These rules are especially important in opening up the telecommunications sector to competition and foreign investment. Some consider the break-up of monopolies a prerequisite of increasing information flows and of encouraging the diffusion of ICT. Until the World Trade Organization agreements, the telecommunication markets in most countries had been closed to competition and had been operated by de facto monopolies—the national telecommunications operators. This is still the case in many of the non-signatory countries, and it is changing slowly in some of the signatory countries as well. For signatories, the end result will be similar in all cases: more open national and international markets for telecommunications goods and services.

Many countries have developed visions of the future where ICT is seen as an engine of transformation toward a desired state. Invariably, this future state is e-enabled. Some of the best known include Malaysia's Vision 2020, which foresees Malaysia becoming a fully developed country by 2020,[2] and e-Japan, which is a vision of a society "where everyone can actively utilise information technology (IT) and fully enjoy its benefits."[3] In Botswana, one tenet of Vision 2016, which proposes "prosperity for all," calls for Botswana to become an educated and informed society. Finally, the national vision for Canada is based on rolling out infrastructure to "make the information and knowledge infrastructure accessible to all Canadians, making Canada the most connected nation in the world."[4]

There is thus a very sensitive collaborative ecosystem innovation (Figure 2) that we must address if we are to successfully introduce working models that take

advantage of the economic opportunity triangle. Five principles ensure win-win-win among the public-private-government aspects of this collaborative ecosystem:

1. Reward compliance rather than penalize non-compliance.
2. Create business models that pass on incentives to participating citizens.
3. Make it financially attractive to be compliant.
4. Enable private good to lead up to and equate with public good.
5. Absolutely ensure that it costs less to be green than not to be.

As an example, let us consider the transport sector, which remains a major source of emissions. Low-carbon technologies already exist that can significantly reduce global emissions, but the enabling of frameworks and specific policy responses are needed to support the rapid deployment of those technologies, in both developed and developing countries. The government plays an important role in encouraging pro-green changes by levying differential duty to encourage the manufacture and take-up of cleaner fuels.

In this context, a favorable tariff treatment for unleaded gas since 1987 has significantly reduced the use of leaded gas, a major source of lead in the atmosphere. The success of this policy has helped facilitate the phasing out of leaded gas from January 1, 2000, in line with European Union (EU) directives. As a result of these measures, lead emissions from traffic have been cut to almost zero, with older cars—which are unable to use unleaded gas—switching to lead-replacement gas. Such indirect fuel taxes reduce CO_2 emissions in two ways: they have a direct impact on the number of miles driven and, indirectly, they encourage more fuel-efficient or alternate energy source–based vehicles.

It is by offering such incentives that we can advance environmental principles ensuring that cheaper, cleaner fuel is available in every garage, provide better deals for drivers, and facilitate cleaner air across the world. It is typical to ask motorists to bear the entire cost of driving—not only wear and tear and congestion on the roads, but the wider environmental costs. Any solution that helps cut fuel consumption or reduces emissions by encouraging certain behavior patterns or preferential changes ought to be given careful consideration.

We next introduce some working examples of such new-age models.

Intelligent emissions monitoring

Rising air pollution levels is a concern to governments and environmentalists across the world. Vehicular exhaust gases are the single largest contributors to air pollution. Greenhouse gases released into the atmosphere because of vehicular emissions caused by irresponsible driving behavior have an important impact on global warming and extreme weather conditions.

Transport is the fastest growing source of greenhouse gases (Figure 3). On the one hand, transport is vital for industrial development and the economy; on the other, it conflicts with environmental objectives that clamor for attention. Over the last 50 years, the industrial economy has replaced the agricultural economy and, as a consequence, cities all over the globe are feeling the effects of globalization and climate change.

There is a growing need for a solution to this universal problem. ICT can help address this. Creative use of technology coupled with innovation in business models and progressive policymaking will play a critical role in delivering CO_2 emissions cuts needed to meet global climate change targets.

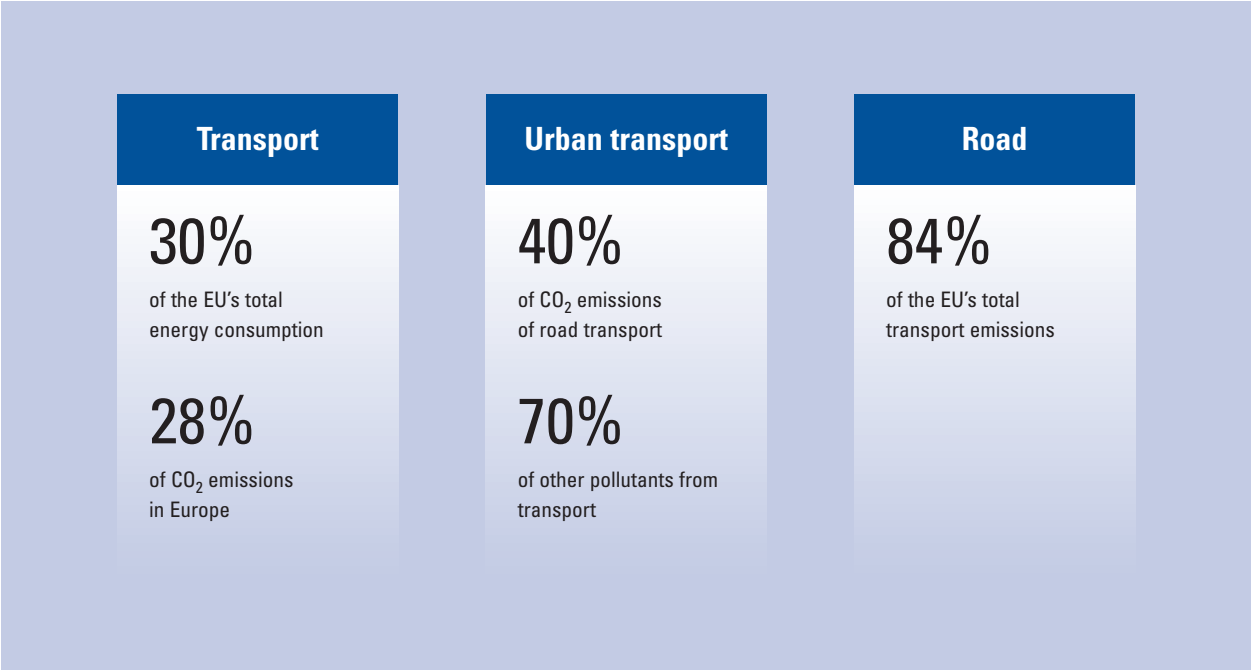
Personal mobility contributes to 51 percent of the carbon footprint for a typical household in the Western world.[5] Going by this figure, there is no way emerging economies such as India can replicate that model as-is; with an emerging work force of half a billion people, this would be a disaster. New-wave personal mobility must focus on creating a much more sustainable transportation system. Displaying the right behavior has a major role to play in the new scheme of things.

The big question is: on a social level, how does one promote green behavior in emerging economies that are unwilling to pay more for going green? Here, a creative business model will be one in which private good drives public good, a model that makes it financially attractive for individual citizens to be green. Models are needed that reward compliance rather than penalize noncompliance.

Modern technology allows real-time monitoring of vehicular emissions. Wireless emission data from cars can thereafter be used to offer differential fuel pricing to the vehicle driver.[6]

In this model, the fuel station offers a fuel price tailored to every individual vehicle and driving behavior. If the driving behavior is green, the fuel is priced lower; conversely, if the driving behavior is poor, the fuel price goes up for the next tank fill for that driver. This model enables drivers to improve their driving patterns and thereby empowers them to go green. By capturing real-time vehicle emissions values, it facilitates usage of these data for a number of purposes that change human behavior. The technology also offers audible feedback on the driving behavior of the driver in real time to allow him to alter his driving style to make the most efficient use of fuel. It measures emissions under actual driving conditions via a unit of measure called the *green index,* thus raising the driver's awareness through feedback and reward/penalty schemes for fuel prices using accurate and credible data.

Figure 3: Sustainable mobility



Source: Logica, 2009.

A sustainability offering modeled around these principles provides a high level of immediate driver orientation on how driving behavior impacts emissions and fuel consumption.

There are two compelling reasons why such ICT-driven green models are proving successful:

- According to Logica's research, feedback on their driving patterns has helped drivers become aware of their driving behaviors; an improved driving behavior was noted in 95 percent of the cases.

- Some overall fuel savings and associated emissions of up to 15 percent could be recorded with the adoption of this sustainability model. Driver profiling and training also contribute to this fuel savings. Decrease in fuel consumption is observed as a result of decrease in excessive speeding, braking, and idling times. Audible notifications alert the driver in real time and help to modify driving behavior, which in turn helps to reduce fuel consumption.

There is another dimension to this model that helps drive social acceptance. Traditionally, the car has been positioned as a social statement of "who you are." It is time to introduce a new paradigm by positioning not the car but its value on a green index as a social statement.

Readings from the green index would appear on various social media, and your reading would become the new statement of "who you are." One would have to visualize people proudly posting their green rating on their social profiles (such as Facebook, MySpace, Twitter). People would compare their ratings with those of others and of friends, enabling the entire network to take notice.

ICT also drives progressive policymaking by government and regulatory bodies. It acts as a catalyst for policy changes toward a greener environment, enabling governments to implement policies and programs that reward initiatives toward reduced vehicle emissions. ICT, hence, exerts its influence on regulatory changes that will continue to have a powerful impact on driver behavior.

Over a period of time, the differential fuel pricing type models hold the potential to tip social behavior in the direction of greener options in personal mobility. ICT companies can work with governments, regulatory bodies, and oil retail companies as well as individual citizens to create an ecosystem where technology coupled with progressive policymaking drives the overall societal good. Any new business model that aims to successfully change behavior in a significant way must enlighten, inform, and empower users. This example does just that and is a forerunner of many more such ICT-based green aids to come.

Other than eco-driving and support, the energy efficiency in the transport and logistics sector can be improved by deploying ICT systems such as:

- traffic management and control,
- navigation and guidance,
- access and demand management,
- freight logistics and fleet management, and
- higher penetration of in-vehicle safety devices to avoid accidents and related congestion.

Pay-as-you-drive insurance

If one adds insurance companies and an insurance regulator to the model of pervasive collaboration platform cited above, one can create another business model called *pay-as-you-drive (PAYD) insurance.*

Vehicle insurance is generally considered a fixed cost, irrespective of the amount of vehicle usage. Usage-based insurance makes vehicle insurance more actuarially accurate (the premiums better reflect the claim costs of each vehicle) and gives motorists an opportunity to save money when they reduce their mileage. It can help achieve several public policy objectives, including road safety, consumer savings and choice, congestion reduction, and environmental protection.

In the near future, ICT will help enable every vehicle to have "intelligence" so that they act as connected nodes in the dynamic traffic network. Vehicles will be able to constantly exchange contextual information such as traffic status, infrastructure usage, and sustainability parameters to avail various services. At the heart of this vision is an integrated plug-and-play device that will get installed in every vehicle. Several unified services will be built around this smart device, and the unified service offering could include PAYD insurance.

PAYD service models calculate premium balances in real time based on distance, time, and speed of the vehicle, using an on-board device (Figure 4). The on-board device uses existing global system for mobile communication technology to transmit the data to an application at the back-office server. Motorists are notified of periodic updates on mileage using text messages. The service provides motorists with options to top up their insurance premium even as they travel, using text messages and the Internet. PAYD service models allow for the customization of insurance premiums using customer-specific rate plans. The system incorporates well-defined open interfaces to facilitate quick integration with existing insurance applications.

So how does all this help in incentivizing pro-green changes to social behavior? Insurance companies have always tried to differentiate and reward "safe" drivers, giving those who qualify lower premiums and/or a no-claims bonus. However, conventional differentiation is a reflection of past history rather than present patterns of behavior. What if, instead of paying for your insurance in the beginning of the year, you could pay it every time you drive? This in itself is a great incentive to drive less and thereby reduce your insurance cost. For insurance companies it reduces risk and for society it reduces driving; people become more aware of the fact that, as with fuel, the amount they pay for insurance depends on how much they use their vehicle, and that they can control such usage. Moreover, PAYD provides a much more immediate feedback loop to the driver: by changing the cost of insurance dynamically with a change of risk, drivers have a stronger incentive to adopt safer practices. This is a huge catalyst of behavioral change. It is estimated that if all motorists were to switch to PAYD insurance service models, the world's total oil consumption would decrease by 12 percent per car. This in turn, would dramatically reduce CO_2 emissions.[7]

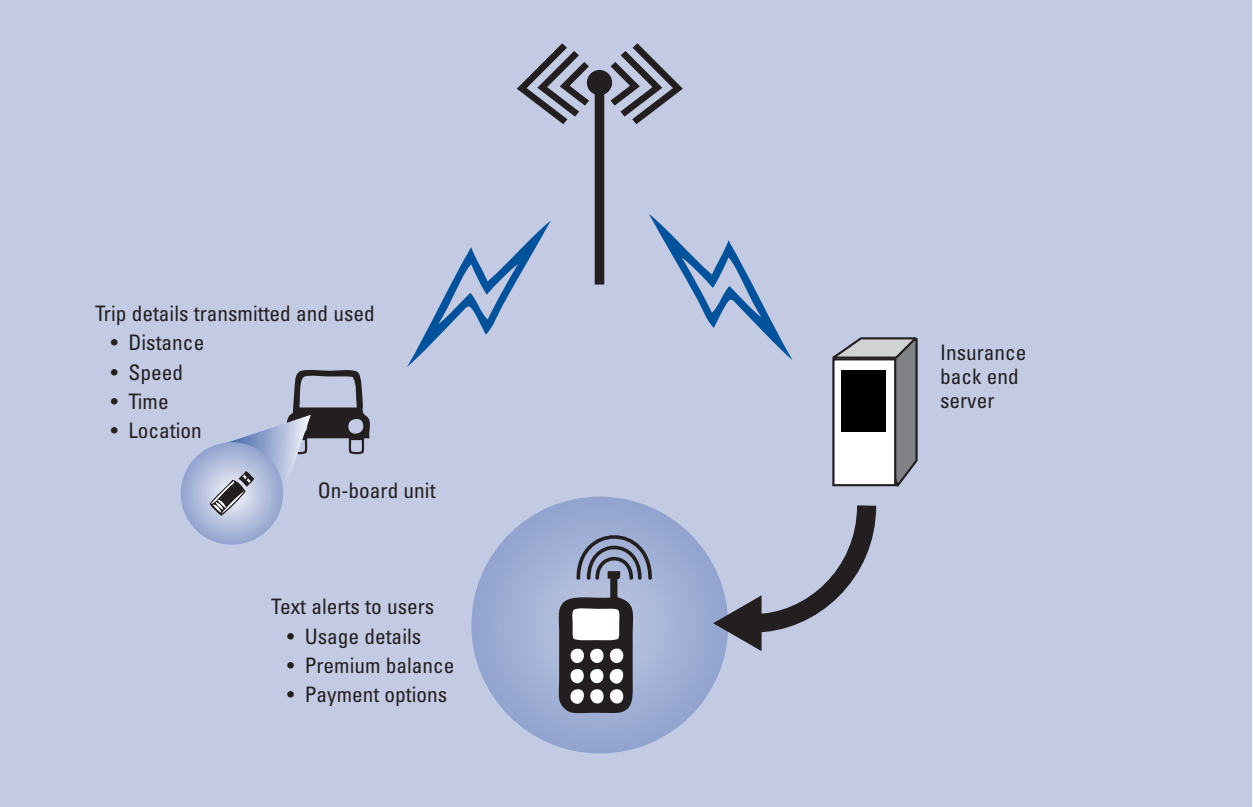
A recent study in the United States estimated that a PAYD-based insurance model would reduce driving nationally by 8 percent.[8] Such a reduction in driving would reduce CO_2 emissions and oil consumption by an estimated 2 percent and 4 percent, respectively. Only increasing the gasoline tax by US$1 per gallon could achieve the same reduction in driving. However, unlike an increase in the fuel tax, PAYD would save most drivers money regardless of where they live. Almost two-thirds of households would pay less for auto insurance, with each of those households saving an average of US$270 per car. In short, PAYD represents a win-win policy. What is good for drivers, in this case, is also good for society.

Travel Together

There are millions of us who engage in solitary travel to and from work, cumulatively driving billions of miles each year, spending heavily on gas, and pumping tons of emissions into the atmosphere. According to urban travel standards (single-passenger statistics), a small car emits around 0.59 pounds of CO_2 per mile, a medium car emits around 1.10 pounds of CO_2 per mile, and an SUV/4 wheel drive vehicle emits around 1.57 pounds of CO_2 per mile. This, in itself, is a huge contributor to the carbon footprint of a society that supports such usage.[9]

Formal carpooling is thought to have emerged in mid 1970s, probably because of the oil crisis at that time. Carpooling not only supports sustainability by reducing fuel consumption, vehicular emissions, and congestion, but it also directly benefits users by reducing the stress and cost of travel. However, for carpooling to work, each member must own a car that can be shared on a rotational basis, and members of the carpool should live or work close to each other. Some companies have been experimenting with a new socio-business model called *Travel Together,* offering a different social-cum-economic stimulus that enables carpooling to work even when members do not own a car or do not live or work close to each other.

Figure 4: Insurance premiums and vehicle usage



Source: Logica, 2008a.

Travel Together brings together individuals who drive their car to work and would like to share with those who do not drive but would like to share part or the entire trip. It enables the users of the service to share the cost of the ride based on the distance traveled by each unique user, potentially turning every private vehicle into a shared node in the transport network.

Travel Together promises to change the dynamics of shared transport and transform people's commuting experience. It does this by fusing a social networking element into the usual car pooling system. Any person who wishes to travel together registers first on a site by giving his/her personal credentials, which are validated and stored in the system. The owner of a group can publish a route by providing details such as start point, end point, via points, timing, vehicle details, and seat availability, among others. The routes can be ad-hoc or planned as per a published calendar. Alternatively, registered users can search published routes and if the route details match their requirements, they can contact the route owner, citing their interest in joining that group and indicating their preferred pick-up and drop points on that route.

Once a route owner accepts a user's request, the user is notified that he/she is now a member of the carpool for that route. At the time of registration, each user's account is linked with his/her debit or credit card. The person who provides the service will get points credited to his/her account based on the distance for which the service was offered to each user. These points are debited from the accounts of the individuals who availed the service and settled at regular intervals; fees paid by non-car users are netted off by "money received" by the car/group owner of that route. This model encourages those who prefer to drive to volunteer their vehicles for carpooling, as they can recover part of the travel cost by providing a mutually beneficial transportation service to others who prefer not to drive. It also throws in exciting social networking possibilities, with Web 2.0 features supporting the online application. One can blog on the site or choose one's co-travelers based on their social profile as well as local proximity. Collaborative play thus allows for the full use of seats, saves on fuel, and reduces the emission contribution per person.

Smart buildings

More than 40 percent of the energy consumption in Europe is for heating, cooling, and lighting operations within buildings.[10] Moreover, buildings are the largest

source of CO_2 emissions in the European Union. The majority of energy consumption is caused by space and water heating within households, although the share of consumption of lighting and appliances is rising over time (this is similar to the situation within the services sector, although the share of lighting and appliance consumption is higher there than in households because of a greater utilization of ICT equipment).

Worldwide energy consumption for buildings will grow by 45 percent by 2025, when buildings will account for about 40 percent of energy demand, with 33 percent of that demand in commercial buildings and 67 percent in residential buildings.[11]

Five areas in which energy efficiency can potentially be improved through the use of ICT have been identified, as below:

- **Design and simulation tools.** When new buildings are built, designers can apply ICT tools to plan buildings that minimize energy consumption. For example, consider simulating and optimizing envelope measures and passive solar heating techniques. By achieving significant improvements in buildings' energy performance via monitors and sensors, one could more accurately measure usage, system status, and equipment conditions. It is also possible to obtain full price information, dynamic tariff, and demand response, thereby allowing more energy-efficient customer choices, value-added services, and better-integrated demand-side automation.

- **Interoperability standards.** Most building control systems today are based on localized microprocessors with hardwired sensors controlling single functions. It is not unusual to have separate controllers for heating, cooling, air conditioning, and so on. There are significant opportunities for efficiency but most are lost because of a lack of integration and compatibility. The most appropriate solution would be to use a single control system that governs all heating, ventilation, and air conditioning (HVAC); lighting and other electrical applications; and related subsystems installed in a building. The main barrier to this logical solution is the fact that the different subsystems are manufactured and often installed and even operated by different companies.

- **Building automation.** In the area of home automation, which is primarily perceived as improving the quality of life (for example, more comfortable, safer homes), ICT has the potential to contribute to energy efficiency through the use of improved control and management systems based on smart appliances and communication networks.

- **Smart metering.** This technology enables more accurate measurement of consumption via the use of advanced meters that are connected to a central unit through a communications network, improving data collection for billing purposes. Smart metering provides information on consumption patterns, thus contributing to more sustainable consumption and energy savings.

- **User-awareness tools.** Providing intuitive feedback to users on real-time energy consumption has significant potential to change behavior on energy-intensive systems usage. Various studies have shown that energy consumption could be reduced by 5–15 percent by implementing this measure.[12]

Smart electricity grids

Energy generation and distribution use one-third of all primary energy. Electricity generation could be made more efficient by 40 percent and its transport and distribution by 10 percent. ICT could not only make the management of power grids more efficient but also facilitate the integration of renewable energy sources.[13]

Heating, cooling, and lighting buildings account for more than 40 percent of European energy consumption. The introduction of real-time updates on their energy consumption stimulates consumer behavioral changes. In Finland, this smart metering encouraged consumers to reduce energy consumption by 7 percent. According to the French regulator Commission de Régulation de l'Energie (CRE), the implementation of smart metering would decrease residential consumption by up to 5 percent and decrease CO_2 emissions by as much as 5 percent.[14]

The integration of ICT tools for the management of distribution and the use of smart meters at the consumer location, with telecommunication networks forming an intelligent network capable of supporting distributed generation plants, is generally known as *active distribution networks* and *advanced metering infrastructure within smart grids.* ICT enablement of the smart grid, via such things as two-way communication between grid operators and customers; pervasive control systems through substation, distribution, and feeder automation; and decision-support systems that increase predictive reliability should be supported.

Green consumerism: The next market mantra

A growing number of consumers are beginning to realize the environmental and social significance of their purchase decisions as related to the variety of brands available today. This trend can be an opportunity for placing consumers in a position to demand green products from their manufacturers and even retailers. To help individuals make appropriate, informed choices, manufacturers and retailers need to have a deep understanding of consumers' lives and consumption patterns so they can determine the best engagement model

aligning attitudinal and behavioral changes to a greener world.

Everything we produce, buy, and use has a carbon footprint. The carbon footprint of a product or service is the total CO_2 and other greenhouse gases emitted during its entire life, from production to use and disposal. Until now, everything we consume has been taken for granted in terms of renewability and sustainability: no business, government, or society cared to ask what is more damaging to the air we breathe—airlifting oranges from halfway across the world or growing them locally in greenhouses. The global call to action on climate change has put pressure on companies to measure the volume of CO_2 and other greenhouse gases for which they are responsible. Such footprints are typically communicated by using *carbon labels.*

Carbon labels show a product's carbon footprint from source to store and further, until its disposal. They convey this information to consumers as a simple numerical value; by using this value, they can then make an informed responsible purchase choice at the point of sale.

Carbon labeling can potentially lead to changes in consumption, market, and business behavior by:

- informing consumers of the carbon contribution of the product or service they are planning to purchase, which can potentially influence purchasing decisions;
- engaging consumers to educate themselves about products high in carbon content, which can potentially influence changes in lifestyles;
- enabling manufacturers to gain differential posi-tioning (and even branding) based on green credentials;
- enabling/encouraging manufacturers to improve their efficiency and influence the supply chain to move toward cleaner methods and means of manufacturing; and
- providing retailers with new marketing and business models to engage with consumers based on carbon thresholds and green shopping habits.

Carbon labeling thus holds tremendous potential to lead to positive consumer behavior changes and make the entire supply chain aware of the impact of various component steps on climate change. This is the case provided that the challenges of achieving international consensus, objectives, and processes and standards on accessible, auditable carbon estimation and labeling are overcome.

ICT can help in measuring and tracking the carbon label for each consumable. However, what we have today are static labels. Static CO_2 labels do not capture dynamic parameters that influence individual products: transportation, refrigeration, and heating are some prime examples. What if one had a way to see the update dynamic carbon label of a product one wishes to purchase on one's mobile handset?

Figure 5 shows how near field communication (NFC) technology could be leveraged to display dynamic carbon labels of prospective purchases on consumers' mobile phones. This provides consumers with real-time carbon information that takes into account the dynamic nature of carbon emissions and the potential difference in footprints between instances of the same product from different producers or even different batches from the same producer. This leads to behavioral changes in consumer patterns: people check not just the nutritional information on a loaf of bread but also its carbon label before deciding on the purchase.

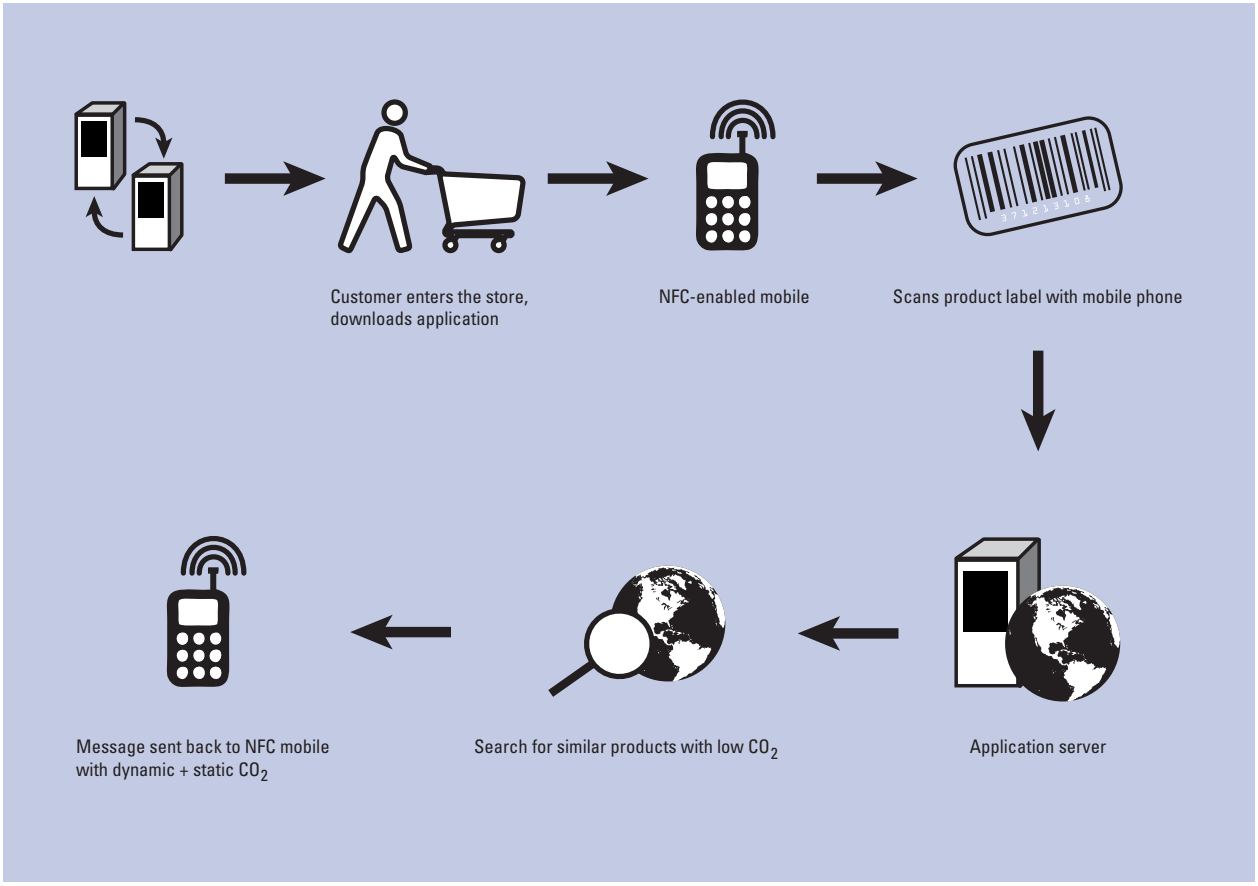
From a business perspective, competing in the low-carbon economy requires the right tools to brand right in order to take advantage of such opportunities; ICT helps organizations with the right green capabilities and skills to differentiate themselves from competitors who are "less green." Again, government policies should be framed in such a way as to reward producers with a smaller carbon footprint. This, in turn, translates into buying fewer carbon credits to offset any negative balance and is, hence, cheaper (besides being healthier) in the longer run. For reducing emissions, carbon labeling on its own would not be sufficient, but it is a tool that can help create increased awareness among consumers and demand for green products and services from the market.

Conclusions

ICT is a powerful enabler of green behavior through new business models aimed at reducing emissions in almost any sector, notably in smart buildings, smart grids, reduced travel, improved energy efficiency, and so on. ICT can do this primarily by combining new business (services) opportunities that effectively help abate CO_2 emissions from traditional arrangements to the tremendous potential for growth offered by an exploding marketplace. This is the economic opportunity triangle. The best of such working models secures a win-win-win ecosystem among business-society-government.

ICT-based travel-optimizing solutions can help reduce or substitute the travel requirements (both business and personal) of people and goods. A second area where ICT has been extensively used for reducing CO_2 emissions caused by transport is in the use of green intelligent transport system (ITS) solutions, the three main elements of which are the vehicle, the infrastructure, and the driver. ITS can enlighten, inform, and support behavioral change for the key players in green

Figure 5: Empowering consumers to choose low-carbon products



Source: Logica, 2008b.

ITS models. A third way in which ICT can assist other powerful sectors of the economy in reducing greenhouse gas emissions is through allowing consumers to make carbon label–based choices at the point of sale itself.

We have touched on only some examples in this chapter. There are innumerable other smart green models being attempted in the world today: among them are variable congestion, parking, and road-usage fees based on how environmentally friendly the vehicle being driven is; smart parking and smart charging solutions that guide the driver to the nearest available parking space and charging point, thereby reducing the extra cruising around (and pollution) required to find a place to park. All these examples we now see breaking in our midst are just the tip of the opportunity iceberg where ICT can induce and catalyze pro-green behavioral changes through innovative, smart business models.

Notes

1 Insight Research Corporation 2008.

2 Mohamad 2008.

3 Prime Minister of Japan, e-Japan Strategy 2001.

4 Industry Canada 1998.

5 See U.S. Department of Energy 2007.

6 See U.S. Department of Energy 2007.

7 Logica's study and inference are based on following sources:

- http://www.brookings.edu/papers/2008/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf
- http://www.dft.gov.uk/pgr/statistics/datatablespublications/intcomparisons/
- http://www.worldometers.info/cars/

8 Bordoff and Noel 2008.

9 Sightline Institute 2007.

10 eu.bac 2008.

11 European Commission 2009.

12 European Commission 2008.

13 European Commission 2009.

14 European Commission 2009.

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Part 2

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

CHAPTER 2.1

Promoting Information Societies in Complex Environments: An In-Depth Look at Spain's Plan Avanza

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Worldwide, countries of all sizes and development levels are striving to become competitive knowledge economies and build inclusive information societies. In this context, the intensive adoption of information and communication technologies (ICT) as the optimal base for sustainable social welfare and economic growth in all economic sectors and social activities is becoming a top priority in every public policy and corporate agenda. To a large extent, this trend has been seconded and accelerated by the recent crisis, as a large array of traditional industrial and natural resource–intensive sectors have had to face shrinking demand and margins.

Among the richer countries of Western Europe, Spain is a case in point. On one hand, the country has known one of the most spectacular and sustained growth rates of the last 30 years. On the other hand, it has also been one of the countries hardest hit by the recent crisis, with unemployment rates surging from 12.8 percent in October 2007 to 19.3 percent in October 2009.[1] The specific political and administrative context of Spain—where almost everything from taxes to education is subject to complex sharing mechanisms between central and local governments—as well as the emphasis the country has put on developing its information infrastructure make it an even more interesting case as well as a source of expertise and lessons to illustrate the challenges and possible rewards of designing and promoting information society strategies.

The present chapter includes four sections. In the first, an attempt will be made to better understand the context in which Spain's information society vision was born and how, as a result, Plan Avanza was designed and launched. The second section will focus on identifying the main results generated by this approach, while the last two sections will address the remaining challenges to be faced by Spain's information society strategy and the lessons that other countries could use from its experience.

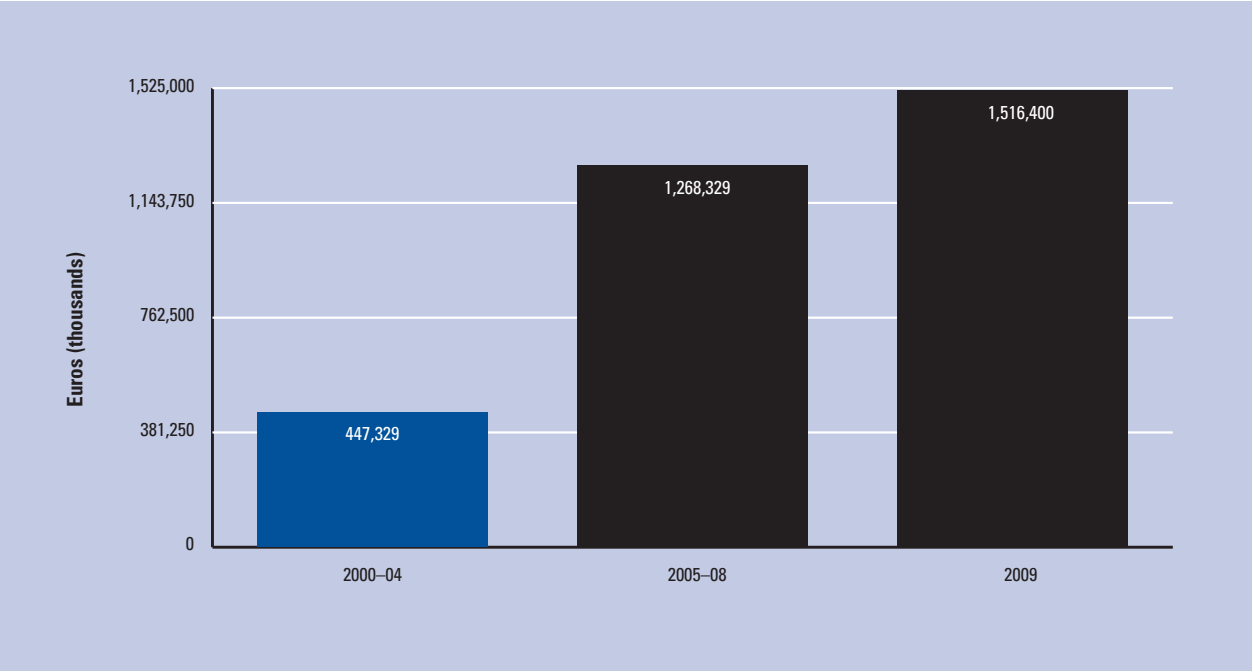
The past is the prologue: Plan Avanza's design and launch

In Spain, the traditional growth model has relied mainly on economic sectors that, though producing positive results in the short term, were neither intensive in ICT nor sustainable in the long run.

In this context, the Spanish government designed and started Plan Avanza (literally, "Move Forward" in Spanish) in late 2005. Avanza is aimed at the full, effective development of the information society in the country, thus ensuring the convergence of social and economic growth across Spanish regions with European levels.

The authors wish to thank David Gago Saldaña (consultant and advisor, Spain's State Secretariat for Telecommunications and the Information Society) for his significant input and background research for this chapter.

Figure 1: Average annual budget devoted to information society (direct financing)



Source: SETSI.

A complex background

Spain's efforts to build a sustainable information society have been marked by a unique combination of three characteristics:

- These efforts were led by a vision and an ambition formulated at the highest levels of the country's central government.
- They were formulated in the context of (and firmly aligned with) Europe's Lisbon Strategy and other national policies.
- They were based on a strong philosophy and practice of cooperation with local Spanish authorities (mainly Autonomous Communities and Local Authorities).[2]

It is against this complex background that Spain's information society strategy emerged under the ambitious banner of Plan Avanza. The Plan emerged from the need to build a "convergence plan aimed at catching up with European levels and promote information society across the different regions."[3] This aim was expressed as early as 2004 by the Spanish government, which, at a more general level, also stressed the crucial role of ICT both in the economy and in society. In this way, Plan Avanza was the programmatic expression of the government's commitment to the promotion and use of ICT in Spain. It was framed in a strategic governmental commitment started in 2004 and intended to redefine the Spanish productive base, on which ICT was bound to play a pivotal role.

Spain's authorities clearly understood that such a demanding plan could succeed only with the involvement and commitment of the whole Spanish society. For this reason, they were determined to build an inclusive plan able to cope with different needs and sensitivities of the private sector, civil society, and the public administration.

Within this framework, regions and local administrations played significant roles, as warranted by the highly decentralized organization of the country. In fact, the central Spanish government, all 19 regional governments, local governments, private agents and associations from the ICT sector, political parties, and citizens were involved. A large array of working groups was created to build a strategic diagnosis of the initial situation and suggest objectives and measures for shaping the Plan. These recommendations were endorsed unanimously by every group, leading to the elaboration of the main lines of the Plan.

Plan Avanza was one of the key pillars of the Programa Ingenio 2010, the strategy that the government put in motion to foster research, development, and

innovation (RDI) in 2005. The rationale behind this program was that Spain's position was severely backward compared with that of Europe in RDI.[4] In fact, according to 2005 data, Spain's ratio of R&D to GDP was 1.13 percent, versus 2 percent in the original 15 members of the European Union (EU15). And Spain's share of private R&D to total R&D was 46.3 percent, versus 56.6 percent in the EU15.[5]

From 2005 to 2009, the government devoted more than €6.5 billion to the development of the ICT sector and the information society in Spain under Plan Avanza's umbrella. This has facilitated the additional mobilization of over €4 billion by other stakeholders (with regional governments playing a primary role). The sum of these efforts means that around €11 billion has been directly committed to foster ICT diffusion in Spanish society (see Figure 1).

A brief overview of the Spanish ICT sector

ICT is a thriving sector in Spain, as reflected by the performance of different macroeconomic indicators in recent years.[6] ICT sector turnover in Spain accounted for €114.32 billion in 2008,[7] reflecting a cumulative growth of 43 percent over the period 2005–08.

The value-added of the ICT sector in Spain surpassed €64 billion in 2008, which means that it was 7.7 percent higher than in 2007, and it made up about 6 percent of Spanish GDP in 2008. If indirect, induced, and network externalities fueled by ICT are also accounted for, ICT value-added climbed in 2008 to €246.16 billion, thus making up about 22.5 percent of total Spanish GDP.[8]

Moreover, the Spanish ICT sector employed around 400,000 people in 2008—2.5 percent more than in 2007. As in the case of the value-added, if indirect, induced, and network externalities are also included in the analysis, the figure peaks at 1.52 million, making up about 7.5 percent of total employees in Spain.

This rapid (pre-crisis) development is also reflected in the number of ICT enterprises, which increased by no less than 28 percent between 2005 and 2007 (from 21,966 to 28,189).[9] Some of those ICT enterprises have emerged as pioneers and leaders in activities such as transport and infrastructure management (such as Telvent or Avanzit), defense systems (Indra, Amper Programas, Sitre), information technology (IT) security (Panda, Secuware), digital TV or audiovisual engineering solutions (Telefónica, Televés, Itelsis, Brainstorm). As a case in point, two-thirds of air traffic worldwide is monitored by information systems created in Spain, such as Indra.

Two emerging objectives: Internationalization and innovation

The increasing international exposure of Spanish companies is contributing to a shift in the economic model. In fact, the new productive model should be more foreign demand–based, because the prevailing one was rather dependent on internal demand. The economic crisis is likely to reinforce this trend.

ICT exports are still small in Spain as a proportion of total exports (about 4 percent). Nevertheless, they have strongly increased over the last four years, leaping from €3.77 billion in 2004 to €6.46 billion in 2008.[10] The leading international role of some ICT Spanish companies is quite promising, which means that this figure is expected to be substantially higher in the near future.

Even though innovation is still scarce in Spain when compared with EU levels, the remarkable increase observed over the last years has been fueled by the decisive contribution of ICT. According to specialized sources, innovation expenditures in the ICT sector amounted to €9.10 billion in 2008, which means a growth of 70 percent over the last four years. The figure makes up a third of total RDI invested by the private sector in Spain.[11]

Five years later: Plan Avanza's achievements

Considering the ambition and scope of Plan Avanza, five years is a very short time to assess its achievements. Yet the Plan can clearly be considered a success, both from the point of view of developing infrastructure (in particular, broadband, where critical mass has been reached), and from that of developing new services and usages for ICT across all components of the society. But Plan Avanza's most significant achievement may be in the way it has contributed to changing Spain's attitudes about ICT.

Moving attitudes, reaching critical mass

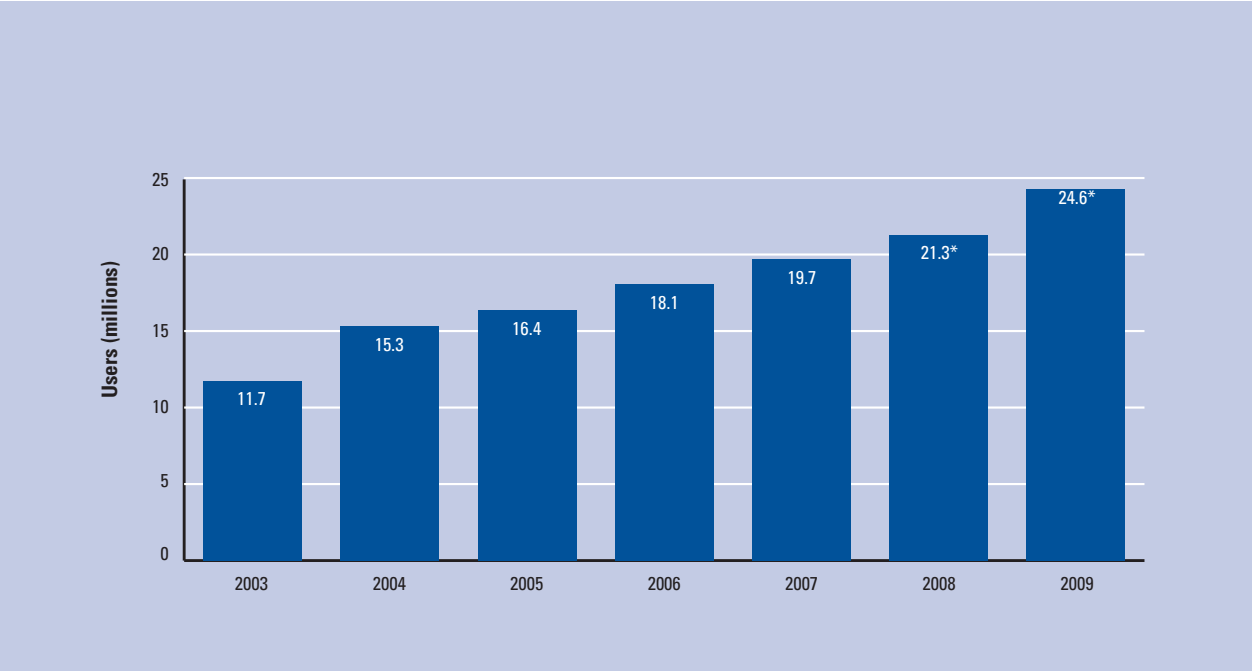
One of the most important goals achieved by Plan Avanza has been a change in attitudes and culture among Spanish citizens and businesses. In fact, ICT is increasingly being perceived as crucial for the country's development, a perception that lags behind its gradual introduction into economic, institutional, and civic life.

Additionally, Plan Avanza has enabled the achievement of a critical mass—not only in terms of the ICT market and subscribers, but also in terms of the gradual acceptance of ICT and the global coverage of ICT services. This is a substantial landmark that will further facilitate ICT developments in the future.

The critical mass achieved is epitomized by the progress in a number of indicators. For instance, the number of Internet users has more than doubled, to reach 24.6 million, with a penetration rate of 60.1 percent in 2009 (see Figure 2). Furthermore, more than 97.5 percent of lines are now broadband, compared with just over 45 percent in 2003, according to the National Statistics Institute (INE).

The contribution of the Plan in achieving the critical mass must be highlighted here. Some 257,000 families have benefited from no-interest loans for

Figure 2: Internet users in Spain, 2003–09



Source: INE; ONTSI, 2009a.
Note: Users are 16–74 years old; * indicates individuals 10 years old and older.

acquiring ICT equipment. Furthermore, 3,000 telecenters and 2,500 libraries are at the disposal of 12 million inhabitants residing in rural areas. On the business front, Spanish enterprises have also witnessed positive performances in their IT capabilities. Enterprises with broadband have climbed to nearly 94 percent in January 2009 (see Figure 3), remarkably higher than the European average (i.e., 83 percent in 2009), with a widespread use of advanced electronic signature—51 percent of enterprises in Spain, as compared with only 26 percent in the whole European Union (EU27).

Plan Avanza has contributed a wide array of initiatives, including funding RDI and ICT-training programs for more than 210,000 enterprises, mainly small- and medium-sized enterprises (SMEs). The Plan has provided nearly 134,500 enterprises with no-interest loans to purchase IT equipment, and has enabled the creation of more than 62,000 websites by enterprises as a result of different measures of diffusion and awareness since 2007.[12]

Measurable results

The success of Plan Avanza is not only reflected in a number of intangible assets such as new institutional or cultural arrangements, but also in a widespread array of tangible results. These outcomes are seen in ICT indicators such as (1) the supply and coverage of ICT infrastructure, (2) networked education, (3) networked healthcare, (4) networked administration, and (5) the development of a new regulatory framework.

Supply and penetration of ICT infrastructure: Broadband everywhere

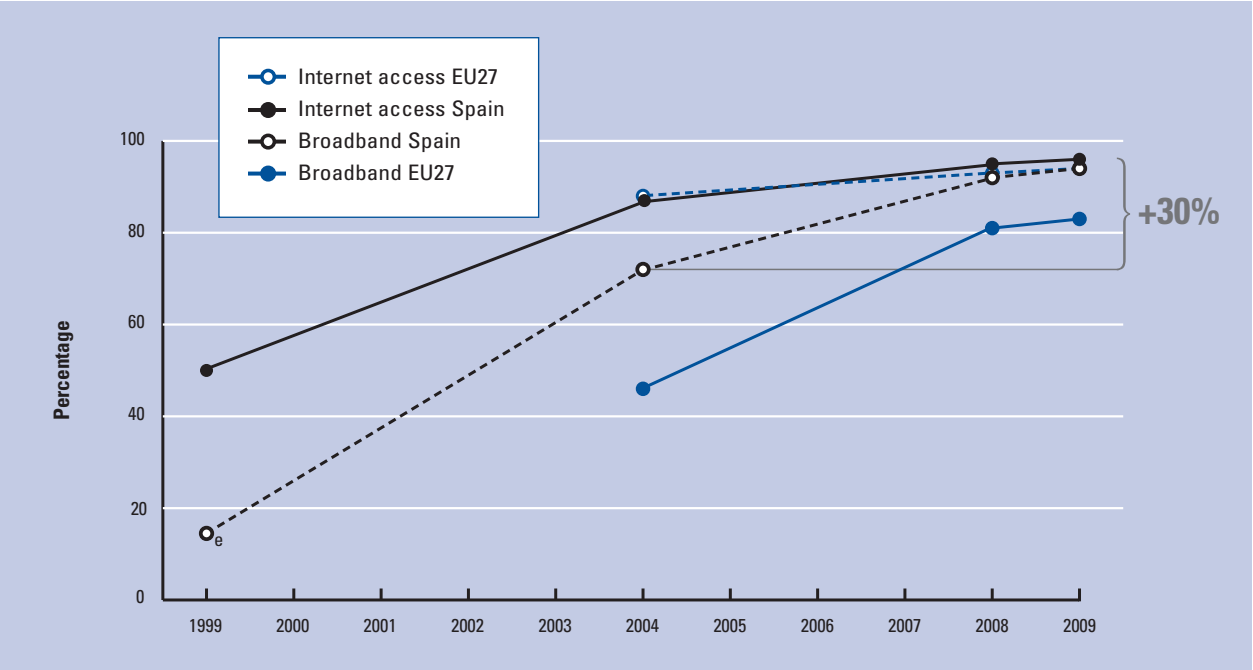
The Broadband Extension Plan, implemented since 2005, has made Spain reach quasi-universal broadband penetration (99 percent), despite the fact that almost 50 percent of the country is mountainous. This figure means that Spain has one of the highest broadband penetration rates worldwide.

Spain ranks first in terms of mobile broadband users in Europe, with a penetration rate of 28.3 percent as compared with the European average of 18 percent.[13] In fact, Spain is the only country from the "Big Five" where both fixed and mobile broadband penetration accounts for more than 20 percent of the population. By contrast, in other countries the development of fixed broadband seems to take place at the expense of mobile broadband (and vice versa). The combined fixed and mobile broadband penetration in Spain accounts for nearly 49 lines per 100 inhabitants, whereas in France, Italy, Germany, and the United Kingdom it stands at 34–48.[14]

Public policies and higher demand by users have been the drivers of the spectacular increase in the number of broadband lines in Spain over recent years (Figure 4). Broadband lines as of September 2009 are more than 4.5 times the figure in 2003, and the average speed has increased 15-fold.

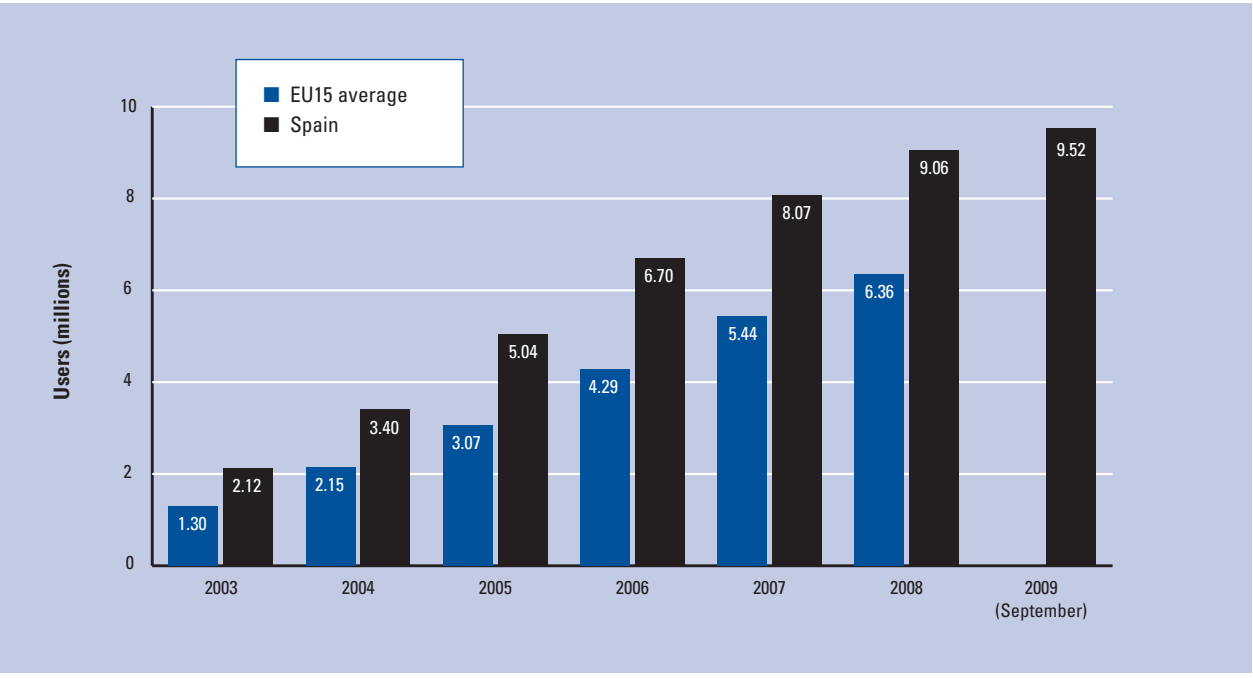
With regard to speed, 88 percent of fixed broadband connections operate at speeds higher than 2 megabits per second (Mb/s), which is higher than the

Figure 3: Internet and broadband use in enterprises: Spain and European Union, 1999–2009



Source: Eurostat and INE.
Note: Figures for 2009 are provisional; e = estimate. Internet access refers to the percentage of enterprises with Internet access out of total enterprises. *Broadband* refers to the percentage of enterprises with a broadband connection out of total enterprises.

Figure 4: Growth of the number of broadband lines, 2002–09 (millions)



Source: ONTSI, 2009a, based on Eurostat and CMT.

EU average (81 percent).[15] Another area where Plan Avanza has achieved outstanding results is the development of digital terrestrial television (DTT). The importance of DTT hinges on different factors. In fact, it enables television modernization, allowing broader and more diverse offerings thanks to the greater number of channels, improvements in the quality of sound and image, higher availability of value-added content (such as subtitled broadcast, digital teletext, 16/9 format), and access to new services such as high definition television and mobile television, among others.

Spain is a pioneering country in terms of DTT development. DTT coverage exceeds 98.35 percent, far beyond the European average, and the digital switch-over has already occurred in some parts of Spain. Decoders' purchases have proceeded quickly, amounting to over 23 million decoders sold (which amounts to one decoder each for almost half the population).

Networked education: The birth of a European champion

The support given to networked education through Plan Avanza has transformed the Spanish educational system into one of the most ICT-intensive in Europe. In fact, 99.5 percent of schools in Spain are Internet-connected, over 98 percent of them through broadband, and they have been equipped with ICT resources. Furthermore, 90 percent of teachers have received ICT training. In addition, Wi-Fi is available in all 50 public universities, thanks to the Campus en Red (Networked Campus) program.

It is worth emphasizing the development of the open source educational platform Agrega. This Spanish platform, which has also been adopted by the United Kingdom, has received international awards. Other countries—such as Australia, New Zealand, Saudi Arabia, and several others in Latin America—are also interested and talking to Spanish experts (see Box 1).

Networked healthcare: Creating a source of expertise for the world

The promotion of networked healthcare is one of the key pillars of Plan Avanza and explains the leading role of Spain in the sector. In fact, all public healthcare centers in Spain are now interconnected through a common network. Applications such as e-appointment, digital records or electronic medical history are already achieving substantial improvements in health and efficiency ratios. The achievements are crystal clear: for example, 97 percent of primary care doctors in Spain have now electronic access to their patients' records (vs. only 14 percent in Canada or 12 percent in the United States).[16] As a result of the success of the initiatives implemented so far, Spanish e-health experts are currently counseling other countries in the design and implementation of solutions of this kind. For example, they are advising four other EU member countries in the context of the European Patients Smart Open Services project.[17] This project aims to develop a practical e-health framework and an ICT infrastructure that will enable secure access to patient health information, particularly with respect to basic patient summaries and e-prescriptions between different European healthcare systems.

Networked administration: Reaching out to all Spanish citizens

One of the main objectives of Plan Avanza has to do with substantially improving the number and quality of services provided by the public administration. This field has developed at an outstanding pace over the last five years, and, as a result, the availability of online public services in Spain is now 9 percentage points higher than the European average (80 percent versus 71 percent).[18]

The introduction of e-identification (e-ID) has taken place in this context. As a result of this pioneering project, more than 15 million Spaniards are e-ID holders (i.e., about 32 percent of the population), which allows them to access over 2,500 public services at national, regional, and local levels. Over 17 million e-identity instruments have been issued (more than 15 million e-ID cards and over 2 million e-signature certificates), making Spain the first country in the world by number of users. Additionally, almost 7 million Spaniards filed their tax returns through the Internet in 2009.[19]

Another relevant e-administration project has been the gradual digitization of civil registries and magistrates' courts. Once this project is finished, citizens will be able to access electronically every document placed in these records. This will result in significant time savings and simplification of procedures.

The civil registry online program is highlighted as an example of a good practice in epractice.eu, an EU-based Web portal aimed at fostering the participation and diffusion of experiences among users in electronic administration.[20]

Other programs for revamping the local administration are being implemented to develop online services for citizens and enterprises, setting up electronic payments platforms or raising awareness about the potential benefits of ICT use.

Development of a new regulatory framework: Aligning law and ambitions

The design of the new regulatory framework is groundbreaking in Europe. Two main laws have shaped the main developments in this area: Law 56/2007 on Measures to Promote the Information Society (Ley para el Impulso de la Sociedad de la Información) and Law 11/2007 on Citizens' Electronic Access to Public Services (Ley de Acceso Electrónico de los Ciudadanos a los Servicios Públicos).

The laws have been focused on issues such as compulsory online access to specific services (e.g., public utilities) by citizens; a progressive obligation for electronic invoicing; mandatory accessibility for people with

Box 1: Agrega: Search, find, and participate

Agrega is part of a national program to foster ICT in education and offer access to digital curriculum content. Participation and funding for the program are provided by state and regional authorities.

The project

- Agrega addresses the need of digital curriculum standard resources to foster ICT in education.
- It offers a single point of access to digital learning resources publicly funded by different initiatives (the ministries of education and industry, and regional authorities' education departments).
- It provides teachers, students, and parents with curriculum resources that can be used at school and at home.

Ten good reasons to follow Agrega

1. **It provides access to multilingual digital learning resources.** Each regional authority in Spain will deploy an Agrega node to provide unified access to digital learning content.
2. **It provides content quality.** Digital learning resources have been produced as the result of cooperation between teachers and multimedia content industry.
3. **It generates an out-of-the-box resources catalog.** Each Agrega node can generate a resources catalog in PDF format, organized according to the Spanish curriculum, with hyperlinks to the digital content.
4. **Resources are community friendly.** Learning resources can be re-used by teachers, and also annotated and rated by registered users.
5. **Content is e-learning friendly.** Agrega allows a preview via Web of sharable content object reference model (SCORM) 2004 content format (a registered user is able to access to a full SCORM view).
6. **Widgets are Web 2.0 friendly.** Agrega offers out-of-the-box widgets to embed its resources in other sites and allows content to be downloaded in several digital learning formats.
7. **Content and access are built according to digital learning services standards.** Well-known standards have been used both for repository access and the content itself.
8. **Navigation is available from the teacher's view.** Digital curriculum content can be searched for using specific education taxonomies or thesauruses. Registered users can navigate through taxonomies and thesauruses out-of-the-box.
9. **Out-of-the-box tools are built in.** Agrega provides some built-in tools for packaging (SCORM 2004) and cataloging (full LOM-ES).[1] These tools can be experienced offline with a program installed locally on a personal computer.
10. **Open source development allows reuse.** Agrega has been developed using open source software and will be EU-PL licensed. Contents are licensed with Creative Commons to allow distribution, copy, and reuse of most of the resources.

Source: http://red.es/index.action.

Note

1 LOM-ES is the official version of the IEEE-LOM standard for the Spanish educational community. LOM (i.e., Learning Object Metadata) is a model, usually encoded in XML, used to describe a learning object and similar digital resources used to support learning. IEEE is the internationally recognized open standard for Learning Object Metadata published by the Institute of Electrical and Electronics Engineers Standards Association, New York.

disabilities and older people; better and wider statistical coverage and information availability on the ICT sector; and online access to public administration content. The laws have been fully discussed with diverse public authorities, political parties, the private sector, and citizens' associations.

Also, an advantageous new telecommunications users' bill was passed on May 15, 2009, implying, inter alia: speeding up users' deregistration (i.e., from 15 days to 2 days); better protection of users in the use of Telecommunications Users Support Office; extended warranties in the use of premium rate services; an ad hoc regulation of pre-paid users' rights; and reducing to a maximum of one day the time needed to transfer to a different carrier/operator while maintaining the same telephone number.

What next?

In November 2009, the Spanish Minister for Industry announced that, by January 1, 2011, a broadband speed of 1 Mb/s would become part of Spain's definition of universal access. This is the kind of symbolic threshold that Plan Avanza has made possible. Even if much remains to be done to fulfill the country's full potential to perform as a leading knowledge economy, its ambitions can now be set against remarkably high standards because attitudes have changed: Spain has proved to itself that it can do as well as the champions. It can now look with confidence at the many challenges it still has to face in building a fully cohesive, inclusive, and vibrant information society.

No bed of roses: Plan Avanza's past and remaining challenges

Altogether (and with hindsight), Plan Avanza can now be regarded as a powerful tool to help a country such as Spain look beyond the current economic crisis. Generating interest and support at the local level is clearly a necessary ingredient for turning a national vision into a sustainable reality.

Nevertheless, the road to achieve this reality is a difficult one. Though Plan Avanza's achievements suggest that the right choices have been made in terms of budget allocation and management and cooperation models, there are many lessons that have been learned since the Plan was started, as well as challenges going forward.

Some of the main challenges are presented here:

- **Slow uptake.** Though the stimulation of the supply side of the ICT sector has been followed by visible results, the demand side has not yet reacted in this way. A case in point is the use of e-ID: more than 15 million citizens have an e-ID, but only a few of them actually use their e-ID services. Consequently, the government has developed a plan to foster e-ID use through measures that include demonstration and training workshops, free distribution of e-ID readers, and awareness campaigns, among others. On the demand side, promotion efforts should be combined with support for ICT companies (SMEs in particular) to innovate.

- **Resistance to change.** Specific economic sectors and SMEs still hesitate at moving to intensive, productive adoption of ICT. An increased adoption of these technologies has taken place, but in SMEs this use has not yet reached the desired degree of sophistication because these technologies are still used more for internal processes than for external, business operations. Insofar as SMEs are the main engines of growth and employment creation, it is crucial to foster ICT penetration through promotion and training measures.

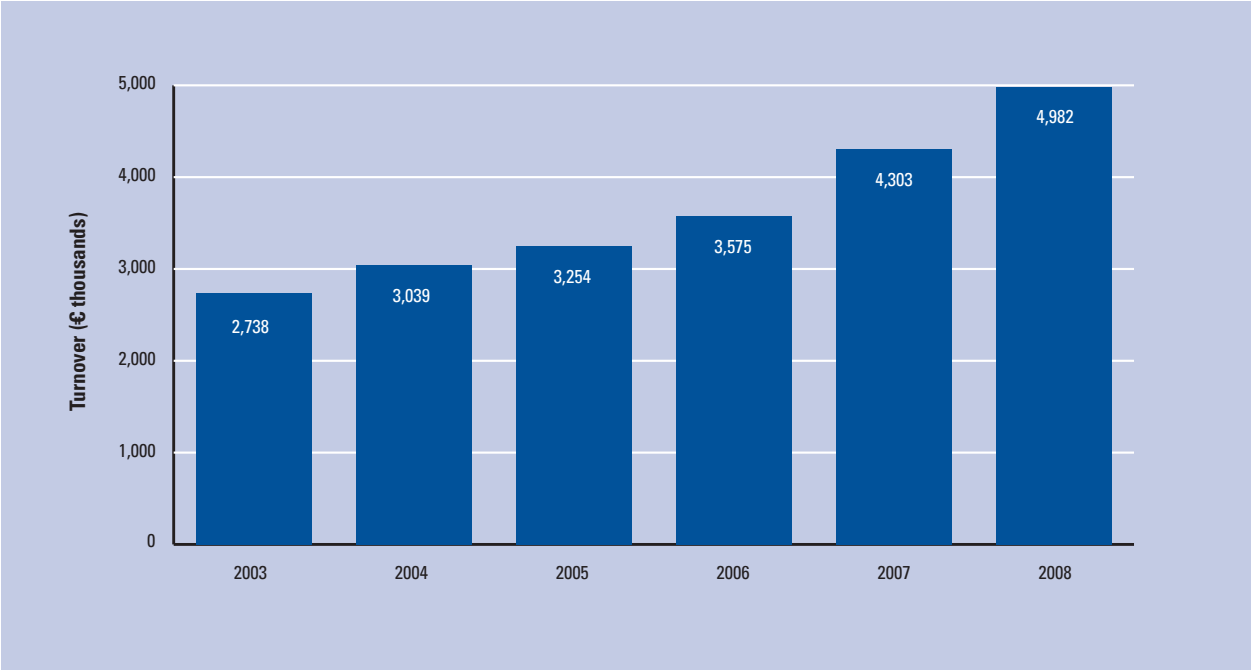
  E-commerce has grown, but not as much as desired. It is true that e-commerce in Spain is evolving rapidly, as recently released figures by the National Observatory for Telecommunications and the Information Society (ONTSI) have shown. In fact, the business volume generated by e-commerce exceeded €5.3 billion, an increase of 192 percent compared with 2004, but this is still far from European standards.[21] Furthermore, the current challenge in Spain is to raise awareness about the crucial role of e-commerce among Spanish enterprises. As such, e-commerce should not be considered an option but a strategic weapon able to increase sales and the competitiveness of companies. Only around 6 percent of medium enterprises and 1.5 percent of small enterprises make their products available through the Internet.[22] This figure is in sharp contrast to the 8.8 million Spanish e-buyers in 2008, which have increased by 3.8 million in three years.[23]

- **The challenge of e-inclusion.** Internet use by Spanish youths ranks among the highest in Europe: Spanish 16- to 34-year-olds are more intensive Internet users than their counterparts in the rest of Europe. But the situation is reversed for those over 55, who are lagging behind their European counterparts in the uptake, use, and acceptance of ICT. Thus, it is of great importance to develop specific actions intended to raise awareness of the advantages prompted by the information society to these potential users.

Building on success to face new challenges

As mentioned earlier, Spain has gained international renown through the achievements of some of its ICT companies. Several sectors are worth considering in

Figure 5: Growth of digital content industry turnover in Spain, 2003–08 (€ thousands)



Source: ONTSI, 2009b.

greater detail as examples of areas in which Spanish enterprises have been able to turn higher levels of ICT readiness into higher levels of business performance and customer satisfaction. This is the case of the digital content and banking sectors.

Digital content: Fast growth and increasing visibility

The production, management, and distribution of digital content have known spectacular development in Spain: the industry has grown by more than 82 percent in 2003–08,[24] drawing increased attention among content developers, content producers and editors, and content feed aggregators (see Figure 5).

This industry, which encompasses dynamic sectors such as video, music, television, cinema, advertising and communication, videogames, and Internet and mobile content, is currently a substantial asset with extraordinary promise for Spain by virtue of its technological and creative features, productive and social acceptance, and the additional advantage of its potential ability to address new markets that share culture and language.

Additionally, Feria Internacional de los Contenidos Digitales (FICOD—the Digital Contents International Exhibition), has become a benchmark meeting point for the digital content industry and community and is already the reference in the Spanish-speaking world. The 2009 exhibition was attended by some 15,000 participants, with over 200 speakers from industry, government, and international institutions; more than 42,000 virtual participants connected through FICOD TV.

How e-banking transformed banking

Spain has become an ecosystem for banking technological innovation. Spanish banks are among the most profitable and efficient in the world because of, among other factors, their excellent capacities in the management of IT as a lever for business innovation. In 2009, Spanish banks achieved the best efficiency ratios in the European Union (42 percent vs. the EU average of 60.7 percent), and indeed among the best in the world.[25]

The story of the banking industry in the European Union in the 1980s and 1990s is related to deregulation, increased competition, consolidation processes (mergers and acquisitions), and the creation of the euro. All these elements have profoundly shaped the European banking landscape—and in particular Spanish banks, which in some cases started as local or regional institutions and became global players in the 21st century.

This story dates back to the 1980s, when the Banco de España (the Spanish Central Bank) began promoting policies to deregulate the national market and directives to reduce costs and the amount of paper used in banking and to improve security by reducing the scope for fraud.[26] This deregulation prompted banks to automate the vast majority of their transactions, such as payrolls and payments. In Spain, checks are hardly ever used, and many utility and service payments are directly debited through customers' accounts.

The retail financial market chose a proximity strategy, adopting a very aggressive expansion by opening new branches throughout the country. The existing IT costs

were too high for the branch model used at the time, which had fewer than five employees and much greater capillarity than banks in the rest of Europe. For example, because of these limitations, the biggest European savings bank—la Caixa—and other institutions worked with IBM in the 1980s to create a pioneering solution that would lead to the deployment of personal computers in their branches. The solution—called *financial branch system services*—became an IBM standard. It was orchestrated from what was then called the *IBM Barcelona Lab* (which developed worldwide, multi-channel front-office solutions during the 1990s).[27] At the same time, Accenture in Spain developed what is now a global solution for the banking core system, called *Alnova*. The solution aimed to respond to the high volume of transactions from the different channels the average Spanish bank had to support. Alnova is currently deployed in hundreds of banks around the world.

The largest global player in the euro zone, Grupo Santander, has in *Partenón* (its core banking system), and its governance model, one of the strategic resources to leverage its IT-centric growth strategy beyond Spanish borders,[28] for example, in the United Kingdom with Abbey, in one of the largest transnational acquisitions ever. More recently, its IT governance and infrastructure have been critical to its expansion worldwide. This fact has been recently recognized by The Banker, which considered Grupo Santander to be the best Western global bank in 2009.[29] Banc Sabadell (the fourth largest in the Spanish market), has also re-invented itself, developing a new software banking system called *Proteo* and helping to integrate four other Spanish banks with which it has merged or acquired between 2003 and 2007 and after entering the US market.[30] Banco Bilbao Vizcaya Argentaria (BBVA) also has its BBVA Compass franchise in the United States, among the top 25 largest banks in the US market.

Spain now has the highest number of branch offices in the European Union per 10,000 inhabitants: 8.5. In the United Kingdom or France, this figure is 4 per 10,000 inhabitants. Spaniards, in fact, prefer automated teller machines (ATMs) (80 percent use them) over branches with tellers (14 percent). There are approximately 60,000 ATMs in Spain, compared with 58,500 in Germany.[31] Spanish banks still open new branches in Spain and in other countries to expand their proximity strategy. Moreover, the ATM network in Spain offers a wide range of services: from cash withdrawals to ticket sales (with seat selection, depending on the theater), tax payments, and many other functions.

With the onset of the global economic crisis in 2008, Spanish global banks have been facing increasing challenges, like their peers in the rest of the world. Small savings banks are also confronting the need to merge with others to increase their scale and economic viability. However, it may very well be that the biggest challenge they will face in the future (besides maintaining front-office profitability) will be to develop their clients' use of available electronic services. Only 15 percent of Spaniards regularly use the Internet for financial transactions, compared with 22 percent in the EU15. That notwithstanding, the mid-size bank Bankinter, for example, has become one of the leading banking institutions in Spain, leveraging its business model through the use of the Internet (which represents approximately 54 percent of its business) and successfully capturing new sources of wealth and private banking accounts between 2007 and 2009.

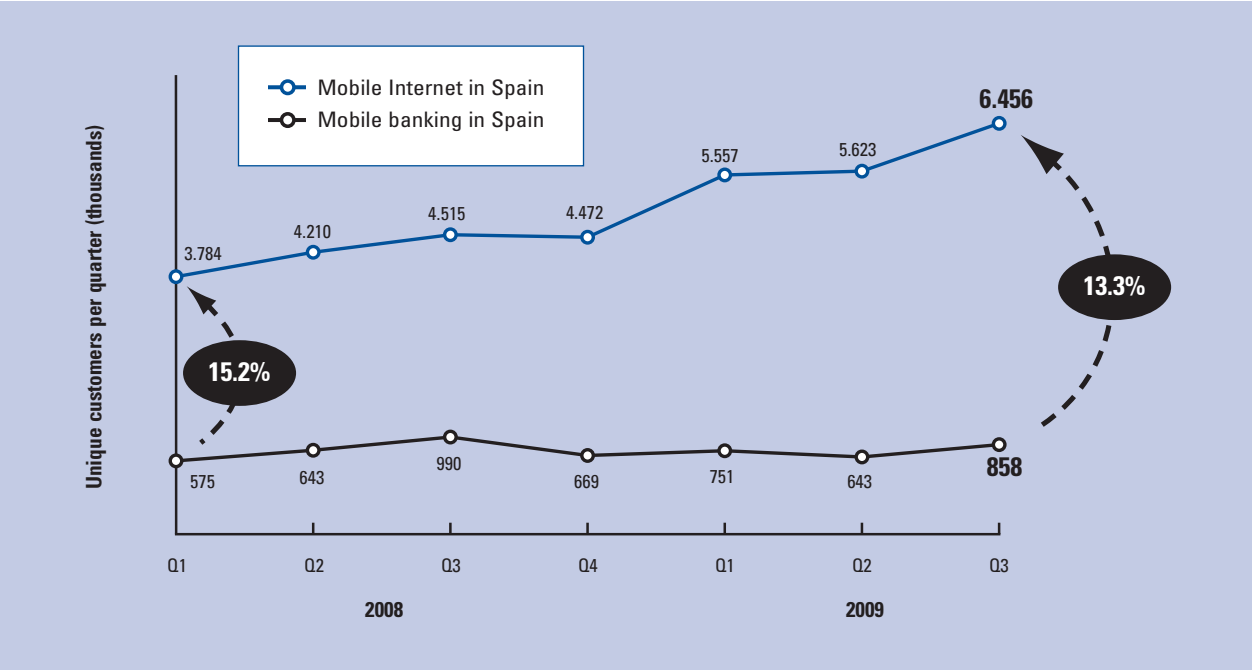
This trend is increasingly important for Spanish global banks that are facing new sources of competition, such as the emergent financial services provided by mobile or Internet players.[32]

Perhaps the most important of these emergent services is mobile banking. This is particularly true since at the end of 2009 there were some 3.6 billion mobile sets on the planet for only 1 billion banking accounts. Mobile banking services are intended to provide a new and more convenient communication channel with customers and increasing security for money transfers in emerging countries. For example, in 2009, some 190 million workers in Europe transferred some 800 billion euros to their home countries.[33] Examples of mobile banking services are MicroBank of la Caixa or Microcréditos BBVA that has provided this kind of loans to some 1,000,000 people in Latin America. In Spain, mobile banking is rapidly being adopted and is closing the gap with mobile Internet (see Figure 6). Another area of exploration is the link between mobile services and social networks, now under study.

Spanish banks have leveraged their strategy on IT management and they have generated a technological innovation ecosystem based on the highly qualified IT managers and experts found among banking staff and in external IT firms. They have a clear focus on a customer-centric information strategy, which has led to a high degree of specialization in loan management and fraud control. Spanish global institutions face an average of 3 percent non-performing loan ratio, which is relatively low compared with their peers in the international context.[34]

Moreover, Spain's banking industry will now focus on talent to leverage its front-office IT investments. Such talent will be key to customer-centric information and thus encourage an increase in sales opportunities, marketing efforts, and productivity. The combination of skilled human resources and digital platforms will be critical to allowing Spanish banks to develop their sales and administrative capacities through a multi-channel approach, thus balancing sales opportunities and tightly controlled operational costs.

Figure 6: Growth of mobile Internet and mobile banking in Spain, 2008–09



Source: Nielsen.

Acknowledging the challenges of building durable success: Plan Avanza II

As a new version of Plan Avanza (Plan Avanza II) is currently in preparation—this should be announced during Spain's European Presidency in early 2010—the challenges described above are going to attract much of the attention of Spanish leaders. Because Spain offers such a unique environment in terms of multi-layered sovereignty and governance, Plan Avanza should remain a source of lessons and best practices for all those who, around the world, strive to enhance e-readiness and e-usage by building sustainable information societies.

The new Plan is incorporated in the Spanish Plan for the Employment and Economy Stimulus (Plan E) aimed at fostering demand and envisaging the pillars of sustainable competitiveness to return to a path of growth and employment in the near future. As such, one of the main objectives of Plan Avanza II is to contribute to the Spanish economic recovery through the widespread use of ICT, emphasizing those projects that combine sustainability and energetic savings as well as changing the productive model.

So far, Plan Avanza has been a very useful tool in the processing of the town councils' applications to be eligible for €8 billion provided by the government in the form of a local investment fund integrated into Plan E. In fact, this provision has been made entirely by electronic means; nearly 31,000 projects were successfully submitted by more than 8,100 town councils.[35]

Plan Avanza is an evolving plan, open to new incoming requirements and needs. In this sense, the Plan is still growing and improving as its measures are implemented and obtain tangible results. Plan Avanza II will also be a product of the consensus among the main stakeholders and will be funded with nearly €1.5 billion in 2010.

Emphasizing demand instead of supply will also be brought about by a shift in the instruments used. Hence, providing loans will be favored over subsidies, because it is acknowledged that loans may enhance entrepreneurship and invigorate the productive base more than subsidies. Furthermore, the promotion of public-private partnerships, which is a recommended mechanism for fostering ICT RDI, may be fueled thanks to this shift in policy.

The experience from the effective implementation of Plan Avanza is proving extremely useful for launching an action plan to promote an economic model shift using ICT during the Spanish presidency of the EU Council in the first semester of 2010. A series of meetings to start defining the roadmap about future European priorities in information society have already taken place.

The definition of such priorities is crucial, as Europe is currently losing ground against other economic areas (i.e., the United States and Asia). To regain that ground, Europe should be at the forefront of main ICT developments going into the future. Open government, the Internet of Things, net neutrality, new trends in business models (e.g., crowdsourcing, cloud computing), cyber security, and sustainable or green IT are all issues that should be on the European policy agenda

and, one way or another, tackled during the Spanish presidency.

The value of Plan Avanza is being recognized at an international level not only by many eminent international organizations, but also by different governments. These have openly shown interest in analyzing the Plan, applying it to their scenarios, and using it as a framework to define similar initiatives.

All in all, the future reinforcement of the measures of Plan Avanza already implemented, along with the determination of all stakeholders involved (public administration, private agents, and citizens), is the foundation on which to build to position the information society as the main engine of social and economic progress in Spain.

Lessons to be drawn from Spain's experience

Because of its unique administrative and political structure, Spain's case holds particular interest for all those countries engaged in building competitive and inclusive information societies. The ways in which Spain's central leadership and vision have been combined with the continuous contribution, support, and shared responsibility of local entities (typically provinces and cities) offers valuable insights about how information societies can be successfully built.

Because Spain has suffered more than many other European countries from the current economic crisis, the coming years will also constitute a test of how enduring the local/central dynamics of Plan Avanza can be and how the Plan's success can be maintained over the longer run. The success registered by Spain in areas such as digital content, e-banking, and e-health will undoubtedly contribute to making this objective a realistic one. Moreover, with the European Union under Spanish presidency from January to June 2010, a unique opportunity is at hand to make Spain's experience more visible and to use it as the basis for sharing experiences about how information societies can be built as a joint central/local effort and as a combination of political, cultural, social, and economic objectives.

Notes

1 Boletín de Estadísticas Laborales Servicio Público de Empleo (Labour Statistics Bulletin, Public State Employment Service), December 2009.

2 Spain is a decentralized state organized under of 17 Autonomous Communities (or Regions) plus 2 Autonomous Cities (Ceuta and Melilla) with their own regional governments that assume a wide array of responsibilities. Furthermore, Autonomous Communities are composed of provinces (50 in total), which correspond to the European administrative divisions of NUTS III; some Autonomous Communities (e.g., Navarre or Madrid) are uniprovincial. The smallest administrative unit is the Municipality (of which there are 8,110 in Spain).

3 Ministerial Agreement on Plan Avanza, November 2005.

4 Besides Plan Avanza, Programa Ingenio is composed of two main programs, as follows:

- the CENIT Program, intended to foster RDI among enterprises, universities, research centers, technological and scientific parks, and technological centers (http://www.ingenio2010.es/contenido.asp?menu1=2&menu2=0&menu3=&dir=./02_instrumentos/02_Caracteristicas/02_CENIT); and
- the CONSOLIDER program, aimed at increasing critical mass and research excellence (http://www.ingenio2010.es/contenido.asp?menu1=3&menu2=1&dir=./02_instrumentos/02_Caracteristicas/01_CONSOLIDER).

5 EUROSTAT 2009. Unless otherwise specified, all data used this chapter are from Eurostat, SETSI (Spain's State Secretariat for Technology and Information Society), and INE (National Statistics Institute).

6 ONTSI 2009a.

7 The ICT sector includes telecommunications (industry, operators, and telecommunications service providers), information technologies, digital content, audiovisual services, and other ICT firms.

8 See ONTSI 2009b.

9 See ONTSI 2009a.

10 AETIC 2009.

11 AETIC 2009.

12 Websites created under Plan Avanza's "No Enterprise Without Web" program. Oficina Técnica del Plan Avanza (Plan Avanza Technical Office), SETSI.

13 European Commission 2009a.

14 European Commission 2009a.

15 European Commission 2009a.

16 Spanish Ministry of Health and Social Policy.

17 See http://www.epsos.eu/.

18 European Commission 2009b.

19 AEAT (Agencia Estatal de Administración Tributaria) (Spanish Tax Agency).

20 See http://www.epractice.eu/ .

21 ONTSI 2009a.

22 Data available at Asociación Española de Comercio Electrónico y Marketing Relacional (Spanish Association of eCommerce and Relational Marketing, AECEM); see http://www.aecem.org/inicio.html?11_opm=7.

23 ONTSI 2009.

24 The figure refers to the sum of digital content plus audiovisual services. See ONTSI 2009.

25 Boletín Fundación BBVA 1/2009, http://www.fbbva.es. The efficiency ratio is one of the most widely used indicators in the banking industry to measure the respective institutions' competitiveness. It measures the unit of cost necessary to generate a unit of income—thus the lower the figure, the better.

26 Bank of Spain, http://www.bankofspain.org.

27 See Busquets and Mallart 2009.

28 Credit Suisse Research and Analytics, http://www.csfb.com.

29 The Banker 2009.

30 M&B Capital Advisers, http://www.mbca.es.

31 Centro de Estudios "la Caixa," http://www.lacaixacomunicacions.com.

32 Nielsen, http://www.nielsen.com.

33 http://www.worldbank.org

34 IBM 2009.

35 http://www.mpt.es/prensa/actualidad/noticias/2008/12/20081210.html.

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CHAPTER 2.2

ICT Supporting the Smart Economy: The Case of Ireland

BARRY MCSWEENEY, National Knowledge Society Strategy, Ireland

This case study examines the contribution of information and communication technologies (ICT) to national economic development in the context of Ireland's National Knowledge Society Strategy. It charts the evolution of the national industrial development strategy from early-stage, low value-added manufacturing to higher value-added innovation-driven approach and identifies essential steps relating to public investment in education and research.

Ireland has a long tradition of mathematics and related disciplines supporting ICT. As far back as the 7th century, monasteries throughout Ireland were engaged in a mathematical science "computus" aimed at calculating the exact date of Easter. In later years, the work of Hamilton (1805–1865) and of Boole (1815–1864) provided a significant basis for modern computer systems.

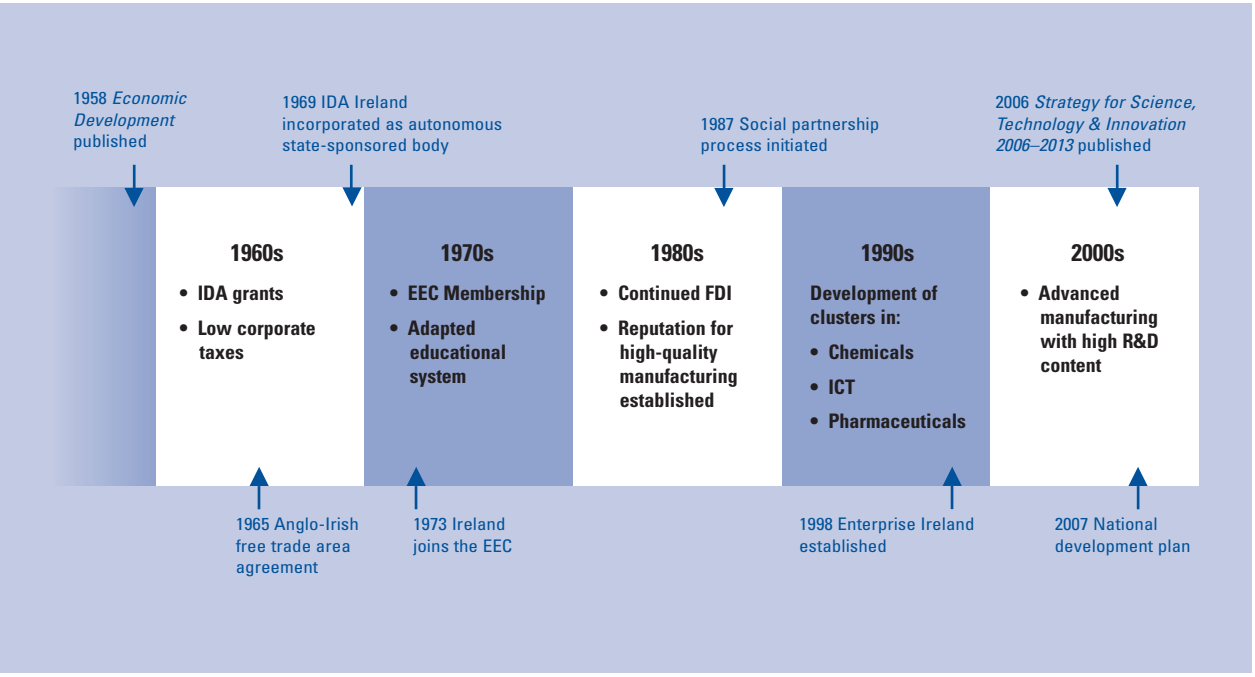
The government published its blueprint for sustainable economic renewal, *Building Ireland's Smart Economy,* in December 2008. This report contains a list of smart (ICT-based) actions in the context of a low-carbon economy. A National Knowledge Society Strategy is also under preparation and will be published in 2010. The theme of the strategy is to increase employment and enhance quality of life. A first report—*Technology Actions to Support the Smart Economy*—was published in July 2009 and identifies a number of innovative approaches with high job-creation potential. A target of 30,000 new, high-value sustainable jobs has been set for these actions.

The main section of this case study presents six technology actions and examines the relevant contribution these can make to accelerate the development of the smart economy. The actions are:

- an exemplar communications test-bed based on optical burst switching (OBS), where Ireland is a global leader;
- an initiative to establish Ireland as a location for energy-efficient data centers 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 author would like to acknowledge the support of Brendan Whelan (National Knowledge Society Strategy, Ireland) in preparing this chapter. The author also thanks the Industrial Development Authority Ireland for their information on foreign direct investment and the Apple Ireland illustration; Enterprise Ireland for information on indigenous companies; Science Foundation Ireland, Forfás (Ireland's national advisory body for enterprise and science), and the Irish Higher Education Authority for details on research; the Irish Business and Employers Confederation; and Maire Herbert (University College Cork) and David O'Gorman (National Knowledge Society Strategy, Ireland) for their helpful input.

Figure 1: Industrial development in Ireland



- the development of a real-time remote water monitoring system; and
- a combined intelligent traffic/work commuting approach.

ICT will play a very significant role in realizing the goals of these actions and also in the development of a wide range of green products and services.

ICT and industrial development policy

Ireland introduced a series of initiatives to stimulate industrial development in the 1960s. The establishment of the Industrial Development Authority (IDA), the introduction of grants to attract foreign direct investment (FDI), and the establishment of low corporate taxation on profits all had a significant impact on the growth of manufacturing. The low-cost base, the availability of a young educated workforce, and good connections to the United States–based Irish diaspora led to an influx of US multinational corporations (MNCs).

Joining the European Economic Community (EEC) in the 1970s increased the rate of FDI. The Irish educational system adapted to the needs of MNCs and showed flexibility in organizing specialist tertiary courses in both regional technical colleges (now institutes of technology) and universities.

Management of Irish corporations concentrated on raising their reputation as quality manufacturers by setting high standards in quality assurance and good manufacturing practice and establishing strong engineering expertise in their plants. These initiatives were encouraged and stimulated by the government through the provision of generous training grants.

A strong reputation for high-quality and efficient manufacturing gained in the 1970s and 1980s, the availability of plant engineers skilled in production adaptation, and the international marketing expertise of the IDA with its international network of offices led to continued success in FDI attraction. A strong MNC presence stimulated indigenous industrial development. Initially, these new Irish companies aimed at servicing the needs of the MNCs and then evolved as manufacturers and providers of services in their own right. The government established a related state marketing board with offices throughout the world (often sharing premises with the IDA). The development of an indigenous industry was separated from the IDA and is managed today by Enterprise Ireland (EI). Clusters of companies gradually developed. The main sectors that emerged were chemicals/pharmaceuticals and ICT. Green technology/energy is a new developing cluster. Figure 1 provides an overview of Ireland's industrial development.

In recent years, Ireland, along with many other Western economies, is seeing the gradual move of low-skill, labor-intense manufacturing operations to lower-cost countries. Ireland, however, continues to attract advanced manufacturing operations at the cutting edge of technology, usually with significant research and development (R&D) content, where high productivity relies heavily on the skills, capability, and agility of the

Table 1: ICT sector's economic contribution, 2008

	Persons employed	Enterprises	Turnover (million euros)	Gross value-added (million euros)	Turnover (percent of GDP)	Gross value-added (percent of GDP)
ICT manufacturing	28,646	166	38,195	7,611	21.61	4.31
ICT services	58,514	5,236	37,175	7,882	21.03	4.46
Total	87,160	5,402	75,370	15,493	42.64	8.77
Total ICT (percent of total industry and services)	**8.2**	**5.6**	**24.4**	**18.6**	**n/a**	**n/a**

SOURCE: Central Statistics Office, 2008.

workforce. Manufacturing and the provision of services by ICT-related companies continue to make a highly significant contribution to the Irish economy, accounting for exports of €75 billion (see Table 1). Seven of *Fortune Magazine* 2007's top 10 leading ICT companies have a substantial presence in Ireland.

At 12.5 percent, Ireland has one of the lowest corporate tax rates in the world (see Table 2 for a comparison of corporate tax rates). Ireland's fiscal system is also sufficiently flexible to allow new measures that will assist businesses in a changing economic landscape. For example, the 2004 Finance Act acknowledged the importance of R&D by introducing a 20 percent tax credit on incremental R&D expenditure. This tax credit was subsequently increased to 25 percent in 2009.

Table 2: Corporate tax rate on profit (selected countries), 2009

Country	Percent
Ireland	12.50
Singapore	18.00
Switzerland	21.17
Korea, Rep.	22.00
Netherlands	25.50
Sweden	26.30
United Kingdom	28.00
Luxembourg	28.59
Germany	32.92
France	33.33
United States	35.00
Japan	40.50

SOURCE: IMD, 2009.

Ireland has one of the lowest rates of employer social security contributions, at 10.75 percent; the United Kingdom is higher, at 12.8 percent, Portugal much higher, at 23.75 percent; and Germany even more, at 25 percent.[1]

Ireland has double-taxation agreements with 45 countries worldwide and has excellent legal expertise with a strong reputation in exploitation and protection of intellectual property rights.

In line with market requirements, Ireland has also introduced more flexible operating models by combining manufacturing operations with sophisticated supply chain management and optimization structures. These include Lean, Six Sigma, Kaisen, and KanBan.

Box 1 provides a good illustration of the evolution of the ICT manufacturing and services sector in the country.

The indigenous ICT sector focuses mainly on software and comprises over 500 companies, employing in excess of 13,000 workers, with combined sales of €1.4 billion—the vast majority of which is based on exports. There is a strong entrepreneurial culture, which typically sees the emergence of over 30 high-potential startup companies every year. The development of the software industry in Ireland owes much to the enterprise environment, which provides a uniquely supportive ecosystem within which individual firms can thrive. This includes:

- a young, skilled workforce;
- R&D support (see next section);
- specialist clusters—there are networks of companies in the telecommunications, finance, and e-learning areas that have access to leading-edge publically funded research;
- MNCs' presence—almost all the world's leading software companies are present in Ireland and contribute to the development of the local skill base. Many also provide smaller specialist companies with market access; and
- cultural and geographical advantage. Ireland is a member of the European Union and has close ties to the United States, particularly through the extensive Irish diaspora. Ireland is the only English-language country in the euro zone and has an overlap of working hours with the West Coast of the United States and the Far East.

Box 1: The Apple Ireland business model

- Apple was established in Cork in 1980 to do final assembly and test of personal computers, providing 150 jobs.
- Over the following 10 years, this plant evolved into an integrated high-volume manufacturing site producing Apple's full range of computers from the component level to finished product and employing 1,500 staff.
- In the mid 1990s, Apple Corp (because of severe cost and competitive pressures) decided to subcontract most of its computer manufacturing capacity. This posed a major threat to the Cork operation, so local management persuaded the parent company to extend their mandate to include a range of other business functions.
- The Irish facility has now evolved into a multi-function manufacturing and services site and is now Apple's European Middle East and African (EMEA) operations headquarters.
- The Irish operation now has responsibility for the following functions across EMEA:
  - assembly and test of high-end computers (500 jobs);
  - customer support center (all European languages);
  - telesales and order management;
  - financial shared services;
  - treasury management;
  - supply chain management; and
  - software testing and localization.
- Apple Cork now employs 1,400 permanent employees, of whom 64 percent have a tertiary qualification.

Ireland has a history and track record of investing in advanced telecommunications infrastructure to stimulate economic activity. The first undersea transatlantic cable was laid between Ireland (Valentia Island) and Canada (Hearts Content) in 1858. In the 1980s, Ireland invested in a digital telephone exchange. In 2000, the government partnered with Global Crossing to deliver a high-capacity fiber optic cable providing telecommunications connectivity between Ireland and 40 European cities as well as cables between Europe and the United States. This resulted in a quantum reduction in the cost of international telecommunications from Ireland, as well as the attraction of significant FDI and the generation of thousands of new jobs.

Project Kelvin is a current collaboration with the Department of Enterprise, Trade and Investment in Northern Ireland involving the roll out of further direct international telecommunications connectivity. Kelvin will connect a new submarine cable from County Derry to an existing transatlantic cable 22 miles off the northern coast of Ireland. The €32 million project will provide faster, cheaper broadband and direct international telecommunications connectivity for Northern Ireland, the border counties, and Dublin.

The growing focus on the importance of knowledge-based development can be seen by the €527 million spent by Irish ICT companies in 2007 on R&D.

R&D to support the development of the ICT sector

In 1998, the government formally recognized ICT and biotechnology as priority areas for economic development. A *Technology Foresight* report concluded that "A world–class research capability in selected niches of these two enabling technologies is an essential foundation for future growth."[2] Recently green technology/energy has been added as a additional priority.

The Programme for Research in Third-Level Institutions (PRTLI) and Science Foundation Ireland (SFI) were established in order to support these enabling technologies. PRTLI is the Higher Education Authority's (HEA) fund to strengthen the research capabilities of third-level institutions. Since 1998, PRTLI has invested €865 million in human and physical infrastructure. PRTLI aims to establish Ireland as a premier location for carrying out world-class research and development. SFI is the government agency responsible for investing €1.4 billion over the course of seven years (2007–13) in research likely to generate new knowledge, leading-edge technologies, and competitive enterprises in the fields of science and engineering. It funds research centers, groups, and individuals in ICT, biotechnology, and sustainable energy.

In 2006, the government published its *Strategy for Science, Technology and Innovation, 2006–2013* (SSTI). This strategy states that: "Ireland by 2013 will be internationally renowned for the excellence of its research, and will be at the forefront in generating and using new knowledge for economic and social progress, within an innovation driven culture."[3]

The government has committed €8 billion to achieving this vision over the period 2006–13. A whole-of-government science management system has been put in place, including a Cabinet Committee on Science and Technology.

This SSTI investment is to establish Ireland as a knowledge society built on excellence in science, technology, and innovation. The SSTI recognizes the importance of increasing the skills of the population

and raising the levels of scientific and mathematical literacy. The strategy aims to harness the Irish tradition of creativity and talent for communications. It brings together researchers and innovators from a wide range of disciplines, including the physical and social sciences, and arts and humanities, to meet the challenges and opportunities presented by a diverse and rapidly changing world.

A key goal of the SSTI is to double the output of PhD graduates from tertiary institutions. A substantial number of these researchers should be employed by the enterprise sector to develop, manufacture, license, and export products and services based on innovative ideas.

Using Ireland's current strengths in ICT and biotechnology, together with emerging nano- and cognitive technologies, will drive development of next-generation engineering concepts and high value-added products.

The government has placed a strong emphasis on collaboration between higher education and industry and on technology transfer in general. This, coupled with Ireland's attention to industry clustering, has led the US consultancy, Forrester Research, to place Ireland at the top of a league of 26 industrialized countries benefitting from "innovation networks"—partnerships between companies and countries. Likewise, the World Economic Forum's *Global Competitiveness Report 2009–2010* places Ireland first of 133 countries for FDI and technology transfer.

The extensive range of R&D centers in Ireland can be seen in Appendix A.

National Knowledge Society Strategy: Technology actions to support the smart economy

Ireland will publish its National Knowledge Society Strategy in 2010. The objective of the strategy is to establish an environment that fully supports the development of a smart, low-carbon economy with sustainable job creation and an improved quality of life.

The strategy will include a major section on e-participation aimed at ensuring that all of society is included and benefits from the planned digital developments. In addition to the drive to create new jobs, significant efforts will be aimed at the use of digital technologies in the retraining and employment of the growing number of unemployed resulting from the present economic recession. Many of these are casualties of the building and retail boom and many will need to re-skill. The clear focus on increasing jobs will ensure public backing for the various actions that will be undertaken.

Ireland has invested heavily in education and research. As outlined in the previous section, the government is committed to knowledge and skill generation through research investment. This is vital if the country is to sustain higher value-added jobs across a range of sectors, but particularly in the ICT sector, where the potential for such jobs is great. These jobs will originate from manufacturing and service provision. Current and future manufacturing will contain significant service provision and will rely heavily on research and access to advanced infrastructure.

E-health and e-learning will be other ICT-related areas of focus in the Knowledge Society Strategy. The Irish government plans major initiatives in the national monitoring of early-stage obesity and in the home monitoring of the elderly. Both initiatives will have significant economic and social benefits.

Ireland has developed global leadership in e-learning. The strategy will aim to ensure that these products and this expertise are fully incorporated into all stages of the country's educational system. Ireland's investment in education and skill development is well recognized, and it has the highest number of tertiary graduates in the 25- to 35-year-old group in Europe, the majority being in science, engineering, and business. The flexibility of Ireland's educational system is seen by its high rating in international studies on supporting enterprise development. In order to support a smart economy, Ireland plans specific initiatives to increase mathematical skills at all levels and to further increase the numbers of graduates in science and engineering. This is an important aspect of the SSTI.[4]

The government published the *Technology Actions to Support the Smart Economy* report in July 2009, the first report in the Knowledge Society series. The function of this first report is to identify key actions that will deliver the critical technology infrastructure and the signature knowledge-intense projects necessary for the development of a smart economy.

Economic advantage will be secured by being early adopters of new digital and clean energy technologies. Popular participation in the emerging digital world of work and leisure will create domestic markets and develop the workforce for smart industries. Digital tools offer significant opportunities to cut carbon emissions in the home and workplace. E-learning will offer alternative paths in education and training, allowing second chances for people disaffected by traditional classroom-based rote learning, and thus increasing the size of the skilled labor workforce. E-government will lower the cost and increase the productivity of public services. E-inclusiveness is a key requirement for bringing the wider public into the smart economy and raising Ireland's international profile as a technologically sophisticated nation.

The report sets out six actions, all of which have a strong ICT component. A recurring theme within the report is the development of exemplar actions and the promotion of Ireland as a test-bed for innovative products and actions. Using the new tools and services in Ireland develops the workforce for indigenous and foreign investors, developing the local market creates both jobs and the test-bed environments, investment

creates high-end jobs, and these jobs create the potential for a high quality of life. Ireland intends to create a smart virtuous circle of participation, investment, jobs, and quality of life. The six actions are as follows:

Exemplar Smart Communications Network

Network Internet Protocol traffic is doubling every two years. Unable to contend with this huge increase in the volume of data, the existing switching and routing technologies are becoming bottlenecks across the network. Ireland is establishing itself as a world leader in developing a revolutionary, technological solution to this problem, evolving from the cutting-edge optoelectronic research that has been funded by government over the past 20 years.

Founded in 1999, Intune Networks is an Irish company focused on building a platform for optical burst packet switching. Holders of worldwide patents in key areas of this new technology, Intune Networks' early clients include Massachusetts Institute of Technology, the European Space Agency, the US National Aeronautics and Space Administration, and the US Defense Advanced Research Projects Agency. The founders commenced developing their technology in the early 1990s at the University College Dublin, and are receiving ongoing support from SFI-backed institutions such as the Tyndall National Institute at University College Cork. Enterprise Ireland is an investor in the company.

Moving to optical burst packet switching and transport—a technology based on transferring images and data using colored light (tunable laser technology)—will unblock the network and, by lowering the requirement for switches and routers, significantly reduce the energy requirement for running the network. It will also dramatically improve image quality. Until now it has been possible to transport images and data only using fiber optic networks. Intune has succeeded in making the fiber optic network programmable. This breakthrough innovation allows the possibility of sending, switching, and collecting digital data and images in a single optical infrastructure.

Ireland now has an opportunity to capitalize on its leadership in optoelectronics R&D and the emerging solutions from Intune to develop a low-energy and ultra-fast Exemplar Smart Communications Network. This will enhance Irish ICT capacity and act as a magnet for FDI and research. It creates an opportunity for the emergence of an Irish MNC onto the global ICT stage, and it will highlight Ireland's leadership in green technology. The Exemplar Network will also provide a test-bed for the trial and further development of next-generation communications devices and technologies including mobile TV, interactive video, and a large range of other applications.

Although it is always difficult to predict the exact number of new jobs that could arise from break-through technology, it is estimated that 5,000 direct jobs and a further 5,000 indirect jobs could be established over a 5–10 year period as a result of the Exemplar Network.

The test-bed phase of the network will be established during 2010 and will provide researchers, indigenous companies, and MNCs access to a test and trial facility prior to their technology being deployed commercially throughout the world. The first global use of the core technology supporting the Exemplar Network (OBS) was used to support the broadcast of a live music concert in Dingle, Ireland, in December 2009.

Energy-efficient data centers and cloud computing

Data are the lifeblood of business. Data centers house the servers that hold the data; they also automate a range of essential back-end functions that manipulate data for end-users.

Cloud computing allows individuals and companies to store their data remotely, thereby lowering their server and energy costs. Data are stored, backed-up, and secured by expert companies on a scale impossible for even large companies to match. This allows for significant increases in server efficiency. Savings on hardware and electricity are shared by the provider and customer.

Nonetheless, data centers themselves consume a significant amount of energy. This has led to ever-increasing demands to reduce the cost of data centers by improving their energy efficiency—in short, to create green data centers.

Establishing Ireland as a center for energy-efficient data centers and cloud computing not only allows the country to capitalize on this growth opportunity but it also realizes the objectives of the smart economy. Though data centers in themselves are not large employers, they do support valuable international and European headquarters. As an example, EMC in Cork has an advanced data center supporting 1,700 jobs. IBM has its European cloud computing center located in Dublin, and Microsoft opened its state-of-the-art facility in Dublin in September 2009. Recently Hewlett-Packard announced the establishment of its global cloud computing center in Galway. Ireland has significant expertise in the design and management of data centers. It is estimated that a minimum of 10,000 high-value jobs based on advanced data centers could come on stream over the next 5–10 years.

An expert group has been established to put in place the priority measures necessary to position Ireland as a center for green data center technologies. The group will define a national green standard and focus on advanced virtualization technology. .

International content services center (ICSC)

The establishment of an international content services center modeled on Ireland's International Financial Services Centre (IFSC) attempts to harness Ireland's reputation in three areas:

- digital creative arts (film, games, music, and animation);
- modern communications technology; and
- legal and other professional services.

The ICSC will house content and provide content generation, distribution, and management expertise. This facility will support the ongoing development of the 1,000 or so digital content companies currently located in Ireland. The majority of these companies are small (1–10 persons) and highly creative, with great potential for growth. The central mission of the proposed center is to establish itself as a world-class broker between the digital content developers and owners and the major content distributors. There is an added challenge posed by the fact that a significant number of existing data are transferred illegally. Content developers will benefit from being able to exercise their legitimate property rights and content users will be assured of the legal status of the content they access. The ICSC's success will also depend on the development of a certain and consistent regulatory environment at both the national level and within the single European market.

A high-level task force has been established and will define the implementation plan for the initiative. It should finalize its work by mid 2010. This development will target the creation of 10,000 jobs over the next 5–10 years.

Smart electricity networks

A *smart electricity network* will facilitate bi-directional flows of energy and information. This will enable the connection of micro-generators, and will improve planning and optimize pricing and a range of efficiency measures.

Irish companies such as Glen-Dimplex are already developing a range of intelligent home heaters using smart meters and motion detectors. Having introduced significant state supports for domestic renewable heating and insulation schemes, the greatest potential for further economic and energy performance improvements lies in this area of smart energy management systems.

Ireland also has the potential to play a lead role in the widespread deployment of electric vehicles, which both rely on, and in turn support, the development of smart grid technologies. The Electricity Supply Board (ESB) is committing to developing an electric vehicle (EV) charging system involving the standardization of connections and open data management systems.

A working group has been established in the Department of Communications, Energy and Natural Resources (DCENR) to set out how to meet the government's target of rolling out a smart meter to every home in the next five years. To date, some 8,000 meters have been installed as part of the testing phase of the project. The government has signed a memorandum of understanding with the ESB and Renault Nissan with the aim of having a first fleet of new vehicles from those two companies available in Ireland by the end of 2010.

The last two actions are related to the Internet of Things, one of the key characteristics of the new digital world, extending the Internet to include information coming from sensors attached to equipment and physical objects. Technologies such as radio frequency identification, short-range wireless communications, real-time localization, and sensor networks are now becoming increasingly common, bringing the Internet of Things into commercial use. There is a series of actions identified in the report that will allow Ireland to become an early-mover in the commercialization of the Internet of Things. In particular, the report focuses on the development of projects such as Work Flow and Smart Bay.

Work Flow

Work Flow is a new concept using Web-enabled mobile traffic sensors, communication and collaboration tools, and flexible work practices to increase productivity, reduce congestion, and lower carbon emissions. Live feeds of real-time estimates of commute times between company and home office enable workers to choose optimum travel times. Smoothing peak-hour traffic will also result in better return on transportation investment and shorter business delivery times.

Unified communications and collaboration tools and services open up possibilities for rich, real-time integration of home and work offices and for the development of e-centers outside the main cities. Working from home or local e-centers will save on commuting time and traffic congestion and could provide an economic stimulus for smaller towns and villages—now often reduced to ghost status during the workday.

A pilot scheme for Work Flow will be rolled out in 2010 with the assistance of the DCENR, the Department of Transport, and industry partners.

SmartBay

SmartBay is a key action of the marine component of the government's SSTI. As an island nation, Ireland is both threatened by the marine elements of climate change and ideally placed to develop smart solutions for use nationally and for international export. Combining indigenous and FDI businesses with government-funded R&D will provide the capacity to develop products and services that can be commercialized.

SmartBay aims to establish a marine research, test, and demonstration platform in Galway Bay. It will link surface and underwater sensors and networks for environmental research. By understanding whole marine systems, new technologies will be developed that will aid oil and gas exploration; port and harbor development;

and the mitigation of storm surges, coastal flooding, and rising sea levels.

IBM Ireland and Intel are already working with the SmartBay project. EpiSensor, an indigenous Irish company, has already worked with Dublin City University on a product developed in the SmartCoast project (funded by the Marine Institute of Ireland and the US Environmental Protection Agency) and is now working with IBM to develop environmental monitoring solutions.

Over the course of 2010 and 2011, SmartBay will be graduated from a pilot to a full-scale national platform and test-bed, involving the upgrading of its wireless facilities and the laying of fiber on the seabed.

Conclusions and future direction

A number of conclusions and lessons can be drawn from this case study. Countries that decide on a *knowledge* approach to economic and social development should focus their strategies on areas of distinctive strengths in order to address national challenges. Ireland has developed significant strength in attracting FDI investment in the ICT sector. At the same time, the country faces the specter of losing employment to countries with a lower cost base. The solution is to increase the knowledge intensity of manufacturing and development of innovative services.

Development of the Exemplar Smart Communications Network based on innovative technology developed in Ireland and protected by a series of worldwide-granted patents is an example of a distinctive strength being harnessed to establish a unique test-bed for advanced optical-based communications products that will act as a magnet for high-value inward investment, support an ecosystem of indigenous companies, and help focus and provide a platform for the commercialization of publically funded research. Communications is the largest and fastest growing sector of the €6.5 trillion ICT area.[5]

Significant government investment in R&D has worked well, as seen by the increase in recent FDI with noteworthy R&D components. Countries that decide on a knowledge-intensive approach must allocate significant funding to all stages of education in addition to research. Product life cycles are notoriously fast in the ICT areas, with new communications trends and products serving as a good example. Ireland made significant investment in international conductivity in order to attract investment in newer wave ICT companies. The attraction of Google, Facebook, and others resulted.

The country has raised its profile by concentrating on six technology actions that showcase Ireland as a leader in these areas. Raising the country's technological profile has already led to significant interest by international investors. The profile of distinctive innovative areas could prove useful to countries seeking collaborative partners and investors.

Focusing on the convergence of ICT and energy is an example of how the extremely challenging national situation of heavy dependence on imported fossil fuel is being addressed by the development of sustainable energy resources (wind and ocean) and incorporating these into the national electricity network using a smart grid/network approach. The development of electric vehicles and a national roll out of smart meters to every home in the country are other examples where ICT plays a key role.

The Irish have a long history of curiosity, travel, education, and adapting to new people and settings. Disadvantages have been turned into advantages. Losing the native language as the vernacular has allowed access to the dominant English-speaking world, being an offshore island of Europe has placed Ireland between the United States and Europe, and emigration first drove a powerful diaspora and now fuels an emerging sense of global Irishness.

The lack of traditional industrial raw materials forces the country to be smart—to be smart in tools and with natural resources. National history has driven an intense commitment to education as the only real access to survival and prosperity. While bad mistakes have been made in the last decade, such as the property bubble, the country continues to thrive in the smart end of economics. History has prepared the nation for an era of serial crises.

Irish culture has always been outward looking; as such, it is a draw for the rest of the world. Success in literature, music, and the other arts are both selling points for Ireland as a place with a high quality of living and the stuff of new digital media industries. The curiosity of a migrant people is now powered by social media, communication, and collaboration tools.

The progression from great Irish colleges of education in Europe after the Dark Ages to leadership in e-learning is not accidental—it is driven by the needs and talents of an ambitious people. Ireland is already the EMEA headquarters for ICT USA. It will now pioneer new data and electricity network solutions and become both a serious green data center and a serious digital content center.

This small, open economy powered by highly educated people from home and abroad, looking not just to their own concerns but to global ones, is well placed to overcome the current major economic downturn and prosper in this era of knowledge societies and smart economies.

Notes

1 See OECD 2007.

2 Irish Council for Science, Technology and Innovation, 1998, recommendation ii, p. 7.

3 See Government of Ireland 2006, pp. 8, 21.

4 Government of Ireland 2006.

5 World Information Technology and Services Alliance 2008.

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Appendix A: Centers for science, engineering, and technology in Ireland

SFI-funded centers for science, engineering, and technology (CSET)

SFI is the main funder of ICT-related research in Ireland. Six CSETs, mainly in ICT, are key to the development of the smart /knowledge economy. Ireland is currently leading future Internet initiatives in Europe in areas covering platform integration, Web 2.0 technologies, and the Sensor Web.

The following descriptions are based on the websites of the six CSETs.

Digital Enterprise Research Institute (DERI)[1]

Focused on the Semantic Web and supported by SFI since 2003 with approximately €25 million in grants, DERI aims to develop the software that will allow the Internet to become a platform where organizations and individuals communicate and collaborate more easily and intuitively.

DERI's partners include Nortel, Storm, Ericsson, IBM, and Cisco.

The Centre for Telecommunications Value-Chain Research (CTVR)[2]

CTVR was established in 2004 as a five-year, €69 million program between Lucent Technologies, Bell Labs, IDA Ireland, and SFI. CTVR is designed to make Ireland a world-leading location for research in telecommunication design, engineering, manufacturing, and servicing. The project established a Bell Labs global headquarters for research into telecommunications and supply chain technologies in Ireland.

The Irish software engineering research center Lero[3]

With a €11.7 million commitment from SFI, Lero is a partnership of academic researchers and industry, led by the University of Limerick. Lero is researching, developing, and validating theories, technologies, methods, and notations that help make software production more predictable, efficient, reliable, flexible, and adaptable. It is also establishing an automotive software engineering center.

The Centre for Next Generation Localisation (CNGL)[4]

CNGL is an academia-industry partnership funded as an SFI CSET. With over 100 researchers, CNGL is developing novel technologies addressing the key localization challenges of volume, access, and personalization and is carrying out the fundamental and applied research into the next generation localization factory.

Among companies that are working with CNGL are Microsoft, IBM, Symantec, Dai Nippon Printing, Traslán, and others.

CLARITY[5]

CLARITY is an SFI-funded CSET focusing on the research intersection between adaptive sensing and information discovery. CLARITY will bridge the physical-digital divide by producing a new generation of smarter, more proactive information services.

Among companies that are working with CLARITY are IBM, Big Green, Vodafone, Ericsson, Foster-Miller, ChangingWorlds, Fidelity Investments, and Critical Path. Other partners include the Irish Environmental Protection Agency, the Marine Institute of Ireland, and the National Museum of Ireland.

Biomedical Diagnostics Institute (BDI)[6]

BDI is a multidisciplinary research institute focused on the development of next-generation biomedical diagnostic devices. These devices will be applied in both point-of-care and self-test home use. The availability of sophisticated personal-use diagnostic devices will allow for early detection of life-threatening events and will also allow chronic diseases to be controlled more effectively.

Current MNC and SME industrial partners include Becton Dickinson and Co., Analog Devices Inc., Hospira Inc., Inverness Medical Innovations Inc., Enfer Technologies Ltd., and Amic AB.

Other relevant SFI initiatives

SFI also funds a large number of strategic research clusters (SRCs). Relevant SRCs include:

- FAME (federated, autonomic management of end-to-end communication services) at Waterford Institute of Technology (WIT).
- Complex and Adaptive Systems Laboratory (CASL) cluster on Graph & Network Analysis at University College Dublin (UCD).
- Strategic Research in Advanced Geotechnologies (StratAG) strategic research cluster, led by the National University of Ireland Maynooth (NUIM).
- Clique, which is working on data mining of graphs and networks.
- The Irish Centre for High End Computing (ICHEC).

Other SFI-funded groups include:

- Tyndall's photonics projects.
- The Research Institute for Networks and Communications Engineering (RINCE) (see below) project on tunable lasers in optical networks.

(cont'd.)

- NUIM's project on next-generation communication networks.

PRTLI-funded centers

The PRTLI has established 30 research centers or institutes and 2 research libraries. Three of the centers are involved in ICT/advanced communications research.

Research Institute for Networks and Communications Engineering (RINCE)[7]

Established in 1999 as a national center of excellence in ICT, RINCE is located in Dublin City University and addresses major research challenges related to the complexity and integration of new global communications networks.

The Radio and Optical Communications Laboratory is central to RINCE. This laboratory focuses on the design, simulation, and demonstration of new technologies for future broadband photonic communication systems.

Boole Centre for Research in Informatics[8]

The Boole Centre for Research in Informatics combines research expertise in computer science and mathematics from University College Cork. The computation facilities of the center include a 100-node Beowulf cluster parallel computer and a connection to the Irish computational grid. Research themes include information theory, theory of computation, and computing power.

The Institute for Information Technology and Advanced Computation Research (IITAC)[9]

IITAC was established at Trinity College Dublin (TCD) in 1999. It is housed in a purpose-built facility and conducts a strategic research program in computational and biomolecular sciences. IITAC links computer, physical, and biological sciences in a program coordinated and supported by the TCD Centre for High-Performance Computing.

IITAC research themes include proteomics, structural biology, biomolecular modeling, physical sciences (molecular dynamics and quantum chemistry), mathematics, computational physics, and computational chemistry.

National Digital Research Centre (NDRC)[10]

The NDRC is a translational research center located in the country's digital hub, Dublin, bringing together collaborative industry and academic joint venture projects. Founded in 2006 by a consortium of tertiary institutions with the support of the DCENR, the NDRC operates as an independent, not-for-profit center of excellence with a focus on converting digital research into marketplace success.

Technology Research for Independent Living (TRIL)[11]

TRIL operates at the convergence of life sciences and ICT, focusing on new technologies to enable people to live independent lives for as long as possible in the environment of their choice. The center created dedicated laboratories at Intel and in each of the universities involved, and is driving bi-directional knowledge and technology transfer through the collective work of a multidisciplinary team.

The work of TRIL is important to e-health programs that will feature prominently in the National Knowledge Society Strategy.

Notes

1 http://www.deri.ie/.
2 http://www.ctvr.ie/.
3 http://www.lero.ie/.
4 http://www.cngl.ie/.
5 http://www.clarity-centre.org/.
6 http://www.bdi.ie/.
7 http://www.rince.ie/rince/g1/117-EE.html.
8 http://www.bcri.ucc.ie/.
9 http://www.iitac.tchpc.tcd.ie/.
10 http://www.ndrc.ie/.
11 http://www.trilcentre.org/.

CHAPTER 2.3

ICT in Tunisia: A Strategic Lever for Building a Knowledge-Based Economy

TAWFIK JELASSI, Ecole Nationale des Ponts et Chaussées, France

> We have dedicated a privileged position, in our program for the future, to the building of the society of knowledge and technological innovation, based on our conviction that no progress or development can be achieved without mastering, adapting and benefiting from modern technologies, in a way that consolidates the foundations of the new economy and expands the prospects of employment and integration in professional life.
>
> *—Zine El Abidine Ben Ali, President of Tunisia, (excerpt from his swearing-in speech before Parliament, November 12, 2009)*

Information and communication technologies (ICT) can be used as a strategic lever for socioeconomic development and as a competitive tool in an increasingly global and deregulated market. In Tunisia, the government has positioned these technologies at the heart of the national development plan. They are considered an enabler for economic diversification and for the creation of new, value-added activities in all sectors.

Tunisia has been among the first African countries to implement an ICT-based national strategy aimed at:

1. modernizing the telecommunications infrastructure throughout the country;
2. formulating a regulatory framework for the digital economy that supports the private sector and fosters corporate competitiveness;
3. developing human resources through the restructuring of education, training, and research institutions; and
4. enhancing international cooperation and partnerships in the ICT field.

Since 2002, the telecommunications sector in Tunisia has been deregulated, a national telecommunications agency created, and an electronic signature and electronic document exchange adopted. The World Summit on the Information Society (WSIS), started by the United Nations in 1998 on Tunisia's proposal and hosted by the country in its second phase in 2005, boosted the role of ICT in the country's economic and

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social development. In this context, specific actions included (1) creating across the country, technology parks aimed at strengthening the synergy among education, research, and the private sector; and (2) fostering the national program for enterprise upgrading, which promoted corporate use of ICT and made it economically affordable for companies.

The purpose of this chapter is to present an overview of Tunisia's ICT strategy and its contribution to building a knowledge-based economy. The following section highlights the role played by ICT in boosting Tunisia's growth and competitiveness. Next, the chapter describes the way the government created a nationwide digital culture, provided ICT access for all, and established a trustworthy environment for ICT development. Also the importance of education and technology parks in building a knowledge-based economy are discussed. The chapter concludes with an overview of the challenges faced in implementing nationwide ICT strategy, future perspectives, and lessons learned from Tunisia's experience.

ICT: A powerful booster of Tunisia's growth and competitiveness

The importance of ICT in fostering a knowledge-based economy is confirmed year after year. Measurements of the degree of companies' knowledge appropriation have seen a net increase of ICT contribution to such economy over the last few years. For the 1997–2005 period,[1] the Knowledge Economy Index has registered an average growth rate of 4.3 percent per year, essentially due to companies' use of ICT (for which the average annual growth rate was approximately 9 percent).[2] Thus a better ICT utilization enables companies to achieve a better integration of their business processes and stronger market competitiveness.

Also the ICT sector's share of the country's GDP rose from 2.6 percent in 1997 to 10 percent in 2008, and is expected to reach 13.5 percent in 2011. This encouraging trend is mirrored in Tunisia's performance in the Networked Readiness Index (NRI) 2009–2010, in which it ranked 1st in North Africa and 39th worldwide. Between 2001 and 2008, investment in Tunisia's ICT sector has increased by 8.1 percent annually. For the last three years, the increase has been 15 percent sectorwide and 26.6 percent in ICT-related activities. Government incentives to set up ICT ventures and the increasing spread of a digital culture have led to the annual creation of, on average, 400 private enterprises.[3]

In 2007, Tunisia was the fourth largest African exporter of ICT and ICT-enabled services, with exports valued at US$572 million and imports amounting to US$496 million.[4] On a related note, to enhance their internal efficiency and overall effectiveness and in order to benefit from online services offered by the government and other institutions, companies are increasingly integrating ICT into their business activities. To this end, 90 percent of Tunisia's companies were connected to the Internet in 2009, up from 88 percent in 2008 and 80 percent in 2007. Moreover, 47 percent of the companies surveyed have their own website, up from 37 percent in 2008 and 32 percent in 2007.[5]

The ICT sector analysis carried out in 2009 by the Tunisian Institute of Competitiveness and Quantitative Studies revealed that 54 percent of service companies—especially in banking, insurance, and tourism—have their own websites, compared with 42 percent of industrial enterprises.[6] This higher number can be explained by the attitude of top management toward ICT and its commitment to using these technologies for business competitiveness, especially since online services have become a more crucial market imperative than ever (see Box 1).

Creating a national digital culture

This section highlights the approach that Tunisia has taken to create a national digital culture. More specifically, it addresses how the government provided ICT access for all, built a state-of-the art ICT infrastructure, and established a trustworthy environment for ICT development.

ICT access for all

Aware of the essential role that ICT plays in building the information society, Tunisia has implemented a strategy that guarantees, over time, universal digital access, regardless of gender, region, or any other possible criteria of exclusion. Indeed, in order to secure digital opportunity for all, several initiatives have been undertaken:

- The creation of a national IT center for children (known as the Centre Régional d'Informatique Pour Enfants, or CRIPE),[7] as well as regional centers, throughout the country aimed at training 5- to 15-year-olds. Moreover, in order to cater to children who have specific needs, specialized areas within each CRIPE and an IT center for disabled children (Centre d'Informatique Pour Enfants Handicapés, or CIPEH) were established.

- The use of IT as a teaching aid for preschool activities. This resulted in setting up microenterprises, especially in big cities, focused on this market niche.

- The connection of elementary and secondary schools and colleges, as well as of all other higher-education institutions, to the Internet.[8]

- The connection of university libraries, community arts centers (161 out of 209), municipal libraries (203 out of 318), and almost all youth clubs (294 out of 296) to the Internet.[9]

- The creation of computer and multimedia clubs within community arts centers (79 out of 209) and of public Internet access centers throughout the country.

- The fostering of ICT access in rural areas through the use of special buses equipped to serve as mobile computer laboratories, with Internet connections and educational tools and games targeted at young users.

- The improvement of the rate of household personal computer (PC) ownership. The number of computers in Tunisia increased from 472,000 in 2004 to 997,000 units in 2008, and PC penetration in households increased from 7 percent in 2004 to 13.1 percent in 2008.[10] This growth in computer usage was an outcome of the presidential initiative entitled The Family PC.[11]

- The offer to citizens and corporations, through the national strategy for e-Administration, of an integrated set of e-services from different government organizations. This strategy aims to reduce costs, enhance citizens' involvement, and improve public sector efficiency.[12]

- The modernization of the national healthcare information system by establishing a broadband infrastructure to connect 280 healthcare centers and developing high value-added services such as telemedicine.

A trustworthy environment for ICT development

As early as 1999, Tunisia formulated a national cybersecurity strategy aimed at increasing information systems' security in the country and fostering electronic commerce and online services, as well as protecting users against cyber-threats. A first measure was the adoption in 1999 of a law defining cybercrime and specifying sanctions against IT hackers. Subsequent measures included the establishment of the National Agency for Computer Security (ANSI) and the Tunisian Computer Emergency Response Team (TunCERT).[13] ANSI's mission is to raise governmental and business organizations' awareness and assist them to implement actions to ensure the security of their information systems. Through its TunCERT, ANSI is the first operational center in Africa recognized by the worldwide network Forum of Incident Response and Security Teams. It is a member of the Network of Centers of Excellence of the United Nations Conference on Trade and Development (UNCTAD), and also serves as Vice President of the Organization of the Islamic Conference-Computer Emergency Response Team.

The establishment in 2000 of the National Agency for Electronic Certification as Tunisia's certification authority has provided a technical and legal framework for the recognition of electronic signatures.[14] Furthermore, the implementation of the local electronic payment system E-dinar by the Tunisian Post in 2001 and of secure online banking solutions "Secure Payment Server" in 2005 fostered the development of electronic commercial transactions.[15] These actions aimed at creating a trustworthy IT environment, a prerequisite for the successful

Box 1: The contribution of the Enterprise Upgrading Program to ICT adoption and use

Corporate adoption and use of ICT is a major imperative for gaining business value. These technologies enable companies in today's highly competitive marketplace to improve the quality, cost, and time-to-market of their products and services. ICT applications go far beyond fostering internal efficiency and effectiveness to establishing shared processes and inter-organizational systems, thus linking a company with its customers, suppliers, and business partners.

The key ICT role in improving business competitiveness is at the heart of Tunisia's national Enterprise Upgrading Program (known as *Programme de Mise à Niveau,* or PMN). This program covers a good share of corporate ICT adoption costs since it pays for up to 50 percent of computer hardware costs, 70 percent of software costs, and 70 percent of some technical assistance costs.

More specifically, PMN covers the costs of computer hardware acquisition, communication network set up, and some ICT application development. Regarding software acquisition, the following are some software categories for which PMN pays:

- management software (e.g., customer relationship management, enterprise resource planning, accounting, finance, marketing, and production);

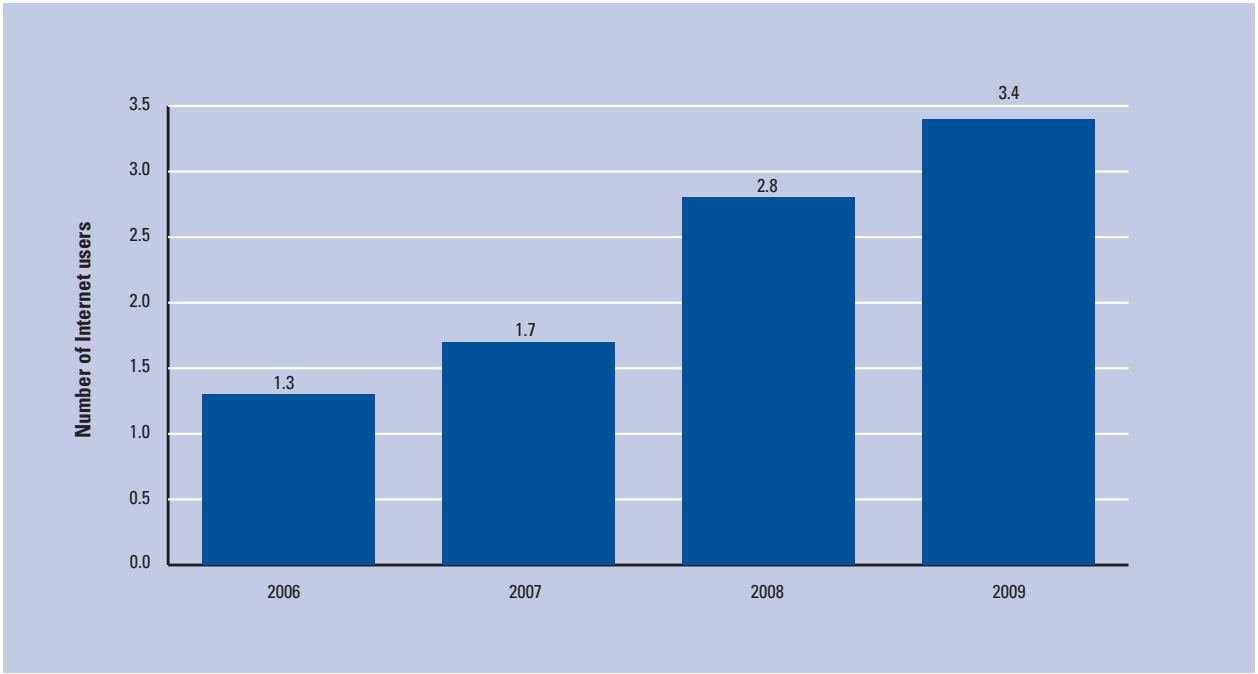
- technical software (e.g., computer-aided design, computer-aided manufacturing, and computation software);

- collaborative and document management software (e.g., workflow, digital document management, and archiving); and

- networking software (e.g., network management and firewalls).

As of May 2009, some 2,800 companies have planned to make ICT investments totaling 294 million dinars within the PMN framework. This figure includes 177 million dinars in software-related investments.

Figure 1: Number of Internet users in Tunisia (millions)



Source: Ministry of Communication Technologies.

implementation of e-commerce, e-banking, and other online services. As of November 2009, more than 80 percent of companies' income taxes are paid online using electronic signatures, and all students in the country register online for their university classes.

A reliable and state-of-the-art ICT infrastructure: Toward high-speed connectivity

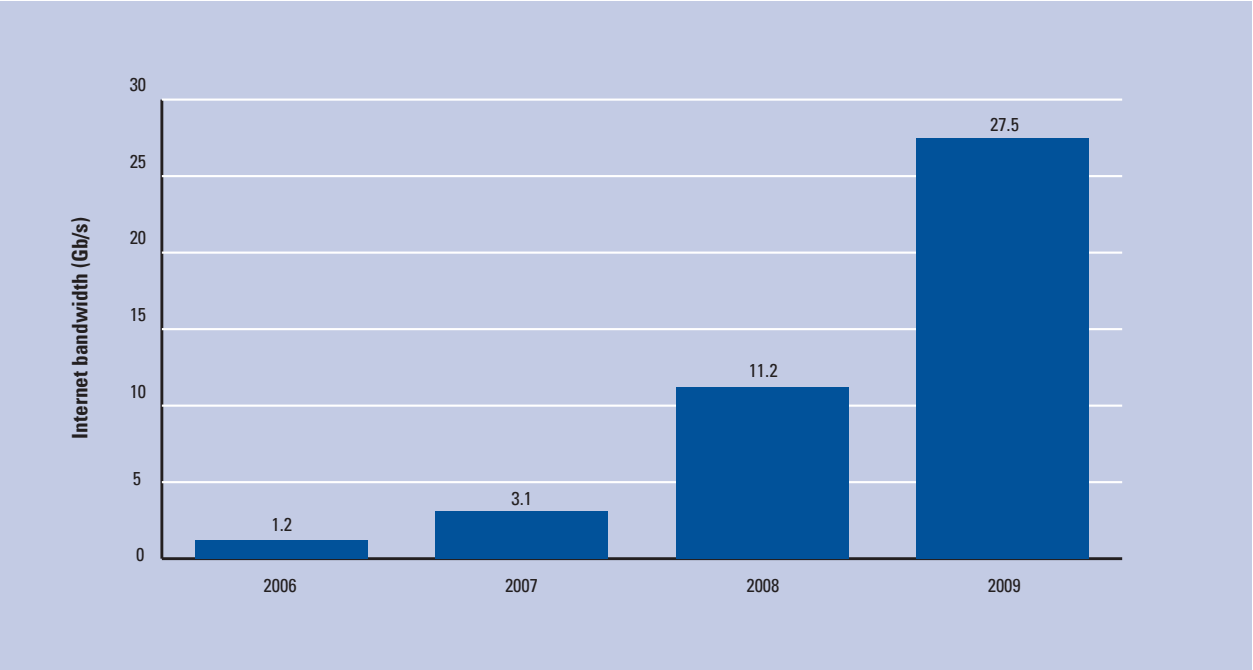
A high-quality ICT infrastructure is a critical pillar for establishing a knowledge-based economy. Investments made since the 1990s have enabled Tunisia to set up a state-of-the-art infrastructure that includes a high-performance network with more than 10,000 kilometers of optical fiber links. With its countrywide multiple-link network of 10 gigabits per second (Gb/s), the national Internet protocol/multiprotocol label switching (IP/MPLS) backbone enables high-speed Internet transmission. Industrial and business zones connected to the IP backbone allow data and Internet transfer at speeds of up to 1 Gb/s.

ICT networks for higher education, healthcare, and e-government were designed using virtual private networks and fiber optic links with the IP/MPLS backbone. Access networks installed in Tunisia by telecommunications operators offer several technologies, such as worldwide interoperability for microwave access (WIMAX), very small aperture terminal, asymmetric digital subscriber line, symmetric digital subscriber line, and fiber optic links. All regions, including rural areas, have benefited from total convergence of fixed and mobile telephony, allowing a penetration rate of more than 98.8 percent.

The deployment of broadband networks has resulted in a significant expansion, mainly through the rapid deployment of digital subscriber line (DSL) and fiber optic technologies. The number of Internet users has grown over the past few years to reach one-third of the population, stimulated by the reduction in DSL subscription costs that makes subscription affordable to most citizens (See Figure 1). More specifically, the cost of a 1 Mb connection was reduced by 25 percent in 2008 and by an additional 45 percent in 2009, to reach almost US$27 per month, compared with a cost of US$61.5 in 2007.[16]

For international connectivity and as part of the "Hannibal system," Tunisia has just laid out its own submarine cable to Europe, with a capacity of 3.2 terabits per second (Tb/s). Added to this is the capacity provided by the Keltra cable (which links Tunisia to Italy) and by the South East Asia-Middle East-Western Europe 4 (SEA-ME-WE4) submarine fiber-optic cable consortium. International connectivity using several submarine cables, the national IP/MPLS, and multiple technology access networks has enabled operators to offer reliable national and international links at an affordable price. The international Internet reached 27.5 Gb/s in November 2009, up from only 11.25 Gb/s in 2008 (see Figure 2).

Figure 2: Evolution of international Internet bandwidth in Tunisia (Gb/s)



Source: Ministry of Communication Technologies.

Qualified human capital and the building of a knowledge-based economy

This section argues that qualified human capital is a key building block of the knowledge-based economy. It stresses Tunisia's focus, since its independence, on education and the country's effort to ensure a better fit between training supply and market demand. It also highlights the importance of fostering scientific research and technological innovation at the national level.

Focus on education

Since its independence in 1956, Tunisia has focused on education as a key lever for its social and economic development. This strategic choice continued after the advent of a new political leadership in November 1987. The democratization of education and the reinforcement of women's rights have been the salient features of public policies. In Tunisia, nearly one-third of the national budget (nearly 7.5 percent of the country's GDP) is spent on education. For the current academic year 2009–10, one Tunisian in four (that is 2.5 million people out of a population of 10 million) is enrolled in a school, college, or university. Comprised of a majority of female students, this enrollment is divided up between educational and vocational training. The latter has an enrollment of 2.1 million with a 90 percent schooling rate for 6- to 16-year-olds, while the former accounts for 400,000 students with a 40 percent schooling rate for 19- to 24-year-olds.[17] Based on an index that takes into account access to education, equity, efficiency, and the quality of reforms in primary and secondary education, Tunisia is in pole position in the MENA region, according to a World Bank report.[18]

Over the last couple of decades, higher education in Tunisia has evolved at a quickening pace. The country today has 14 universities and 200 institutions of higher education covering all parts of Tunisia and providing students with over 1,000 study programs or career paths. Total university enrollment has increased from 40,000 students (37 percent of them women) in the academic year 1986–87 to more than 350,000 students (59 percent of them women) in the academic year 2007–08. Students enrolled in sciences and engineering increased from 10 percent in 1992–93 to 25 percent in 2007–08. Also, the number of higher-education graduates increased 12-fold within two decades, from 5,200 in 1987–88 to more than 60,000 in 2007–08, significantly contributing to the country's economic development.[19]

ICT education programs

Faced with the dual challenge of integrating the country into the global economy while ensuring employment for the growing number of university graduates, Tunisia has implemented some major reforms. These include increased deregulation of several economic sectors, enhanced research and development (R&D) efforts through sustained public investment, the development of new technology parks across the country, and higher awareness in the public and private sectors about the country's move toward a knowledge-based economy.

In this context, ICT study programs have taken a more market-oriented focus with the aim of generating skills and competencies that can attract foreign direct investment (FDI). During the academic year 2007–08, approximately 46,000 students (i.e., 13 percent of the total student population) were enrolled in ICT study programs. Furthermore, increased effort was placed on creating digital educational resources, e-learning programs, and setting up the Tunis Virtual University. Also, between 1997 and 2007, engineering programs saw a threefold increase in enrollment, with the number of graduates climbing from 1,500 to about 4,500 engineers per year. In 2007, about 30 percent of the country's graduating engineers specialized in ICT.[20]

Scientific research and innovation

Since the government introduced a law enacting new research policy guidelines in 1996, Tunisia's scientific research has advanced at a steady pace. In addition to 30 specialized research centers and institutes, the country today has 140 laboratories and 630 research units (mainly located within universities) grouping together some 20,000 researchers, including faculty members, PhD candidates, and Master-level students. Tunisia's budget for scientific research and technological innovation currently represents 1.25 percent of its GDP and is expected to reach 1.5 percent of GDP by 2014.[21]

In order to reinforce science-industry links and bolster R&D and innovation, the country's infrastructure also includes technical centers, high-tech enterprises, and incubators, mostly located within a network of 10 technology parks spread all over the country. Furthermore, the government established the Research and Innovation Promotion Agency in 2009 with the aim of promoting and transferring research results across different sectors of the economy.

Technology parks: An interdisciplinary meeting of minds

Tunisia's transition toward a knowledge-based economy represents a key pillar of the country's 10th and 11th development plans (for the 2002–06 and 2007–11 periods, respectively), thus extending the national effort, begun in the 1990s, to restructure the higher-education and research sectors. Within this framework, the government set up a dozen technology parks (three of which are devoted to ICT) countrywide, in order to create the interdisciplinary innovation and synergies needed for sustainable economic development.

The above approach enables technology-based development and provides solid foundations for a high-tech industry. These technology parks host science and technology education and training programs as well as R&D projects. Such activities are aimed at enhancing Tunisia's value-added products and services and the country's attractiveness for FDI. The success of the technology parks' strategy requires having a minimum critical mass (through the effective onsite presence of several stakeholders); a good experimentation, learning, and adaptation approach; and an institutional and organizational proximity, which enables sharing experiences and best practices.

El-Gazala is the first technology park in Tunisia and North Africa fully devoted to ICT.[22] Since its inception in 1999, it has housed many high-value-added startups and companies. It currently hosts 90 enterprises employing more than 1,700 people, predominantly engineers. These enterprises cover a wide range of activities (e.g., network engineering, computer systems and services engineering, Web technologies, embarked electronic systems engineering, among others) and include some leading ICT firms (such as ST-Microelectronics, Alcatel Lucent, Ericsson, Satec, Microsoft, among others), which export 75 percent of their Tunisian activities.

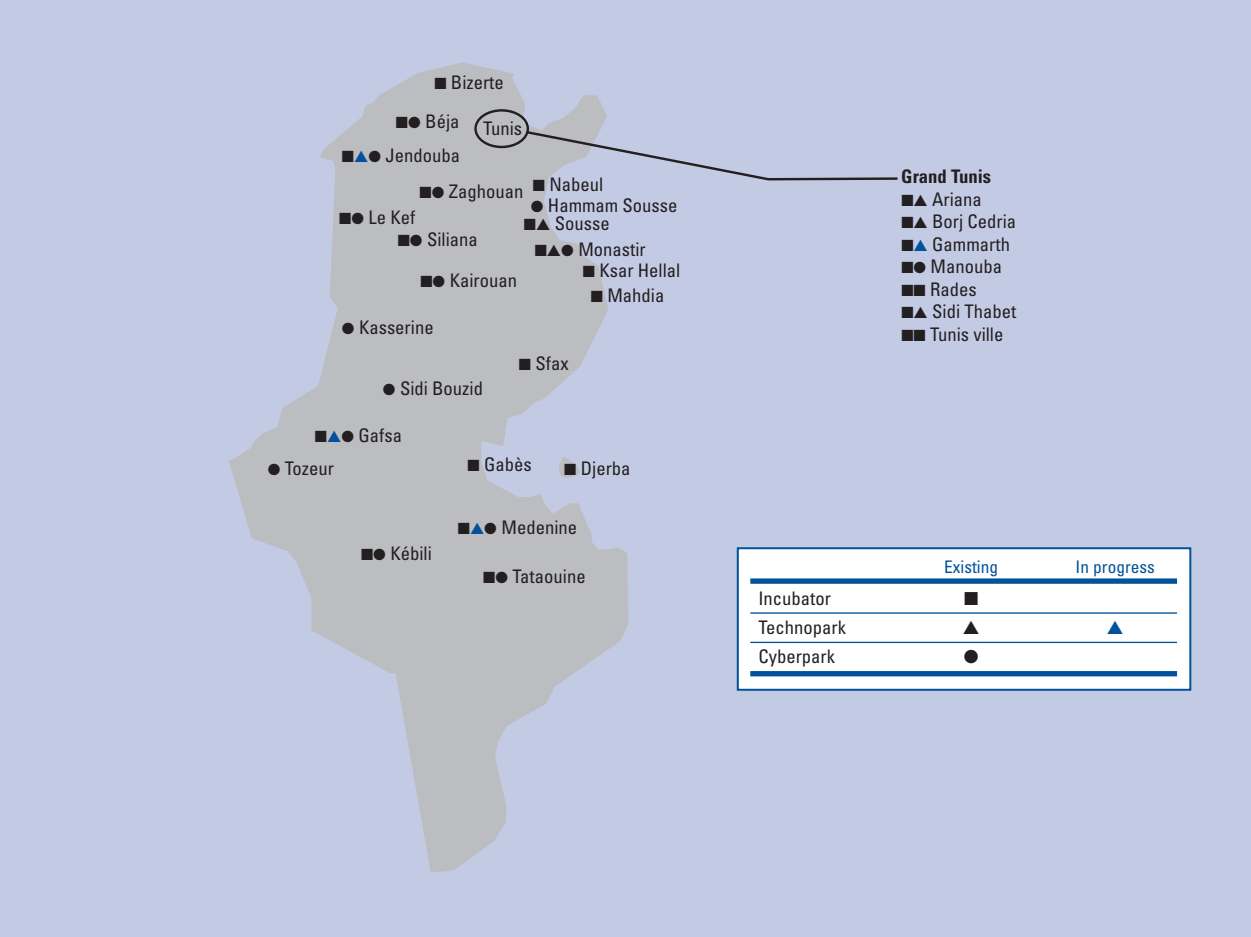
Since 2002, El-Gazala has been a member of the International Association of Science Parks and is referred to as a Business Innovation Center by the European Business Innovation Center Network. It also has several partnership agreements with world-class technology parks including STPI in India as well as Sophia Antipolis, Marseille Innovation, and System@tic-Paris in France.

El-Gazala's education and research facilities include the School of Communications (Sup'Com), which offers telecommunications engineering programs; the Institute of Technological Studies in Communications (ISET'Com), which trains high-level technicians in telecommunications; the Center for Training and Documentation (CIFODE'Com); and the Center for Studies and Research in Telecommunications (CERT). Research is particularly dynamic within the seven research laboratories and units associated with Sup'Com, bringing together more than 250 researchers working on a wide range of ICT-related themes.

The ongoing extension of El-Gazala to the Ennahli and Manouba areas, coupled with the creation or further development of 15 technology parks throughout the country (in Gafsa, Kef, Kasserine, Monastir, Siliana, Kairouan, Sousse, Tozeur, Kebili, Tataouine, Zaghouan, Béja, Jendouba, Medenine, and Sidi Bouzid) constitute a national priority for the government (see Figure 3). This effort, which by 2014 will create a total of 500,000 square meters of high-tech facilities, is aimed at fostering the ICT sector and also contributing to regional development and integration.

Furthermore, the government implemented a national program to connect 300 industrial and service areas to fiber optic telecommunications networks. In 2008, it also put in place the MPLS network with a speed of more than 100 Mb/s to provide a range of secure corporate services that meet the needs of banking, commercial, and industrial enterprises. The 2009 award of a new telecommunications license for the development of fixed telephony and Internet networks,

Figure 3: Technoparks, cyberparks, and incubators in Tunisia



Source: Ministry of Communication Technologies.

as well as 2nd and 3rd generation mobile telephony services, to Divona/Orange-France Telecom aims to enhance the sector's competitiveness through sound competition among operators.

ICT investment and a conducive business environment

In the Euro-Mediterranean region, Tunisia presently offers an attractive transport and logistics platform. The latter comprises nine international airports, seven sea-shipping ports, a 2,400-kilometer rail network, and 20,000 kilometers of roads. It is also home to a free economic zone, a deep-water port, a new petrochemicals' port at Skhira, a network of seven logistics platforms, new sea and air transportation carriers, and a new intercontinental airport at Enfidha (in the center of the country) with an annual traffic capacity of 20 million passengers.

Tunisia also launched several reforms to facilitate cross-border trade and offer guarantees to foreign investors. These reforms have earned Tunisia 1st place in Africa for the ease of doing business, 10th in terms of the number of procedures to start a business, and 11th for the time it takes to start a new venture.[23]

The first seven months of 2009 have seen a 10 percent increase in priority technological investments compared with the same period in 2008. The share of investments made in content (i.e., data, information, and software) in relation to hardware-related investments increased to 63 percent during the first 7 months of 2009, up from 59 percent during the same period in 2008.[24]

Tunisia and value-added ICT services

This section covers Tunisia's effort to reinforce its position as an international destination for value-added ICT services. It describes the country's current position in the global ICT market and the national strategy of offering state-of-the-art IT services.

Box 2: ICT4ALL Forum: A flagship ICT event for Africa and the MENA region

ICT4ALL Forum is an annual multi-stakeholder, high-level global forum that has been hosted by Tunisia since 2006. It has been hailed since its inception as an important international event, particularly for Africa and the Middle East and North Africa (MENA) region. The forum aims to contribute to the implementation of the outcomes of the WSIS through the promotion of investment and partnerships in the ICT sector and also the development of a knowledge-based economy.

ICT4ALL, which is organized in collaboration mainly with UNCTAD and the International Telecommunication Union (ITU), addresses key issues such as ICT investment in Africa, public-private partnership in ICT, and ICT innovation as a tool for strengthening competitiveness and growth. The Forum's program typically comprises plenary sessions, panels, parallel events, and an international technology exhibition.

The 2009 edition of ICT4ALL has witnessed the participation of 1,800 delegates from 52 countries, 23 international organizations, and over 200 worldwide ICT companies, with a view to enhance opportunities in this field, promote investment and partnerships, and stimulate growth. In 2010, ICT4ALL will have a special importance since it will enable making a mid-term evaluation of the WSIS Tunis agenda and action plan as related to the United Nations' Millennium Development Goals.

Tunisia's position in the global ICT market

The success of the second phase of the 2005 WSIS in Tunis, and the subsequent annual ICT4ALL international forum (see Box 2), enhanced the international visibility of Tunisia's ICT and business process outsourcing (BPO) sectors. This has fostered the country's competitiveness in the ICT field and attracted a growing number of foreign R&D and engineering operations, set up in partnership with national firms. The evolution of the ICT sector was mirrored in the ratings achieved by Tunisia in this field. Besides the NRI ranking mentioned earlier, the 2009 A.T. Kearney report confirmed Tunisia's positioning in the services field and its ambition to become an ICT hub in the Mediterranean region.[25]

National strategy for offering state-of-the-art IT services

Tunisia's ICT development strategy aims at making this sector a catalyst for economic growth and international competitiveness. Determined to stay at the cutting edge of the ICT field, the country pays special attention to the continuous improvement of the installed infrastructure. The use of ICT in the public sector enhances its adoption in all economic sectors and in society at large. Thanks to this effective utilization, ICT's contribution to GDP has increased from 7 percent in the last three years to 11 percent at present.

Several major initiatives have been undertaken over the last decade to develop ICT-based value-added services. These were either fully supported by the government or made possible through public-private partnerships. Examples of such e-services, which received international recognition and in some cases were adopted and used by other countries, include Tunisie TradeNet, TrainPost, and financial e-clearance (detailed information on these services is available in Box 3).

Furthermore, the new US$3 billion project, called Tunis Telecom City, will position Tunisia as a key international destination in the telecommunications sector. It will offer state-of-the-art education, research, and training in the telecommunications field and a business incubator for telecommunications startups, as well as venture capital and financing (see Box 4).

Challenges for implementing Tunisia's ICT strategy

This section reviews the main challenges that Tunisia has faced when implementing its ICT strategy. It also highlights the challenges encountered in developing e-content.

Challenges for the ICT sector

Tunisia has faced several challenges in implementing its national ICT strategy. In particular:

- There has been insufficient innovation in software and application development in spite of the government's offer to companies of financial support and tax incentives.
- Competition from other IT offshoring, BPO, and IT service destinations in the region (such as Morocco and Egypt) has been stiff.
- Enhancing the country's technology platform remains a challenge, although several projects have been launched to develop software for telecommunications and industrial systems, machine-to-machine solutions, embedded software, mobile services and content, digital media, and security for information systems and infrastructure.
- Notwithstanding government efforts to improve online service quality and expand the use of ICT in educational institutions, public-sector agencies, and with cybercafés throughout the country, the digital divide has not been completely bridged yet.
- In spite of government incentives to boost R&D activities in the ICT sector, many ICT firms faced difficulties in international competition. This is because of their limited financial resources and the lack of private investment in the sector.

Box 3: Examples of e-services

Tunisie TradeNet: The electronic one-stop shop for clearing trading transactions

Tunisie TradeNet (TTN) was set up to streamline foreign trade transactions. It is an IT network that links the different stakeholders in Tunisia involved in these transactions, among which are: customs and selected government agencies, the central bank and other banks, technical monitoring services, maritime shipping port authorities, maritime and air freight carriers, transporters, and logistics and handling companies. Since 2001, TTN has enabled administrative and other foreign trade procedures to be fully digitized, thus eliminating paperwork and offering the service 24 hours a day, 7 days a week. Since 2006, TTN has reduced, from 15 to 3 days, the time needed to clear all trade procedures and thus the time that goods remain at port. Furthermore, the system allows stakeholders to start the clearance process before the physical arrival of the goods. TTN received the first prize in the public-private partnership category in the 2009 Technology in Government in Africa (TIGA) awards competition, organized by the Economic Commission for Africa and the Canadian Fund for Africa. It is part of the African Information Society Initiative.

TrainPost: A platform for e-learning and vocational training in trade and postal services

TrainPost is a distance training platform developed by the Tunisian postal service with the aim of enhancing postal staff skills within the Universal Postal Union member states. It is an integrated, multifunctional platform that offers courses on trade topics related to postal services. Since 2004, seven TrainPost distance training courses have been organized for 3,012 managers working in the postal services of 148 countries from all over the world. These courses, delivered in Arabic, French, Spanish, and English, covered the following topics: terminal and transit expenses, parcel post, philately, service quality, universal postal service, postal reform and development, letter post, postal security, postal markets, and customs. TrainPost received the 2009 World Summit Award for the best development of digital content suited for e-learning and distance training.

Télé-compensation: Tunisia's financial e-clearance system

The financial e-clearance system ensures the electronic exchange of stocks to be compensated. It is based on:

- the electronic exchange of data on stocks to be cleared and on scanned checks and bills of exchange;
- the electronic archiving of online consultations for a six-month period (which can be renewed); and
- the removal of any paper trail for financial clearance transactions.

The e-clearance system, operational since December 1999 for financial transfers and withdrawals, is currently used by Tunisia's central bank, 21 other banks, and the National Post Office in Tunisia as well as banks in Central Africa and Arab countries.

Box 4: Tunis Telecom City

Tunis Telecom City is a US$3 billion investment by the Vision 3 consortium, which is an alliance of Global Finance House with Ithmaar Bank and Abu Dhabi Investment House. This mega-project, which will create 26,000 jobs, comprises the following:

- an international telecommunications university with a business school and an engineering school focusing on the telecommunications field;
- venture capital institutions specialized in telecommunications to fund telecommunications startups;
- an international stock exchange dedicated to the telecommunications sector;
- an institute of technology and design to develop new products in integrated circuits, semiconductors, and software, and a research laboratory that will test new protocols for the Internet as well as for data and mobile telephony products and services;
- a BPO facility comprising technology, consulting, and outsourcing centers;
- an offshore business center offering professional support and back-office services to non-technology firms;
- a data recovery center managing and recovering electronic data and documents (this will be the first center of its kind in Africa and the Middle East); and
- a multimedia and content management center that will develop multimedia content and satellite-based mobile applications.

- Cooperation between universities and the private sector is rather weak, thus hindering R&D and company-sponsored projects in the ICT field.

Challenges in developing e-content

Another important challenge that Tunisia faced in implementing its ICT strategy is the development of digital content. This is mainly the result of the following factors:

- **Lack of awareness.** Many small and medium-sized enterprises (SMEs) still do not feel the need to have their own websites, or are not ready to invest in setting up a website, thus overlooking the positive impact (including the return on investment) that they could achieve.
- **Poor digital marketing.** Even when SMEs launch their own websites, they are often poorly referenced and poorly updated.
- **International competition for Web hosting services.** Better Web hosting solutions available abroad do not encourage companies to opt for locally offered hosting services.
- **Lack of a viable business model.** Tunisian companies have not so far significantly used online advertising, thus limiting content providers' interest in this sector.[26]

To foster the development of local e-content services, several actions have been taken, as follows:

- Export-oriented companies have been offered state subsidies to cover 70 percent of their website development costs.
- Public grants to civil society organizations have been increased substantially in order to encourage them to develop their websites; in addition, free domain names and free Web hosting services have been provided.
- A National Digital Excellence Award has been established to reward the best e-content in different fields (e.g., education, government, culture).

Developing e-content has become even more pressing with the advent of a third telecommunications operator, which is expected to launch 3G services by early 2010. This is in addition to the need for other services such as mobile e-commerce, mobile e-government, mobile TV, and so on. In this regard, the incumbent operator Tunisie Télécom has launched its venture capital enterprise DIVA Sicar to promote mobile content start-ups, as has the second mobile operator, Tunisiana, which has also set up an investment fund for developing mobile e-content.

Future perspectives

> Knowledge has become an essential factor for enhancing technological innovation, boosting economic activity, creating jobs, and consolidating competitiveness at national and international levels. To that end, we have provided for our country the necessary conditions to master communication technologies and lay the foundations of the information society and the knowledge-based economy, especially in promising sectors and in all specialties that can boost our economic growth, consolidate our competitive capacity, and provide more job opportunities for our youth.
>
> *—Zine El Abidine Ben Ali, President of Tunisia, (excerpt from his speech at the International Conference on the Knowledge-based Economy, Tunis, December 1, 2009)*

Tunisia's restructuring of its higher-education system aims to provide more internationally recognized degrees and sought-after graduates in the global market place. To this end, the country's 11th development plan, for the 2007–11 period, considers investment in developing highly qualified human resources that have a good command of advanced technologies to be a national strategic priority. Such human resources will boost the country's socioeconomic development and contribute to building a knowledge-based economy. The new law, providing policy guidelines for the higher-education sector, redefines universities' mission and role with a view to improving the quality of their services, reinforcing engineering studies as well as technological and scientific specializations, promoting foreign languages, and bringing about the information society. It is in this context that the deployment of the Bologna system (of Bachelor's, Master's, and Doctoral degrees) will help harmonize Tunisia's diplomas and curricula with international quality standards and align the country's higher-education system with the European one.

Engineering education is also part of the 11th development plan, with a target on the one hand of doubling the number of graduate engineers by 2014, and on the other hand of providing these engineers with technical/technological, linguistic, managerial, and entrepreneurial expertise recognized by international certifications. A program for the certification of 20,000 managers and engineers in the next five years is underway.

The President's program for the 2009–14 period represents a major opportunity for Tunisia's ICT sector. It calls for ambitious projects for the country, including:

Box 5: The President's 2009–14 program "Together We Meet Challenges" for Tunisia's ICT sector

The President's program for Tunisia's ICT sector for the 2009–14 period calls for making ICT technologies a major pillar of the country's economic development. Specific objectives of this ambitious program include the following:

- Gain 1 million new subscribers to broadband Internet by:
  - using the most-advanced communication networks providing high-speed connections;
  - increasing the international Internet bandwidth to reach 100 Gigabytes (GB/s) per second by 2014; and
  - operating third-generation mobile telephone networks.
- Offer a digital opportunity to Tunisian families, including students.
- Establish digital terrestrial television by:
  - covering all regions of the country by 2014;
  - re-allocating the used frequency spectrum in order to develop future services of high-speed radio communication and wireless broadband Internet (such as WIMAX); and
  - developing the most recent broadcasting technologies, such as high-definition technology.
- Involve civil society in building the knowledge-based economy and adopting modern technologies by providing a grant of 10,000 dinars to every association that creates an interactive website (Web 2.0) with content pertaining to Tunisia's culture and national heritage and reflecting the various concerns of the country.
- Develop Tunisia's Internet domain name (i.e., .tn).
- Set up a national agency for the promotion of investment in the digital economy, with a focus on fostering technology parks and developing digital activities and remote services.
- Achieve a qualitative improvement of the activities offered by public Internet service centers.
- Allocate 0.5 percent (up from the current 0.15 percent) of the sales turnover of telecommunications operators and ICT companies to research and innovation.

- providing broadband access to everyone in society;
- developing quality digital content that is relevant to all stakeholders and implementing a terrestrial digital television; and
- strengthening the country's telecommunications infrastructure, promoting ICT investment and employment, and fostering the knowledge-based economy (see Box 5).

Lessons learned

Tunisia's ICT experience offers several lessons that other countries may find relevant to their own context. In particular:

- Steady investment in education and human capital development is key to providing a country with the skills and competencies needed to implement an ambitious ICT strategy.
- The creation of a nationwide digital culture and the provision of ICT access to all represent prerequisites for building the information society.
- An ambitious policy to set up a network of technology parks creates the necessary interdisciplinary synergies among education, research, funding, and commercialization of ICT-based products and services.
- The creation of a suitable legal framework and the offering of a variety of incentives are crucial to attract FDI; these allowed Tunisia to become a major outsourcing destination in the region.
- A strong and continuous commitment to the ICT sector in the government's agenda is a critical enabler for the creation of a knowledge-based economy and the emergence of local ICT champions able to compete internationally.

Notes

1 This is the last period for which data are available.

2 See ITCEQ 2008.

3 ITCEQ, Ministry of Economic Development and International Cooperation. These private enterprises exclude call centers.

4 UNCTAD 2009.

5 See ITCEQ, 2009, available at http://www.ieq.nat.tn.

6 See http://www.ieq.nat.tn.

7 See www.cnipe.nat.tn.

8 See http:// www.edunet.tn for the connection of elementary and secondary schools and colleges; see http://www.cck.rnu.tn for the connection of all other higher-education institutions.

9 See www.jeunesse.tn.

10 See http://www.infocom.tn; for an explanation of The Family PC Initiative in Arabic, see www.pcfamilial.tn.

11 This initiative, launched in 2001, offered incentives to the private sector to promote the PC assembly industry and create jobs as well as reduce the PC purchase price. It has also helped promote Tunisia's e-content industry and enhanced the perception and the application of the law on intellectual property rights by requiring the use of original software licenses. See http://www.pcfamilial.tn.

12 See http://www.pm.gov.tn/pm/article/article.php?id=188&lang=en.

13 Information about ANSI can be found at http://www.ansi.tn; information about TunCERT can be found at http://www.first.org/members/teams/tuncert/.

14 See http://www.certification.tn.

15 See http://www.e-dinar.poste.tn.

16 Ministry of Communication Technologies (http://www.infocom.tn).

17 See the Ministry of Higher Education, Scientific Research and Technology (http://www.mes.tn). This enrollment rate of 40 percent of 19- to 24-year-olds is close to the average rate for OECD countries.

18 World Bank 2008.

19 See the Ministry of Higher Education, Scientific Research and Technology (http://www.mes.tn).

20 See the Ministry of Higher Education, Scientific Research and Technology (http://www.mes.tn).

21 See the Ministry of Higher Education, Scientific Research and Technology (http://www.mes.tn).

22 See http://www.elgazalacom.nat.tn for more information about this technology park.

23 These rankings are according to the World Bank's international annual report Doing Business 2010. See http://www.doingbusiness.org/ExploreTopics/StartingBusiness/.

24 See the Ministry of Communication Technologies (http://www.infocom.tn).

25 See A.T. Kearney 2009. The report, which looked at financial attractiveness, the availability of human resources, and the business environment, ranked Tunisia 17th out of 50 countries selected for their offshoring services. An interesting feature of the A.T. Kearney report is its emphasis on the balance between a country's offer and the durability of the benefits that offering provides.

26 Internet advertising represented in 2007 nearly 2 percent of total spending in advertising.

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CHAPTER 2.4

The Sustainable Development of ICT in China: The Rise and Future Development of the Internet

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Since the 1980s, information and communication technologies (ICT) has become a vibrantly developing field. Notably, 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 our society. However, ICT has always been controversial, especially when it comes to its future development. This can be a problem particularly with the Internet, where the extensibility, safety, and quality of service have been subject to constant debate. Many different nations are exploring ways to develop the ICT industry in a sustainable manner as a means of advancing human progress.

China is no exception. Like all the other nations, it has its own experiences and knowledge to share as far as the development of the ICT industry is concerned. Based on the history of ICT development in China, this chapter will discuss ICT's contribution to the country's economy and society, analyze the problems and challenges facing the sustainable development of ICT and make recommendations for pursuing this goal.

The rise of ICT in China

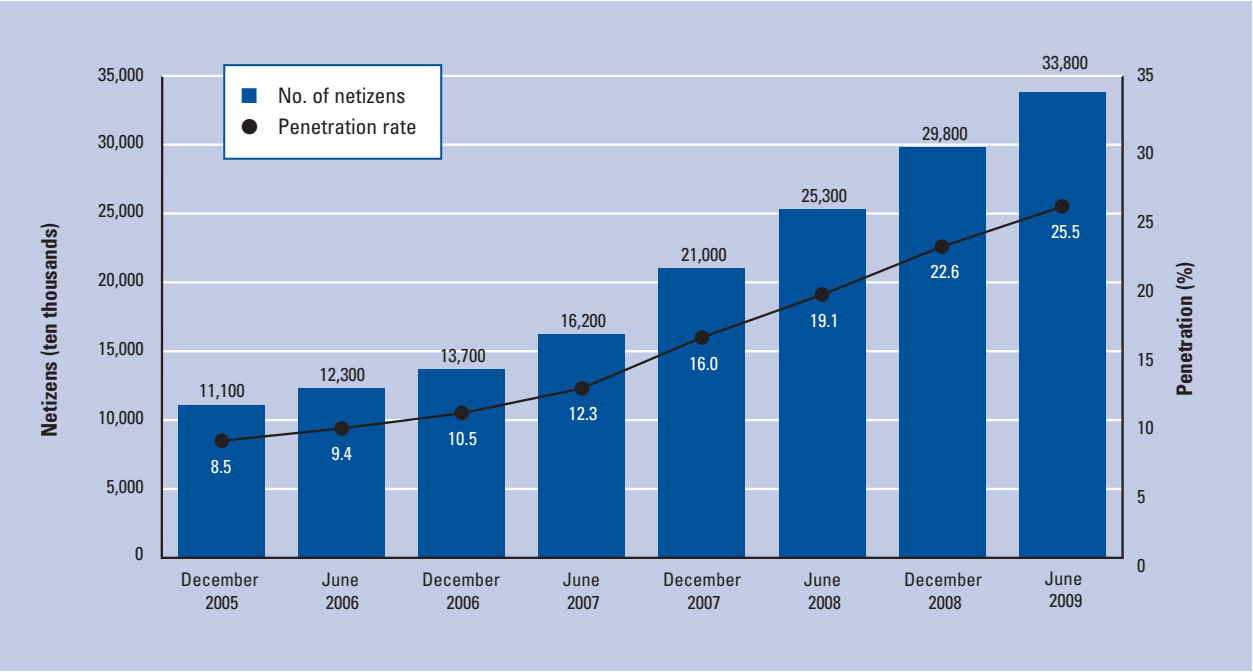
The ICT industry in China includes such sectors as telecommunications, the Internet, the electronic and information technology industry, and broadcasting. Of these elements, the Internet has especially seen considerable growth in recent years.

The history of the Internet in China

Concomitantly with China's economic boom and the development, by leaps and bounds, of its telecommunications industry, the Internet in the country started from scratch to reach today's impressive coverage, with the highest number of users in the world. This achievement would be unfathomable without taking into account the combined efforts of the government, the private enterprises, and the public at large. Under the planned economy, the Chinese government has implemented decisive strategies to encourage further technological development. This development laid a solid foundation for the spread of the Internet. This in turn, when nourished by a friendly market economy, has greatly spurred the development of the Internet under the favorable conditions of China's national characteristics and strong social demands.

In 1994, the Department of Post and Telecomunications established the State Administration on Data and Telecom (SADT), which was intended to run the planning, design, construction, operation, and management of data telecommunication networks in China. The SADT started constructing the Chinese Internet, referred to as CHINANET, which was launched in 1995—one of the earliest efforts in this area internationally.

Figure 1: Number of netizens and penetrations rate in China, 2005–09



Source: CNNIC, 2009.

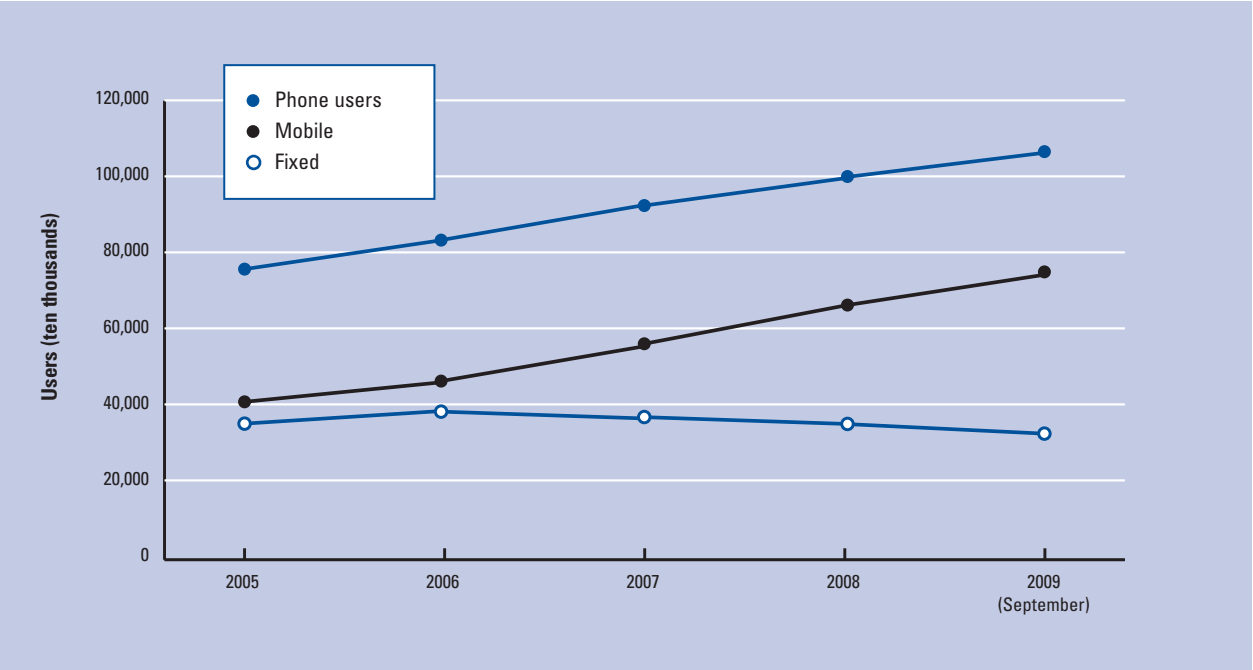
The earliest users of the Internet in China were universities and research institutes that mainly targeted international digital archives of scholarly content. At this stage, the pace of development was rather slow. In 1995, at the INET'95 International Conference held in Hawaii, the Chinese experts' request to connect the national Internet with its counterpart in the United States was flatly refused by the American experts. The reason given was the insufficient number of users and content on the part of China's Internet. The Internet in China was not at parity with that in the United States, thereby rendering an interconnection both unnecessary and undesirable. This nonetheless provided a strong incentive for the Chinese experts to develop content, as well as to tailor Internet services to the general public in the country. The synergies among the government, telecommunication enterprises, research institutes, Internet service providers, and numerous users has been indispensable to the mushrooming of the Internet in the country.

By June 2009, the number of netizens in China reached 338 million (see Figure 1).[1] The country was ranked number 1 in the whole world in this area, with a penetration rate higher than the global average of 25.5 percent. The number of broadband users reached 93.48 million, also the largest worldwide. The world's largest Internet infrastructure covered all the counties, cities, and towns in China, providing Internet access to 90.9 percent of the administrative villages. Broadband was also made available to 95.6 percent of all towns in China. The scale of basic resources for the Internet has also expanded enormously. By June 2009, the number of Internet Protocol version 4 (IPv4) addresses reached 210 million, putting the country at 2nd place worldwide. By way of comparison, the number of domain names reached 16.26 million, of which 12.96 were .CN ones—the most widely used worldwide among all the country-designated domain names.[2] Moreover, this favorable environment not only catalyzed the first generation of such well-known enterprises as Sina, Sohu, and Netease, but it also contributed to the emergence of a new wave of enterprises (e.g., Tencent, Baidu, and Alibaba) at the end of the Internet bubble in 2000.

The development of ICT

As early as 1882, China had its first telephone. During the three decades from 1978 to 2008, the telecommunications industry in China built the world's biggest communications network, and also nurtured the biggest group of telecommunications users globally. Three Chinese telecommunications enterprises entered the list of Fortune 500. By September 2009, the number of telephone users in China reached 1.04 billion, of which 320 million were fixed lines users and 720 million were mobile subscribers—the biggest number worldwide. There was a substantial improvement in the country's network capacity, technology, and service quality. Furthermore, up to September 2009, the capacity of fixed-line office telephone exchanges reached 495 million, exceeding that of households and business users. Meanwhile, the

Figure 2: Telephone users in China, 2005–09



Source: MIIT, 2009 (see http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/index.html).

capacity of mobile telephone exchanges reached 1.305 billion.[3] The fact that this number approximates the total Chinese population makes it possible to satisfy its wide variety of social and economic demands. This is even more evident when we consider the extensive coverage of telecommunication networks over almost all the populated areas and villages in China (Figure 2).

Over the last two decades, a fairly developed personal computer (PC) industry has resulted in China becoming the biggest producer of PCs worldwide. A robust local market provided a fertile environment for this burgeoning industry, where companies such as Lenovo and Founder could be created.[4]

In 1974, the first cable television (TV) station in China was launched. Three decades later, the optical-fiber telecommunication network for cable TV reached 40,000 kilometers nationally, with over 300,000 kilometers at the provincial level. Of these, the allocation access network reached 3 million kilometers; the total number of users is now as large as 164 million. From 2003 onward, China established a digital cable TV network by selecting a few cities as pilot sites. There are now many cities that have already built the technology platforms for digital cable TV. Over 100 cities, such as Qingdao, Hangzhou, and Shenzhen, have completed the overall digitalization of TV, and the number of digital cable TV users in China has reached 60 million so far.

Economic and social contributions of ICT

The impacts of ICT, especially the rise of the Internet, on societies and economies are palpable worldwide as well as in China. In the past three decades, ICT has played an indispensable role in facilitating China's increasing integration into the global economy and international community. Moreover, ICT has made positive contributions to such societal progress as the establishment of a civil society and an increasing democratization of the country.

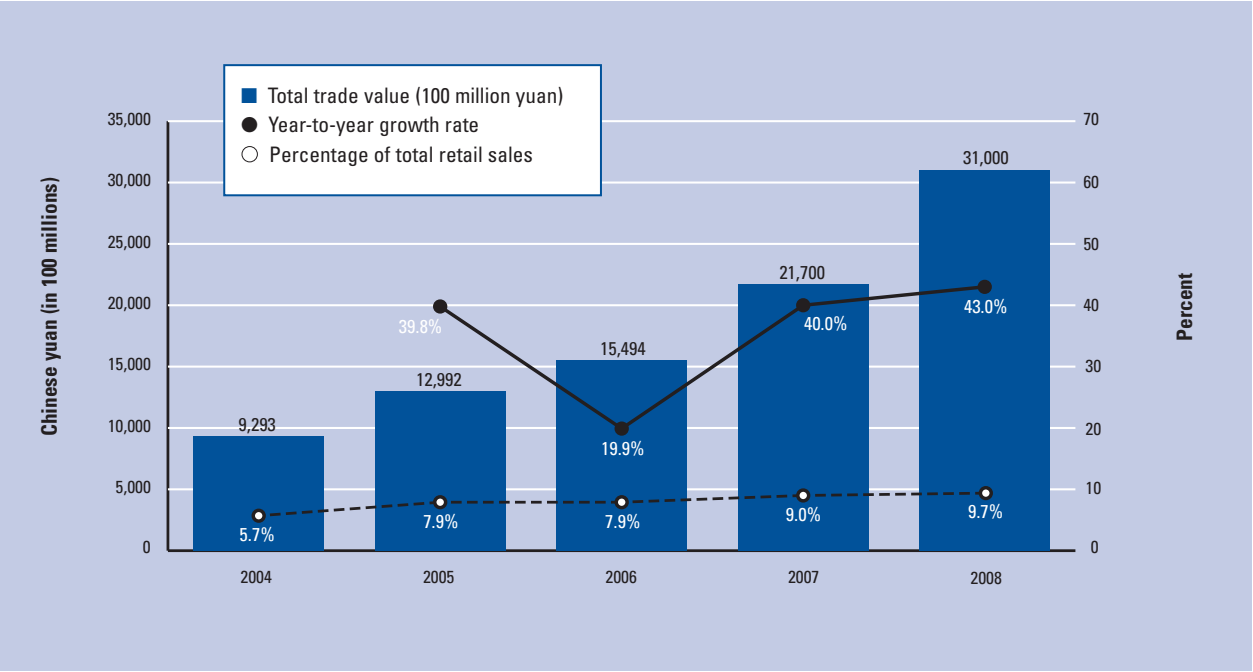
The Internet and China's economic growth

The Internet industry is becoming more and more significant in China. It grows so quickly that it has become one of the factors driving the country's economic development and operational efficiency. At the same time, industries that rely on the Internet are emerging, thus creating a large number of jobs.

The rise of the Internet industry and its implications

In 2008, the Internet service market in China—including Internet access and Internet information services—generated 150 billion yuan (roughly €15 billion). Of this, Internet access provided 72.5 billion yuan in revenues and 5.6 billion yuan came from the Information Data Center, 49.2 billion yuan from fixed Internet information services, and 18.1 billion yuan from wireless application protocol (WAP) services. In the Internet information services market, the main sources of revenues came from such services as Web portals and search engine

Figure 3: Total e-commerce transactions, 2004–08



Source: National Bureau of Statistics (http://www.stats.gov.cn/english/); Economic Information & Agency, 2009.

advertisements, Internet games, WAP, instant messaging applications, and e-business.[5]

On a related note, a group of Chinese Internet companies rapidly grew into top global companies. Measured by their market value in March 2009, Tencent and Baidu both had joined the top 10 global Internet companies, at 8th and 9th place, respectively, while Alibaba and Netease entered the top 15, at 12th and 14th place. The average annual revenues in 2008 for the top enterprises (e.g., Tencent, Baidu, Alibaba, SDO, Netease, Sohu, Sina, and TOM) exceeded 2 billion yuan, while that of Tencent reached a record 7.15 billion yuan.[6]

The application of new technology and services to the Internet in China keeps pace with international standards. Recent Internet applications such as blogs, podcasts, wikis, socializing network services, and online videos have all experienced extremely fast growth and had considerable impact. By June 2009, the number of Chinese bloggers had reached 180 million; users of online videos numbered 220 million. The mobile Internet has been the focal point and latest trend in the development of the Internet. By June 2009, the number of mobile netizens in China reached 155 million, an increase of 38 million over the previous six months.[7]

The Internet economy and China's productivity

The Internet has significantly reduced transaction costs and raised productivity. In 2008, the total revenues of e-business transactions in China reached 3.1 trillion yuan—9.7 percent of the total volume of retail sales (Figure 3). The business-to-consumer online shopping market reached over 100 billion yuan. There were 7.9 million registered users for the international trading market and 30 million for the Chinese domestic market at the e-commerce platform provided by Alibaba, the third-party e-commerce service provider.[8]

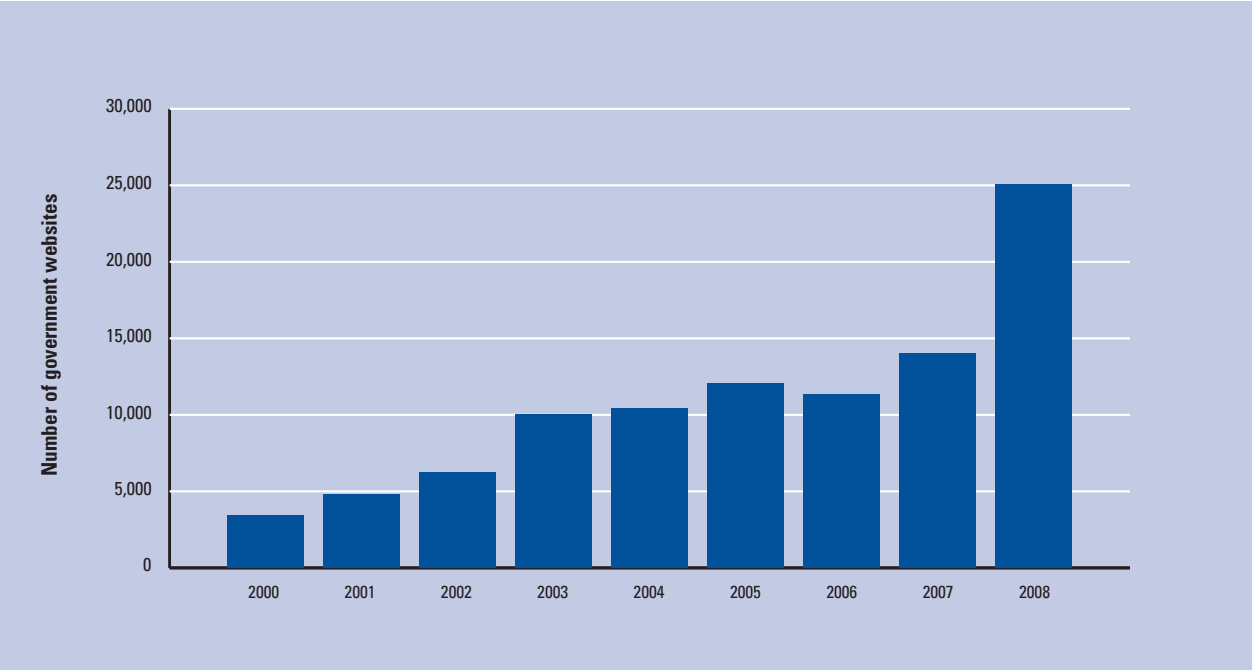
Alongside reducing transaction costs, the Internet has increased payment and settlement efficiency, accelerated capital turnover rate, and fostered the economy's vitality. In 2008, the number of online payments in China reached 2.6 billion, with a total value of 263.6 trillion yuan—this is eight times China's GDP and 23.3 percent of total non-cash transactions.[9]

The Internet and emerging industries

The Internet has become the operation platform for software and service outsourcing industries. From January to June 2009, software outsourcing services experienced rapid growth, with their revenues accounting for 12.27 billion yuan at a year-to-year growth rate of 87.7 percent.[10] Such unprecedented growth is fairly exceptional against the background of the current global economic crisis.

The marriage between the Internet and traditional information content and culture has greatly advanced the development of digital content and entertainment industries. In 2008, the output value for the digital content industry in China reached 210 billion yuan, with an annual growth rate of 45 percent.[11] It has thus

Figure 4: Number of government websites in China, 2000–08



Source: CNNIC, 2009.
Note: Government websites are those with the ending gov.cn.

become one of the new areas of economic growth, in which the revenues generated by online games, for instance, have far exceeded that of traditional entertainment industries such as film and audio-visual manufacturing. The daily download of "You and Me," the theme song for the Beijing Olympics, reached 5.73 million at its peak, creating an overwhelming record for the music industry in China.[12]

The Internet and job opportunities

The rapid expansion of the Internet economy has created a large number of knowledge-based job opportunities, which, in turn, has compensated for the job loss resulting from adjustments in the country's economic structure. In addition, the Internet economy has greatly helped to optimize the employment structure. In 2008, there were 557,000 direct employees in the value-added telecommunication services industry, creating even more indirect job opportunities. In 2008, the business-to-business platform of Alibaba alone involved over 10 million e-commerce employees working in small- and medium-sized enterprises. Also 570,000 individuals opened their own stores on http://www.taobao.com. Sixty percent of these were people between 22 and 30 years old—most of them recent university graduates or early career professionals.[13]

An Internet society, public services, and cultural development

In the first half of 2009, over 230 million Chinese used search engines for information related to work, study, and daily activities. Over 260 million used the Internet to browse the news, and 100 million used a wide variety of forums and bulletin board systems for sharing and distributing information. And 180 million Chinese disseminated information and personal opinions through blogs, while 290 million visited different websites to listen to music and 88 million shopped online.[14]

The Internet has also become an important part of the infrastructure for governance and the provision of public services in China (Figure 4). By 2008, 100 percent of central government agencies, 98.5 percent of municipality-level governments and 95 percent of county-level governments had established their own portal sites. Many public services—including industrial and commercial registrations, filing for taxation, and social security—had successfully gone online. Campus networks have been widely established around the country, covering over 90 percent of universities, 35 percent of technical and professional colleges, and 38,000 primary and secondary schools. Telemedicine has played an important part in medical routines and the monitoring of major epidemics.

ICT and innovation

The tremendous growth of the Internet in China can be seen from the fact that, by 2008, the country had the

Table 1: Output value of electronic and information technology products: World and China, 2007–08

Value (US$ trillions)	2007	2008	Year-to-year growth rate (%)
World's output value	1.61	1.66	3.1%
China's output value	0.36	0.41	14.7%
China's percentage	22.4%	24.9%	11.3%

Source: MIIT, 2009; CIID analysis.

world's greatest number of netizens. A close examination reveals that the *raison d'être* for this development lies in the ICT demand prompted by the transformations brought about by institutional reforms in the telecommunications industry.

Prior to 1994, China's telecommunications industry was a national monopoly. This came to an end with the appearance of China Unicom Co. Ltd., which indicated the beginning of telecommunications competition in the country. This competition caused the whole industry to develop very quickly and fostered progress in network technologies and innovation. At the time of the global Internet boom in 1999, China Unicom grasped the opportunity to restructure its networks and propose such improvements as adding traffic engineering to IP networks, operation administration and management, and bi-directional failure detection to solve problems of the uncontrollability and unmanageability of IP networks and the lack of quality of service (QoS) guarantee. China Unicom also sought to harmonize additional functions for improving network performance with such equipment manufacturers as Cisco, Lucent, Juniper, and Huawei.

In 2000, China Unicom pioneered the use of improved IP network technologies to build the China Uninet—the world's first multiservice unified network platform with quality assurance. This network was the first of its kind to provide a single multiservice physical network that can handle voice, circuit fax, video conference, the Internet, and the CDMAIX mobile data. This network covered 337 cities in China and handled a monthly load of 1 billion minutes of Voice over Internet Protocol (VoIP) services and 3,500 concurrent video conferences at a transmission bandwidth of 384 kilobytes per second (KB/s) per conference. At that time, China Uninet was an IP network with the world's highest business volume that included high-quality assurance. This project explored effective solutions for network integration and evolution, which inspired many other international telecommunications enterprises.

Tencent is another example. When the Internet bubble burst in 2001, the company was on the verge of bankruptcy. Thanks to the instant messaging service QQ, which was highly popular among Chinese netizens, Tencent was able to rebound and has now joined the group of companies with a market value exceeding 100 billion yuan. In spite of the overwhelming global presence of Google, the Chinese search engine Baidu grew rapidly into a global company with technological innovations in searching Chinese characters. Uninterrupted technological innovation was also responsible for the growth of such companies as the telecommunication solutions provider Huawei and the telecommunication equipment and network solutions provider ZTE into leading global players.

Telecommunications, electronic and information technology, and China's economic growth

The telecommunications and electronic and information technology industries have played an increasingly important role in China's economy (see Table 1). In 2008, the combined value of the two industries took up 7.9 percent of China's total GDP, becoming the largest industry in the national economy. Of these, the output value for the manufacturing industry of electronic and information technology equipment reached 25.5 percent of the total output value of global electronic products.[15]

Problems and challenges facing the sustainable development of ICT

With its pervasive application, the Internet has permeated every aspect of our daily life and work. This constant use has brought to light certain latent problems that could jeopardize the Internet's robust development. We will analyze these issues in the following sections.

The scalability of IP networks

The omnipresence and explosive growth of the Internet have brought huge challenges to network capacities. For instance, even if Internet capacity in China doubles every year, it may still be unable to meet the growing users' demands. This is also the case with IP networks owned by other global operators. According to statistics by APNIC, the regional Internet registry that allocates IP and AS numbers in the Asia Pacific region, the average update rate for border gateway protocol reached 6 times per second and over 500,000 times per day. In November 2006, at the Internet Architecture Board Conference held in Amsterdam, it was pointed out that the growth rate of network routing had exceeded that of hardware performance.[16] Moreover, because of the enormous growth in energy consumption by network devices, the Internet has accounted for 5.4 percent of global power consumption; this is growing at an annual rate of 8–10 percent. What is more worrisome, the IPv4 addresses will be exhausted by 2012, which may be exacerbated by the deployment of IPv6.

IP networks: Safety, controllability, manageability, and QoS guarantee

Initially, the design and application of IP networks were restricted to certain communities based on acquaintance and mutual trust; hence there was insufficient consideration of the complexity of applications that would appear in its future development. This situation has resulted in the increasingly important problem of safety for IP networks. According to statistics from the China Internet Network Information Center (CNNIC), in 2008, security incidents involving China's Internet were double that of the previous year. Current security measures of adding firewalls and closing loopholes for IP networks are far from being the systematic solutions needed for the whole network frame. Far from realizing its original purpose of serving mankind, the IP network's weaknesses have become weapons for attacking each other, which unquestionably is a great irony.

That the Internet can provide no more than a "best effort" service is mainly caused by the core network's lack of intelligence, which renders it unable to sense, detect, and control effectively. Moreover, it lacks the QoS guarantee, which is why it is often referred to as a "moron network, intelligent terminal."

The Internet and the new mobile, ubiquitous demands

In the Internet, *ubiquitous demand* refers to a comprehensive service for network users that operates regardless of time, location, and content. There are two main reasons for which the Internet needs to increase capacity to deal with this growing demand. First, because it targets fixed-location hosts and singular data services, the traditional Internet cannot provide the best solutions for mobile services, let alone the dynamic binding of hosts and IP addresses. Second, the majority of contemporary Internet services are concentrated on the client-server model, which is far from being capable of providing comprehensive and ubiquitous services. A top-down approach to examine the structure of future networks should fully take into account mobility and ubiquity, so as to support mobile and ubiquitous demands.

The widening digital divide

Internet development has also been inhibited by the economic, educational, and cultural divide in the country. The digital literacy of the poor and the disadvantaged depends on the improvement of their economic and social well-being. For instance, in China, 15 million people still live on a daily income of less than US$0.31.[17] The number of people belonging to the disadvantaged group is even higher if we use the World Bank standard of US$1.25 per day. These people will find the Internet inaccessible because it is unaffordable to them. The sustainable development of the Internet, therefore, will be inevitably bound up with anti-poverty endeavors. In light of this perspective, the challenges posed by the digital divide can equally present numerous opportunities for China to improve the status quo.

Different initiatives have been implemented to develop ICT, notably the Internet, in the poor regions of the country. For instance, the Sichuan Branch of China Unicom established a Tianfu Agriculture Information Network, which—through subsidies from government and enterprises—has created an all-inclusive information communication network with mobile text messages as its priority, and launched such multiple telecommunication platforms as mobile phones, fixed phones, pagers, the Internet, and call centers. A website bearing the same name has also been created. Information work stations established in over 1,000 towns and villages throughout the province have mainly been responsible for disseminating to over 500,000 local officials, agricultural enterprises, professional associations, and the rural population information about politics, agro-technology, commerce, weather, and agriculture. The Tianfu Agriculture Information Network is a comprehensive platform that can effectively communicate information to the rural areas. By promoting the division of labor, setting up markets, and improving the quality of public services, this platform is capable of substantially raising rural income. This project won the World Summit on the Information Society Prize at Tunis in 2005.

Internet trends: China's strategies for sustainable ICT development

There is a general consensus that ICT can effectively promote the goal of sustainable development, thanks to its role as an unceasing driver of economic and social progress. To achieve sustainable development of ICT, thus contributing to sustainable economic and social development, China has implemented many measures, including ICT research and development (R&D) and the application of ICT in traditional industries, with the aim of fostering the industry's growth.

Internet development trends

Faced with serious challenges of energy and environmental protection, sustainability has become an issue that concerns every walk of society. As far as network technology is concerned, a new trend that demands our attention is appearing. Networks are inevitably moving toward convergence. According to past experience, converged networks will save space, power, and network administration costs over separate networks. Cloud computing has received so much attention because of its highly efficient utilization of servers. Compared with the current low utilization of computer servers (less than 10 percent of their capacity), cloud computing may increase the servers' utilization efficiency, thus making it an inevitable choice for sustainable development. The technology of sensor networks can greatly improve humankind's ability to comprehend the world and to

explore nature by integrating its sensitivity to the physical world with network technology, computing, and control technology. For this very reason, sensor networks are regarded as one of the most promising areas for the future development of network applications.

Existing networks also have problems in areas such as scalability, security, quality of service, mobility, robustness, and energy conservation. Finding solutions for these problems will be the greatest challenge going into the future.

It is held by the international academic community that the current method of "patching up" the current network by improving it without replacing it with a new one is no longer viable for satisfying the needs of future networks. Instead, a "clean slate" strategy of constructing a new network to replace the current one should be adopted. This means the current IP network framework should be discarded and a new network framework should be constructed from scratch. As a matter of course, the advantages of traditional networks should be kept—especially existing network and user resources, which can be easily transferred to the future network.

China's strategies for the sustainable development of ICT

The Chinese government has attached great importance to the sustainable development of ICT, adopting a series of effective measures toward that end. China has extended this approach to technology innovation and industrial training. An integration of ICT with other industrial sectors is actively sought.

Key projects in ICT

In the National Mid- and Long-Term Programme for the Development of Science and Technology, the Chinese government set up 16 main projects, hoping to achieve breakthroughs in certain key areas and to enable a substantial development of overall productivity through the dynamics of the sectoral leap forward in science and technology. Of these, ICT has been highly prioritized, with three special key areas:

1. core electronics, high-end universal chips, and basic software;
2. manufacturing technology and complete processing of Great Large Scale Integration; and
3. the next-generation broadband wireless mobile communication network.[18]

Enterprises will carry out these projects, so as to promote a synergy between manufacturing and research through market mechanisms. In this process, the government will provide necessary support in terms of legislation and governance.

Support for ICT as an emerging strategic industry

The recent global economic crisis has probably been the worst since the Great Depression. History demonstrates that new discoveries in science and technology are frequently conceived in times of financial crises, and the past decade has witnessed the leading role played by ICT in global economic growth. The recovery and future economic growth across the world will depend largely on further developments in the ICT industry and on new technologies. In November 2009, Premier Wen Jiabao delivered a speech to the scientific research community in Beijing entitled "Enabling Science and Technology to Lead the Sustainable Development of China," in which he pointed out that building an innovation-oriented country should be the strategic goal in fostering the sustainable development of the national economy in the long term. To achieve this, the emerging strategic industries will play a leading role. As he emphasized, "specific efforts should be directed to exploring core technologies on sensor networks and the Internet of Things, as well as to deploy R&D on post-IP technologies. The information network industry should be made the 'engine' in industrial upgrading and our move towards an information society."[19] The Chinese government is now exploring concrete strategies to achieve this goal.

Integration within the ICT industry and with other industries

China is actively promoting an integrated development of telecommunication networks, broadcasting networks, and the Internet, in the hope of achieving interconnection and sharing optical fiber and access pipelines among these three networks. On January 13, 2010, at the Executive Meeting of the State Council, it was explicitly suggested that from 2010 to 2012 the pilot bi-directional access be carried out between broadcasting and telecommunication services, and from 2013 to 2015, a convergence of the triple networks should be implemented.[20]

By converging industrialization and digitalization, China wishes to carve out a path of industrialization that entails low consumption and low pollution through the application of ICT. This aim also points to the direction of future ICT development in the country, creating an enormous space for its integration with industrialization and an organic combination of the sustainable development of ICT and that of the economy. Last year, after careful examination, the MIIT organized and promoted the pilot sites of an industrialization-digitalization convergence at the three levels of enterprise, industry, and region. Enterprises were encouraged to apply ICT for raising productivity through a technological upgrade. The issuance of the Directive on Advancing `the Industrialization-Digitalization Convergence for the Consumer Goods Industry was an attempt to test this convergence on specific industries.[21] In addition,

pilot zones were set up in eight cities—including Shanghai, Chongqing, and Guangzhou—to explore different paths of convergence across regions. The positive effect of these measures is gradually manifesting itself in various aspects of the development of industrialization and digitalization.

Conclusions

One of the main lessons to be learned from the development of the ICT industry in China has to do with the joint efforts of the government, the business sector, and research institutions in such a process. The government, in particular, played a leading role, by regulating the development of ICT through market mechanisms whenever possible as well as by encouraging enterprises and research institutions to strengthen their cooperation on innovation and emphasizing the integration of ICT development and social needs.

Going forward, China's ICT industry faces some difficulties and challenges that may affect its sustainable development. Among these are the threats to networks' security and stability; information security issues such as privacy violations and youth protection; and, last but not least, the digital divide in the country. These challenges highlight the need to continuously strengthen technological innovation in order to promote the industry's development as well as to increasingly take into account the needs and participation of the whole society. This chapter has described China's strategy of cultivating a strategic emerging industry, and—through promoting the integration of information technology and industrialization—gradually encouraging an increased use of ICT in simplifying processes, improving efficiency, conserving energy, and reducing carbon emissions.

Notes

1 A *netizen* is a citizen who uses the Internet as a way of participating in political society (for example, by exchanging views and providing information).

2 CNNIC 2009.

3 See the Ministry of Industry and Information Technology (MIIT) at http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/12985083.html and http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/12964759.html (in Chinese).

4 See the State Administration of Radio Film and Television, available at http://www.sarft.gov.cn.

5 This was compiled and calculated from the data available at MIIT, annual reviews, and annual reports of listed Internet companies.

6 See the quarterly reports of these enterprises.

7 See the State Administration of Radio Film and Television, available at http://www.sarft.gov.cn.

8 See the quarterly reports of these enterprises.

9 Bank of China 2009.

10 Data from China Electronics News. See http://www.cena.com.cn/Article/yaowen/zonghexinwen/2009-07-29/20090729105329_20851.shtml (in Chinese).

11 These figures are from the internal journals of the Ministry of Culture.

12 These figures are from the MIIT, 2008. See http://ccnews.people.com.cn/GB/87326/7646129.html (in Chinese).

13 See http://www.alibaba.com/.

14 CNNIC 2009.

15 Figures are from the National Statistics Bureau. See Economic Information & Agency 2009.

16 See http://bgpupdates.potaroo.net. This report was generated on February 2, 2010.

17 See the State Council Office of Poverty Alleviation and Development, available at http://www.cpad.gov.cn/data/2009/0320/article_340063.htm (in Chinese).

18 See http://www.gov.cn/jrzg/2006-02/09/content_183787.htm (in Chinese).

19 See http://www.gov.cn/ldhd/2009-11/23/content_1471208.htm (in Chinese).

20 See http://www.gov.cn/ldhd/2010-01/13/content_1509622.htm (in Chinese).

21 See http://www.miit.gov.cn/n11293472/n11293832/n11294057/n11302390/12742632.html (in Chinese).

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Part 3

Country/Economy Profiles

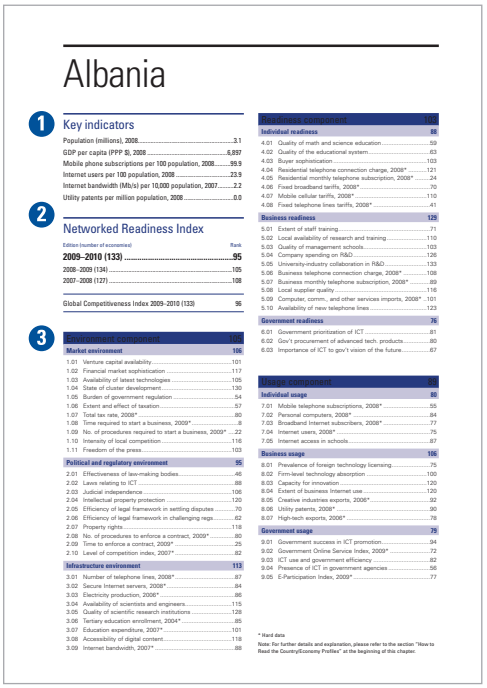
How to Read the Country/Economy Profiles

The following pages present the profiles of the 133 economies covered by *The Global Information Technology Report 2009–2010*. They provide a picture of the level of ICT development of an economy by grouping information under the following sections:

1. Key indicators: population in millions of inhabitants, gross domestic product (GDP) valued at purchasing power parity (PPP) per capita, mobile telephone subscriptions per 100 population, Internet users per 100 population, Internet bandwidth measured in megabits per second (Mb/s) per 10,000 population, and utility patents.[1]

2. Overall Networked Readiness Index (NRI) ranking for 2009–2010, which gives insight into overall ICT readiness; one can compare this ranking with those of the NRI 2007–2008 and NRI 2008–2009 if the economy was covered in those editions. Also shown is the economy's ranking on the World Economic Forum's Global Competitiveness Index 2009–2010.[2]

3. Detailed ranking for the three component subindexes, the nine pillars, and the 68 variables of the NRI. The numbering of the variables matches the numbering of the Data Tables found at the end of the *Report,* which provide descriptions, rankings, and scores for all the variables. For hard data indicators (identified by *), the year of the value used to calculate the rank appears next to the title. The section "Technical Notes and Sources" at the end of the *Report* provides further details on each indicator, including its definition, method of computation, and full sources. For Survey variables, the rank shown is derived from the results of the 2008 and 2009 editions of the World Economic Forum's Executive Opinion Survey. Note that for the sake of readability, the years were omitted. For more information on the framework and computation of the NRI, as well as on the Executive Opinion Survey, please refer to Chapter 1.1.


Albania

1 Key indicators

Population (millions), 2008 ..... 3.1
GDP per capita (PPP $), 2008 6,897
Mobile phone subscriptions per 100 population, 2008 ..... 99.9
Internet users per 100 population, 2008 ..... 23.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 2.2
Utility patents per million population, 2008 ..... 0.0

2 Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	95
2008–2009 (134)	105
2007–2008 (127)	108

Global Competitiveness Index 2009–2010 (133) 96

3 Environment component 102
Market environment 106
1.01 Venture capital availability 101
1.02 Financial market sophistication 117
1.03 Availability of latest technologies 105
1.04 State of cluster development 130
1.05 Burden of government regulation 54
1.06 Extent and effect of taxation 57
1.07 Total tax rate, 2008* 80
1.08 Time required to start a business, 2009* 8
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 116
1.11 Freedom of the press 103
Political and regulatory environment 95
2.01 Effectiveness of law-making bodies 46
2.02 Laws relating to ICT 88
2.03 Judicial independence 106
2.04 Intellectual property protection 120
2.05 Efficiency of legal framework in settling disputes 70
2.06 Efficiency of legal framework in challenging regs 62
2.07 Property rights 118
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 25
2.10 Level of competition index, 2007* 82
Infrastructure environment 113
3.01 Number of telephone lines, 2008* 87
3.02 Secure Internet servers, 2008* 84
3.03 Electricity production, 2006* 86
3.04 Availability of scientists and engineers 115
3.05 Quality of scientific research institutions 128
3.06 Tertiary education enrollment, 2004* 85
3.07 Education expenditure, 2007* 101
3.08 Accessibility of digital content 118
3.09 Internet bandwidth, 2007* 88

Readiness component 130
Individual readiness 88
4.01 Quality of math and science education 59
4.02 Quality of the educational system 63
4.03 Buyer sophistication 103
4.04 Residential telephone connection charge, 2008* 121
4.05 Residential monthly telephone subscription, 2008* 24
4.06 Fixed broadband tariffs, 2008* 70
4.07 Mobile cellular tariffs, 2008* 110
4.08 Fixed telephone lines tariffs, 2008* 41
Business readiness 129
5.01 Extent of staff training 71
5.02 Local availability of research and training 110
5.03 Quality of management schools 103
5.04 Company spending on R&D 126
5.05 University-industry collaboration in R&D 133
5.06 Business telephone connection charge, 2008* 108
5.07 Business monthly telephone subscription, 2008* 89
5.08 Local supplier quality 116
5.09 Computer, comm., and other services imports, 2008* 101
5.10 Availability of new telephone lines 123
Government readiness 76
6.01 Government prioritization of ICT 81
6.02 Gov't procurement of advanced tech. products 80
6.03 Importance of ICT to gov't vision of the future 67

Usage component 80
Individual usage 80
7.01 Mobile telephone subscriptions, 2008* 55
7.02 Personal computers, 2005* 84
7.03 Broadband Internet subscribers, 2008* 77
7.04 Internet users, 2008* 75
7.05 Internet access in schools 87
Business usage 106
8.01 Prevalence of foreign technology licensing 75
8.02 Firm-level technology absorption 100
8.03 Capacity for innovation 120
8.04 Extent of business Internet use 120
8.05 Creative industries exports, 2006* 92
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 78
Government usage 79
9.01 Government success in ICT promotion 84
9.02 Government Online Service Index, 2009* 72
9.03 ICT use and government efficiency 82
9.04 Presence of ICT in government agencies 56
9.05 E-Participation Index, 2009* 77

* Hard data
Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Notes

1 The source for population is the World Bank's World Development Indicators Online (retrieved January 25, 2010) and the International Monetary Fund's *World Economic Outlook Database* (October 2009 edition). GDP figures are from the International Monetary Fund's *World Economic Outlook Database* (October 2009 edition). Data on Internet users, Internet bandwidth, and mobile telephony are from the International Telecommunication Union's *World Telecommunication/ICT Indicators Database 2009* (December 2009 update) and from national sources. Data on utility patents are from the United States Patent and Trademark Office (June 2009).

2 See World Economic Forum. 2009. *The Global Competitiveness Report 2009–2010*. Geneva: World Economic Forum.

List of Countries/Economies

Albania

Key indicators

Population (millions), 2008 ..... 3.1
GDP per capita (PPP $), 2008 6,897
Mobile phone subscriptions per 100 population, 2008 ..... 99.9
Internet users per 100 population, 2008 ..... 23.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 2.2
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**95**
2008–2009 (134)	105
2007–2008 (127)	108
Global Competitiveness Index 2009–2010 (133)	96

Environment component 105

Market environment 106

1.01 Venture capital availability 101
1.02 Financial market sophistication 117
1.03 Availability of latest technologies 105
1.04 State of cluster development 130
1.05 Burden of government regulation 54
1.06 Extent and effect of taxation 57
1.07 Total tax rate, 2008* 80
1.08 Time required to start a business, 2009* 8
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 116
1.11 Freedom of the press 103

Political and regulatory environment 95

2.01 Effectiveness of law-making bodies 46
2.02 Laws relating to ICT 88
2.03 Judicial independence 106
2.04 Intellectual property protection 120
2.05 Efficiency of legal framework in settling disputes 70
2.06 Efficiency of legal framework in challenging regs 62
2.07 Property rights 118
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 25
2.10 Level of competition index, 2007* 82

Infrastructure environment 113

3.01 Number of telephone lines, 2008* 87
3.02 Secure Internet servers, 2008* 84
3.03 Electricity production, 2006* 86
3.04 Availability of scientists and engineers 115
3.05 Quality of scientific research institutions 128
3.06 Tertiary education enrollment, 2004* 85
3.07 Education expenditure, 2007* 101
3.08 Accessibility of digital content 118
3.09 Internet bandwidth, 2007* 88

Readiness component 103

Individual readiness 88

4.01 Quality of math and science education 59
4.02 Quality of the educational system 63
4.03 Buyer sophistication 103
4.04 Residential telephone connection charge, 2008* 121
4.05 Residential monthly telephone subscription, 2008* 24
4.06 Fixed broadband tariffs, 2008* 70
4.07 Mobile cellular tariffs, 2008* 110
4.08 Fixed telephone lines tariffs, 2008* 41

Business readiness 129

5.01 Extent of staff training 71
5.02 Local availability of research and training 110
5.03 Quality of management schools 103
5.04 Company spending on R&D 126
5.05 University-industry collaboration in R&D 133
5.06 Business telephone connection charge, 2008* 108
5.07 Business monthly telephone subscription, 2008* 89
5.08 Local supplier quality 116
5.09 Computer, comm., and other services imports, 2008* 101
5.10 Availability of new telephone lines 123

Government readiness 76

6.01 Government prioritization of ICT 81
6.02 Gov't procurement of advanced tech. products 80
6.03 Importance of ICT to gov't vision of the future 67

Usage component 89

Individual usage 80

7.01 Mobile telephone subscriptions, 2008* 55
7.02 Personal computers, 2008* 84
7.03 Broadband Internet subscribers, 2008* 77
7.04 Internet users, 2008* 75
7.05 Internet access in schools 87

Business usage 106

8.01 Prevalence of foreign technology licensing 75
8.02 Firm-level technology absorption 100
8.03 Capacity for innovation 120
8.04 Extent of business Internet use 120
8.05 Creative industries exports, 2006* 92
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 78

Government usage 79

9.01 Government success in ICT promotion 94
9.02 Government Online Service Index, 2009* 72
9.03 ICT use and government efficiency 82
9.04 Presence of ICT in government agencies 56
9.05 E-Participation Index, 2009* 77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Algeria

Key indicators

Population (millions), 2008 ..... 34.4
GDP per capita (PPP $), 2008 6,709
Mobile phone subscriptions per 100 population, 2008 ..... 92.7
Internet users per 100 population, 2008 ..... 11.9
Internet bandwidth (Mb/s) per 10,000 population ..... n/a
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**113**
2008–2009 (134)	108
2007–2008 (127)	88

Global Competitiveness Index 2009–2010 (133) 83

Environment component 120

Market environment 128

1.01 Venture capital availability 118
1.02 Financial market sophistication 127
1.03 Availability of latest technologies 126
1.04 State of cluster development 131
1.05 Burden of government regulation 126
1.06 Extent and effect of taxation 70
1.07 Total tax rate, 2008* 121
1.08 Time required to start a business, 2009* 75
1.09 No. of procedures required to start a business, 2009* 120
1.10 Intensity of local competition 109
1.11 Freedom of the press 101

Political and regulatory environment 121

2.01 Effectiveness of law-making bodies 103
2.02 Laws relating to ICT 127
2.03 Judicial independence 112
2.04 Intellectual property protection 110
2.05 Efficiency of legal framework in settling disputes 86
2.06 Efficiency of legal framework in challenging regs 100
2.07 Property rights 120
2.08 No. of procedures to enforce a contract, 2009* 117
2.09 Time to enforce a contract, 2009* 90
2.10 Level of competition index, 2007* 82

Infrastructure environment 86

3.01 Number of telephone lines, 2008* 93
3.02 Secure Internet servers, 2008* 112
3.03 Electricity production, 2006* 91
3.04 Availability of scientists and engineers 57
3.05 Quality of scientific research institutions 111
3.06 Tertiary education enrollment, 2007* 79
3.07 Education expenditure, 2007* 54
3.08 Accessibility of digital content 126
3.09 Internet bandwidth* ..... n/a

Readiness component 93

Individual readiness 66

4.01 Quality of math and science education 101
4.02 Quality of the educational system 118
4.03 Buyer sophistication 118
4.04 Residential telephone connection charge, 2008* 61
4.05 Residential monthly telephone subscription, 2008* 8
4.06 Fixed broadband tariffs, 2008* 40
4.07 Mobile cellular tariffs, 2008* 41
4.08 Fixed telephone lines tariffs, 2008* 67

Business readiness 102

5.01 Extent of staff training 121
5.02 Local availability of research and training 111
5.03 Quality of management schools 115
5.04 Company spending on R&D 99
5.05 University-industry collaboration in R&D 120
5.06 Business telephone connection charge, 2008* 44
5.07 Business monthly telephone subscription, 2008* 5
5.08 Local supplier quality 120
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 109

Government readiness 121

6.01 Government prioritization of ICT 113
6.02 Gov't procurement of advanced tech. products 122
6.03 Importance of ICT to gov't vision of the future 119

Usage component 125

Individual usage 93

7.01 Mobile telephone subscriptions, 2008* 66
7.02 Personal computers, 2005* 111
7.03 Broadband Internet subscribers, 2008* 81
7.04 Internet users, 2008* 91
7.05 Internet access in schools 123

Business usage 133

8.01 Prevalence of foreign technology licensing 126
8.02 Firm-level technology absorption 130
8.03 Capacity for innovation 129
8.04 Extent of business Internet use 133
8.05 Creative industries exports, 2004* 106
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 120

Government usage 128

9.01 Government success in ICT promotion 112
9.02 Government Online Service Index, 2009* 120
9.03 ICT use and government efficiency 127
9.04 Presence of ICT in government agencies 116
9.05 E-Participation Index, 2009* 118

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Argentina

Key indicators

Population (millions), 2008 ..... 39.9
GDP per capita (PPP $), 2008 14,408
Mobile phone subscriptions per 100 population, 2008 ..... 116.6
Internet users per 100 population, 2008 ..... 28.1
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 23.2
Utility patents per million population, 2008 ..... 0.8

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**91**
2008–2009 (134)	87
2007–2008 (127)	77
Global Competitiveness Index 2009–2010 (133)	85

Environment component 99

Market environment 126

1.01 Venture capital availability 117
1.02 Financial market sophistication 97
1.03 Availability of latest technologies 84
1.04 State of cluster development 71
1.05 Burden of government regulation 110
1.06 Extent and effect of taxation 131
1.07 Total tax rate, 2008* 128
1.08 Time required to start a business, 2009* 81
1.09 No. of procedures required to start a business, 2009* 122
1.10 Intensity of local competition 107
1.11 Freedom of the press 112

Political and regulatory environment 110

2.01 Effectiveness of law-making bodies 128
2.02 Laws relating to ICT 102
2.03 Judicial independence 120
2.04 Intellectual property protection 117
2.05 Efficiency of legal framework in settling disputes 127
2.06 Efficiency of legal framework in challenging regs 131
2.07 Property rights 126
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 78
2.10 Level of competition index, 2007* 1

Infrastructure environment 52

3.01 Number of telephone lines, 2008* 52
3.02 Secure Internet servers, 2008* 59
3.03 Electricity production, 2006* 64
3.04 Availability of scientists and engineers 84
3.05 Quality of scientific research institutions 59
3.06 Tertiary education enrollment, 2007* 20
3.07 Education expenditure, 2007* 71
3.08 Accessibility of digital content 62
3.09 Internet bandwidth, 2007* 49

Readiness component 97

Individual readiness 72

4.01 Quality of math and science education 98
4.02 Quality of the educational system 94
4.03 Buyer sophistication 42
4.04 Residential telephone connection charge, 2008* 71
4.05 Residential monthly telephone subscription, 2008* 37
4.06 Fixed broadband tariffs, 2008* 88
4.07 Mobile cellular tariffs, 2008* 93
4.08 Fixed telephone lines tariffs, 2008* 16

Business readiness 59

5.01 Extent of staff training 81
5.02 Local availability of research and training 57
5.03 Quality of management schools 23
5.04 Company spending on R&D 75
5.05 University-industry collaboration in R&D 63
5.06 Business telephone connection charge, 2007* 62
5.07 Business monthly telephone subscription, 2007* 56
5.08 Local supplier quality 68
5.09 Computer, comm., and other services imports, 2008* 55
5.10 Availability of new telephone lines 81

Government readiness 128

6.01 Government prioritization of ICT 131
6.02 Gov't procurement of advanced tech. products 121
6.03 Importance of ICT to gov't vision of the future 129

Usage component 80

Individual usage 58

7.01 Mobile telephone subscriptions, 2008* 33
7.02 Personal computers, 2005* 67
7.03 Broadband Internet subscribers, 2008* 49
7.04 Internet users, 2008* 64
7.05 Internet access in schools 89

Business usage 76

8.01 Prevalence of foreign technology licensing 80
8.02 Firm-level technology absorption 83
8.03 Capacity for innovation 69
8.04 Extent of business Internet use 59
8.05 Creative industries exports, 2005* 48
8.06 Utility patents, 2008* 53
8.07 High-tech exports, 2007* 64

Government usage 102

9.01 Government success in ICT promotion 130
9.02 Government Online Service Index, 2009* 43
9.03 ICT use and government efficiency 122
9.04 Presence of ICT in government agencies 105
9.05 E-Participation Index, 2009* 55

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Armenia

Key indicators

Population (millions), 2008 ..... 3.1
GDP per capita (PPP $), 2008 5,792
Mobile phone subscriptions per 100 population, 2008 ..... 100.0
Internet users per 100 population, 2008 ..... 6.2
Internet bandwidth (Mb/s) per 10,000 population ..... n/a
Utility patents per million population, 2008 ..... 0.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**101**
2008–2009 (134)	114
2007–2008 (127)	106

Global Competitiveness Index 2009–2010 (133) 97

Environment component 108

Market environment 118

1.01 Venture capital availability 129
1.02 Financial market sophistication 103
1.03 Availability of latest technologies 115
1.04 State of cluster development 122
1.05 Burden of government regulation 64
1.06 Extent and effect of taxation 86
1.07 Total tax rate, 2008* 54
1.08 Time required to start a business, 2009* 52
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 128
1.11 Freedom of the press 127

Political and regulatory environment 113

2.01 Effectiveness of law-making bodies 94
2.02 Laws relating to ICT 111
2.03 Judicial independence 122
2.04 Intellectual property protection 107
2.05 Efficiency of legal framework in settling disputes 111
2.06 Efficiency of legal framework in challenging regs 98
2.07 Property rights 79
2.08 No. of procedures to enforce a contract, 2009* 122
2.09 Time to enforce a contract, 2009* 11
2.10 Level of competition index, 2007* 104

Infrastructure environment 82

3.01 Number of telephone lines, 2008* 64
3.02 Secure Internet servers, 2008* 85
3.03 Electricity production, 2006* 79
3.04 Availability of scientists and engineers 91
3.05 Quality of scientific research institutions 98
3.06 Tertiary education enrollment, 2007* 65
3.07 Education expenditure, 2007* 117
3.08 Accessibility of digital content 99
3.09 Internet bandwidth* ..... n/a

Readiness component 91

Individual readiness 52

4.01 Quality of math and science education 73
4.02 Quality of the educational system 105
4.03 Buyer sophistication 83
4.04 Residential telephone connection charge, 2008* 45
4.05 Residential monthly telephone subscription, 2008* 23
4.06 Fixed broadband tariffs, 2008* 83
4.07 Mobile cellular tariffs, 2008* 46
4.08 Fixed telephone lines tariffs, 2008* 39

Business readiness 120

5.01 Extent of staff training 114
5.02 Local availability of research and training 120
5.03 Quality of management schools 125
5.04 Company spending on R&D 115
5.05 University-industry collaboration in R&D 114
5.06 Business telephone connection charge, 2008* 45
5.07 Business monthly telephone subscription, 2008* 90
5.08 Local supplier quality 112
5.09 Computer, comm., and other services imports, 2008* 109
5.10 Availability of new telephone lines 106

Government readiness 111

6.01 Government prioritization of ICT 84
6.02 Gov't procurement of advanced tech. products 124
6.03 Importance of ICT to gov't vision of the future 106

Usage component 105

Individual usage 87

7.01 Mobile telephone subscriptions, 2008* 54
7.02 Personal computers, 2005* 63
7.03 Broadband Internet subscribers, 2008* 102
7.04 Internet users, 2008* 108
7.05 Internet access in schools 101

Business usage 113

8.01 Prevalence of foreign technology licensing 124
8.02 Firm-level technology absorption 105
8.03 Capacity for innovation 66
8.04 Extent of business Internet use 107
8.05 Creative industries exports, 2006* 77
8.06 Utility patents, 2008* 69
8.07 High-tech exports, 2007* 80

Government usage 121

9.01 Government success in ICT promotion 107
9.02 Government Online Service Index, 2009* 105
9.03 ICT use and government efficiency 120
9.04 Presence of ICT in government agencies 113
9.05 E-Participation Index, 2009* 110

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Australia

Key indicators

Population (millions), 2008 ..... 21.4
GDP per capita (PPP $), 2008 36,918
Mobile phone subscriptions per 100 population, 2008 ..... 105.0
Internet users per 100 population, 2008 ..... 72.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 55.4
Utility patents per million population, 2008 ..... 61.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**16**
2008–2009 (134)	14
2007–2008 (127)	14
Global Competitiveness Index 2009–2010 (133)	15

Environment component 14

Market environment 14

1.01 Venture capital availability 10
1.02 Financial market sophistication 12
1.03 Availability of latest technologies 21
1.04 State of cluster development 37
1.05 Burden of government regulation 66
1.06 Extent and effect of taxation 66
1.07 Total tax rate, 2008* 90
1.08 Time required to start a business, 2009* 2
1.09 No. of procedures required to start a business, 2009* 3
1.10 Intensity of local competition 17
1.11 Freedom of the press 16

Political and regulatory environment 7

2.01 Effectiveness of law-making bodies 4
2.02 Laws relating to ICT 8
2.03 Judicial independence 5
2.04 Intellectual property protection 12
2.05 Efficiency of legal framework in settling disputes 12
2.06 Efficiency of legal framework in challenging regs 20
2.07 Property rights 13
2.08 No. of procedures to enforce a contract, 2009* 11
2.09 Time to enforce a contract, 2009* 28
2.10 Level of competition index, 2007* 1

Infrastructure environment 12

3.01 Number of telephone lines, 2008* 22
3.02 Secure Internet servers, 2008* 5
3.03 Electricity production, 2006* 11
3.04 Availability of scientists and engineers 34
3.05 Quality of scientific research institutions 10
3.06 Tertiary education enrollment, 2007* 13
3.07 Education expenditure, 2007* 42
3.08 Accessibility of digital content 29
3.09 Internet bandwidth, 2007* 35

Readiness component 25

Individual readiness 31

4.01 Quality of math and science education 30
4.02 Quality of the educational system 14
4.03 Buyer sophistication 12
4.04 Residential telephone connection charge, 2008* 24
4.05 Residential monthly telephone subscription, 2008* 73
4.06 Fixed broadband tariffs, 2008* 10
4.07 Mobile cellular tariffs, 2008* 76
4.08 Fixed telephone lines tariffs, 2008* 82

Business readiness 21

5.01 Extent of staff training 18
5.02 Local availability of research and training 17
5.03 Quality of management schools 18
5.04 Company spending on R&D 20
5.05 University-industry collaboration in R&D 14
5.06 Business telephone connection charge, 2007* 22
5.07 Business monthly telephone subscription, 2007* 97
5.08 Local supplier quality 16
5.09 Computer, comm., and other services imports, 2008* 57
5.10 Availability of new telephone lines 63

Government readiness 28

6.01 Government prioritization of ICT 28
6.02 Gov't procurement of advanced tech. products 42
6.03 Importance of ICT to gov't vision of the future 22

Usage component 17

Individual usage 20

7.01 Mobile telephone subscriptions, 2008* 48
7.02 Personal computers* ..... n/a
7.03 Broadband Internet subscribers, 2008* 18
7.04 Internet users, 2008* 18
7.05 Internet access in schools 25

Business usage 30

8.01 Prevalence of foreign technology licensing 11
8.02 Firm-level technology absorption 16
8.03 Capacity for innovation 26
8.04 Extent of business Internet use 23
8.05 Creative industries exports, 2005* 38
8.06 Utility patents, 2008* 15
8.07 High-tech exports, 2007* 60

Government usage 5

9.01 Government success in ICT promotion 32
9.02 Government Online Service Index, 2009* 5
9.03 ICT use and government efficiency 26
9.04 Presence of ICT in government agencies 12
9.05 E-Participation Index, 2009* 2

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Austria

Key indicators

Population (millions), 2008 ..... 8.3
GDP per capita (PPP $), 2008 39,887
Mobile phone subscriptions per 100 population, 2008 ..... 129.7
Internet users per 100 population, 2008 ..... 71.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 201.8
Utility patents per million population, 2008 ..... 55.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**20**
2008–2009 (134)	16
2007–2008 (127)	15

Global Competitiveness Index 2009–2010 (133) 17

Environment component 17

Market environment 24

1.01 Venture capital availability 37
1.02 Financial market sophistication 18
1.03 Availability of latest technologies 13
1.04 State of cluster development 22
1.05 Burden of government regulation 45
1.06 Extent and effect of taxation 67
1.07 Total tax rate, 2008* 104
1.08 Time required to start a business, 2009* 85
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 3
1.11 Freedom of the press 19

Political and regulatory environment 12

2.01 Effectiveness of law-making bodies 33
2.02 Laws relating to ICT 5
2.03 Judicial independence 13
2.04 Intellectual property protection 5
2.05 Efficiency of legal framework in settling disputes 14
2.06 Efficiency of legal framework in challenging regs 7
2.07 Property rights 6
2.08 No. of procedures to enforce a contract, 2009* 4
2.09 Time to enforce a contract, 2009* 30
2.10 Level of competition index, 2007* 59

Infrastructure environment 20

3.01 Number of telephone lines, 2008* 30
3.02 Secure Internet servers, 2008* 18
3.03 Electricity production, 2006* 29
3.04 Availability of scientists and engineers 30
3.05 Quality of scientific research institutions 21
3.06 Tertiary education enrollment, 2007* 40
3.07 Education expenditure, 2007* 31
3.08 Accessibility of digital content 5
3.09 Internet bandwidth, 2007* 14

Readiness component 28

Individual readiness 49

4.01 Quality of math and science education 39
4.02 Quality of the educational system 18
4.03 Buyer sophistication 19
4.04 Residential telephone connection charge, 2008* 110
4.05 Residential monthly telephone subscription, 2008* 94
4.06 Fixed broadband tariffs, 2008* 63
4.07 Mobile cellular tariffs, 2008* 63
4.08 Fixed telephone lines tariffs, 2008* 68

Business readiness 14

5.01 Extent of staff training 24
5.02 Local availability of research and training 12
5.03 Quality of management schools 24
5.04 Company spending on R&D 17
5.05 University-industry collaboration in R&D 16
5.06 Business telephone connection charge, 2008* 96
5.07 Business monthly telephone subscription, 2008* 76
5.08 Local supplier quality 1
5.09 Computer, comm., and other services imports, 2008* 41
5.10 Availability of new telephone lines 4

Government readiness 33

6.01 Government prioritization of ICT 35
6.02 Gov't procurement of advanced tech. products 55
6.03 Importance of ICT to gov't vision of the future 30

Usage component 19

Individual usage 18

7.01 Mobile telephone subscriptions, 2008* 17
7.02 Personal computers, 2005* 16
7.03 Broadband Internet subscribers, 2008* 27
7.04 Internet users, 2008* 19
7.05 Internet access in schools 11

Business usage 20

8.01 Prevalence of foreign technology licensing 19
8.02 Firm-level technology absorption 10
8.03 Capacity for innovation 11
8.04 Extent of business Internet use 21
8.05 Creative industries exports, 2006* 14
8.06 Utility patents, 2008* 17
8.07 High-tech exports, 2007* 27

Government usage 21

9.01 Government success in ICT promotion 42
9.02 Government Online Service Index, 2009* 33
9.03 ICT use and government efficiency 16
9.04 Presence of ICT in government agencies 6
9.05 E-Participation Index, 2009* 21

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Azerbaijan

Key indicators

Population (millions), 2008 ..... 8.7
GDP per capita (PPP $), 2008 8,634
Mobile phone subscriptions per 100 population, 2008 ..... 75.0
Internet users per 100 population, 2008 ..... 28.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 12.0
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**64**
2008–2009 (134)	60
2007–2008 (127)	67
Global Competitiveness Index 2009–2010 (133)	51

Environment component 63

Market environment 59

1.01 Venture capital availability 42
1.02 Financial market sophistication 70
1.03 Availability of latest technologies 60
1.04 State of cluster development 111
1.05 Burden of government regulation 14
1.06 Extent and effect of taxation 38
1.07 Total tax rate, 2008* 67
1.08 Time required to start a business, 2009* 31
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 105
1.11 Freedom of the press 105

Political and regulatory environment 54

2.01 Effectiveness of law-making bodies 36
2.02 Laws relating to ICT 44
2.03 Judicial independence 65
2.04 Intellectual property protection 54
2.05 Efficiency of legal framework in settling disputes 61
2.06 Efficiency of legal framework in challenging regs 42
2.07 Property rights 80
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 4
2.10 Level of competition index, 2007* 82

Infrastructure environment 78

3.01 Number of telephone lines, 2008* 79
3.02 Secure Internet servers, 2008* 94
3.03 Electricity production, 2006* 68
3.04 Availability of scientists and engineers 49
3.05 Quality of scientific research institutions 39
3.06 Tertiary education enrollment, 2007* 96
3.07 Education expenditure, 2007* 102
3.08 Accessibility of digital content 53
3.09 Internet bandwidth, 2008* 58

Readiness component 57

Individual readiness 106

4.01 Quality of math and science education 85
4.02 Quality of the educational system 64
4.03 Buyer sophistication 45
4.04 Residential telephone connection charge, 2008* 106
4.05 Residential monthly telephone subscription, 2008* 11
4.06 Fixed broadband tariffs, 2008* 105
4.07 Mobile cellular tariffs, 2008* 109
4.08 Fixed telephone lines tariffs, 2008* 89

Business readiness 44

5.01 Extent of staff training 32
5.02 Local availability of research and training 60
5.03 Quality of management schools 117
5.04 Company spending on R&D 65
5.05 University-industry collaboration in R&D 55
5.06 Business telephone connection charge, 2008* 102
5.07 Business monthly telephone subscription, 2008* 46
5.08 Local supplier quality 86
5.09 Computer, comm., and other services imports, 2008* 2
5.10 Availability of new telephone lines 86

Government readiness 30

6.01 Government prioritization of ICT 38
6.02 Gov't procurement of advanced tech. products 16
6.03 Importance of ICT to gov't vision of the future 40

Usage component 68

Individual usage 77

7.01 Mobile telephone subscriptions, 2008* 86
7.02 Personal computers, 2008* 71
7.03 Broadband Internet subscribers, 2008* 90
7.04 Internet users, 2008* 65
7.05 Internet access in schools 56

Business usage 70

8.01 Prevalence of foreign technology licensing 70
8.02 Firm-level technology absorption 55
8.03 Capacity for innovation 29
8.04 Extent of business Internet use 89
8.05 Creative industries exports, 2006* 109
8.06 Utility patents, 2008* 72
8.07 High-tech exports, 2007* 113

Government usage 49

9.01 Government success in ICT promotion 30
9.02 Government Online Service Index, 2009* 66
9.03 ICT use and government efficiency 54
9.04 Presence of ICT in government agencies 31
9.05 E-Participation Index, 2009* 64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Bahrain

Key indicators

Population (millions), 2008 ..... 0.8
GDP per capita (PPP $), 2008 34,662
Mobile phone subscriptions per 100 population, 2008 ..... 185.8
Internet users per 100 population, 2008 ..... 51.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 25.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**29**
2008–2009 (134)	37
2007–2008 (127)	45

Global Competitiveness Index 2009–2010 (133) 38

Environment component 33

Market environment 15

1.01 Venture capital availability 11
1.02 Financial market sophistication 28
1.03 Availability of latest technologies 28
1.04 State of cluster development 15
1.05 Burden of government regulation 32
1.06 Extent and effect of taxation 1
1.07 Total tax rate, 2008* 6
1.08 Time required to start a business, 2009* 29
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 51
1.11 Freedom of the press 72

Political and regulatory environment 37

2.01 Effectiveness of law-making bodies 54
2.02 Laws relating to ICT 28
2.03 Judicial independence 36
2.04 Intellectual property protection 25
2.05 Efficiency of legal framework in settling disputes 79
2.06 Efficiency of legal framework in challenging regs 31
2.07 Property rights 32
2.08 No. of procedures to enforce a contract, 2009* 122
2.09 Time to enforce a contract, 2009* 91
2.10 Level of competition index, 2007* 59

Infrastructure environment 44

3.01 Number of telephone lines, 2008* 47
3.02 Secure Internet servers, 2008* 42
3.03 Electricity production, 2006* 10
3.04 Availability of scientists and engineers 42
3.05 Quality of scientific research institutions 112
3.06 Tertiary education enrollment, 2006* 67
3.07 Education expenditure, 2007* 62
3.08 Accessibility of digital content 31
3.09 Internet bandwidth, 2007* 47

Readiness component 34

Individual readiness 21

4.01 Quality of math and science education 54
4.02 Quality of the educational system 40
4.03 Buyer sophistication 34
4.04 Residential telephone connection charge, 2008* 48
4.05 Residential monthly telephone subscription, 2008* 9
4.06 Fixed broadband tariffs, 2008* 58
4.07 Mobile cellular tariffs, 2008* 27
4.08 Fixed telephone lines tariffs, 2008* 38

Business readiness 72

5.01 Extent of staff training 36
5.02 Local availability of research and training 103
5.03 Quality of management schools 41
5.04 Company spending on R&D 87
5.05 University-industry collaboration in R&D 101
5.06 Business telephone connection charge, 2007* 40
5.07 Business monthly telephone subscription, 2006* 16
5.08 Local supplier quality 82
5.09 Computer, comm., and other services imports, 2007* 107
5.10 Availability of new telephone lines 42

Government readiness 17

6.01 Government prioritization of ICT 13
6.02 Gov't procurement of advanced tech. products 18
6.03 Importance of ICT to gov't vision of the future 20

Usage component 27

Individual usage 21

7.01 Mobile telephone subscriptions, 2008* 3
7.02 Personal computers, 2008* 9
7.03 Broadband Internet subscribers, 2008* 36
7.04 Internet users, 2008* 37
7.05 Internet access in schools 28

Business usage 60

8.01 Prevalence of foreign technology licensing 26
8.02 Firm-level technology absorption 59
8.03 Capacity for innovation 58
8.04 Extent of business Internet use 32
8.05 Creative industries exports, 2006* 84
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 124

Government usage 10

9.01 Government success in ICT promotion 15
9.02 Government Online Service Index, 2009* 8
9.03 ICT use and government efficiency 15
9.04 Presence of ICT in government agencies 26
9.05 E-Participation Index, 2009* 11

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Bangladesh

Key indicators

Population (millions), 2008 ..... 160.0
GDP per capita (PPP $), 2008 1,399
Mobile phone subscriptions per 100 population, 2008 ..... 27.9
Internet users per 100 population, 2008 ..... 0.3
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**118**
2008–2009 (134)	130
2007–2008 (127)	124
Global Competitiveness Index 2009–2010 (133)	106

Environment component 122

Market environment 94

1.01 Venture capital availability 122
1.02 Financial market sophistication 115
1.03 Availability of latest technologies 109
1.04 State of cluster development 65
1.05 Burden of government regulation 123
1.06 Extent and effect of taxation 63
1.07 Total tax rate, 2008* 48
1.08 Time required to start a business, 2009* 111
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 74
1.11 Freedom of the press 44

Political and regulatory environment 123

2.01 Effectiveness of law-making bodies 95
2.02 Laws relating to ICT 131
2.03 Judicial independence 82
2.04 Intellectual property protection 124
2.05 Efficiency of legal framework in settling disputes 104
2.06 Efficiency of legal framework in challenging regs 89
2.07 Property rights 107
2.08 No. of procedures to enforce a contract, 2009* 99
2.09 Time to enforce a contract, 2009* 128
2.10 Level of competition index, 2007* 82

Infrastructure environment 128

3.01 Number of telephone lines, 2008* 122
3.02 Secure Internet servers, 2008* 128
3.03 Electricity production, 2006* 117
3.04 Availability of scientists and engineers 69
3.05 Quality of scientific research institutions 108
3.06 Tertiary education enrollment, 2007* 110
3.07 Education expenditure, 2007* 122
3.08 Accessibility of digital content 119
3.09 Internet bandwidth, 2007* 125

Readiness component 100

Individual readiness 61

4.01 Quality of math and science education 118
4.02 Quality of the educational system 108
4.03 Buyer sophistication 92
4.04 Residential telephone connection charge, 2008* 67
4.05 Residential monthly telephone subscription, 2008* 7
4.06 Fixed broadband tariffs, 2008* 104
4.07 Mobile cellular tariffs, 2008* 6
4.08 Fixed telephone lines tariffs, 2008* 10

Business readiness 127

5.01 Extent of staff training 132
5.02 Local availability of research and training 119
5.03 Quality of management schools 101
5.04 Company spending on R&D 130
5.05 University-industry collaboration in R&D 125
5.06 Business telephone connection charge, 2007* 103
5.07 Business monthly telephone subscription, 2007* 4
5.08 Local supplier quality 91
5.09 Computer, comm., and other services imports, 2007* 114
5.10 Availability of new telephone lines 121

Government readiness 117

6.01 Government prioritization of ICT 80
6.02 Gov't procurement of advanced tech. products 127
6.03 Importance of ICT to gov't vision of the future 109

Usage component 126

Individual usage 127

7.01 Mobile telephone subscriptions, 2008* 120
7.02 Personal computers, 2006* 97
7.03 Broadband Internet subscribers, 2008* 117
7.04 Internet users, 2008* 132
7.05 Internet access in schools 132

Business usage 126

8.01 Prevalence of foreign technology licensing 120
8.02 Firm-level technology absorption 109
8.03 Capacity for innovation 123
8.04 Extent of business Internet use 117
8.05 Creative industries exports, 2004* 64
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2004* 96

Government usage 115

9.01 Government success in ICT promotion 117
9.02 Government Online Service Index, 2009* 58
9.03 ICT use and government efficiency 114
9.04 Presence of ICT in government agencies 130
9.05 E-Participation Index, 2009* 90

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Barbados

Key indicators

Population (millions), 2008 ..... 0.3
GDP per capita (PPP $), 2008 18,977
Mobile phone subscriptions per 100 population, 2008 ..... 159.1
Internet users per 100 population, 2008 ..... 73.7
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 17.7
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**35**
2008–2009 (134)	36
2007–2008 (127)	38

Global Competitiveness Index 2009–2010 (133) 44

Environment component 31

Market environment 51

1.01 Venture capital availability 69
1.02 Financial market sophistication 47
1.03 Availability of latest technologies 29
1.04 State of cluster development 66
1.05 Burden of government regulation 17
1.06 Extent and effect of taxation 28
1.07 Total tax rate* ..... n/a
1.08 Time required to start a business* ..... n/a
1.09 No. of procedures required to start a business* ..... n/a
1.10 Intensity of local competition 96
1.11 Freedom of the press 37

Political and regulatory environment 26

2.01 Effectiveness of law-making bodies 7
2.02 Laws relating to ICT 42
2.03 Judicial independence 20
2.04 Intellectual property protection 28
2.05 Efficiency of legal framework in settling disputes 22
2.06 Efficiency of legal framework in challenging regs 18
2.07 Property rights 25
2.08 No. of procedures to enforce a contract* ..... n/a
2.09 Time to enforce a contract* ..... n/a
2.10 Level of competition index, 2007* 104

Infrastructure environment 28

3.01 Number of telephone lines, 2008* 6
3.02 Secure Internet servers, 2008* 27
3.03 Electricity production, 2007* 55
3.04 Availability of scientists and engineers 63
3.05 Quality of scientific research institutions 38
3.06 Tertiary education enrollment, 2007* 37
3.07 Education expenditure, 2007* 9
3.08 Accessibility of digital content 39
3.09 Internet bandwidth, 2007* 53

Readiness component 42

Individual readiness 40

4.01 Quality of math and science education 12
4.02 Quality of the educational system 13
4.03 Buyer sophistication 37
4.04 Residential telephone connection charge, 2008* 53
4.05 Residential monthly telephone subscription, 2008* 119
4.06 Fixed broadband tariffs, 2008* 91
4.07 Mobile cellular tariffs, 2008* 74
4.08 Fixed telephone lines tariffs, 2008* 1

Business readiness 61

5.01 Extent of staff training 37
5.02 Local availability of research and training 62
5.03 Quality of management schools 27
5.04 Company spending on R&D 67
5.05 University-industry collaboration in R&D 35
5.06 Business telephone connection charge, 2007* 43
5.07 Business monthly telephone subscription, 2007* 110
5.08 Local supplier quality 54
5.09 Computer, comm., and other services imports, 2005* 88
5.10 Availability of new telephone lines 83

Government readiness 34

6.01 Government prioritization of ICT 23
6.02 Gov't procurement of advanced tech. products 46
6.03 Importance of ICT to gov't vision of the future 43

Usage component 35

Individual usage 17

7.01 Mobile telephone subscriptions, 2008* 5
7.02 Personal computers, 2005* 51
7.03 Broadband Internet subscribers, 2008* 1
7.04 Internet users, 2008* 15
7.05 Internet access in schools 42

Business usage 58

8.01 Prevalence of foreign technology licensing 55
8.02 Firm-level technology absorption 41
8.03 Capacity for innovation 77
8.04 Extent of business Internet use 42
8.05 Creative industries exports, 2006* 83
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2005* 41

Government usage 67

9.01 Government success in ICT promotion 26
9.02 Government Online Service Index, 2009* 99
9.03 ICT use and government efficiency 56
9.04 Presence of ICT in government agencies 53
9.05 E-Participation Index, 2009* 90

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Belgium

Key indicators

Population (millions), 2008 ..... 10.7
GDP per capita (PPP $), 2008 36,416
Mobile phone subscriptions per 100 population, 2008 ..... 111.6
Internet users per 100 population, 2008 ..... 68.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 253.5
Utility patents per million population, 2008 ..... 48.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**22**
2008–2009 (134)	24
2007–2008 (127)	25
Global Competitiveness Index 2009–2010 (133)	18

Environment component 20

Market environment 25

1.01 Venture capital availability 29
1.02 Financial market sophistication 19
1.03 Availability of latest technologies 19
1.04 State of cluster development 27
1.05 Burden of government regulation 112
1.06 Extent and effect of taxation 130
1.07 Total tax rate, 2008* 108
1.08 Time required to start a business, 2009* 5
1.09 No. of procedures required to start a business, 2009* 5
1.10 Intensity of local competition 7
1.11 Freedom of the press 12

Political and regulatory environment 24

2.01 Effectiveness of law-making bodies 74
2.02 Laws relating to ICT 30
2.03 Judicial independence 25
2.04 Intellectual property protection 22
2.05 Efficiency of legal framework in settling disputes 48
2.06 Efficiency of legal framework in challenging regs 56
2.07 Property rights 23
2.08 No. of procedures to enforce a contract, 2009* 4
2.09 Time to enforce a contract, 2009* 53
2.10 Level of competition index, 2007* 59

Infrastructure environment 16

3.01 Number of telephone lines, 2008* 26
3.02 Secure Internet servers, 2008* 26
3.03 Electricity production, 2006* 23
3.04 Availability of scientists and engineers 17
3.05 Quality of scientific research institutions 8
3.06 Tertiary education enrollment, 2007* 24
3.07 Education expenditure, 2007* 20
3.08 Accessibility of digital content 21
3.09 Internet bandwidth, 2007* 12

Readiness component 23

Individual readiness 18

4.01 Quality of math and science education 4
4.02 Quality of the educational system 7
4.03 Buyer sophistication 16
4.04 Residential telephone connection charge, 2008* 58
4.05 Residential monthly telephone subscription, 2008* 102
4.06 Fixed broadband tariffs, 2008* 15
4.07 Mobile cellular tariffs, 2008* 51
4.08 Fixed telephone lines tariffs, 2008* 92

Business readiness 9

5.01 Extent of staff training 13
5.02 Local availability of research and training 10
5.03 Quality of management schools 7
5.04 Company spending on R&D 15
5.05 University-industry collaboration in R&D 8
5.06 Business telephone connection charge, 2007* 46
5.07 Business monthly telephone subscription, 2007* 72
5.08 Local supplier quality 5
5.09 Computer, comm., and other services imports, 2008* 22
5.10 Availability of new telephone lines 25

Government readiness 55

6.01 Government prioritization of ICT 60
6.02 Gov't procurement of advanced tech. products 35
6.03 Importance of ICT to gov't vision of the future 69

Usage component 22

Individual usage 24

7.01 Mobile telephone subscriptions, 2008* 41
7.02 Personal computers, 2005* 28
7.03 Broadband Internet subscribers, 2008* 15
7.04 Internet users, 2008* 20
7.05 Internet access in schools 24

Business usage 18

8.01 Prevalence of foreign technology licensing 23
8.02 Firm-level technology absorption 27
8.03 Capacity for innovation 12
8.04 Extent of business Internet use 30
8.05 Creative industries exports, 2006* 12
8.06 Utility patents, 2008* 21
8.07 High-tech exports, 2007* 28

Government usage 27

9.01 Government success in ICT promotion 58
9.02 Government Online Service Index, 2009* 17
9.03 ICT use and government efficiency 73
9.04 Presence of ICT in government agencies 45
9.05 E-Participation Index, 2009* 17

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Benin

Key indicators

Networked Readiness Index

Environment component 107

Readiness component 114

Usage component 112

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Bolivia

Key indicators

Population (millions), 2008 ..... 9.7
GDP per capita (PPP $), 2008 4,345
Mobile phone subscriptions per 100 population, 2008 ..... 49.8
Internet users per 100 population, 2008 ..... 10.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 2.3
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**131**
2008–2009 (134)	128
2007–2008 (127)	111
Global Competitiveness Index 2009–2010 (133)	120

Environment component 132

Market environment 130

1.01 Venture capital availability 89
1.02 Financial market sophistication 112
1.03 Availability of latest technologies 129
1.04 State of cluster development 129
1.05 Burden of government regulation 101
1.06 Extent and effect of taxation 125
1.07 Total tax rate, 2008* 125
1.08 Time required to start a business, 2009* 113
1.09 No. of procedures required to start a business, 2009* 122
1.10 Intensity of local competition 126
1.11 Freedom of the press 129

Political and regulatory environment 133

2.01 Effectiveness of law-making bodies 131
2.02 Laws relating to ICT 133
2.03 Judicial independence 128
2.04 Intellectual property protection 133
2.05 Efficiency of legal framework in settling disputes 131
2.06 Efficiency of legal framework in challenging regs 129
2.07 Property rights 131
2.08 No. of procedures to enforce a contract, 2009* 92
2.09 Time to enforce a contract, 2009* 79
2.10 Level of competition index, 2007* 82

Infrastructure environment 93

3.01 Number of telephone lines, 2008* 101
3.02 Secure Internet servers, 2008* 89
3.03 Electricity production, 2006* 108
3.04 Availability of scientists and engineers 127
3.05 Quality of scientific research institutions 130
3.06 Tertiary education enrollment, 2004* 53
3.07 Education expenditure, 2007* 16
3.08 Accessibility of digital content 122
3.09 Internet bandwidth, 2008* 86

Readiness component 132

Individual readiness 121

4.01 Quality of math and science education 112
4.02 Quality of the educational system 126
4.03 Buyer sophistication 121
4.04 Residential telephone connection charge, 2008* 81
4.05 Residential monthly telephone subscription, 2008* 128
4.06 Fixed broadband tariffs, 2008* 95
4.07 Mobile cellular tariffs, 2008* 95
4.08 Fixed telephone lines tariffs, 2008* 81

Business readiness 121

5.01 Extent of staff training 117
5.02 Local availability of research and training 112
5.03 Quality of management schools 112
5.04 Company spending on R&D 132
5.05 University-industry collaboration in R&D 121
5.06 Business telephone connection charge, 2007* 94
5.07 Business monthly telephone subscription, 2006* 74
5.08 Local supplier quality 130
5.09 Computer, comm., and other services imports, 2007* 82
5.10 Availability of new telephone lines 113

Government readiness 133

6.01 Government prioritization of ICT 132
6.02 Gov't procurement of advanced tech. products 133
6.03 Importance of ICT to gov't vision of the future 133

Usage component 127

Individual usage 107

7.01 Mobile telephone subscriptions, 2008* 103
7.02 Personal computers, 2005* 96
7.03 Broadband Internet subscribers, 2008* 91
7.04 Internet users, 2008* 94
7.05 Internet access in schools 114

Business usage 132

8.01 Prevalence of foreign technology licensing 132
8.02 Firm-level technology absorption 132
8.03 Capacity for innovation 117
8.04 Extent of business Internet use 123
8.05 Creative industries exports, 2006* 68
8.06 Utility patents, 2008* 82
8.07 High-tech exports, 2007* 88

Government usage 123

9.01 Government success in ICT promotion 133
9.02 Government Online Service Index, 2009* 76
9.03 ICT use and government efficiency 129
9.04 Presence of ICT in government agencies 131
9.05 E-Participation Index, 2009* 55

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Bosnia and Herzegovina

Key indicators

Population (millions), 2008 ..... 3.8
GDP per capita (PPP $), 2008 7,624
Mobile phone subscriptions per 100 population, 2008 ..... 84.3
Internet users per 100 population, 2008 ..... 34.7
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 5.1
Utility patents per million population, 2008 ..... 0.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**110**
2008–2009 (134)	106
2007–2008 (127)	95
Global Competitiveness Index 2009–2010 (133)	109

Environment component 118

Readiness component 116

Usage component 103

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Botswana

Key indicators

Population (millions), 2008 ..... 1.9
GDP per capita (PPP $), 2008 14,907
Mobile phone subscriptions per 100 population, 2008 ..... 77.3
Internet users per 100 population, 2008 ..... 6.2
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 2.2
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**86**
2008–2009 (134)	77
2007–2008 (127)	78

Global Competitiveness Index 2009–2010 (133)	66

Environment component 65

Market environment 65

1.01 Venture capital availability 51
1.02 Financial market sophistication 83
1.03 Availability of latest technologies 69
1.04 State of cluster development 98
1.05 Burden of government regulation 40
1.06 Extent and effect of taxation 20
1.07 Total tax rate, 2008* 11
1.08 Time required to start a business, 2009* 119
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 88
1.11 Freedom of the press 59

Political and regulatory environment 45

2.01 Effectiveness of law-making bodies 22
2.02 Laws relating to ICT 94
2.03 Judicial independence 27
2.04 Intellectual property protection 49
2.05 Efficiency of legal framework in settling disputes 34
2.06 Efficiency of legal framework in challenging regs 26
2.07 Property rights 38
2.08 No. of procedures to enforce a contract, 2009* 12
2.09 Time to enforce a contract, 2009* 96
2.10 Level of competition index, 2007* 104

Infrastructure environment 96

3.01 Number of telephone lines, 2008* 100
3.02 Secure Internet servers, 2008* 95
3.03 Electricity production, 2006* 107
3.04 Availability of scientists and engineers 100
3.05 Quality of scientific research institutions 73
3.06 Tertiary education enrollment, 2005* 115
3.07 Education expenditure, 2007* 14
3.08 Accessibility of digital content 116
3.09 Internet bandwidth, 2008* 87

Readiness component 86

Individual readiness 96

4.01 Quality of math and science education 81
4.02 Quality of the educational system 42
4.03 Buyer sophistication 80
4.04 Residential telephone connection charge, 2008* 59
4.05 Residential monthly telephone subscription, 2008* 111
4.06 Fixed broadband tariffs, 2008* 82
4.07 Mobile cellular tariffs, 2008* 98
4.08 Fixed telephone lines tariffs, 2008* 105

Business readiness 105

5.01 Extent of staff training 74
5.02 Local availability of research and training 113
5.03 Quality of management schools 118
5.04 Company spending on R&D 73
5.05 University-industry collaboration in R&D 58
5.06 Business telephone connection charge, 2008* 67
5.07 Business monthly telephone subscription, 2008* 113
5.08 Local supplier quality 115
5.09 Computer, comm., and other services imports, 2007* 62
5.10 Availability of new telephone lines 99

Government readiness 52

6.01 Government prioritization of ICT 61
6.02 Gov't procurement of advanced tech. products 40
6.03 Importance of ICT to gov't vision of the future 54

Usage component 97

Individual usage 95

7.01 Mobile telephone subscriptions, 2008* 83
7.02 Personal computers, 2008* 79
7.03 Broadband Internet subscribers, 2008* 95
7.04 Internet users, 2008* 106
7.05 Internet access in schools 96

Business usage 97

8.01 Prevalence of foreign technology licensing 59
8.02 Firm-level technology absorption 73
8.03 Capacity for innovation 95
8.04 Extent of business Internet use 121
8.05 Creative industries exports, 2003* 97
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 91

Government usage 90

9.01 Government success in ICT promotion 48
9.02 Government Online Service Index, 2009* 99
9.03 ICT use and government efficiency 70
9.04 Presence of ICT in government agencies 90
9.05 E-Participation Index, 2009* 90

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Brazil

Key indicators

Population (millions), 2008 ..... 192.0
GDP per capita (PPP $), 2008 10,466
Mobile phone subscriptions per 100 population, 2008 ..... 78.5
Internet users per 100 population, 2008 ..... 37.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 20.8
Utility patents per million population, 2008 ..... 0.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**61**
2008–2009 (134)	59
2007–2008 (127)	59

Global Competitiveness Index 2009–2010 (133) 56

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Brunei Darussalam

Key indicators

Population (millions), 2008 ..... 0.4
GDP per capita (PPP $), 2008 50,199
Mobile phone subscriptions per 100 population, 2008 ..... 95.8
Internet users per 100 population, 2008 ..... 55.3
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 15.6
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**63**
2008–2009 (134)	63
2007–2008 (127)	n/a
Global Competitiveness Index 2009–2010 (133)	32

Environment component 79

Market environment 92

1.01 Venture capital availability 62
1.02 Financial market sophistication 64
1.03 Availability of latest technologies 51
1.04 State of cluster development 72
1.05 Burden of government regulation 39
1.06 Extent and effect of taxation 14
1.07 Total tax rate, 2008* 31
1.08 Time required to start a business, 2009* 127
1.09 No. of procedures required to start a business, 2009* 128
1.10 Intensity of local competition 75
1.11 Freedom of the press 115

Political and regulatory environment 72

2.01 Effectiveness of law-making bodies 31
2.02 Laws relating to ICT 72
2.03 Judicial independence 46
2.04 Intellectual property protection 51
2.05 Efficiency of legal framework in settling disputes 32
2.06 Efficiency of legal framework in challenging regs 55
2.07 Property rights 49
2.08 No. of procedures to enforce a contract, 2009* 130
2.09 Time to enforce a contract, 2009* 63
2.10 Level of competition index, 2007* 116

Infrastructure environment 71

3.01 Number of telephone lines, 2008* 66
3.02 Secure Internet servers, 2008* 55
3.03 Electricity production, 2006* 17
3.04 Availability of scientists and engineers 110
3.05 Quality of scientific research institutions 97
3.06 Tertiary education enrollment, 2007* 95
3.07 Education expenditure, 2007* 82
3.08 Accessibility of digital content 54
3.09 Internet bandwidth, 2008* 55

Readiness component 51

Individual readiness 76

4.01 Quality of math and science education 40
4.02 Quality of the educational system 39
4.03 Buyer sophistication 101
4.04 Residential telephone connection charge, 2008* 32
4.05 Residential monthly telephone subscription, 2008* 67
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 71

5.01 Extent of staff training 54
5.02 Local availability of research and training 108
5.03 Quality of management schools 74
5.04 Company spending on R&D 70
5.05 University-industry collaboration in R&D 75
5.06 Business telephone connection charge, 2008* 24
5.07 Business monthly telephone subscription, 2008* 37
5.08 Local supplier quality 78
5.09 Computer, comm., and other services imports, 2006* 69
5.10 Availability of new telephone lines 73

Government readiness 29

6.01 Government prioritization of ICT 29
6.02 Gov't procurement of advanced tech. products 32
6.03 Importance of ICT to gov't vision of the future 27

Usage component 56

Individual usage 50

7.01 Mobile telephone subscriptions, 2008* 61
7.02 Personal computers, 2005* 68
7.03 Broadband Internet subscribers, 2008* 68
7.04 Internet users, 2008* 35
7.05 Internet access in schools 37

Business usage 85

8.01 Prevalence of foreign technology licensing 89
8.02 Firm-level technology absorption 57
8.03 Capacity for innovation 91
8.04 Extent of business Internet use 51
8.05 Creative industries exports, 2006* 117
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 102

Government usage 56

9.01 Government success in ICT promotion 28
9.02 Government Online Service Index, 2009* 83
9.03 ICT use and government efficiency 43
9.04 Presence of ICT in government agencies 58
9.05 E-Participation Index, 2009* 64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Bulgaria

Key indicators

Population (millions), 2008 ..... 7.6
GDP per capita (PPP $), 2008 12,322
Mobile phone subscriptions per 100 population, 2008 ..... 138.3
Internet users per 100 population, 2008 ..... 34.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 378.5
Utility patents per million population, 2008 ..... 2.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**71**
2008–2009 (134)	68
2007–2008 (127)	68

Global Competitiveness Index 2009–2010 (133)	76

Environment component 61

Market environment 88

1.01 Venture capital availability 71
1.02 Financial market sophistication 110
1.03 Availability of latest technologies 107
1.04 State of cluster development 108
1.05 Burden of government regulation 82
1.06 Extent and effect of taxation 81
1.07 Total tax rate, 2008* 34
1.08 Time required to start a business, 2009* 61
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 66
1.11 Freedom of the press 90

Political and regulatory environment 104

2.01 Effectiveness of law-making bodies 112
2.02 Laws relating to ICT 43
2.03 Judicial independence 108
2.04 Intellectual property protection 109
2.05 Efficiency of legal framework in settling disputes 116
2.06 Efficiency of legal framework in challenging regs 105
2.07 Property rights 110
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 68
2.10 Level of competition index, 2007* 82

Infrastructure environment 35

3.01 Number of telephone lines, 2008* 42
3.02 Secure Internet servers, 2008* 57
3.03 Electricity production, 2006* 38
3.04 Availability of scientists and engineers 88
3.05 Quality of scientific research institutions 75
3.06 Tertiary education enrollment, 2007* 42
3.07 Education expenditure, 2007* 66
3.08 Accessibility of digital content 65
3.09 Internet bandwidth, 2008* 6

Readiness component 92

Individual readiness 82

4.01 Quality of math and science education 56
4.02 Quality of the educational system 82
4.03 Buyer sophistication 82
4.04 Residential telephone connection charge, 2008* 20
4.05 Residential monthly telephone subscription, 2008* 99
4.06 Fixed broadband tariffs, 2008* 39
4.07 Mobile cellular tariffs, 2008* 111
4.08 Fixed telephone lines tariffs, 2008* 80

Business readiness 93

5.01 Extent of staff training 126
5.02 Local availability of research and training 73
5.03 Quality of management schools 92
5.04 Company spending on R&D 94
5.05 University-industry collaboration in R&D 102
5.06 Business telephone connection charge, 2008* 72
5.07 Business monthly telephone subscription, 2008* 106
5.08 Local supplier quality 73
5.09 Computer, comm., and other services imports, 2008* 59
5.10 Availability of new telephone lines 80

Government readiness 98

6.01 Government prioritization of ICT 114
6.02 Gov't procurement of advanced tech. products 97
6.03 Importance of ICT to gov't vision of the future 89

Usage component 57

Individual usage 47

7.01 Mobile telephone subscriptions, 2008* 12
7.02 Personal computers, 2008* 60
7.03 Broadband Internet subscribers, 2008* 43
7.04 Internet users, 2008* 51
7.05 Internet access in schools 52

Business usage 87

8.01 Prevalence of foreign technology licensing 104
8.02 Firm-level technology absorption 107
8.03 Capacity for innovation 73
8.04 Extent of business Internet use 46
8.05 Creative industries exports, 2005* 62
8.06 Utility patents, 2008* 36
8.07 High-tech exports, 2007* 51

Government usage 61

9.01 Government success in ICT promotion 111
9.02 Government Online Service Index, 2009* 44
9.03 ICT use and government efficiency 99
9.04 Presence of ICT in government agencies 61
9.05 E-Participation Index, 2009* 38

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Burkina Faso

Key indicators

Population (millions), 2008 ..... 15.2
GDP per capita (PPP $), 2008 1,268
Mobile phone subscriptions per 100 population, 2008 ..... 16.8
Internet users per 100 population, 2008 ..... 0.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**108**
2008–2009 (134)	113
2007–2008 (127)	103

Global Competitiveness Index 2009–2010 (133)	128

Environment component 100

Market environment 105

1.01 Venture capital availability 132
1.02 Financial market sophistication 113
1.03 Availability of latest technologies 113
1.04 State of cluster development 132
1.05 Burden of government regulation 44
1.06 Extent and effect of taxation 76
1.07 Total tax rate, 2008* 80
1.08 Time required to start a business, 2009* 48
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 113
1.11 Freedom of the press 76

Political and regulatory environment 75

2.01 Effectiveness of law-making bodies 59
2.02 Laws relating to ICT 92
2.03 Judicial independence 96
2.04 Intellectual property protection 76
2.05 Efficiency of legal framework in settling disputes 54
2.06 Efficiency of legal framework in challenging regs 59
2.07 Property rights 71
2.08 No. of procedures to enforce a contract, 2009* 64
2.09 Time to enforce a contract, 2009* 44
2.10 Level of competition index, 2007* 82

Infrastructure environment 111

3.01 Number of telephone lines, 2008* 119
3.02 Secure Internet servers, 2008* 126
3.03 Electricity production, 2007* 126
3.04 Availability of scientists and engineers 99
3.05 Quality of scientific research institutions 58
3.06 Tertiary education enrollment, 2008* 125
3.07 Education expenditure, 2007* 64
3.08 Accessibility of digital content 114
3.09 Internet bandwidth, 2007* 114

Readiness component 112

Individual readiness 130

4.01 Quality of math and science education 82
4.02 Quality of the educational system 127
4.03 Buyer sophistication 122
4.04 Residential telephone connection charge, 2008* 91
4.05 Residential monthly telephone subscription, 2008* 66
4.06 Fixed broadband tariffs, 2008* 118
4.07 Mobile cellular tariffs, 2008* 116
4.08 Fixed telephone lines tariffs, 2008* 102

Business readiness 90

5.01 Extent of staff training 127
5.02 Local availability of research and training 86
5.03 Quality of management schools 86
5.04 Company spending on R&D 92
5.05 University-industry collaboration in R&D 93
5.06 Business telephone connection charge, 2008* 74
5.07 Business monthly telephone subscription, 2007* 39
5.08 Local supplier quality 96
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 96

Government readiness 56

6.01 Government prioritization of ICT 57
6.02 Gov't procurement of advanced tech. products 53
6.03 Importance of ICT to gov't vision of the future 62

Usage component 117

Individual usage 128

7.01 Mobile telephone subscriptions, 2008* 125
7.02 Personal computers, 2006* 119
7.03 Broadband Internet subscribers, 2008* 119
7.04 Internet users, 2008* 128
7.05 Internet access in schools 127

Business usage 116

8.01 Prevalence of foreign technology licensing 113
8.02 Firm-level technology absorption 101
8.03 Capacity for innovation 83
8.04 Extent of business Internet use 127
8.05 Creative industries exports, 2004* 110
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2005* 75

Government usage 89

9.01 Government success in ICT promotion 47
9.02 Government Online Service Index, 2009* 110
9.03 ICT use and government efficiency 49
9.04 Presence of ICT in government agencies 78
9.05 E-Participation Index, 2009* 104

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Burundi

Key indicators

Networked Readiness Index

Environment component 131

Readiness component 120

Usage component 132

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Cambodia

Key indicators

Population (millions), 2008 ..... 14.7
GDP per capita (PPP $), 2008 2,082
Mobile phone subscriptions per 100 population, 2008 ..... 29.1
Internet users per 100 population, 2008 ..... 0.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.2
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**117**
2008–2009 (134)	126
2007–2008 (127)	115

Global Competitiveness Index 2009–2010 (133) 110

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Cameroon

Key indicators

Population (millions), 2008 ..... 18.9
GDP per capita (PPP $), 2008 2,139
Mobile phone subscriptions per 100 population, 2008 ..... 32.3
Internet users per 100 population, 2008 ..... 3.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**128**
2008–2009 (134)	123
2007–2008 (127)	118

Global Competitiveness Index 2009–2010 (133) 111

Environment component 126

Readiness component 127

Usage component 116

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Canada

Key indicators

Population (millions), 2008 ..... 33.3
GDP per capita (PPP $), 2008 39,098
Mobile phone subscriptions per 100 population, 2008 ..... 66.4
Internet users per 100 population, 2008 ..... 75.4
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 162.4
Utility patents per million population, 2008 ..... 102.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**7**
2008–2009 (134)	10
2007–2008 (127)	13
Global Competitiveness Index 2009–2010 (133)	9

Environment component 6

Market environment 7

1.01 Venture capital availability 18
1.02 Financial market sophistication 3
1.03 Availability of latest technologies 9
1.04 State of cluster development 8
1.05 Burden of government regulation 42
1.06 Extent and effect of taxation 65
1.07 Total tax rate, 2008* 76
1.08 Time required to start a business, 2009* 8
1.09 No. of procedures required to start a business, 2009* 1
1.10 Intensity of local competition 24
1.11 Freedom of the press 10

Political and regulatory environment 13

2.01 Effectiveness of law-making bodies 11
2.02 Laws relating to ICT 12
2.03 Judicial independence 11
2.04 Intellectual property protection 18
2.05 Efficiency of legal framework in settling disputes 16
2.06 Efficiency of legal framework in challenging regs 16
2.07 Property rights 12
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 72
2.10 Level of competition index, 2007* 1

Infrastructure environment 6

3.01 Number of telephone lines, 2008* 11
3.02 Secure Internet servers, 2008* 10
3.03 Electricity production, 2006* 3
3.04 Availability of scientists and engineers 6
3.05 Quality of scientific research institutions 11
3.06 Tertiary education enrollment, 2004* 25
3.07 Education expenditure, 2007* 47
3.08 Accessibility of digital content 13
3.09 Internet bandwidth, 2007* 16

Readiness component 13

Individual readiness 16

4.01 Quality of math and science education 14
4.02 Quality of the educational system 5
4.03 Buyer sophistication 14
4.04 Residential telephone connection charge, 2008* 69
4.05 Residential monthly telephone subscription, 2008* 122
4.06 Fixed broadband tariffs, 2008* 4
4.07 Mobile cellular tariffs, 2008* 56
4.08 Fixed telephone lines tariffs, 2008* 1

Business readiness 11

5.01 Extent of staff training 12
5.02 Local availability of research and training 11
5.03 Quality of management schools 2
5.04 Company spending on R&D 22
5.05 University-industry collaboration in R&D 9
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 8
5.09 Computer, comm., and other services imports, 2008* 50
5.10 Availability of new telephone lines 12

Government readiness 27

6.01 Government prioritization of ICT 33
6.02 Gov't procurement of advanced tech. products 25
6.03 Importance of ICT to gov't vision of the future 26

Usage component 8

Individual usage 12

7.01 Mobile telephone subscriptions, 2008* 93
7.02 Personal computers, 2006* 2
7.03 Broadband Internet subscribers, 2008* 11
7.04 Internet users, 2008* 11
7.05 Internet access in schools 12

Business usage 8

8.01 Prevalence of foreign technology licensing 1
8.02 Firm-level technology absorption 21
8.03 Capacity for innovation 20
8.04 Extent of business Internet use 5
8.05 Creative industries exports, 2006* 8
8.06 Utility patents, 2008* 10
8.07 High-tech exports, 2007* 31

Government usage 6

9.01 Government success in ICT promotion 29
9.02 Government Online Service Index, 2009* 3
9.03 ICT use and government efficiency 17
9.04 Presence of ICT in government agencies 10
9.05 E-Participation Index, 2009* 8

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Chad

Key indicators

Population (millions), 2008 ..... 11.1
GDP per capita (PPP $), 2008 1,663
Mobile phone subscriptions per 100 population, 2008 ..... 16.6
Internet users per 100 population, 2008 ..... 1.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**133**
2008–2009 (134)	134
2007–2008 (127)	127

Global Competitiveness Index 2009–2010 (133) 131

Environment component 133

Market environment 133

Political and regulatory environment 131

Infrastructure environment 133

Readiness component 130

Individual readiness 127

Business readiness 128

Government readiness 119

Usage component 131

Individual usage 130

Business usage 102

Government usage 125

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Chile

Key indicators

Population (millions), 2008 ..... 16.8
GDP per capita (PPP $), 2008 14,529
Mobile phone subscriptions per 100 population, 2008 ..... 88.1
Internet users per 100 population, 2008 ..... 32.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 40.7
Utility patents per million population, 2008 ..... 0.8

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**40**
2008–2009 (134)	39
2007–2008 (127)	34
Global Competitiveness Index 2009–2010 (133)	30

Environment component 35

Market environment 27

1.01 Venture capital availability 30
1.02 Financial market sophistication 20
1.03 Availability of latest technologies 32
1.04 State of cluster development 45
1.05 Burden of government regulation 41
1.06 Extent and effect of taxation 42
1.07 Total tax rate, 2008* 20
1.08 Time required to start a business, 2009* 81
1.09 No. of procedures required to start a business, 2009* 83
1.10 Intensity of local competition 23
1.11 Freedom of the press 15

Political and regulatory environment 32

2.01 Effectiveness of law-making bodies 58
2.02 Laws relating to ICT 27
2.03 Judicial independence 43
2.04 Intellectual property protection 65
2.05 Efficiency of legal framework in settling disputes 26
2.06 Efficiency of legal framework in challenging regs 29
2.07 Property rights 31
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 51
2.10 Level of competition index, 2007* 1

Infrastructure environment 50

3.01 Number of telephone lines, 2008* 62
3.02 Secure Internet servers, 2008* 53
3.03 Electricity production, 2006* 58
3.04 Availability of scientists and engineers 23
3.05 Quality of scientific research institutions 57
3.06 Tertiary education enrollment, 2007* 38
3.07 Education expenditure, 2007* 93
3.08 Accessibility of digital content 30
3.09 Internet bandwidth, 2007* 40

Readiness component 53

Individual readiness 85

4.01 Quality of math and science education 116
4.02 Quality of the educational system 107
4.03 Buyer sophistication 26
4.04 Residential telephone connection charge, 2008* 94
4.05 Residential monthly telephone subscription, 2008* 127
4.06 Fixed broadband tariffs, 2008* 85
4.07 Mobile cellular tariffs, 2008* 68
4.08 Fixed telephone lines tariffs, 2008* 78

Business readiness 41

5.01 Extent of staff training 39
5.02 Local availability of research and training 41
5.03 Quality of management schools 17
5.04 Company spending on R&D 56
5.05 University-industry collaboration in R&D 41
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 26
5.09 Computer, comm., and other services imports, 2008* 89
5.10 Availability of new telephone lines 14

Government readiness 45

6.01 Government prioritization of ICT 51
6.02 Gov't procurement of advanced tech. products 54
6.03 Importance of ICT to gov't vision of the future 36

Usage component 42

Individual usage 53

7.01 Mobile telephone subscriptions, 2008* 71
7.02 Personal computers, 2005* 53
7.03 Broadband Internet subscribers, 2008* 47
7.04 Internet users, 2008* 58
7.05 Internet access in schools 38

Business usage 51

8.01 Prevalence of foreign technology licensing 33
8.02 Firm-level technology absorption 31
8.03 Capacity for innovation 60
8.04 Extent of business Internet use 29
8.05 Creative industries exports, 2005* 55
8.06 Utility patents, 2008* 54
8.07 High-tech exports, 2006* 81

Government usage 25

9.01 Government success in ICT promotion 55
9.02 Government Online Service Index, 2009* 18
9.03 ICT use and government efficiency 13
9.04 Presence of ICT in government agencies 29
9.05 E-Participation Index, 2009* 34

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

China

Key indicators

Population (millions), 2008.....1,325.6
GDP per capita (PPP $), 2008 5,970
Mobile phone subscriptions per 100 population, 2008.....47.9
Internet users per 100 population, 2008 .....22.3
Internet bandwidth (Mb/s) per 10,000 population, 2008.....4.8
Utility patents per million population, 2008 .....0.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**37**
2008–2009 (134)	46
2007–2008 (127)	57

Global Competitiveness Index 2009–2010 (133)	29

Environment component 57

Market environment 72

1.01 Venture capital availability.....38
1.02 Financial market sophistication 78
1.03 Availability of latest technologies 87
1.04 State of cluster development.....16
1.05 Burden of government regulation 21
1.06 Extent and effect of taxation.....32
1.07 Total tax rate, 2008*.....123
1.08 Time required to start a business, 2009*.....103
1.09 No. of procedures required to start a business, 2009* ..120
1.10 Intensity of local competition 13
1.11 Freedom of the press.....106

Political and regulatory environment 47

2.01 Effectiveness of law-making bodies.....30
2.02 Laws relating to ICT 48
2.03 Judicial independence 62
2.04 Intellectual property protection 45
2.05 Efficiency of legal framework in settling disputes 43
2.06 Efficiency of legal framework in challenging regs.....57
2.07 Property rights.....39
2.08 No. of procedures to enforce a contract, 2009*.....41
2.09 Time to enforce a contract, 2009* 33
2.10 Level of competition index, 2007*.....82

Infrastructure environment 70

3.01 Number of telephone lines, 2008*.....51
3.02 Secure Internet servers, 2008*.....104
3.03 Electricity production, 2006*.....73
3.04 Availability of scientists and engineers.....36
3.05 Quality of scientific research institutions 35
3.06 Tertiary education enrollment, 2007*.....80
3.07 Education expenditure, 2007*.....123
3.08 Accessibility of digital content.....34
3.09 Internet bandwidth, 2008* 78

Readiness component 19

Individual readiness 9

4.01 Quality of math and science education 35
4.02 Quality of the educational system.....52
4.03 Buyer sophistication 13
4.04 Residential telephone connection charge*.....n/a
4.05 Residential monthly telephone subscription, 2008* 19
4.06 Fixed broadband tariffs, 2008*.....55
4.07 Mobile cellular tariffs, 2008* 17
4.08 Fixed telephone lines tariffs, 2008* 22

Business readiness 34

5.01 Extent of staff training.....50
5.02 Local availability of research and training 47
5.03 Quality of management schools.....72
5.04 Company spending on R&D 23
5.05 University-industry collaboration in R&D 23
5.06 Business telephone connection charge*.....n/a
5.07 Business monthly telephone subscription, 2007* 8
5.08 Local supplier quality 53
5.09 Computer, comm., and other services imports, 2008* 40
5.10 Availability of new telephone lines 65

Government readiness 14

6.01 Government prioritization of ICT 17
6.02 Gov't procurement of advanced tech. products.....13
6.03 Importance of ICT to gov't vision of the future.....13

Usage component 36

Individual usage 71

7.01 Mobile telephone subscriptions, 2008* 107
7.02 Personal computers, 2006* 83
7.03 Broadband Internet subscribers, 2008* 55
7.04 Internet users, 2008* 77
7.05 Internet access in schools.....23

Business usage 16

8.01 Prevalence of foreign technology licensing.....78
8.02 Firm-level technology absorption 47
8.03 Capacity for innovation 22
8.04 Extent of business Internet use 52
8.05 Creative industries exports, 2006*.....1
8.06 Utility patents, 2008* 50
8.07 High-tech exports, 2007* 8

Government usage 30

9.01 Government success in ICT promotion.....16
9.02 Government Online Service Index, 2009* 53
9.03 ICT use and government efficiency 27
9.04 Presence of ICT in government agencies 23
9.05 E-Participation Index, 2009*.....32

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Colombia

Key indicators

Population (millions), 2008 ..... 44.5
GDP per capita (PPP $), 2008 8,229
Mobile phone subscriptions per 100 population, 2008 ..... 91.9
Internet users per 100 population, 2008 ..... 38.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 21.5
Utility patents per million population, 2008 ..... 0.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**60**
2008–2009 (134)	64
2007–2008 (127)	69
Global Competitiveness Index 2009–2010 (133)	69

Environment component 81

Market environment 90

1.01 Venture capital availability 76
1.02 Financial market sophistication 62
1.03 Availability of latest technologies 96
1.04 State of cluster development 51
1.05 Burden of government regulation 107
1.06 Extent and effect of taxation 120
1.07 Total tax rate, 2008* 124
1.08 Time required to start a business, 2009* 67
1.09 No. of procedures required to start a business, 2009* 83
1.10 Intensity of local competition 78
1.11 Freedom of the press 65

Political and regulatory environment 77

2.01 Effectiveness of law-making bodies 92
2.02 Laws relating to ICT 50
2.03 Judicial independence 76
2.04 Intellectual property protection 94
2.05 Efficiency of legal framework in settling disputes 85
2.06 Efficiency of legal framework in challenging regs 72
2.07 Property rights 83
2.08 No. of procedures to enforce a contract, 2009* 41
2.09 Time to enforce a contract, 2009* 125
2.10 Level of competition index, 2007* 1

Infrastructure environment 73

3.01 Number of telephone lines, 2008* 69
3.02 Secure Internet servers, 2008* 66
3.03 Electricity production, 2006* 89
3.04 Availability of scientists and engineers 89
3.05 Quality of scientific research institutions 87
3.06 Tertiary education enrollment, 2007* 68
3.07 Education expenditure, 2007* 43
3.08 Accessibility of digital content 74
3.09 Internet bandwidth, 2008* 50

Readiness component 49

Individual readiness 62

4.01 Quality of math and science education 86
4.02 Quality of the educational system 73
4.03 Buyer sophistication 70
4.04 Residential telephone connection charge, 2008* 43
4.05 Residential monthly telephone subscription, 2008* 20
4.06 Fixed broadband tariffs, 2008* 79
4.07 Mobile cellular tariffs, 2008* 60
4.08 Fixed telephone lines tariffs, 2008* 85

Business readiness 53

5.01 Extent of staff training 105
5.02 Local availability of research and training 59
5.03 Quality of management schools 61
5.04 Company spending on R&D 72
5.05 University-industry collaboration in R&D 36
5.06 Business telephone connection charge, 2007* 31
5.07 Business monthly telephone subscription, 2007* 21
5.08 Local supplier quality 48
5.09 Computer, comm., and other services imports, 2008* 63
5.10 Availability of new telephone lines 56

Government readiness 54

6.01 Government prioritization of ICT 67
6.02 Gov't procurement of advanced tech. products 44
6.03 Importance of ICT to gov't vision of the future 51

Usage component 52

Individual usage 63

7.01 Mobile telephone subscriptions, 2008* 68
7.02 Personal computers, 2008* 59
7.03 Broadband Internet subscribers, 2008* 65
7.04 Internet users, 2008* 49
7.05 Internet access in schools 81

Business usage 77

8.01 Prevalence of foreign technology licensing 85
8.02 Firm-level technology absorption 95
8.03 Capacity for innovation 62
8.04 Extent of business Internet use 53
8.05 Creative industries exports, 2006* 40
8.06 Utility patents, 2008* 70
8.07 High-tech exports, 2007* 74

Government usage 32

9.01 Government success in ICT promotion 75
9.02 Government Online Service Index, 2009* 9
9.03 ICT use and government efficiency 48
9.04 Presence of ICT in government agencies 55
9.05 E-Participation Index, 2009* 26

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Costa Rica

Key indicators

Networked Readiness Index

Environment component 71

Readiness component 32

Usage component 61

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Côte d'Ivoire

Key indicators

Population (millions), 2008 ..... 20.6
GDP per capita (PPP $), 2008 1,643
Mobile phone subscriptions per 100 population, 2008 ..... 50.7
Internet users per 100 population, 2008 ..... 3.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**104**
2008–2009 (134)	111
2007–2008 (127)	n/a

Global Competitiveness Index 2009–2010 (133) 116

Environment component 117

Market environment 113

1.01 Venture capital availability 133
1.02 Financial market sophistication 99
1.03 Availability of latest technologies 73
1.04 State of cluster development 93
1.05 Burden of government regulation 103
1.06 Extent and effect of taxation 94
1.07 Total tax rate, 2008* 79
1.08 Time required to start a business, 2009* 107
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 84
1.11 Freedom of the press 99

Political and regulatory environment 124

2.01 Effectiveness of law-making bodies 115
2.02 Laws relating to ICT 121
2.03 Judicial independence 131
2.04 Intellectual property protection 129
2.05 Efficiency of legal framework in settling disputes 115
2.06 Efficiency of legal framework in challenging regs 113
2.07 Property rights 113
2.08 No. of procedures to enforce a contract, 2009* 37
2.09 Time to enforce a contract, 2009* 105
2.10 Level of competition index, 2007* 82

Infrastructure environment 104

3.01 Number of telephone lines, 2008* 115
3.02 Secure Internet servers, 2008* 114
3.03 Electricity production, 2006* 112
3.04 Availability of scientists and engineers 27
3.05 Quality of scientific research institutions 92
3.06 Tertiary education enrollment, 2007* 108
3.07 Education expenditure, 2007* 49
3.08 Accessibility of digital content 112
3.09 Internet bandwidth, 2007* 104

Readiness component 95

Individual readiness 112

4.01 Quality of math and science education 66
4.02 Quality of the educational system 95
4.03 Buyer sophistication 129
4.04 Residential telephone connection charge, 2008* 16
4.05 Residential monthly telephone subscription, 2008* 108
4.06 Fixed broadband tariffs, 2008* 87
4.07 Mobile cellular tariffs, 2008* 78
4.08 Fixed telephone lines tariffs, 2008* 111

Business readiness 76

5.01 Extent of staff training 47
5.02 Local availability of research and training 70
5.03 Quality of management schools 71
5.04 Company spending on R&D 107
5.05 University-industry collaboration in R&D 126
5.06 Business telephone connection charge, 2008* 10
5.07 Business monthly telephone subscription, 2007* 87
5.08 Local supplier quality 69
5.09 Computer, comm., and other services imports, 2007* 66
5.10 Availability of new telephone lines 68

Government readiness 86

6.01 Government prioritization of ICT 66
6.02 Gov't procurement of advanced tech. products 88
6.03 Importance of ICT to gov't vision of the future 101

Usage component 101

Individual usage 114

7.01 Mobile telephone subscriptions, 2008* 101
7.02 Personal computers, 2005* 104
7.03 Broadband Internet subscribers, 2008* 111
7.04 Internet users, 2008* 118
7.05 Internet access in schools 115

Business usage 84

8.01 Prevalence of foreign technology licensing 82
8.02 Firm-level technology absorption 50
8.03 Capacity for innovation 124
8.04 Extent of business Internet use 100
8.05 Creative industries exports, 2006* 71
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 40

Government usage 94

9.01 Government success in ICT promotion 86
9.02 Government Online Service Index, 2009* 66
9.03 ICT use and government efficiency 113
9.04 Presence of ICT in government agencies 107
9.05 E-Participation Index, 2009* 64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Croatia

Key indicators

Population (millions), 2008 ..... 4.4
GDP per capita (PPP $), 2008 18,575
Mobile phone subscriptions per 100 population, 2008 ..... 133.0
Internet users per 100 population, 2008 ..... 50.6
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 154.9
Utility patents per million population, 2008 ..... 3.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**51**
2008–2009 (134)	49
2007–2008 (127)	49

Global Competitiveness Index 2009–2010 (133) 72

Environment component 56

Market environment 91

1.01 Venture capital availability 97
1.02 Financial market sophistication 73
1.03 Availability of latest technologies 61
1.04 State of cluster development 106
1.05 Burden of government regulation 120
1.06 Extent and effect of taxation 116
1.07 Total tax rate, 2008* 38
1.08 Time required to start a business, 2009* 71
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 93
1.11 Freedom of the press 97

Political and regulatory environment 67

2.01 Effectiveness of law-making bodies 63
2.02 Laws relating to ICT 54
2.03 Judicial independence 98
2.04 Intellectual property protection 68
2.05 Efficiency of legal framework in settling disputes 126
2.06 Efficiency of legal framework in challenging regs 118
2.07 Property rights 85
2.08 No. of procedures to enforce a contract, 2009* 69
2.09 Time to enforce a contract, 2009* 67
2.10 Level of competition index, 2007* 1

Infrastructure environment 42

3.01 Number of telephone lines, 2008* 25
3.02 Secure Internet servers, 2008* 37
3.03 Electricity production, 2006* 67
3.04 Availability of scientists and engineers 80
3.05 Quality of scientific research institutions 50
3.06 Tertiary education enrollment, 2007* 47
3.07 Education expenditure, 2007* 63
3.08 Accessibility of digital content 57
3.09 Internet bandwidth, 2008* 18

Readiness component 63

Individual readiness 75

4.01 Quality of math and science education 33
4.02 Quality of the educational system 75
4.03 Buyer sophistication 89
4.04 Residential telephone connection charge, 2008* 103
4.05 Residential monthly telephone subscription, 2008* 95
4.06 Fixed broadband tariffs, 2008* 20
4.07 Mobile cellular tariffs, 2008* 88
4.08 Fixed telephone lines tariffs, 2008* 83

Business readiness 56

5.01 Extent of staff training 107
5.02 Local availability of research and training 54
5.03 Quality of management schools 89
5.04 Company spending on R&D 49
5.05 University-industry collaboration in R&D 61
5.06 Business telephone connection charge, 2008* 84
5.07 Business monthly telephone subscription, 2008* 75
5.08 Local supplier quality 74
5.09 Computer, comm., and other services imports, 2008* 11
5.10 Availability of new telephone lines 46

Government readiness 80

6.01 Government prioritization of ICT 69
6.02 Gov't procurement of advanced tech. products 94
6.03 Importance of ICT to gov't vision of the future 80

Usage component 43

Individual usage 39

7.01 Mobile telephone subscriptions, 2008* 15
7.02 Personal computers, 2007* 31
7.03 Broadband Internet subscribers, 2008* 40
7.04 Internet users, 2008* 38
7.05 Internet access in schools 51

Business usage 63

8.01 Prevalence of foreign technology licensing 57
8.02 Firm-level technology absorption 102
8.03 Capacity for innovation 52
8.04 Extent of business Internet use 54
8.05 Creative industries exports, 2006* 45
8.06 Utility patents, 2008* 35
8.07 High-tech exports, 2007* 36

Government usage 53

9.01 Government success in ICT promotion 77
9.02 Government Online Service Index, 2009* 40
9.03 ICT use and government efficiency 95
9.04 Presence of ICT in government agencies 79
9.05 E-Participation Index, 2009* 25

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Cyprus

Key indicators

Population (millions), 2008 ..... 0.9
GDP per capita (PPP $), 2008 29,853
Mobile phone subscriptions per 100 population, 2008 ..... 117.9
Internet users per 100 population, 2008 ..... 38.8
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 16.0
Utility patents per million population, 2008 ..... 1.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**32**
2008–2009 (134)	33
2007–2008 (127)	41

Global Competitiveness Index 2009–2010 (133) 34

Environment component 25

Market environment 16

1.01 Venture capital availability 19
1.02 Financial market sophistication 34
1.03 Availability of latest technologies 31
1.04 State of cluster development 30
1.05 Burden of government regulation 16
1.06 Extent and effect of taxation 13
1.07 Total tax rate, 2008* 26
1.08 Time required to start a business, 2009* 26
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 16
1.11 Freedom of the press 28

Political and regulatory environment 28

2.01 Effectiveness of law-making bodies 19
2.02 Laws relating to ICT 37
2.03 Judicial independence 24
2.04 Intellectual property protection 29
2.05 Efficiency of legal framework in settling disputes 25
2.06 Efficiency of legal framework in challenging regs 25
2.07 Property rights 29
2.08 No. of procedures to enforce a contract, 2009* 107
2.09 Time to enforce a contract, 2009* 102
2.10 Level of competition index, 2007* 59

Infrastructure environment 30

3.01 Number of telephone lines, 2008* 21
3.02 Secure Internet servers, 2008* 20
3.03 Electricity production, 2006* 36
3.04 Availability of scientists and engineers 21
3.05 Quality of scientific research institutions 52
3.06 Tertiary education enrollment, 2007* 58
3.07 Education expenditure, 2007* 21
3.08 Accessibility of digital content 41
3.09 Internet bandwidth, 2007* 54

Readiness component 31

Individual readiness 17

4.01 Quality of math and science education 13
4.02 Quality of the educational system 9
4.03 Buyer sophistication 20
4.04 Residential telephone connection charge, 2007* 100
4.05 Residential monthly telephone subscription, 2007* 109
4.06 Fixed broadband tariffs, 2008* 24
4.07 Mobile cellular tariffs, 2008* 20
4.08 Fixed telephone lines tariffs, 2008* 53

Business readiness 40

5.01 Extent of staff training 43
5.02 Local availability of research and training 39
5.03 Quality of management schools 32
5.04 Company spending on R&D 38
5.05 University-industry collaboration in R&D 47
5.06 Business telephone connection charge, 2007* 78
5.07 Business monthly telephone subscription, 2007* 70
5.08 Local supplier quality 29
5.09 Computer, comm., and other services imports, 2008* 85
5.10 Availability of new telephone lines 29

Government readiness 31

6.01 Government prioritization of ICT 47
6.02 Gov't procurement of advanced tech. products 19
6.03 Importance of ICT to gov't vision of the future 35

Usage component 37

Individual usage 38

7.01 Mobile telephone subscriptions, 2008* 32
7.02 Personal computers, 2006* 27
7.03 Broadband Internet subscribers, 2008* 34
7.04 Internet users, 2008* 48
7.05 Internet access in schools 34

Business usage 43

8.01 Prevalence of foreign technology licensing 39
8.02 Firm-level technology absorption 39
8.03 Capacity for innovation 40
8.04 Extent of business Internet use 38
8.05 Creative industries exports, 2006* 88
8.06 Utility patents, 2008* 47
8.07 High-tech exports, 2007* 32

Government usage 37

9.01 Government success in ICT promotion 36
9.02 Government Online Service Index, 2009* 52
9.03 ICT use and government efficiency 35
9.04 Presence of ICT in government agencies 37
9.05 E-Participation Index, 2009* 23

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Czech Republic

Key indicators

Population (millions), 2008 ..... 10.4
GDP per capita (PPP $), 2008 25,118
Mobile phone subscriptions per 100 population, 2008 ..... 133.5
Internet users per 100 population, 2008 ..... 58.4
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 71.8
Utility patents per million population, 2008 ..... 4.7

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**36**
2008–2009 (134)	32
2007–2008 (127)	36

Global Competitiveness Index 2009–2010 (133)	31

Environment component 40

Market environment 44

1.01 Venture capital availability 55
1.02 Financial market sophistication 45
1.03 Availability of latest technologies 48
1.04 State of cluster development 34
1.05 Burden of government regulation 114
1.06 Extent and effect of taxation 45
1.07 Total tax rate, 2008* 87
1.08 Time required to start a business, 2009* 52
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 10
1.11 Freedom of the press 49

Political and regulatory environment 50

2.01 Effectiveness of law-making bodies 85
2.02 Laws relating to ICT 32
2.03 Judicial independence 61
2.04 Intellectual property protection 46
2.05 Efficiency of legal framework in settling disputes 80
2.06 Efficiency of legal framework in challenging regs 70
2.07 Property rights 55
2.08 No. of procedures to enforce a contract, 2009* 9
2.09 Time to enforce a contract, 2009* 84
2.10 Level of competition index, 2007* 59

Infrastructure environment 34

3.01 Number of telephone lines, 2008* 60
3.02 Secure Internet servers, 2008* 31
3.03 Electricity production, 2006* 22
3.04 Availability of scientists and engineers 24
3.05 Quality of scientific research institutions 19
3.06 Tertiary education enrollment, 2007* 36
3.07 Education expenditure, 2007* 68
3.08 Accessibility of digital content 20
3.09 Internet bandwidth, 2007* 30

Readiness component 38

Individual readiness 53

4.01 Quality of math and science education 10
4.02 Quality of the educational system 25
4.03 Buyer sophistication 31
4.04 Residential telephone connection charge, 2008* 27
4.05 Residential monthly telephone subscription, 2008* 126
4.06 Fixed broadband tariffs, 2008* 47
4.07 Mobile cellular tariffs, 2008* 70
4.08 Fixed telephone lines tariffs, 2008* 98

Business readiness 24

5.01 Extent of staff training 28
5.02 Local availability of research and training 16
5.03 Quality of management schools 36
5.04 Company spending on R&D 25
5.05 University-industry collaboration in R&D 26
5.06 Business telephone connection charge, 2008* 19
5.07 Business monthly telephone subscription, 2008* 115
5.08 Local supplier quality 15
5.09 Computer, comm., and other services imports, 2008* 24
5.10 Availability of new telephone lines 34

Government readiness 48

6.01 Government prioritization of ICT 56
6.02 Gov't procurement of advanced tech. products 23
6.03 Importance of ICT to gov't vision of the future 58

Usage component 33

Individual usage 31

7.01 Mobile telephone subscriptions, 2008* 14
7.02 Personal computers, 2005* 34
7.03 Broadband Internet subscribers, 2008* 33
7.04 Internet users, 2008* 30
7.05 Internet access in schools 19

Business usage 29

8.01 Prevalence of foreign technology licensing 32
8.02 Firm-level technology absorption 35
8.03 Capacity for innovation 21
8.04 Extent of business Internet use 19
8.05 Creative industries exports, 2005* 24
8.06 Utility patents, 2008* 32
8.07 High-tech exports, 2007* 22

Government usage 58

9.01 Government success in ICT promotion 90
9.02 Government Online Service Index, 2009* 36
9.03 ICT use and government efficiency 61
9.04 Presence of ICT in government agencies 44
9.05 E-Participation Index, 2009* 77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Denmark

Key indicators

Population (millions), 2008.....5.5
GDP per capita (PPP $), 2008.....37,304
Mobile phone subscriptions per 100 population, 2008.....125.7
Internet users per 100 population, 2008.....83.9
Internet bandwidth (Mb/s) per 10,000 population, 2007.....346.3
Utility patents per million population, 2008.....71.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**3**
2008–2009 (134)	1
2007–2008 (127)	1

Global Competitiveness Index 2009–2010 (133) 5

Environment component 2

Market environment 10

1.01 Venture capital availability.....17
1.02 Financial market sophistication.....15
1.03 Availability of latest technologies.....7
1.04 State of cluster development.....14
1.05 Burden of government regulation.....27
1.06 Extent and effect of taxation.....129
1.07 Total tax rate, 2008*.....28
1.08 Time required to start a business, 2009*.....12
1.09 No. of procedures required to start a business, 2009*.....13
1.10 Intensity of local competition.....11
1.11 Freedom of the press.....1

Political and regulatory environment 5

2.01 Effectiveness of law-making bodies.....2
2.02 Laws relating to ICT.....2
2.03 Judicial independence.....3
2.04 Intellectual property protection.....6
2.05 Efficiency of legal framework in settling disputes.....6
2.06 Efficiency of legal framework in challenging regs.....6
2.07 Property rights.....2
2.08 No. of procedures to enforce a contract, 2009*.....41
2.09 Time to enforce a contract, 2009*.....24
2.10 Level of competition index, 2007*.....59

Infrastructure environment 3

3.01 Number of telephone lines, 2008*.....19
3.02 Secure Internet servers, 2008*.....4
3.03 Electricity production, 2006*.....20
3.04 Availability of scientists and engineers.....18
3.05 Quality of scientific research institutions.....9
3.06 Tertiary education enrollment, 2007*.....7
3.07 Education expenditure, 2007*.....4
3.08 Accessibility of digital content.....9
3.09 Internet bandwidth, 2007*.....7

Readiness component 2

Individual readiness 4

4.01 Quality of math and science education.....15
4.02 Quality of the educational system.....6
4.03 Buyer sophistication.....8
4.04 Residential telephone connection charge, 2008*.....86
4.05 Residential monthly telephone subscription, 2008*.....76
4.06 Fixed broadband tariffs, 2008*.....5
4.07 Mobile cellular tariffs, 2008*.....4
4.08 Fixed telephone lines tariffs, 2008*.....42

Business readiness 2

5.01 Extent of staff training.....4
5.02 Local availability of research and training.....6
5.03 Quality of management schools.....9
5.04 Company spending on R&D.....6
5.05 University-industry collaboration in R&D.....6
5.06 Business telephone connection charge*.....n/a
5.07 Business monthly telephone subscription*.....n/a
5.08 Local supplier quality.....10
5.09 Computer, comm., and other services imports*.....n/a
5.10 Availability of new telephone lines.....10

Government readiness 5

6.01 Government prioritization of ICT.....6
6.02 Gov't procurement of advanced tech. products.....8
6.03 Importance of ICT to gov't vision of the future.....6

Usage component 11

Individual usage 4

7.01 Mobile telephone subscriptions, 2008*.....22
7.02 Personal computers, 2007*.....21
7.03 Broadband Internet subscribers, 2008*.....3
7.04 Internet users, 2008*.....4
7.05 Internet access in schools.....6

Business usage 17

8.01 Prevalence of foreign technology licensing.....8
8.02 Firm-level technology absorption.....7
8.03 Capacity for innovation.....7
8.04 Extent of business Internet use.....7
8.05 Creative industries exports, 2006*.....26
8.06 Utility patents, 2008*.....14
8.07 High-tech exports, 2007*.....26

Government usage 8

9.01 Government success in ICT promotion.....9
9.02 Government Online Service Index, 2009*.....13
9.03 ICT use and government efficiency.....8
9.04 Presence of ICT in government agencies.....4
9.05 E-Participation Index, 2009*.....13

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Dominican Republic

Key indicators

Population (millions), 2008 ..... 9.8
GDP per capita (PPP $), 2008 8,619
Mobile phone subscriptions per 100 population, 2008 ..... 72.4
Internet users per 100 population, 2008 ..... 21.6
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 14.1
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**74**
2008–2009 (134)	75
2007–2008 (127)	75

Global Competitiveness Index 2009–2010 (133)	95

Environment component 78

Market environment 77

1.01 Venture capital availability 102
1.02 Financial market sophistication 84
1.03 Availability of latest technologies 68
1.04 State of cluster development 63
1.05 Burden of government regulation 78
1.06 Extent and effect of taxation 115
1.07 Total tax rate, 2008* 60
1.08 Time required to start a business, 2009* 64
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 82
1.11 Freedom of the press 66

Political and regulatory environment 68

2.01 Effectiveness of law-making bodies 106
2.02 Laws relating to ICT 62
2.03 Judicial independence 88
2.04 Intellectual property protection 79
2.05 Efficiency of legal framework in settling disputes 71
2.06 Efficiency of legal framework in challenging regs 114
2.07 Property rights 88
2.08 No. of procedures to enforce a contract, 2009* 41
2.09 Time to enforce a contract, 2009* 46
2.10 Level of competition index, 2007* 1

Infrastructure environment 87

3.01 Number of telephone lines, 2008* 91
3.02 Secure Internet servers, 2008* 62
3.03 Electricity production, 2006* 84
3.04 Availability of scientists and engineers 93
3.05 Quality of scientific research institutions 121
3.06 Tertiary education enrollment, 2004* 64
3.07 Education expenditure, 2007* 87
3.08 Accessibility of digital content 42
3.09 Internet bandwidth, 2008* 56

Readiness component 71

Individual readiness 89

4.01 Quality of math and science education 131
4.02 Quality of the educational system 129
4.03 Buyer sophistication 86
4.04 Residential telephone connection charge, 2008* 34
4.05 Residential monthly telephone subscription, 2008* 100
4.06 Fixed broadband tariffs, 2008* 67
4.07 Mobile cellular tariffs, 2008* 71
4.08 Fixed telephone lines tariffs, 2008* 71

Business readiness 84

5.01 Extent of staff training 76
5.02 Local availability of research and training 63
5.03 Quality of management schools 96
5.04 Company spending on R&D 105
5.05 University-industry collaboration in R&D 82
5.06 Business telephone connection charge, 2007* 55
5.07 Business monthly telephone subscription, 2007* 78
5.08 Local supplier quality 70
5.09 Computer, comm., and other services imports, 2007* 113
5.10 Availability of new telephone lines 35

Government readiness 43

6.01 Government prioritization of ICT 32
6.02 Gov't procurement of advanced tech. products 63
6.03 Importance of ICT to gov't vision of the future 37

Usage component 69

Individual usage 78

7.01 Mobile telephone subscriptions, 2008* 88
7.02 Personal computers* ..... n/a
7.03 Broadband Internet subscribers, 2008* 73
7.04 Internet users, 2008* 80
7.05 Internet access in schools 86

Business usage 82

8.01 Prevalence of foreign technology licensing 51
8.02 Firm-level technology absorption 68
8.03 Capacity for innovation 90
8.04 Extent of business Internet use 69
8.05 Creative industries exports, 2006* 117
8.06 Utility patents, 2008* 75
8.07 High-tech exports, 2007* 111

Government usage 46

9.01 Government success in ICT promotion 35
9.02 Government Online Service Index, 2009* 57
9.03 ICT use and government efficiency 25
9.04 Presence of ICT in government agencies 42
9.05 E-Participation Index, 2009* 60

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Ecuador

Key indicators

Population (millions), 2008 ..... 13.5
GDP per capita (PPP $), 2008 7,786
Mobile phone subscriptions per 100 population, 2008 ..... 85.6
Internet users per 100 population, 2008 ..... 28.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 4.4
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**114**
2008–2009 (134)	116
2007–2008 (127)	107
Global Competitiveness Index 2009–2010 (133)	105

Environment component 124

Market environment 122

1.01 Venture capital availability 114
1.02 Financial market sophistication 86
1.03 Availability of latest technologies 123
1.04 State of cluster development 114
1.05 Burden of government regulation 100
1.06 Extent and effect of taxation 107
1.07 Total tax rate, 2008* 47
1.08 Time required to start a business, 2009* 120
1.09 No. of procedures required to start a business, 2009* 115
1.10 Intensity of local competition 124
1.11 Freedom of the press 109

Political and regulatory environment 112

2.01 Effectiveness of law-making bodies 132
2.02 Laws relating to ICT 107
2.03 Judicial independence 130
2.04 Intellectual property protection 126
2.05 Efficiency of legal framework in settling disputes 119
2.06 Efficiency of legal framework in challenging regs 122
2.07 Property rights 116
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 77
2.10 Level of competition index, 2007* 1

Infrastructure environment 117

3.01 Number of telephone lines, 2008* 82
3.02 Secure Internet servers, 2008* 68
3.03 Electricity production, 2006* 90
3.04 Availability of scientists and engineers 129
3.05 Quality of scientific research institutions 129
3.06 Tertiary education enrollment, 2007* 61
3.07 Education expenditure, 2007* 125
3.08 Accessibility of digital content 109
3.09 Internet bandwidth, 2008* 79

Readiness component 121

Individual readiness 80

4.01 Quality of math and science education 117
4.02 Quality of the educational system 122
4.03 Buyer sophistication 98
4.04 Residential telephone connection charge, 2008* 96
4.05 Residential monthly telephone subscription, 2007* 71
4.06 Fixed broadband tariffs, 2008* 94
4.07 Mobile cellular tariffs, 2008* 73
4.08 Fixed telephone lines tariffs, 2008* 9

Business readiness 118

5.01 Extent of staff training 113
5.02 Local availability of research and training 105
5.03 Quality of management schools 109
5.04 Company spending on R&D 120
5.05 University-industry collaboration in R&D 124
5.06 Business telephone connection charge, 2007* 80
5.07 Business monthly telephone subscription, 2007* 96
5.08 Local supplier quality 111
5.09 Computer, comm., and other services imports, 2007* 79
5.10 Availability of new telephone lines 122

Government readiness 125

6.01 Government prioritization of ICT 124
6.02 Gov't procurement of advanced tech. products 125
6.03 Importance of ICT to gov't vision of the future 125

Usage component 100

Individual usage 82

7.01 Mobile telephone subscriptions, 2008* 75
7.02 Personal computers, 2006* 58
7.03 Broadband Internet subscribers, 2008* 99
7.04 Internet users, 2008* 63
7.05 Internet access in schools 97

Business usage 124

8.01 Prevalence of foreign technology licensing 109
8.02 Firm-level technology absorption 116
8.03 Capacity for innovation 114
8.04 Extent of business Internet use 116
8.05 Creative industries exports, 2006* 78
8.06 Utility patents, 2008* 79
8.07 High-tech exports, 2007* 85

Government usage 120

9.01 Government success in ICT promotion 124
9.02 Government Online Service Index, 2009* 69
9.03 ICT use and government efficiency 126
9.04 Presence of ICT in government agencies 125
9.05 E-Participation Index, 2009* 71

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Egypt

Key indicators

Population (millions), 2008 ..... 81.5
GDP per capita (PPP $), 2008 5,897
Mobile phone subscriptions per 100 population, 2008 ..... 50.6
Internet users per 100 population, 2008 ..... 16.6
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 3.5
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**70**
2008–2009 (134)	76
2007–2008 (127)	63

Global Competitiveness Index 2009–2010 (133)	70

Environment component 70

Market environment 54

1.01 Venture capital availability 34
1.02 Financial market sophistication 85
1.03 Availability of latest technologies 66
1.04 State of cluster development 41
1.05 Burden of government regulation 70
1.06 Extent and effect of taxation 52
1.07 Total tax rate, 2008* 75
1.08 Time required to start a business, 2009* 20
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 83
1.11 Freedom of the press 68

Political and regulatory environment 71

2.01 Effectiveness of law-making bodies 66
2.02 Laws relating to ICT 51
2.03 Judicial independence 64
2.04 Intellectual property protection 58
2.05 Efficiency of legal framework in settling disputes 39
2.06 Efficiency of legal framework in challenging regs 63
2.07 Property rights 67
2.08 No. of procedures to enforce a contract, 2009* 99
2.09 Time to enforce a contract, 2009* 120
2.10 Level of competition index, 2007* 82

Infrastructure environment 75

3.01 Number of telephone lines, 2008* 80
3.02 Secure Internet servers, 2008* 101
3.03 Electricity production, 2006* 85
3.04 Availability of scientists and engineers 53
3.05 Quality of scientific research institutions 101
3.06 Tertiary education enrollment, 2005* 63
3.07 Education expenditure, 2007* 59
3.08 Accessibility of digital content 85
3.09 Internet bandwidth, 2008* 82

Readiness component 65

Individual readiness 71

4.01 Quality of math and science education 124
4.02 Quality of the educational system 123
4.03 Buyer sophistication 106
4.04 Residential telephone connection charge, 2007* 115
4.05 Residential monthly telephone subscription, 2007* 21
4.06 Fixed broadband tariffs, 2008* 18
4.07 Mobile cellular tariffs, 2008* 28
4.08 Fixed telephone lines tariffs, 2008* 27

Business readiness 95

5.01 Extent of staff training 106
5.02 Local availability of research and training 78
5.03 Quality of management schools 114
5.04 Company spending on R&D 54
5.05 University-industry collaboration in R&D 96
5.06 Business telephone connection charge, 2007* 117
5.07 Business monthly telephone subscription, 2007* 22
5.08 Local supplier quality 104
5.09 Computer, comm., and other services imports, 2007* 65
5.10 Availability of new telephone lines 21

Government readiness 53

6.01 Government prioritization of ICT 41
6.02 Gov't procurement of advanced tech. products 72
6.03 Importance of ICT to gov't vision of the future 57

Usage component 70

Individual usage 100

7.01 Mobile telephone subscriptions, 2008* 102
7.02 Personal computers, 2008* 89
7.03 Broadband Internet subscribers, 2008* 88
7.04 Internet users, 2008* 84
7.05 Internet access in schools 95

Business usage 52

8.01 Prevalence of foreign technology licensing 69
8.02 Firm-level technology absorption 48
8.03 Capacity for innovation 96
8.04 Extent of business Internet use 45
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 86
8.07 High-tech exports, 2007* 121

Government usage 42

9.01 Government success in ICT promotion 27
9.02 Government Online Service Index, 2009* 23
9.03 ICT use and government efficiency 53
9.04 Presence of ICT in government agencies 71
9.05 E-Participation Index, 2009* 41

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

El Salvador

Key indicators

Population (millions), 2008.....6.1
GDP per capita (PPP $), 2008.....7,564
Mobile phone subscriptions per 100 population, 2008.....113.3
Internet users per 100 population, 2008.....10.6
Internet bandwidth (Mb/s) per 10,000 population, 2008.....0.3
Utility patents per million population, 2008.....0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**81**
2008–2009 (134)	78
2007–2008 (127)	66

Global Competitiveness Index 2009–2010 (133)	77

Environment component 76

Market environment 48

1.01 Venture capital availability.....85
1.02 Financial market sophistication.....38
1.03 Availability of latest technologies.....78
1.04 State of cluster development.....81
1.05 Burden of government regulation.....48
1.06 Extent and effect of taxation.....25
1.07 Total tax rate, 2008*.....48
1.08 Time required to start a business, 2009*.....59
1.09 No. of procedures required to start a business, 2009*.....70
1.10 Intensity of local competition.....43
1.11 Freedom of the press.....32

Political and regulatory environment 76

2.01 Effectiveness of law-making bodies.....117
2.02 Laws relating to ICT.....83
2.03 Judicial independence.....99
2.04 Intellectual property protection.....96
2.05 Efficiency of legal framework in settling disputes.....81
2.06 Efficiency of legal framework in challenging regs.....77
2.07 Property rights.....78
2.08 No. of procedures to enforce a contract, 2009*.....15
2.09 Time to enforce a contract, 2009*.....107
2.10 Level of competition index, 2007*.....1

Infrastructure environment 103

3.01 Number of telephone lines, 2008*.....70
3.02 Secure Internet servers, 2008*.....69
3.03 Electricity production, 2006*.....93
3.04 Availability of scientists and engineers.....118
3.05 Quality of scientific research institutions.....125
3.06 Tertiary education enrollment, 2007*.....82
3.07 Education expenditure, 2007*.....106
3.08 Accessibility of digital content.....52
3.09 Internet bandwidth, 2008*.....108

Readiness component 77

Individual readiness 77

4.01 Quality of math and science education.....111
4.02 Quality of the educational system.....102
4.03 Buyer sophistication.....77
4.04 Residential telephone connection charge, 2008*.....63
4.05 Residential monthly telephone subscription, 2008*.....92
4.06 Fixed broadband tariffs, 2008*.....51
4.07 Mobile cellular tariffs, 2008*.....83
4.08 Fixed telephone lines tariffs, 2008*.....60

Business readiness 75

5.01 Extent of staff training.....56
5.02 Local availability of research and training.....71
5.03 Quality of management schools.....70
5.04 Company spending on R&D.....116
5.05 University-industry collaboration in R&D.....94
5.06 Business telephone connection charge, 2008*.....64
5.07 Business monthly telephone subscription, 2008*.....98
5.08 Local supplier quality.....56
5.09 Computer, comm., and other services imports, 2007*.....99
5.10 Availability of new telephone lines.....18

Government readiness 77

6.01 Government prioritization of ICT.....94
6.02 Gov't procurement of advanced tech. products.....81
6.03 Importance of ICT to gov't vision of the future.....63

Usage component 81

Individual usage 84

7.01 Mobile telephone subscriptions, 2008*.....38
7.02 Personal computers, 2005*.....81
7.03 Broadband Internet subscribers, 2008*.....78
7.04 Internet users, 2008*.....96
7.05 Internet access in schools.....98

Business usage 90

8.01 Prevalence of foreign technology licensing.....65
8.02 Firm-level technology absorption.....79
8.03 Capacity for innovation.....110
8.04 Extent of business Internet use.....73
8.05 Creative industries exports, 2004*.....80
8.06 Utility patents, 2008*.....90
8.07 High-tech exports, 2007*.....76

Government usage 65

9.01 Government success in ICT promotion.....97
9.02 Government Online Service Index, 2009*.....39
9.03 ICT use and government efficiency.....42
9.04 Presence of ICT in government agencies.....59
9.05 E-Participation Index, 2009*.....100

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Estonia

Key indicators

Population (millions), 2008 ..... 1.3
GDP per capita (PPP $), 2008 20,561
Mobile phone subscriptions per 100 population, 2008 ..... 188.2
Internet users per 100 population, 2008 ..... 66.2
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 120.3
Utility patents per million population, 2008 ..... 1.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**25**
2008–2009 (134)	18
2007–2008 (127)	20

Global Competitiveness Index 2009–2010 (133) 35

Environment component 23

Market environment 20

1.01 Venture capital availability 21
1.02 Financial market sophistication 27
1.03 Availability of latest technologies 26
1.04 State of cluster development 77
1.05 Burden of government regulation 8
1.06 Extent and effect of taxation 15
1.07 Total tax rate, 2008* 94
1.08 Time required to start a business, 2009* 20
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 26
1.11 Freedom of the press 26

Political and regulatory environment 23

2.01 Effectiveness of law-making bodies 40
2.02 Laws relating to ICT 3
2.03 Judicial independence 22
2.04 Intellectual property protection 34
2.05 Efficiency of legal framework in settling disputes 40
2.06 Efficiency of legal framework in challenging regs 47
2.07 Property rights 27
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 39
2.10 Level of competition index, 2007* 59

Infrastructure environment 26

3.01 Number of telephone lines, 2008* 33
3.02 Secure Internet servers, 2008* 24
3.03 Electricity production, 2006* 30
3.04 Availability of scientists and engineers 67
3.05 Quality of scientific research institutions 27
3.06 Tertiary education enrollment, 2007* 22
3.07 Education expenditure, 2007* 51
3.08 Accessibility of digital content 1
3.09 Internet bandwidth, 2008* 21

Readiness component 24

Individual readiness 32

4.01 Quality of math and science education 17
4.02 Quality of the educational system 36
4.03 Buyer sophistication 63
4.04 Residential telephone connection charge, 2008* 1
4.05 Residential monthly telephone subscription, 2008* 56
4.06 Fixed broadband tariffs, 2008* 64
4.07 Mobile cellular tariffs, 2008* 59
4.08 Fixed telephone lines tariffs, 2008* 70

Business readiness 33

5.01 Extent of staff training 40
5.02 Local availability of research and training 24
5.03 Quality of management schools 35
5.04 Company spending on R&D 44
5.05 University-industry collaboration in R&D 32
5.06 Business telephone connection charge, 2007* 61
5.07 Business monthly telephone subscription, 2007* 42
5.08 Local supplier quality 25
5.09 Computer, comm., and other services imports, 2008* 45
5.10 Availability of new telephone lines 26

Government readiness 16

6.01 Government prioritization of ICT 9
6.02 Gov't procurement of advanced tech. products 36
6.03 Importance of ICT to gov't vision of the future 12

Usage component 21

Individual usage 19

7.01 Mobile telephone subscriptions, 2008* 2
7.02 Personal computers, 2008* 37
7.03 Broadband Internet subscribers, 2008* 20
7.04 Internet users, 2008* 23
7.05 Internet access in schools 2

Business usage 40

8.01 Prevalence of foreign technology licensing 53
8.02 Firm-level technology absorption 29
8.03 Capacity for innovation 37
8.04 Extent of business Internet use 4
8.05 Creative industries exports, 2006* 56
8.06 Utility patents, 2008* 41
8.07 High-tech exports, 2007* 29

Government usage 9

9.01 Government success in ICT promotion 11
9.02 Government Online Service Index, 2009* 27
9.03 ICT use and government efficiency 4
9.04 Presence of ICT in government agencies 3
9.05 E-Participation Index, 2009* 9

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Ethiopia

Key indicators

Population (millions), 2008 ..... 80.7
GDP per capita (PPP $), 2008 898
Mobile phone subscriptions per 100 population, 2008 ..... 2.4
Internet users per 100 population, 2008 ..... 0.4
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**122**
2008–2009 (134)	129
2007–2008 (127)	123
Global Competitiveness Index 2009–2010 (133)	118

Environment component 127

Market environment 117

1.01 Venture capital availability 112
1.02 Financial market sophistication 130
1.03 Availability of latest technologies 124
1.04 State of cluster development 91
1.05 Burden of government regulation 28
1.06 Extent and effect of taxation 77
1.07 Total tax rate, 2008* 32
1.08 Time required to start a business, 2009* 29
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 123
1.11 Freedom of the press 132

Political and regulatory environment 120

2.01 Effectiveness of law-making bodies 83
2.02 Laws relating to ICT 104
2.03 Judicial independence 101
2.04 Intellectual property protection 74
2.05 Efficiency of legal framework in settling disputes 78
2.06 Efficiency of legal framework in challenging regs 87
2.07 Property rights 74
2.08 No. of procedures to enforce a contract, 2009* 64
2.09 Time to enforce a contract, 2009* 87
2.10 Level of competition index, 2007* 126

Infrastructure environment 129

3.01 Number of telephone lines, 2008* 117
3.02 Secure Internet servers, 2008* 129
3.03 Electricity production, 2006* 127
3.04 Availability of scientists and engineers 124
3.05 Quality of scientific research institutions 114
3.06 Tertiary education enrollment, 2007* 126
3.07 Education expenditure, 2007* 80
3.08 Accessibility of digital content 131
3.09 Internet bandwidth, 2007* 127

Readiness component 96

Individual readiness 90

4.01 Quality of math and science education 106
4.02 Quality of the educational system 70
4.03 Buyer sophistication 110
4.04 Residential telephone connection charge, 2008* 73
4.05 Residential monthly telephone subscription, 2008* 5
4.06 Fixed broadband tariffs, 2008* 116
4.07 Mobile cellular tariffs, 2008* 45
4.08 Fixed telephone lines tariffs, 2008* 33

Business readiness 108

5.01 Extent of staff training 119
5.02 Local availability of research and training 109
5.03 Quality of management schools 119
5.04 Company spending on R&D 118
5.05 University-industry collaboration in R&D 110
5.06 Business telephone connection charge, 2006* 75
5.07 Business monthly telephone subscription, 2006* 12
5.08 Local supplier quality 121
5.09 Computer, comm., and other services imports, 2007* 64
5.10 Availability of new telephone lines 111

Government readiness 73

6.01 Government prioritization of ICT 98
6.02 Gov't procurement of advanced tech. products 65
6.03 Importance of ICT to gov't vision of the future 65

Usage component 128

Individual usage 132

7.01 Mobile telephone subscriptions, 2008* 132
7.02 Personal computers, 2007* 118
7.03 Broadband Internet subscribers, 2008* 131
7.04 Internet users, 2008* 131
7.05 Internet access in schools 122

Business usage 127

8.01 Prevalence of foreign technology licensing 108
8.02 Firm-level technology absorption 121
8.03 Capacity for innovation 106
8.04 Extent of business Internet use 130
8.05 Creative industries exports, 2003* 102
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 89

Government usage 108

9.01 Government success in ICT promotion 88
9.02 Government Online Service Index, 2009* 99
9.03 ICT use and government efficiency 92
9.04 Presence of ICT in government agencies 94
9.05 E-Participation Index, 2009* 110

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Finland

Key indicators

Population (millions), 2008 ..... 5.3
GDP per capita (PPP $), 2008 36,320
Mobile phone subscriptions per 100 population, 2008 ..... 128.8
Internet users per 100 population, 2008 ..... 82.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 172.6
Utility patents per million population, 2008 ..... 155.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**6**
2008–2009 (134)	6
2007–2008 (127)	6

Global Competitiveness Index 2009–2010 (133) 6

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

France

Key indicators

Population (millions), 2008 ..... 62.0
GDP per capita (PPP $), 2008 34,205
Mobile phone subscriptions per 100 population, 2008 ..... 93.4
Internet users per 100 population, 2008 ..... 68.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 294.9
Utility patents per million population, 2008 ..... 51.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**18**
2008–2009 (134)	19
2007–2008 (127)	21
Global Competitiveness Index 2009–2010 (133)	16

Environment component 19

Market environment 30

1.01 Venture capital availability 31
1.02 Financial market sophistication 10
1.03 Availability of latest technologies 17
1.04 State of cluster development 26
1.05 Burden of government regulation 127
1.06 Extent and effect of taxation 92
1.07 Total tax rate, 2008* 118
1.08 Time required to start a business, 2009* 20
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 15
1.11 Freedom of the press 39

Political and regulatory environment 18

2.01 Effectiveness of law-making bodies 20
2.02 Laws relating to ICT 19
2.03 Judicial independence 42
2.04 Intellectual property protection 10
2.05 Efficiency of legal framework in settling disputes 27
2.06 Efficiency of legal framework in challenging regs 17
2.07 Property rights 22
2.08 No. of procedures to enforce a contract, 2009* 12
2.09 Time to enforce a contract, 2009* 18
2.10 Level of competition index, 2007* 1

Infrastructure environment 15

3.01 Number of telephone lines, 2008* 10
3.02 Secure Internet servers, 2008* 28
3.03 Electricity production, 2006* 14
3.04 Availability of scientists and engineers 11
3.05 Quality of scientific research institutions 17
3.06 Tertiary education enrollment, 2007* 35
3.07 Education expenditure, 2007* 36
3.08 Accessibility of digital content 27
3.09 Internet bandwidth, 2007* 9

Readiness component 26

Individual readiness 45

4.01 Quality of math and science education 8
4.02 Quality of the educational system 24
4.03 Buyer sophistication 21
4.04 Residential telephone connection charge, 2008* 42
4.05 Residential monthly telephone subscription, 2008* 89
4.06 Fixed broadband tariffs, 2008* 28
4.07 Mobile cellular tariffs, 2008* 97
4.08 Fixed telephone lines tariffs, 2008* 72

Business readiness 12

5.01 Extent of staff training 17
5.02 Local availability of research and training 8
5.03 Quality of management schools 3
5.04 Company spending on R&D 13
5.05 University-industry collaboration in R&D 42
5.06 Business telephone connection charge, 2007* 29
5.07 Business monthly telephone subscription, 2007* 71
5.08 Local supplier quality 11
5.09 Computer, comm., and other services imports, 2008* 42
5.10 Availability of new telephone lines 13

Government readiness 37

6.01 Government prioritization of ICT 49
6.02 Gov't procurement of advanced tech. products 37
6.03 Importance of ICT to gov't vision of the future 32

Usage component 15

Individual usage 22

7.01 Mobile telephone subscriptions, 2008* 65
7.02 Personal computers, 2006* 14
7.03 Broadband Internet subscribers, 2008* 12
7.04 Internet users, 2008* 21
7.05 Internet access in schools 35

Business usage 12

8.01 Prevalence of foreign technology licensing 24
8.02 Firm-level technology absorption 26
8.03 Capacity for innovation 9
8.04 Extent of business Internet use 20
8.05 Creative industries exports, 2006* 7
8.06 Utility patents, 2008* 18
8.07 High-tech exports, 2007* 20

Government usage 16

9.01 Government success in ICT promotion 38
9.02 Government Online Service Index, 2009* 11
9.03 ICT use and government efficiency 24
9.04 Presence of ICT in government agencies 32
9.05 E-Participation Index, 2009* 15

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Gambia, The

Key indicators

Population (millions), 2008 ..... 1.7
GDP per capita (PPP $), 2008 1,395
Mobile phone subscriptions per 100 population, 2008 ..... 70.2
Internet users per 100 population, 2008 ..... 6.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**77**
2008–2009 (134)	91
2007–2008 (127)	101

Global Competitiveness Index 2009–2010 (133)	81

Environment component 72

Market environment 82

1.01 Venture capital availability 77
1.02 Financial market sophistication 81
1.03 Availability of latest technologies 76
1.04 State of cluster development 58
1.05 Burden of government regulation 4
1.06 Extent and effect of taxation 36
1.07 Total tax rate, 2008* 130
1.08 Time required to start a business, 2009* 81
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 76
1.11 Freedom of the press 102

Political and regulatory environment 30

2.01 Effectiveness of law-making bodies 21
2.02 Laws relating to ICT 60
2.03 Judicial independence 41
2.04 Intellectual property protection 35
2.05 Efficiency of legal framework in settling disputes 20
2.06 Efficiency of legal framework in challenging regs 37
2.07 Property rights 44
2.08 No. of procedures to enforce a contract, 2009* 32
2.09 Time to enforce a contract, 2009* 43
2.10 Level of competition index, 2007* 59

Infrastructure environment 120

3.01 Number of telephone lines, 2008* 108
3.02 Secure Internet servers, 2008* 93
3.03 Electricity production, 2007* 119
3.04 Availability of scientists and engineers 120
3.05 Quality of scientific research institutions 78
3.06 Tertiary education enrollment, 2004* 132
3.07 Education expenditure, 2007* 121
3.08 Accessibility of digital content 59
3.09 Internet bandwidth, 2007* 106

Readiness component 52

Individual readiness 101

4.01 Quality of math and science education 91
4.02 Quality of the educational system 29
4.03 Buyer sophistication 107
4.04 Residential telephone connection charge, 2007* 77
4.05 Residential monthly telephone subscription, 2007* 10
4.06 Fixed broadband tariffs, 2008* 114
4.07 Mobile cellular tariffs, 2008* 72
4.08 Fixed telephone lines tariffs, 2008* 88

Business readiness 57

5.01 Extent of staff training 41
5.02 Local availability of research and training 81
5.03 Quality of management schools 58
5.04 Company spending on R&D 106
5.05 University-industry collaboration in R&D 71
5.06 Business telephone connection charge, 2007* 60
5.07 Business monthly telephone subscription, 2007* 7
5.08 Local supplier quality 65
5.09 Computer, comm., and other services imports, 2007* 47
5.10 Availability of new telephone lines 78

Government readiness 20

6.01 Government prioritization of ICT 18
6.02 Gov't procurement of advanced tech. products 27
6.03 Importance of ICT to gov't vision of the future 16

Usage component 91

Individual usage 97

7.01 Mobile telephone subscriptions, 2008* 90
7.02 Personal computers, 2007* 92
7.03 Broadband Internet subscribers, 2008* 122
7.04 Internet users, 2008* 105
7.05 Internet access in schools 84

Business usage 89

8.01 Prevalence of foreign technology licensing 76
8.02 Firm-level technology absorption 70
8.03 Capacity for innovation 76
8.04 Extent of business Internet use 80
8.05 Creative industries exports, 2005* 115
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 119

Government usage 72

9.01 Government success in ICT promotion 13
9.02 Government Online Service Index, 2009* 124
9.03 ICT use and government efficiency 30
9.04 Presence of ICT in government agencies 43
9.05 E-Participation Index, 2009* 118

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Georgia

Key indicators

Population (millions), 2008 ..... 4.4
GDP per capita (PPP $), 2008 4,869
Mobile phone subscriptions per 100 population, 2008 ..... 64.0
Internet users per 100 population, 2008 ..... 23.8
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 7.5
Utility patents per million population, 2008 ..... 0.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**93**
2008–2009 (134)	88
2007–2008 (127)	91
Global Competitiveness Index 2009–2010 (133)	90

Environment component 83

Market environment 57

1.01 Venture capital availability 109
1.02 Financial market sophistication 96
1.03 Availability of latest technologies 93
1.04 State of cluster development 85
1.05 Burden of government regulation 3
1.06 Extent and effect of taxation 19
1.07 Total tax rate, 2008* 7
1.08 Time required to start a business, 2009* 3
1.09 No. of procedures required to start a business, 2009* 5
1.10 Intensity of local competition 115
1.11 Freedom of the press 108

Political and regulatory environment 83

2.01 Effectiveness of law-making bodies 84
2.02 Laws relating to ICT 97
2.03 Judicial independence 117
2.04 Intellectual property protection 100
2.05 Efficiency of legal framework in settling disputes 91
2.06 Efficiency of legal framework in challenging regs 102
2.07 Property rights 109
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 11
2.10 Level of competition index, 2007* 1

Infrastructure environment 97

3.01 Number of telephone lines, 2008* 81
3.02 Secure Internet servers, 2008* 82
3.03 Electricity production, 2006* 83
3.04 Availability of scientists and engineers 96
3.05 Quality of scientific research institutions 123
3.06 Tertiary education enrollment, 2007* 55
3.07 Education expenditure, 2007* 104
3.08 Accessibility of digital content 87
3.09 Internet bandwidth, 2007* 69

Readiness component 105

Individual readiness 93

4.01 Quality of math and science education 84
4.02 Quality of the educational system 97
4.03 Buyer sophistication 90
4.04 Residential telephone connection charge, 2008* 113
4.05 Residential monthly telephone subscription, 2008* 17
4.06 Fixed broadband tariffs, 2008* 92
4.07 Mobile cellular tariffs, 2008* 61
4.08 Fixed telephone lines tariffs, 2008* 109

Business readiness 116

5.01 Extent of staff training 82
5.02 Local availability of research and training 122
5.03 Quality of management schools 106
5.04 Company spending on R&D 124
5.05 University-industry collaboration in R&D 122
5.06 Business telephone connection charge, 2007* 100
5.07 Business monthly telephone subscription, 2007* 13
5.08 Local supplier quality 129
5.09 Computer, comm., and other services imports, 2008* 102
5.10 Availability of new telephone lines 72

Government readiness 92

6.01 Government prioritization of ICT 87
6.02 Gov't procurement of advanced tech. products 95
6.03 Importance of ICT to gov't vision of the future 91

Usage component 90

Individual usage 73

7.01 Mobile telephone subscriptions, 2008* 95
7.02 Personal computers, 2008* 35
7.03 Broadband Internet subscribers, 2008* 76
7.04 Internet users, 2008* 76
7.05 Internet access in schools 65

Business usage 111

8.01 Prevalence of foreign technology licensing 100
8.02 Firm-level technology absorption 115
8.03 Capacity for innovation 119
8.04 Extent of business Internet use 97
8.05 Creative industries exports, 2005* 104
8.06 Utility patents, 2008* 65
8.07 High-tech exports, 2007* 66

Government usage 88

9.01 Government success in ICT promotion 93
9.02 Government Online Service Index, 2009* 92
9.03 ICT use and government efficiency 60
9.04 Presence of ICT in government agencies 62
9.05 E-Participation Index, 2009* 104

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Germany

Key indicators

Population (millions), 2008 ..... 82.1
GDP per capita (PPP $), 2008 35,539
Mobile phone subscriptions per 100 population, 2008 ..... 128.3
Internet users per 100 population, 2008 ..... 75.3
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 255.5
Utility patents per million population, 2008 ..... 108.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**14**
2008–2009 (134)	20
2007–2008 (127)	16

Global Competitiveness Index 2009–2010 (133) 7

Environment component 16

Market environment 22

1.01 Venture capital availability 53
1.02 Financial market sophistication 17
1.03 Availability of latest technologies 16
1.04 State of cluster development 11
1.05 Burden of government regulation 84
1.06 Extent and effect of taxation 106
1.07 Total tax rate, 2008* 80
1.08 Time required to start a business, 2009* 61
1.09 No. of procedures required to start a business, 2009* 83
1.10 Intensity of local competition 1
1.11 Freedom of the press 9

Political and regulatory environment 11

2.01 Effectiveness of law-making bodies 27
2.02 Laws relating to ICT 18
2.03 Judicial independence 6
2.04 Intellectual property protection 13
2.05 Efficiency of legal framework in settling disputes 17
2.06 Efficiency of legal framework in challenging regs 10
2.07 Property rights 9
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 27
2.10 Level of competition index, 2007* 1

Infrastructure environment 14

3.01 Number of telephone lines, 2008* 2
3.02 Secure Internet servers, 2008* 17
3.03 Electricity production, 2006* 24
3.04 Availability of scientists and engineers 35
3.05 Quality of scientific research institutions 5
3.06 Tertiary education enrollment, 2006* 50
3.07 Education expenditure, 2007* 56
3.08 Accessibility of digital content 18
3.09 Internet bandwidth, 2007* 11

Readiness component 18

Individual readiness 24

4.01 Quality of math and science education 45
4.02 Quality of the educational system 27
4.03 Buyer sophistication 22
4.04 Residential telephone connection charge, 2008* 55
4.05 Residential monthly telephone subscription, 2008* 98
4.06 Fixed broadband tariffs, 2008* 33
4.07 Mobile cellular tariffs, 2008* 18
4.08 Fixed telephone lines tariffs, 2008* 59

Business readiness 6

5.01 Extent of staff training 11
5.02 Local availability of research and training 2
5.03 Quality of management schools 26
5.04 Company spending on R&D 4
5.05 University-industry collaboration in R&D 10
5.06 Business telephone connection charge, 2008* 38
5.07 Business monthly telephone subscription, 2006* 65
5.08 Local supplier quality 3
5.09 Computer, comm., and other services imports, 2008* 27
5.10 Availability of new telephone lines 19

Government readiness 42

6.01 Government prioritization of ICT 37
6.02 Gov't procurement of advanced tech. products 45
6.03 Importance of ICT to gov't vision of the future 47

Usage component 12

Individual usage 15

7.01 Mobile telephone subscriptions, 2008* 19
7.02 Personal computers, 2006* 13
7.03 Broadband Internet subscribers, 2008* 16
7.04 Internet users, 2008* 13
7.05 Internet access in schools 39

Business usage 4

8.01 Prevalence of foreign technology licensing 25
8.02 Firm-level technology absorption 14
8.03 Capacity for innovation 2
8.04 Extent of business Internet use 17
8.05 Creative industries exports, 2006* 5
8.06 Utility patents, 2008* 9
8.07 High-tech exports, 2007* 25

Government usage 20

9.01 Government success in ICT promotion 39
9.02 Government Online Service Index, 2009* 21
9.03 ICT use and government efficiency 33
9.04 Presence of ICT in government agencies 25
9.05 E-Participation Index, 2009* 14

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Ghana

Key indicators

Population (millions), 2008 ..... 23.4
GDP per capita (PPP $), 2008 1,518
Mobile phone subscriptions per 100 population, 2008 ..... 49.6
Internet users per 100 population, 2008 ..... 4.3
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.8
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**98**
2008–2009 (134)	103
2007–2008 (127)	n/a

Global Competitiveness Index 2009–2010 (133)	114

Environment component 89

Market environment 75

1.01 Venture capital availability 115
1.02 Financial market sophistication 80
1.03 Availability of latest technologies 98
1.04 State of cluster development 96
1.05 Burden of government regulation 77
1.06 Extent and effect of taxation 61
1.07 Total tax rate, 2008* 40
1.08 Time required to start a business, 2009* 96
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 65
1.11 Freedom of the press 24

Political and regulatory environment 74

2.01 Effectiveness of law-making bodies 35
2.02 Laws relating to ICT 116
2.03 Judicial independence 69
2.04 Intellectual property protection 84
2.05 Efficiency of legal framework in settling disputes 66
2.06 Efficiency of legal framework in challenging regs 74
2.07 Property rights 72
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 52
2.10 Level of competition index, 2007* 82

Infrastructure environment 110

3.01 Number of telephone lines, 2008* 126
3.02 Secure Internet servers, 2008* 108
3.03 Electricity production, 2006* 111
3.04 Availability of scientists and engineers 98
3.05 Quality of scientific research institutions 68
3.06 Tertiary education enrollment, 2007* 113
3.07 Education expenditure, 2007* 48
3.08 Accessibility of digital content 117
3.09 Internet bandwidth, 2008* 97

Readiness component 87

Individual readiness 73

4.01 Quality of math and science education 100
4.02 Quality of the educational system 74
4.03 Buyer sophistication 113
4.04 Residential telephone connection charge, 2007* 75
4.05 Residential monthly telephone subscription, 2007* 22
4.06 Fixed broadband tariffs, 2008* 100
4.07 Mobile cellular tariffs, 2008* 37
4.08 Fixed telephone lines tariffs, 2008* 94

Business readiness 106

5.01 Extent of staff training 90
5.02 Local availability of research and training 104
5.03 Quality of management schools 69
5.04 Company spending on R&D 133
5.05 University-industry collaboration in R&D 118
5.06 Business telephone connection charge, 2007* 58
5.07 Business monthly telephone subscription, 2007* 9
5.08 Local supplier quality 105
5.09 Computer, comm., and other services imports, 2007* 93
5.10 Availability of new telephone lines 114

Government readiness 84

6.01 Government prioritization of ICT 55
6.02 Gov't procurement of advanced tech. products 116
6.03 Importance of ICT to gov't vision of the future 90

Usage component 120

Individual usage 113

7.01 Mobile telephone subscriptions, 2008* 105
7.02 Personal computers, 2008* 110
7.03 Broadband Internet subscribers, 2008* 106
7.04 Internet users, 2008* 114
7.05 Internet access in schools 106

Business usage 123

8.01 Prevalence of foreign technology licensing 110
8.02 Firm-level technology absorption 110
8.03 Capacity for innovation 127
8.04 Extent of business Internet use 106
8.05 Creative industries exports, 2006* 66
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 110

Government usage 119

9.01 Government success in ICT promotion 85
9.02 Government Online Service Index, 2009* 112
9.03 ICT use and government efficiency 115
9.04 Presence of ICT in government agencies 115
9.05 E-Participation Index, 2009* 94

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Greece

Key indicators

Population (millions), 2008 ..... 11.2
GDP per capita (PPP $), 2008 30,681
Mobile phone subscriptions per 100 population, 2008 ..... 123.9
Internet users per 100 population, 2008 ..... 43.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 45.6
Utility patents per million population, 2008 ..... 2.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**56**
2008–2009 (134)	55
2007–2008 (127)	56

Global Competitiveness Index 2009–2010 (133) 71

Environment component 49

Market environment 78

1.01 Venture capital availability 75
1.02 Financial market sophistication 58
1.03 Availability of latest technologies 64
1.04 State of cluster development 87
1.05 Burden of government regulation 125
1.06 Extent and effect of taxation 78
1.07 Total tax rate, 2008* 88
1.08 Time required to start a business, 2009* 64
1.09 No. of procedures required to start a business, 2009* 122
1.10 Intensity of local competition 68
1.11 Freedom of the press 25

Political and regulatory environment 62

2.01 Effectiveness of law-making bodies 57
2.02 Laws relating to ICT 78
2.03 Judicial independence 75
2.04 Intellectual property protection 42
2.05 Efficiency of legal framework in settling disputes 90
2.06 Efficiency of legal framework in challenging regs 84
2.07 Property rights 47
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 109
2.10 Level of competition index, 2007* 59

Infrastructure environment 38

3.01 Number of telephone lines, 2008* 14
3.02 Secure Internet servers, 2008* 45
3.03 Electricity production, 2006* 42
3.04 Availability of scientists and engineers 20
3.05 Quality of scientific research institutions 77
3.06 Tertiary education enrollment, 2007* 3
3.07 Education expenditure, 2007* 107
3.08 Accessibility of digital content 95
3.09 Internet bandwidth, 2007* 38

Readiness component 72

Individual readiness 65

4.01 Quality of math and science education 47
4.02 Quality of the educational system 90
4.03 Buyer sophistication 50
4.04 Residential telephone connection charge, 2008* 31
4.05 Residential monthly telephone subscription, 2008* 101
4.06 Fixed broadband tariffs, 2008* 17
4.07 Mobile cellular tariffs, 2008* 82
4.08 Fixed telephone lines tariffs, 2008* 55

Business readiness 74

5.01 Extent of staff training 101
5.02 Local availability of research and training 84
5.03 Quality of management schools 80
5.04 Company spending on R&D 101
5.05 University-industry collaboration in R&D 90
5.06 Business telephone connection charge, 2007* 18
5.07 Business monthly telephone subscription, 2007* 60
5.08 Local supplier quality 61
5.09 Computer, comm., and other services imports, 2008* 78
5.10 Availability of new telephone lines 50

Government readiness 93

6.01 Government prioritization of ICT 77
6.02 Gov't procurement of advanced tech. products 91
6.03 Importance of ICT to gov't vision of the future 97

Usage component 60

Individual usage 48

7.01 Mobile telephone subscriptions, 2008* 24
7.02 Personal computers, 2006* 65
7.03 Broadband Internet subscribers, 2008* 37
7.04 Internet users, 2008* 43
7.05 Internet access in schools 73

Business usage 73

8.01 Prevalence of foreign technology licensing 47
8.02 Firm-level technology absorption 98
8.03 Capacity for innovation 101
8.04 Extent of business Internet use 99
8.05 Creative industries exports, 2006* 34
8.06 Utility patents, 2008* 37
8.07 High-tech exports, 2007* 47

Government usage 70

9.01 Government success in ICT promotion 83
9.02 Government Online Service Index, 2009* 58
9.03 ICT use and government efficiency 76
9.04 Presence of ICT in government agencies 89
9.05 E-Participation Index, 2009* 46

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Guatemala

Key indicators

Population (millions), 2008 ..... 13.7
GDP per capita (PPP $), 2008 4,907
Mobile phone subscriptions per 100 population, 2008 ..... 109.2
Internet users per 100 population, 2008 ..... 14.3
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 1.9
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**83**
2008–2009 (134)	82
2007–2008 (127)	80
Global Competitiveness Index 2009–2010 (133)	80

Environment component 87

Market environment 52

1.01 Venture capital availability 81
1.02 Financial market sophistication 68
1.03 Availability of latest technologies 56
1.04 State of cluster development 47
1.05 Burden of government regulation 38
1.06 Extent and effect of taxation 44
1.07 Total tax rate, 2008* 67
1.08 Time required to start a business, 2009* 86
1.09 No. of procedures required to start a business, 2009* 104
1.10 Intensity of local competition 50
1.11 Freedom of the press 33

Political and regulatory environment 100

2.01 Effectiveness of law-making bodies 127
2.02 Laws relating to ICT 76
2.03 Judicial independence 100
2.04 Intellectual property protection 115
2.05 Efficiency of legal framework in settling disputes 96
2.06 Efficiency of legal framework in challenging regs 93
2.07 Property rights 92
2.08 No. of procedures to enforce a contract, 2009* 27
2.09 Time to enforce a contract, 2009* 129
2.10 Level of competition index, 2007* 1

Infrastructure environment 98

3.01 Number of telephone lines, 2008* 88
3.02 Secure Internet servers, 2008* 76
3.03 Electricity production, 2006* 105
3.04 Availability of scientists and engineers 86
3.05 Quality of scientific research institutions 96
3.06 Tertiary education enrollment, 2007* 88
3.07 Education expenditure, 2007* 105
3.08 Accessibility of digital content 37
3.09 Internet bandwidth, 2007* 91

Readiness component 78

Individual readiness 69

4.01 Quality of math and science education 126
4.02 Quality of the educational system 125
4.03 Buyer sophistication 65
4.04 Residential telephone connection charge, 2008* 97
4.05 Residential monthly telephone subscription, 2008* 49
4.06 Fixed broadband tariffs, 2008* 81
4.07 Mobile cellular tariffs, 2008* 12
4.08 Fixed telephone lines tariffs, 2008* 66

Business readiness 63

5.01 Extent of staff training 64
5.02 Local availability of research and training 55
5.03 Quality of management schools 48
5.04 Company spending on R&D 63
5.05 University-industry collaboration in R&D 50
5.06 Business telephone connection charge, 2006* 95
5.07 Business monthly telephone subscription, 2006* 28
5.08 Local supplier quality 36
5.09 Computer, comm., and other services imports, 2007* 112
5.10 Availability of new telephone lines 24

Government readiness 116

6.01 Government prioritization of ICT 120
6.02 Gov't procurement of advanced tech. products 96
6.03 Importance of ICT to gov't vision of the future 104

Usage component 77

Individual usage 85

7.01 Mobile telephone subscriptions, 2008* 45
7.02 Personal computers, 2005* 100
7.03 Broadband Internet subscribers, 2008* 93
7.04 Internet users, 2008* 88
7.05 Internet access in schools 103

Business usage 62

8.01 Prevalence of foreign technology licensing 64
8.02 Firm-level technology absorption 44
8.03 Capacity for innovation 63
8.04 Extent of business Internet use 34
8.05 Creative industries exports, 2005* 58
8.06 Utility patents, 2008* 73
8.07 High-tech exports, 2007* 68

Government usage 63

9.01 Government success in ICT promotion 114
9.02 Government Online Service Index, 2009* 74
9.03 ICT use and government efficiency 58
9.04 Presence of ICT in government agencies 70
9.05 E-Participation Index, 2009* 36

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Guyana

Key indicators

Population (millions), 2008 ..... 0.8
GDP per capita (PPP $), 2008 4,029
Mobile phone subscriptions per 100 population ..... n/a
Internet users per 100 population, 2008 ..... 26.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.5
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**100**
2008–2009 (134)	100
2007–2008 (127)	102

Global Competitiveness Index 2009–2010 (133) 104

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Honduras

Key indicators

Population (millions), 2008 ..... 7.2
GDP per capita (PPP $), 2008 4,275
Mobile phone subscriptions per 100 population, 2008 ..... 84.9
Internet users per 100 population, 2008 ..... 13.1
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 2.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**106**
2008–2009 (134)	95
2007–2008 (127)	90
Global Competitiveness Index 2009–2010 (133)	89

Environment component 109

Market environment 76

1.01 Venture capital availability 92
1.02 Financial market sophistication 77
1.03 Availability of latest technologies 92
1.04 State of cluster development 79
1.05 Burden of government regulation 33
1.06 Extent and effect of taxation 37
1.07 Total tax rate, 2008* 91
1.08 Time required to start a business, 2009* 48
1.09 No. of procedures required to start a business, 2009* 115
1.10 Intensity of local competition 91
1.11 Freedom of the press 45

Political and regulatory environment 128

2.01 Effectiveness of law-making bodies 91
2.02 Laws relating to ICT 91
2.03 Judicial independence 102
2.04 Intellectual property protection 90
2.05 Efficiency of legal framework in settling disputes 98
2.06 Efficiency of legal framework in challenging regs 90
2.07 Property rights 84
2.08 No. of procedures to enforce a contract, 2009* 115
2.09 Time to enforce a contract, 2009* 118
2.10 Level of competition index, 2007* 126

Infrastructure environment 106

3.01 Number of telephone lines, 2008* 86
3.02 Secure Internet servers, 2008* 81
3.03 Electricity production, 2006* 95
3.04 Availability of scientists and engineers 109
3.05 Quality of scientific research institutions 119
3.06 Tertiary education enrollment, 2004* 91
3.07 Education expenditure, 2007* 85
3.08 Accessibility of digital content 71
3.09 Internet bandwidth, 2007* 84

Readiness component 122

Individual readiness 123

4.01 Quality of math and science education 125
4.02 Quality of the educational system 116
4.03 Buyer sophistication 72
4.04 Residential telephone connection charge, 2007* 38
4.05 Residential monthly telephone subscription, 2007* 80
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 113

5.01 Extent of staff training 94
5.02 Local availability of research and training 88
5.03 Quality of management schools 108
5.04 Company spending on R&D 109
5.05 University-industry collaboration in R&D 105
5.06 Business telephone connection charge, 2007* 71
5.07 Business monthly telephone subscription, 2007* 102
5.08 Local supplier quality 84
5.09 Computer, comm., and other services imports, 2007* 111
5.10 Availability of new telephone lines 103

Government readiness 108

6.01 Government prioritization of ICT 112
6.02 Gov't procurement of advanced tech. products 82
6.03 Importance of ICT to gov't vision of the future 114

Usage component 95

Individual usage 90

7.01 Mobile telephone subscriptions, 2008* 76
7.02 Personal computers, 2008* 95
7.03 Broadband Internet subscribers, 2008* 132
7.04 Internet users, 2008* 89
7.05 Internet access in schools 90

Business usage 92

8.01 Prevalence of foreign technology licensing 87
8.02 Firm-level technology absorption 91
8.03 Capacity for innovation 93
8.04 Extent of business Internet use 57
8.05 Creative industries exports, 2006* 75
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 106

Government usage 97

9.01 Government success in ICT promotion 101
9.02 Government Online Service Index, 2009* 80
9.03 ICT use and government efficiency 102
9.04 Presence of ICT in government agencies 106
9.05 E-Participation Index, 2009* 77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Hong Kong SAR

Key indicators

Population (millions), 2008.....7.0
GDP per capita (PPP $), 2008.....43,847
Mobile phone subscriptions per 100 population, 2008.....165.9
Internet users per 100 population, 2008.....67.0
Internet bandwidth (Mb/s) per 10,000 population, 2008...5,256.4
Utility patents per million population, 2008.....42.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**8**
2008–2009 (134)	12
2007–2008 (127)	11

Global Competitiveness Index 2009–2010 (133)	11

Environment component 15

Market environment 1

1.01 Venture capital availability.....1
1.02 Financial market sophistication.....5
1.03 Availability of latest technologies.....11
1.04 State of cluster development.....4
1.05 Burden of government regulation.....2
1.06 Extent and effect of taxation.....2
1.07 Total tax rate, 2008*.....18
1.08 Time required to start a business, 2009*.....12
1.09 No. of procedures required to start a business, 2009*.....5
1.10 Intensity of local competition.....35
1.11 Freedom of the press.....51

Political and regulatory environment 17

2.01 Effectiveness of law-making bodies.....42
2.02 Laws relating to ICT.....13
2.03 Judicial independence.....14
2.04 Intellectual property protection.....23
2.05 Efficiency of legal framework in settling disputes.....2
2.06 Efficiency of legal framework in challenging regs.....5
2.07 Property rights.....8
2.08 No. of procedures to enforce a contract, 2009*.....3
2.09 Time to enforce a contract, 2009*.....8
2.10 Level of competition index*.....n/a

Infrastructure environment 23

3.01 Number of telephone lines, 2008*.....7
3.02 Secure Internet servers, 2008*.....23
3.03 Electricity production, 2006*.....41
3.04 Availability of scientists and engineers.....78
3.05 Quality of scientific research institutions.....34
3.06 Tertiary education enrollment, 2007*.....66
3.07 Education expenditure, 2007*.....99
3.08 Accessibility of digital content.....15
3.09 Internet bandwidth, 2008*.....2

Readiness component 9

Individual readiness 2

4.01 Quality of math and science education.....11
4.02 Quality of the educational system.....28
4.03 Buyer sophistication.....7
4.04 Residential telephone connection charge, 2008*.....1
4.05 Residential monthly telephone subscription, 2008*.....51
4.06 Fixed broadband tariffs, 2008*.....53
4.07 Mobile cellular tariffs, 2008*.....1
4.08 Fixed telephone lines tariffs, 2008*.....1

Business readiness 27

5.01 Extent of staff training.....25
5.02 Local availability of research and training.....20
5.03 Quality of management schools.....28
5.04 Company spending on R&D.....33
5.05 University-industry collaboration in R&D.....27
5.06 Business telephone connection charge, 2008*.....1
5.07 Business monthly telephone subscription, 2008*.....69
5.08 Local supplier quality.....20
5.09 Computer, comm., and other services imports, 2007*.....68
5.10 Availability of new telephone lines.....6

Government readiness 21

6.01 Government prioritization of ICT.....31
6.02 Gov't procurement of advanced tech. products.....28
6.03 Importance of ICT to gov't vision of the future.....14

Usage component 6

Individual usage 7

7.01 Mobile telephone subscriptions, 2008*.....4
7.02 Personal computers, 2008*.....10
7.03 Broadband Internet subscribers, 2008*.....14
7.04 Internet users, 2008*.....22
7.05 Internet access in schools.....14

Business usage 7

8.01 Prevalence of foreign technology licensing.....16
8.02 Firm-level technology absorption.....17
8.03 Capacity for innovation.....43
8.04 Extent of business Internet use.....18
8.05 Creative industries exports, 2006*.....4
8.06 Utility patents, 2008*.....22
8.07 High-tech exports, 2007*.....1

Government usage 7

9.01 Government success in ICT promotion.....24
9.02 Government Online Service Index*.....n/a
9.03 ICT use and government efficiency.....12
9.04 Presence of ICT in government agencies.....19
9.05 E-Participation Index*.....n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Hungary

Key indicators

Population (millions), 2008 ..... 10.0
GDP per capita (PPP $), 2008 19,553
Mobile phone subscriptions per 100 population, 2008 ..... 122.1
Internet users per 100 population, 2008 ..... 58.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 60.0
Utility patents per million population, 2008 ..... 6.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**46**
2008–2009 (134)	41
2007–2008 (127)	37

Global Competitiveness Index 2009–2010 (133)	58

Environment component 45

Market environment 80

1.01 Venture capital availability 94
1.02 Financial market sophistication 61
1.03 Availability of latest technologies 54
1.04 State of cluster development 99
1.05 Burden of government regulation 130
1.06 Extent and effect of taxation 132
1.07 Total tax rate, 2008* 109
1.08 Time required to start a business, 2009* 5
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 44
1.11 Freedom of the press 62

Political and regulatory environment 59

2.01 Effectiveness of law-making bodies 114
2.02 Laws relating to ICT 64
2.03 Judicial independence 57
2.04 Intellectual property protection 53
2.05 Efficiency of legal framework in settling disputes 99
2.06 Efficiency of legal framework in challenging regs 99
2.07 Property rights 57
2.08 No. of procedures to enforce a contract, 2009* 37
2.09 Time to enforce a contract, 2009* 28
2.10 Level of competition index, 2007* 59

Infrastructure environment 33

3.01 Number of telephone lines, 2008* 41
3.02 Secure Internet servers, 2008* 40
3.03 Electricity production, 2006* 56
3.04 Availability of scientists and engineers 40
3.05 Quality of scientific research institutions 23
3.06 Tertiary education enrollment, 2007* 17
3.07 Education expenditure, 2007* 29
3.08 Accessibility of digital content 32
3.09 Internet bandwidth, 2008* 32

Readiness component 85

Individual readiness 92

4.01 Quality of math and science education 26
4.02 Quality of the educational system 80
4.03 Buyer sophistication 93
4.04 Residential telephone connection charge, 2008* 119
4.05 Residential monthly telephone subscription, 2008* 115
4.06 Fixed broadband tariffs, 2008* 37
4.07 Mobile cellular tariffs, 2008* 86
4.08 Fixed telephone lines tariffs, 2008* 99

Business readiness 49

5.01 Extent of staff training 89
5.02 Local availability of research and training 49
5.03 Quality of management schools 68
5.04 Company spending on R&D 85
5.05 University-industry collaboration in R&D 31
5.06 Business telephone connection charge, 2007* 107
5.07 Business monthly telephone subscription, 2007* 108
5.08 Local supplier quality 64
5.09 Computer, comm., and other services imports, 2008* 7
5.10 Availability of new telephone lines 33

Government readiness 107

6.01 Government prioritization of ICT 103
6.02 Gov't procurement of advanced tech. products 118
6.03 Importance of ICT to gov't vision of the future 93

Usage component 38

Individual usage 34

7.01 Mobile telephone subscriptions, 2008* 26
7.02 Personal computers, 2007* 36
7.03 Broadband Internet subscribers, 2008* 32
7.04 Internet users, 2008* 29
7.05 Internet access in schools 29

Business usage 38

8.01 Prevalence of foreign technology licensing 58
8.02 Firm-level technology absorption 72
8.03 Capacity for innovation 48
8.04 Extent of business Internet use 56
8.05 Creative industries exports, 2005* 44
8.06 Utility patents, 2008* 28
8.07 High-tech exports, 2007* 11

Government usage 54

9.01 Government success in ICT promotion 116
9.02 Government Online Service Index, 2009* 26
9.03 ICT use and government efficiency 71
9.04 Presence of ICT in government agencies 54
9.05 E-Participation Index, 2009* 36

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Iceland

Key indicators

Population (millions), 2008 ..... 0.3
GDP per capita (PPP $), 2008 40,471
Mobile phone subscriptions per 100 population, 2008 ..... 108.6
Internet users per 100 population, 2008 ..... 90.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 73.1
Utility patents per million population, 2008 ..... 85.8

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**12**
2008–2009 (134)	7
2007–2008 (127)	8

Global Competitiveness Index 2009–2010 (133) 26

Environment component 7

Market environment 21

1.01 Venture capital availability 57
1.02 Financial market sophistication 65
1.03 Availability of latest technologies 1
1.04 State of cluster development 48
1.05 Burden of government regulation 5
1.06 Extent and effect of taxation 11
1.07 Total tax rate, 2008* 19
1.08 Time required to start a business, 2009* 8
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 57
1.11 Freedom of the press 31

Political and regulatory environment 14

2.01 Effectiveness of law-making bodies 25
2.02 Laws relating to ICT 14
2.03 Judicial independence 18
2.04 Intellectual property protection 17
2.05 Efficiency of legal framework in settling disputes 21
2.06 Efficiency of legal framework in challenging regs 13
2.07 Property rights 17
2.08 No. of procedures to enforce a contract, 2009* 7
2.09 Time to enforce a contract, 2009* 36
2.10 Level of competition index, 2007* 1

Infrastructure environment 2

3.01 Number of telephone lines, 2008* 4
3.02 Secure Internet servers, 2008* 1
3.03 Electricity production, 2006* 1
3.04 Availability of scientists and engineers 8
3.05 Quality of scientific research institutions 24
3.06 Tertiary education enrollment, 2007* 15
3.07 Education expenditure, 2007* 6
3.08 Accessibility of digital content 3
3.09 Internet bandwidth, 2007* 29

Readiness component 8

Individual readiness 8

4.01 Quality of math and science education 21
4.02 Quality of the educational system 3
4.03 Buyer sophistication 27
4.04 Residential telephone connection charge, 2008* 9
4.05 Residential monthly telephone subscription, 2008* 68
4.06 Fixed broadband tariffs, 2008* 57
4.07 Mobile cellular tariffs, 2008* 22
4.08 Fixed telephone lines tariffs, 2008* 21

Business readiness 16

5.01 Extent of staff training 14
5.02 Local availability of research and training 18
5.03 Quality of management schools 10
5.04 Company spending on R&D 24
5.05 University-industry collaboration in R&D 17
5.06 Business telephone connection charge, 2008* 4
5.07 Business monthly telephone subscription, 2008* 48
5.08 Local supplier quality 19
5.09 Computer, comm., and other services imports, 2007* 71
5.10 Availability of new telephone lines 1

Government readiness 18

6.01 Government prioritization of ICT 15
6.02 Gov't procurement of advanced tech. products 20
6.03 Importance of ICT to gov't vision of the future 17

Usage component 18

Individual usage 6

7.01 Mobile telephone subscriptions, 2008* 47
7.02 Personal computers, 2006* 22
7.03 Broadband Internet subscribers, 2008* 7
7.04 Internet users, 2008* 1
7.05 Internet access in schools 1

Business usage 19

8.01 Prevalence of foreign technology licensing 2
8.02 Firm-level technology absorption 1
8.03 Capacity for innovation 23
8.04 Extent of business Internet use 13
8.05 Creative industries exports, 2006* 105
8.06 Utility patents, 2008* 12
8.07 High-tech exports, 2007* 19

Government usage 40

9.01 Government success in ICT promotion 12
9.02 Government Online Service Index, 2009* 47
9.03 ICT use and government efficiency 11
9.04 Presence of ICT in government agencies 13
9.05 E-Participation Index, 2009* 110

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

India

Key indicators

Networked Readiness Index

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Indonesia

Key indicators

Population (millions), 2008 ..... 228.2
GDP per capita (PPP $), 2008 3,980
Mobile phone subscriptions per 100 population, 2008 ..... 61.8
Internet users per 100 population, 2008 ..... 7.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 1.2
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**67**
2008–2009 (134)	83
2007–2008 (127)	76

Global Competitiveness Index 2009–2010 (133)	54

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Ireland

Key indicators

Population (millions), 2008 ..... 4.5
GDP per capita (PPP $), 2008 42,110
Mobile phone subscriptions per 100 population, 2008 ..... 120.7
Internet users per 100 population, 2008 ..... 62.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 154.6
Utility patents per million population, 2008 ..... 37.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**24**
2008–2009 (134)	23
2007–2008 (127)	23
Global Competitiveness Index 2009–2010 (133)	25

Environment component 18

Market environment 26

1.01 Venture capital availability 39
1.02 Financial market sophistication 29
1.03 Availability of latest technologies 34
1.04 State of cluster development 28
1.05 Burden of government regulation 74
1.06 Extent and effect of taxation 26
1.07 Total tax rate, 2008* 22
1.08 Time required to start a business, 2009* 41
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 49
1.11 Freedom of the press 14

Political and regulatory environment 15

2.01 Effectiveness of law-making bodies 28
2.02 Laws relating to ICT 29
2.03 Judicial independence 9
2.04 Intellectual property protection 16
2.05 Efficiency of legal framework in settling disputes 30
2.06 Efficiency of legal framework in challenging regs 24
2.07 Property rights 15
2.08 No. of procedures to enforce a contract, 2009* 1
2.09 Time to enforce a contract, 2009* 60
2.10 Level of competition index, 2007* 1

Infrastructure environment 18

3.01 Number of telephone lines, 2008* 16
3.02 Secure Internet servers, 2008* 16
3.03 Electricity production, 2006* 33
3.04 Availability of scientists and engineers 12
3.05 Quality of scientific research institutions 16
3.06 Tertiary education enrollment, 2007* 26
3.07 Education expenditure, 2007* 35
3.08 Accessibility of digital content 47
3.09 Internet bandwidth, 2007* 19

Readiness component 27

Individual readiness 28

4.01 Quality of math and science education 24
4.02 Quality of the educational system 8
4.03 Buyer sophistication 24
4.04 Residential telephone connection charge, 2008* 92
4.05 Residential monthly telephone subscription, 2008* 118
4.06 Fixed broadband tariffs, 2008* 21
4.07 Mobile cellular tariffs, 2008* 38
4.08 Fixed telephone lines tariffs, 2008* 52

Business readiness 10

5.01 Extent of staff training 15
5.02 Local availability of research and training 25
5.03 Quality of management schools 19
5.04 Company spending on R&D 21
5.05 University-industry collaboration in R&D 13
5.06 Business telephone connection charge, 2007* 76
5.07 Business monthly telephone subscription, 2007* 92
5.08 Local supplier quality 21
5.09 Computer, comm., and other services imports, 2008* 1
5.10 Availability of new telephone lines 53

Government readiness 58

6.01 Government prioritization of ICT 63
6.02 Gov't procurement of advanced tech. products 59
6.03 Importance of ICT to gov't vision of the future 56

Usage component 26

Individual usage 28

7.01 Mobile telephone subscriptions, 2008* 28
7.02 Personal computers, 2006* 19
7.03 Broadband Internet subscribers, 2008* 29
7.04 Internet users, 2008* 27
7.05 Internet access in schools 47

Business usage 21

8.01 Prevalence of foreign technology licensing 27
8.02 Firm-level technology absorption 32
8.03 Capacity for innovation 30
8.04 Extent of business Internet use 31
8.05 Creative industries exports, 2006* 28
8.06 Utility patents, 2008* 23
8.07 High-tech exports, 2007* 10

Government usage 35

9.01 Government success in ICT promotion 64
9.02 Government Online Service Index, 2009* 28
9.03 ICT use and government efficiency 40
9.04 Presence of ICT in government agencies 30
9.05 E-Participation Index, 2009* 26

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Israel

Key indicators

Population (millions), 2008 ..... 7.3
GDP per capita (PPP $), 2008 28,474
Mobile phone subscriptions per 100 population, 2008 ..... 127.4
Internet users per 100 population, 2008 ..... 49.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 20.8
Utility patents per million population, 2008 ..... 166.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**28**
2008–2009 (134)	25
2007–2008 (127)	18
Global Competitiveness Index 2009–2010 (133)	27

Environment component 26

Market environment 23

1.01 Venture capital availability 14
1.02 Financial market sophistication 22
1.03 Availability of latest technologies 15
1.04 State of cluster development 49
1.05 Burden of government regulation 76
1.06 Extent and effect of taxation 64
1.07 Total tax rate, 2008* 39
1.08 Time required to start a business, 2009* 97
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 29
1.11 Freedom of the press 7

Political and regulatory environment 43

2.01 Effectiveness of law-making bodies 38
2.02 Laws relating to ICT 56
2.03 Judicial independence 15
2.04 Intellectual property protection 44
2.05 Efficiency of legal framework in settling disputes 44
2.06 Efficiency of legal framework in challenging regs 23
2.07 Property rights 65
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 117
2.10 Level of competition index, 2007* 82

Infrastructure environment 22

3.01 Number of telephone lines, 2008* 18
3.02 Secure Internet servers, 2008* 25
3.03 Electricity production, 2006* 25
3.04 Availability of scientists and engineers 16
3.05 Quality of scientific research institutions 3
3.06 Tertiary education enrollment, 2007* 27
3.07 Education expenditure, 2007* 17
3.08 Accessibility of digital content 16
3.09 Internet bandwidth, 2007* 52

Readiness component 50

Individual readiness 108

4.01 Quality of math and science education 103
4.02 Quality of the educational system 98
4.03 Buyer sophistication 74
4.04 Residential telephone connection charge, 2006* 50
4.05 Residential monthly telephone subscription, 2006* 58
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 19

5.01 Extent of staff training 35
5.02 Local availability of research and training 28
5.03 Quality of management schools 65
5.04 Company spending on R&D 11
5.05 University-industry collaboration in R&D 21
5.06 Business telephone connection charge, 2006* 35
5.07 Business monthly telephone subscription, 2006* 32
5.08 Local supplier quality 30
5.09 Computer, comm., and other services imports, 2008* 18
5.10 Availability of new telephone lines 11

Government readiness 49

6.01 Government prioritization of ICT 46
6.02 Gov't procurement of advanced tech. products 26
6.03 Importance of ICT to gov's vision of the future 75

Usage component 20

Individual usage 25

7.01 Mobile telephone subscriptions, 2008* 20
7.02 Personal computers* ..... n/a
7.03 Broadband Internet subscribers, 2008* 19
7.04 Internet users, 2008* 39
7.05 Internet access in schools 31

Business usage 15

8.01 Prevalence of foreign technology licensing 40
8.02 Firm-level technology absorption 11
8.03 Capacity for innovation 8
8.04 Extent of business Internet use 6
8.05 Creative industries exports, 2005* 36
8.06 Utility patents, 2008* 4
8.07 High-tech exports, 2007* 35

Government usage 36

9.01 Government success in ICT promotion 45
9.02 Government Online Service Index, 2009* 19
9.03 ICT use and government efficiency 46
9.04 Presence of ICT in government agencies 41
9.05 E-Participation Index, 2009* 30

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Italy

Key indicators

Population (millions), 2008 ..... 59.9
GDP per capita (PPP $), 2008 30,631
Mobile phone subscriptions per 100 population, 2008 ..... 151.6
Internet users per 100 population, 2008 ..... 41.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 131.8
Utility patents per million population, 2008 ..... 23.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**48**
2008–2009 (134)	45
2007–2008 (127)	42
Global Competitiveness Index 2009–2010 (133)	48

Environment component 55

Market environment 81

1.01 Venture capital availability 104
1.02 Financial market sophistication 67
1.03 Availability of latest technologies 65
1.04 State of cluster development 3
1.05 Burden of government regulation 128
1.06 Extent and effect of taxation 126
1.07 Total tax rate, 2008* 119
1.08 Time required to start a business, 2009* 31
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 103
1.11 Freedom of the press 98

Political and regulatory environment 84

2.01 Effectiveness of law-making bodies 109
2.02 Laws relating to ICT 63
2.03 Judicial independence 93
2.04 Intellectual property protection 50
2.05 Efficiency of legal framework in settling disputes 128
2.06 Efficiency of legal framework in challenging regs 116
2.07 Property rights 69
2.08 No. of procedures to enforce a contract, 2009* 92
2.09 Time to enforce a contract, 2009* 121
2.10 Level of competition index, 2007* 1

Infrastructure environment 40

3.01 Number of telephone lines, 2008* 34
3.02 Secure Internet servers, 2008* 36
3.03 Electricity production, 2006* 46
3.04 Availability of scientists and engineers 39
3.05 Quality of scientific research institutions 79
3.06 Tertiary education enrollment, 2007* 19
3.07 Education expenditure, 2007* 65
3.08 Accessibility of digital content 78
3.09 Internet bandwidth, 2008* 20

Readiness component 64

Individual readiness 51

4.01 Quality of math and science education 83
4.02 Quality of the educational system 87
4.03 Buyer sophistication 40
4.04 Residential telephone connection charge, 2008* 88
4.05 Residential monthly telephone subscription, 2008* 88
4.06 Fixed broadband tariffs, 2008* 7
4.07 Mobile cellular tariffs, 2008* 26
4.08 Fixed telephone lines tariffs, 2008* 61

Business readiness 45

5.01 Extent of staff training 118
5.02 Local availability of research and training 43
5.03 Quality of management schools 46
5.04 Company spending on R&D 42
5.05 University-industry collaboration in R&D 69
5.06 Business telephone connection charge, 2007* 70
5.07 Business monthly telephone subscription, 2007* 61
5.08 Local supplier quality 34
5.09 Computer, comm., and other services imports, 2008* 15
5.10 Availability of new telephone lines 90

Government readiness 120

6.01 Government prioritization of ICT 118
6.02 Gov't procurement of advanced tech. products 120
6.03 Importance of ICT to gov't vision of the future 110

Usage component 39

Individual usage 36

7.01 Mobile telephone subscriptions, 2008* 6
7.02 Personal computers, 2005* 30
7.03 Broadband Internet subscribers, 2008* 30
7.04 Internet users, 2008* 44
7.05 Internet access in schools 68

Business usage 25

8.01 Prevalence of foreign technology licensing 52
8.02 Firm-level technology absorption 87
8.03 Capacity for innovation 27
8.04 Extent of business Internet use 76
8.05 Creative industries exports, 2006* 2
8.06 Utility patents, 2008* 25
8.07 High-tech exports, 2007* 39

Government usage 87

9.01 Government success in ICT promotion 109
9.02 Government Online Service Index, 2009* 82
9.03 ICT use and government efficiency 79
9.04 Presence of ICT in government agencies 98
9.05 E-Participation Index, 2009* 52

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Jamaica

Key indicators

Population (millions), 2008 ..... 2.7
GDP per capita (PPP $), 2008 8,967
Mobile phone subscriptions per 100 population, 2008 ..... 100.6
Internet users per 100 population, 2008 ..... 56.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 7.3
Utility patents per million population, 2008 ..... 1.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**66**
2008–2009 (134)	53
2007–2008 (127)	46
Global Competitiveness Index 2009–2010 (133)	91

Environment component 62

Market environment 56

1.01 Venture capital availability 120
1.02 Financial market sophistication 43
1.03 Availability of latest technologies 46
1.04 State of cluster development 82
1.05 Burden of government regulation 121
1.06 Extent and effect of taxation 123
1.07 Total tax rate, 2008* 100
1.08 Time required to start a business, 2009* 26
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 48
1.11 Freedom of the press 42

Political and regulatory environment 57

2.01 Effectiveness of law-making bodies 60
2.02 Laws relating to ICT 73
2.03 Judicial independence 47
2.04 Intellectual property protection 69
2.05 Efficiency of legal framework in settling disputes 73
2.06 Efficiency of legal framework in challenging regs 83
2.07 Property rights 60
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 94
2.10 Level of competition index, 2007* 59

Infrastructure environment 74

3.01 Number of telephone lines, 2008* 85
3.02 Secure Internet servers, 2008* 54
3.03 Electricity production, 2006* 66
3.04 Availability of scientists and engineers 117
3.05 Quality of scientific research institutions 51
3.06 Tertiary education enrollment, 2003* 86
3.07 Education expenditure, 2007* 28
3.08 Accessibility of digital content 69
3.09 Internet bandwidth, 2008* 70

Readiness component 56

Individual readiness 54

4.01 Quality of math and science education 109
4.02 Quality of the educational system 83
4.03 Buyer sophistication 51
4.04 Residential telephone connection charge, 2008* 6
4.05 Residential monthly telephone subscription, 2008* 74
4.06 Fixed broadband tariffs, 2008* 69
4.07 Mobile cellular tariffs, 2008* 48
4.08 Fixed telephone lines tariffs, 2008* 34

Business readiness 60

5.01 Extent of staff training 61
5.02 Local availability of research and training 82
5.03 Quality of management schools 67
5.04 Company spending on R&D 77
5.05 University-industry collaboration in R&D 60
5.06 Business telephone connection charge, 2006* 5
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 81
5.09 Computer, comm., and other services imports, 2007* 52
5.10 Availability of new telephone lines 91

Government readiness 74

6.01 Government prioritization of ICT 62
6.02 Gov't procurement of advanced tech. products 98
6.03 Importance of ICT to gov't vision of the future 73

Usage component 73

Individual usage 54

7.01 Mobile telephone subscriptions, 2008* 53
7.02 Personal computers, 2005* 76
7.03 Broadband Internet subscribers, 2008* 67
7.04 Internet users, 2008* 31
7.05 Internet access in schools 85

Business usage 91

8.01 Prevalence of foreign technology licensing 84
8.02 Firm-level technology absorption 69
8.03 Capacity for innovation 103
8.04 Extent of business Internet use 63
8.05 Creative industries exports, 2005* 108
8.06 Utility patents, 2008* 42
8.07 High-tech exports, 2007* 109

Government usage 82

9.01 Government success in ICT promotion 52
9.02 Government Online Service Index, 2009* 97
9.03 ICT use and government efficiency 64
9.04 Presence of ICT in government agencies 65
9.05 E-Participation Index, 2009* 94

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Japan

Key indicators

Population (millions), 2008 ..... 127.7
GDP per capita (PPP $), 2008 34,116
Mobile phone subscriptions per 100 population, 2008 ..... 86.7
Internet users per 100 population, 2008 ..... 75.4
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 57.6
Utility patents per million population, 2008 ..... 263.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**21**
2008–2009 (134)	17
2007–2008 (127)	19

Global Competitiveness Index 2009–2010 (133) 8

Environment component 22

Market environment 28

1.01 Venture capital availability 54
1.02 Financial market sophistication 44
1.03 Availability of latest technologies 12
1.04 State of cluster development 1
1.05 Burden of government regulation 22
1.06 Extent and effect of taxation 101
1.07 Total tax rate, 2008* 105
1.08 Time required to start a business, 2009* 73
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 8
1.11 Freedom of the press 29

Political and regulatory environment 20

2.01 Effectiveness of law-making bodies 34
2.02 Laws relating to ICT 33
2.03 Judicial independence 23
2.04 Intellectual property protection 20
2.05 Efficiency of legal framework in settling disputes 31
2.06 Efficiency of legal framework in challenging regs 41
2.07 Property rights 19
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 20
2.10 Level of competition index, 2007* 1

Infrastructure environment 25

3.01 Number of telephone lines, 2008* 32
3.02 Secure Internet servers, 2008* 19
3.03 Electricity production, 2006* 18
3.04 Availability of scientists and engineers 2
3.05 Quality of scientific research institutions 15
3.06 Tertiary education enrollment, 2007* 32
3.07 Education expenditure, 2007* 96
3.08 Accessibility of digital content 14
3.09 Internet bandwidth, 2008* 33

Readiness component 36

Individual readiness 68

4.01 Quality of math and science education 25
4.02 Quality of the educational system 31
4.03 Buyer sophistication 1
4.04 Residential telephone connection charge, 2008* 123
4.05 Residential monthly telephone subscription, 2008* 81
4.06 Fixed broadband tariffs, 2008* 31
4.07 Mobile cellular tariffs, 2008* 106
4.08 Fixed telephone lines tariffs, 2008* 32

Business readiness 13

5.01 Extent of staff training 5
5.02 Local availability of research and training 13
5.03 Quality of management schools 77
5.04 Company spending on R&D 2
5.05 University-industry collaboration in R&D 20
5.06 Business telephone connection charge, 2008* 113
5.07 Business monthly telephone subscription, 2008* 82
5.08 Local supplier quality 4
5.09 Computer, comm., and other services imports, 2008* 16
5.10 Availability of new telephone lines 9

Government readiness 38

6.01 Government prioritization of ICT 44
6.02 Gov't procurement of advanced tech. products 49
6.03 Importance of ICT to gov't vision of the future 33

Usage component 14

Individual usage 26

7.01 Mobile telephone subscriptions, 2008* 73
7.02 Personal computers, 2007* 20
7.03 Broadband Internet subscribers, 2008* 21
7.04 Internet users, 2008* 12
7.05 Internet access in schools 33

Business usage 3

8.01 Prevalence of foreign technology licensing 9
8.02 Firm-level technology absorption 2
8.03 Capacity for innovation 1
8.04 Extent of business Internet use 10
8.05 Creative industries exports, 2006* 16
8.06 Utility patents, 2008* 2
8.07 High-tech exports, 2007* 14

Government usage 22

9.01 Government success in ICT promotion 53
9.02 Government Online Service Index, 2009* 13
9.03 ICT use and government efficiency 77
9.04 Presence of ICT in government agencies 48
9.05 E-Participation Index, 2009* 6

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Jordan

Key indicators

Population (millions), 2008 ..... 5.9
GDP per capita (PPP $), 2008 5,537
Mobile phone subscriptions per 100 population, 2008 ..... 86.6
Internet users per 100 population, 2008 ..... 26.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 7.5
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**44**
2008–2009 (134)	44
2007–2008 (127)	47

Global Competitiveness Index 2009–2010 (133) 50

Environment component 41

Market environment 41

Political and regulatory environment 33

Infrastructure environment 60

Readiness component 40

Individual readiness 30

Business readiness 73

Government readiness 26

Usage component 51

Individual usage 68

Business usage 57

Government usage 38

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Kazakhstan

Key indicators

Population (millions), 2008 ..... 15.7
GDP per capita (PPP $), 2008 11,434
Mobile phone subscriptions per 100 population, 2008 ..... 96.1
Internet users per 100 population, 2008 ..... 11.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 7.1
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**68**
2008–2009 (134)	73
2007–2008 (127)	71
Global Competitiveness Index 2009–2010 (133)	67

Environment component 80

Market environment 93

1.01 Venture capital availability 59
1.02 Financial market sophistication 95
1.03 Availability of latest technologies 101
1.04 State of cluster development 76
1.05 Burden of government regulation 85
1.06 Extent and effect of taxation 89
1.07 Total tax rate, 2008* 52
1.08 Time required to start a business, 2009* 67
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 101
1.11 Freedom of the press 110

Political and regulatory environment 89

2.01 Effectiveness of law-making bodies 52
2.02 Laws relating to ICT 55
2.03 Judicial independence 97
2.04 Intellectual property protection 78
2.05 Efficiency of legal framework in settling disputes 82
2.06 Efficiency of legal framework in challenging regs 75
2.07 Property rights 103
2.08 No. of procedures to enforce a contract, 2009* 69
2.09 Time to enforce a contract, 2009* 25
2.10 Level of competition index, 2007* 104

Infrastructure environment 58

3.01 Number of telephone lines, 2008* 59
3.02 Secure Internet servers, 2008* 92
3.03 Electricity production, 2006* 49
3.04 Availability of scientists and engineers 74
3.05 Quality of scientific research institutions 80
3.06 Tertiary education enrollment, 2008* 45
3.07 Education expenditure, 2007* 58
3.08 Accessibility of digital content 72
3.09 Internet bandwidth, 2008* 71

Readiness component 74

Individual readiness 95

4.01 Quality of math and science education 72
4.02 Quality of the educational system 66
4.03 Buyer sophistication 79
4.04 Residential telephone connection charge, 2007* 111
4.05 Residential monthly telephone subscription, 2007* 14
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 67

5.01 Extent of staff training 83
5.02 Local availability of research and training 68
5.03 Quality of management schools 97
5.04 Company spending on R&D 60
5.05 University-industry collaboration in R&D 77
5.06 Business telephone connection charge, 2007* 111
5.07 Business monthly telephone subscription, 2007* 36
5.08 Local supplier quality 97
5.09 Computer, comm., and other services imports, 2008* 6
5.10 Availability of new telephone lines 98

Government readiness 60

6.01 Government prioritization of ICT 64
6.02 Gov't procurement of advanced tech. products 62
6.03 Importance of ICT to gov't vision of the future 52

Usage component 54

Individual usage 57

7.01 Mobile telephone subscriptions, 2008* 60
7.02 Personal computers* ..... n/a
7.03 Broadband Internet subscribers, 2008* 64
7.04 Internet users, 2008* 93
7.05 Internet access in schools 55

Business usage 88

8.01 Prevalence of foreign technology licensing 102
8.02 Firm-level technology absorption 85
8.03 Capacity for innovation 50
8.04 Extent of business Internet use 84
8.05 Creative industries exports, 2006* 89
8.06 Utility patents, 2008* 85
8.07 High-tech exports, 2007* 54

Government usage 39

9.01 Government success in ICT promotion 63
9.02 Government Online Service Index, 2009* 24
9.03 ICT use and government efficiency 68
9.04 Presence of ICT in government agencies 64
9.05 E-Participation Index, 2009* 18

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Kenya

Key indicators

Population (millions), 2008 ..... 38.5
GDP per capita (PPP $), 2008 1,712
Mobile phone subscriptions per 100 population, 2008 ..... 42.1
Internet users per 100 population, 2008 ..... 8.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.2
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**90**
2008–2009 (134)	97
2007–2008 (127)	92

Global Competitiveness Index 2009–2010 (133) 98

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Korea, Rep.

Key indicators

Population (millions), 2008 ..... 48.6
GDP per capita (PPP $), 2008 27,692
Mobile phone subscriptions per 100 population, 2008 ..... 94.7
Internet users per 100 population, 2008 ..... 76.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 45.5
Utility patents per million population, 2008 ..... 156.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**15**
2008–2009 (134)	11
2007–2008 (127)	9

Global Competitiveness Index 2009–2010 (133)	19

Environment component 27

Market environment 43

1.01 Venture capital availability 64
1.02 Financial market sophistication 57
1.03 Availability of latest technologies 24
1.04 State of cluster development 23
1.05 Burden of government regulation 98
1.06 Extent and effect of taxation 72
1.07 Total tax rate, 2008* 36
1.08 Time required to start a business, 2009* 48
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 39
1.11 Freedom of the press 71

Political and regulatory environment 38

2.01 Effectiveness of law-making bodies 110
2.02 Laws relating to ICT 7
2.03 Judicial independence 58
2.04 Intellectual property protection 41
2.05 Efficiency of legal framework in settling disputes 62
2.06 Efficiency of legal framework in challenging regs 69
2.07 Property rights 48
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 3
2.10 Level of competition index, 2007* 1

Infrastructure environment 17

3.01 Number of telephone lines, 2008* 23
3.02 Secure Internet servers, 2008* 14
3.03 Electricity production, 2006* 21
3.04 Availability of scientists and engineers 25
3.05 Quality of scientific research institutions 22
3.06 Tertiary education enrollment, 2007* 1
3.07 Education expenditure, 2007* 75
3.08 Accessibility of digital content 8
3.09 Internet bandwidth, 2008* 39

Readiness component 21

Individual readiness 29

4.01 Quality of math and science education 18
4.02 Quality of the educational system 47
4.03 Buyer sophistication 15
4.04 Residential telephone connection charge, 2008* 68
4.05 Residential monthly telephone subscription, 2008* 33
4.06 Fixed broadband tariffs, 2008* 27
4.07 Mobile cellular tariffs, 2008* 81
4.08 Fixed telephone lines tariffs, 2008* 18

Business readiness 20

5.01 Extent of staff training 29
5.02 Local availability of research and training 35
5.03 Quality of management schools 44
5.04 Company spending on R&D 10
5.05 University-industry collaboration in R&D 24
5.06 Business telephone connection charge, 2008* 52
5.07 Business monthly telephone subscription, 2008* 11
5.08 Local supplier quality 38
5.09 Computer, comm., and other services imports, 2008* 31
5.10 Availability of new telephone lines 48

Government readiness 15

6.01 Government prioritization of ICT 22
6.02 Gov't procurement of advanced tech. products 15
6.03 Importance of ICT to gov't vision of the future 8

Usage component 1

Individual usage 13

7.01 Mobile telephone subscriptions, 2008* 63
7.02 Personal computers, 2007* 18
7.03 Broadband Internet subscribers, 2008* 8
7.04 Internet users, 2008* 9
7.05 Internet access in schools 4

Business usage 5

8.01 Prevalence of foreign technology licensing 34
8.02 Firm-level technology absorption 15
8.03 Capacity for innovation 15
8.04 Extent of business Internet use 3
8.05 Creative industries exports, 2006* 20
8.06 Utility patents, 2008* 5
8.07 High-tech exports, 2007* 6

Government usage 1

9.01 Government success in ICT promotion 17
9.02 Government Online Service Index, 2009* 1
9.03 ICT use and government efficiency 5
9.04 Presence of ICT in government agencies 7
9.05 E-Participation Index, 2009* 1

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Kuwait

Key indicators

Population (millions), 2008 ..... 2.7
GDP per capita (PPP $), 2008 39,915
Mobile phone subscriptions per 100 population, 2008 ..... 99.6
Internet users per 100 population, 2008 ..... 34.3
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 8.1
Utility patents per million population, 2008 ..... 5.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**76**
2008–2009 (134)	57
2007–2008 (127)	52

Global Competitiveness Index 2009–2010 (133)	39

Environment component 60

Market environment 50

1.01 Venture capital availability 32
1.02 Financial market sophistication 54
1.03 Availability of latest technologies 55
1.04 State of cluster development 70
1.05 Burden of government regulation 115
1.06 Extent and effect of taxation 9
1.07 Total tax rate, 2008* 8
1.08 Time required to start a business, 2009* 101
1.09 No. of procedures required to start a business, 2009* 115
1.10 Intensity of local competition 45
1.11 Freedom of the press 41

Political and regulatory environment 88

2.01 Effectiveness of law-making bodies 81
2.02 Laws relating to ICT 99
2.03 Judicial independence 48
2.04 Intellectual property protection 47
2.05 Efficiency of legal framework in settling disputes 38
2.06 Efficiency of legal framework in challenging regs 34
2.07 Property rights 45
2.08 No. of procedures to enforce a contract, 2009* 126
2.09 Time to enforce a contract, 2009* 71
2.10 Level of competition index, 2007* 123

Infrastructure environment 59

3.01 Number of telephone lines, 2008* 68
3.02 Secure Internet servers, 2008* 44
3.03 Electricity production, 2006* 8
3.04 Availability of scientists and engineers 72
3.05 Quality of scientific research institutions 83
3.06 Tertiary education enrollment, 2006* 89
3.07 Education expenditure, 2007* 98
3.08 Accessibility of digital content 90
3.09 Internet bandwidth, 2007* 66

Readiness component 82

Individual readiness 48

4.01 Quality of math and science education 89
4.02 Quality of the educational system 81
4.03 Buyer sophistication 78
4.04 Residential telephone connection charge, 2008* 89
4.05 Residential monthly telephone subscription, 2008* 40
4.06 Fixed broadband tariffs, 2008* 78
4.07 Mobile cellular tariffs, 2008* 25
4.08 Fixed telephone lines tariffs, 2008* 1

Business readiness 107

5.01 Extent of staff training 72
5.02 Local availability of research and training 80
5.03 Quality of management schools 98
5.04 Company spending on R&D 100
5.05 University-industry collaboration in R&D 99
5.06 Business telephone connection charge, 2006* 110
5.07 Business monthly telephone subscription, 2006* 86
5.08 Local supplier quality 46
5.09 Computer, comm., and other services imports, 2007* 119
5.10 Availability of new telephone lines 87

Government readiness 115

6.01 Government prioritization of ICT 110
6.02 Gov't procurement of advanced tech. products 114
6.03 Importance of ICT to gov't vision of the future 105

Usage component 74

Individual usage 59

7.01 Mobile telephone subscriptions, 2008* 56
7.02 Personal computers, 2005* 43
7.03 Broadband Internet subscribers, 2008* 84
7.04 Internet users, 2008* 54
7.05 Internet access in schools 79

Business usage 79

8.01 Prevalence of foreign technology licensing 63
8.02 Firm-level technology absorption 42
8.03 Capacity for innovation 85
8.04 Extent of business Internet use 88
8.05 Creative industries exports, 2006* 117
8.06 Utility patents, 2008* 30
8.07 High-tech exports, 2007* 95

Government usage 81

9.01 Government success in ICT promotion 113
9.02 Government Online Service Index, 2009* 35
9.03 ICT use and government efficiency 106
9.04 Presence of ICT in government agencies 101
9.05 E-Participation Index, 2009* 50

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Kyrgyz Republic

Key indicators

Population (millions), 2008 ..... 5.3
GDP per capita (PPP $), 2008 2,185
Mobile phone subscriptions per 100 population, 2008 ..... 62.7
Internet users per 100 population, 2008 ..... 15.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 1.1
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**123**
2008–2009 (134)	115
2007–2008 (127)	114

Global Competitiveness Index 2009–2010 (133)	123

Environment component 106

Market environment 121

1.01 Venture capital availability 111
1.02 Financial market sophistication 121
1.03 Availability of latest technologies 127
1.04 State of cluster development 121
1.05 Burden of government regulation 97
1.06 Extent and effect of taxation 108
1.07 Total tax rate, 2008* 110
1.08 Time required to start a business, 2009* 35
1.09 No. of procedures required to start a business, 2009* 5
1.10 Intensity of local competition 121
1.11 Freedom of the press 128

Political and regulatory environment 106

2.01 Effectiveness of law-making bodies 104
2.02 Laws relating to ICT 122
2.03 Judicial independence 121
2.04 Intellectual property protection 122
2.05 Efficiency of legal framework in settling disputes 125
2.06 Efficiency of legal framework in challenging regs 127
2.07 Property rights 125
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 5
2.10 Level of competition index, 2007* 1

Infrastructure environment 81

3.01 Number of telephone lines, 2008* 95
3.02 Secure Internet servers, 2008* 109
3.03 Electricity production, 2006* 62
3.04 Availability of scientists and engineers 112
3.05 Quality of scientific research institutions 124
3.06 Tertiary education enrollment, 2007* 51
3.07 Education expenditure, 2007* 34
3.08 Accessibility of digital content 96
3.09 Internet bandwidth, 2008* 95

Readiness component 129

Individual readiness 120

4.01 Quality of math and science education 96
4.02 Quality of the educational system 100
4.03 Buyer sophistication 95
4.04 Residential telephone connection charge, 2007* 114
4.05 Residential monthly telephone subscription, 2007* 13
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 126

5.01 Extent of staff training 97
5.02 Local availability of research and training 125
5.03 Quality of management schools 122
5.04 Company spending on R&D 125
5.05 University-industry collaboration in R&D 128
5.06 Business telephone connection charge, 2007* 106
5.07 Business monthly telephone subscription, 2007* 23
5.08 Local supplier quality 124
5.09 Computer, comm., and other services imports, 2008* 90
5.10 Availability of new telephone lines 124

Government readiness 127

6.01 Government prioritization of ICT 125
6.02 Gov't procurement of advanced tech. products 131
6.03 Importance of ICT to gov't vision of the future 128

Usage component 108

Individual usage 99

7.01 Mobile telephone subscriptions, 2008* 96
7.02 Personal computers, 2005* 102
7.03 Broadband Internet subscribers, 2008* 108
7.04 Internet users, 2008* 86
7.05 Internet access in schools 93

Business usage 130

8.01 Prevalence of foreign technology licensing 130
8.02 Firm-level technology absorption 126
8.03 Capacity for innovation 97
8.04 Extent of business Internet use 102
8.05 Creative industries exports, 2006* 99
8.06 Utility patents, 2008* 77
8.07 High-tech exports, 2007* 84

Government usage 104

9.01 Government success in ICT promotion 125
9.02 Government Online Service Index, 2009* 69
9.03 ICT use and government efficiency 130
9.04 Presence of ICT in government agencies 127
9.05 E-Participation Index, 2009* 28

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Latvia

Key indicators

Population (millions), 2008 ..... 2.3
GDP per capita (PPP $), 2008 17,106
Mobile phone subscriptions per 100 population, 2008 ..... 98.9
Internet users per 100 population, 2008 ..... 60.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 35.4
Utility patents per million population, 2008 ..... 0.4

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**52**
2008–2009 (134)	48
2007–2008 (127)	44

Global Competitiveness Index 2009–2010 (133) 68

Environment component 48

Market environment 62

1.01 Venture capital availability 79
1.02 Financial market sophistication 66
1.03 Availability of latest technologies 71
1.04 State of cluster development 113
1.05 Burden of government regulation 69
1.06 Extent and effect of taxation 80
1.07 Total tax rate, 2008* 42
1.08 Time required to start a business, 2009* 57
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 79
1.11 Freedom of the press 56

Political and regulatory environment 53

2.01 Effectiveness of law-making bodies 96
2.02 Laws relating to ICT 75
2.03 Judicial independence 72
2.04 Intellectual property protection 60
2.05 Efficiency of legal framework in settling disputes 97
2.06 Efficiency of legal framework in challenging regs 104
2.07 Property rights 52
2.08 No. of procedures to enforce a contract, 2009* 9
2.09 Time to enforce a contract, 2009* 15
2.10 Level of competition index, 2007* 1

Infrastructure environment 47

3.01 Number of telephone lines, 2008* 45
3.02 Secure Internet servers, 2008* 35
3.03 Electricity production, 2006* 74
3.04 Availability of scientists and engineers 104
3.05 Quality of scientific research institutions 66
3.06 Tertiary education enrollment, 2007* 16
3.07 Education expenditure, 2007* 23
3.08 Accessibility of digital content 46
3.09 Internet bandwidth, 2007* 41

Readiness component 67

Individual readiness 50

4.01 Quality of math and science education 60
4.02 Quality of the educational system 57
4.03 Buyer sophistication 84
4.04 Residential telephone connection charge, 2006* 84
4.05 Residential monthly telephone subscription, 2008* 43
4.06 Fixed broadband tariffs, 2008* 50
4.07 Mobile cellular tariffs, 2008* 23
4.08 Fixed telephone lines tariffs, 2008* 87

Business readiness 69

5.01 Extent of staff training 70
5.02 Local availability of research and training 66
5.03 Quality of management schools 50
5.04 Company spending on R&D 95
5.05 University-industry collaboration in R&D 86
5.06 Business telephone connection charge, 2006* 93
5.07 Business monthly telephone subscription, 2006* 80
5.08 Local supplier quality 66
5.09 Computer, comm., and other services imports, 2008* 51
5.10 Availability of new telephone lines 62

Government readiness 112

6.01 Government prioritization of ICT 109
6.02 Gov't procurement of advanced tech. products 102
6.03 Importance of ICT to gov't vision of the future 112

Usage component 48

Individual usage 40

7.01 Mobile telephone subscriptions, 2008* 57
7.02 Personal computers, 2006* 33
7.03 Broadband Internet subscribers, 2008* 46
7.04 Internet users, 2008* 28
7.05 Internet access in schools 30

Business usage 68

8.01 Prevalence of foreign technology licensing 83
8.02 Firm-level technology absorption 88
8.03 Capacity for innovation 68
8.04 Extent of business Internet use 50
8.05 Creative industries exports, 2006* 70
8.06 Utility patents, 2008* 66
8.07 High-tech exports, 2007* 46

Government usage 62

9.01 Government success in ICT promotion 104
9.02 Government Online Service Index, 2009* 41
9.03 ICT use and government efficiency 100
9.04 Presence of ICT in government agencies 63
9.05 E-Participation Index, 2009* 44

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Lesotho

Key indicators

Population (millions), 2008 ..... 2.0
GDP per capita (PPP $), 2008 1,305
Mobile phone subscriptions per 100 population, 2008 ..... 28.3
Internet users per 100 population, 2008 ..... 3.6
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**107**
2008–2009 (134)	118
2007–2008 (127)	122
Global Competitiveness Index 2009–2010 (133)	107

Environment component 96

Market environment 101

1.01 Venture capital availability 90
1.02 Financial market sophistication 106
1.03 Availability of latest technologies 119
1.04 State of cluster development 84
1.05 Burden of government regulation 46
1.06 Extent and effect of taxation 71
1.07 Total tax rate, 2008* 12
1.08 Time required to start a business, 2009* 107
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 104
1.11 Freedom of the press 121

Political and regulatory environment 86

2.01 Effectiveness of law-making bodies 89
2.02 Laws relating to ICT 113
2.03 Judicial independence 83
2.04 Intellectual property protection 71
2.05 Efficiency of legal framework in settling disputes 117
2.06 Efficiency of legal framework in challenging regs 124
2.07 Property rights 90
2.08 No. of procedures to enforce a contract, 2009* 99
2.09 Time to enforce a contract, 2009* 98
2.10 Level of competition index, 2007* 1

Infrastructure environment 102

3.01 Number of telephone lines, 2008* 107
3.02 Secure Internet servers, 2008* 115
3.03 Electricity production, 2006* 123
3.04 Availability of scientists and engineers 97
3.05 Quality of scientific research institutions 113
3.06 Tertiary education enrollment, 2006* 121
3.07 Education expenditure, 2007* 2
3.08 Accessibility of digital content 130
3.09 Internet bandwidth, 2008* 121

Readiness component 110

Individual readiness 100

4.01 Quality of math and science education 92
4.02 Quality of the educational system 72
4.03 Buyer sophistication 88
4.04 Residential telephone connection charge, 2008* 70
4.05 Residential monthly telephone subscription, 2008* 61
4.06 Fixed broadband tariffs, 2008* 96
4.07 Mobile cellular tariffs, 2008* 87
4.08 Fixed telephone lines tariffs, 2008* 107

Business readiness 111

5.01 Extent of staff training 77
5.02 Local availability of research and training 98
5.03 Quality of management schools 105
5.04 Company spending on R&D 48
5.05 University-industry collaboration in R&D 107
5.06 Business telephone connection charge, 2007* 54
5.07 Business monthly telephone subscription, 2007* 47
5.08 Local supplier quality 117
5.09 Computer, comm., and other services imports, 2007* 117
5.10 Availability of new telephone lines 126

Government readiness 109

6.01 Government prioritization of ICT 116
6.02 Gov't procurement of advanced tech. products 79
6.03 Importance of ICT to gov't vision of the future 111

Usage component 115

Individual usage 119

7.01 Mobile telephone subscriptions, 2008* 118
7.02 Personal computers, 2005* 124
7.03 Broadband Internet subscribers, 2008* 127
7.04 Internet users, 2008* 116
7.05 Internet access in schools 107

Business usage 98

8.01 Prevalence of foreign technology licensing 111
8.02 Firm-level technology absorption 124
8.03 Capacity for innovation 75
8.04 Extent of business Internet use 122
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2005* 114

Government usage 116

9.01 Government success in ICT promotion 115
9.02 Government Online Service Index, 2009* 87
9.03 ICT use and government efficiency 110
9.04 Presence of ICT in government agencies 118
9.05 E-Participation Index, 2009* 94

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Libya

Key indicators

Population (millions), 2008.....6.3
GDP per capita (PPP $), 2008.....14,192
Mobile phone subscriptions per 100 population, 2008.....76.7
Internet users per 100 population, 2008.....5.1
Internet bandwidth (Mb/s) per 10,000 population, 2007.....0.5
Utility patents per million population, 2008.....0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**103**
2008–2009 (134)	101
2007–2008 (127)	105

Global Competitiveness Index 2009–2010 (133) 88

Environment component 110

Market environment 124

1.01 Venture capital availability.....63
1.02 Financial market sophistication.....131
1.03 Availability of latest technologies.....70
1.04 State of cluster development.....89
1.05 Burden of government regulation.....73
1.06 Extent and effect of taxation.....23
1.07 Total tax rate*.....n/a
1.08 Time required to start a business*.....n/a
1.09 No. of procedures required to start a business*.....n/a
1.10 Intensity of local competition.....122
1.11 Freedom of the press.....131

Political and regulatory environment 125

2.01 Effectiveness of law-making bodies.....69
2.02 Laws relating to ICT.....130
2.03 Judicial independence.....63
2.04 Intellectual property protection.....82
2.05 Efficiency of legal framework in settling disputes.....52
2.06 Efficiency of legal framework in challenging regs.....61
2.07 Property rights.....93
2.08 No. of procedures to enforce a contract*.....n/a
2.09 Time to enforce a contract*.....n/a
2.10 Level of competition index, 2007*.....126

Infrastructure environment 68

3.01 Number of telephone lines, 2008*.....73
3.02 Secure Internet servers, 2008*.....116
3.03 Electricity production, 2006*.....54
3.04 Availability of scientists and engineers.....66
3.05 Quality of scientific research institutions.....91
3.06 Tertiary education enrollment, 2003*.....34
3.07 Education expenditure*.....n/a
3.08 Accessibility of digital content.....93
3.09 Internet bandwidth, 2007*.....101

Readiness component 111

Individual readiness 103

4.01 Quality of math and science education.....80
4.02 Quality of the educational system.....128
4.03 Buyer sophistication.....109
4.04 Residential telephone connection charge, 2006*.....46
4.05 Residential monthly telephone subscription, 2006*.....4
4.06 Fixed broadband tariffs*.....n/a
4.07 Mobile cellular tariffs*.....n/a
4.08 Fixed telephone lines tariffs*.....n/a

Business readiness 130

5.01 Extent of staff training.....99
5.02 Local availability of research and training.....114
5.03 Quality of management schools.....133
5.04 Company spending on R&D.....129
5.05 University-industry collaboration in R&D.....115
5.06 Business telephone connection charge, 2006*.....101
5.07 Business monthly telephone subscription, 2006*.....64
5.08 Local supplier quality.....102
5.09 Computer, comm., and other services imports, 2007*.....116
5.10 Availability of new telephone lines.....88

Government readiness 82

6.01 Government prioritization of ICT.....58
6.02 Gov't procurement of advanced tech. products.....99
6.03 Importance of ICT to gov't vision of the future.....98

Usage component 93

Individual usage 103

7.01 Mobile telephone subscriptions, 2008*.....84
7.02 Personal computers, 2005*.....99
7.03 Broadband Internet subscribers, 2008*.....103
7.04 Internet users, 2008*.....112
7.05 Internet access in schools.....121

Business usage 59

8.01 Prevalence of foreign technology licensing.....94
8.02 Firm-level technology absorption.....66
8.03 Capacity for innovation.....133
8.04 Extent of business Internet use.....113
8.05 Creative industries exports*.....n/a
8.06 Utility patents, 2008*.....90
8.07 High-tech exports*.....n/a

Government usage 100

9.01 Government success in ICT promotion.....61
9.02 Government Online Service Index, 2009*.....113
9.03 ICT use and government efficiency.....105
9.04 Presence of ICT in government agencies.....103
9.05 E-Participation Index, 2009*.....64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Lithuania

Key indicators

Population (millions), 2008 ..... 3.4
GDP per capita (PPP $), 2008 18,977
Mobile phone subscriptions per 100 population, 2008 ..... 151.2
Internet users per 100 population, 2008 ..... 55.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 97.1
Utility patents per million population, 2008 ..... 3.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**41**
2008–2009 (134)	35
2007–2008 (127)	33
Global Competitiveness Index 2009–2010 (133)	53

Environment component 44

Market environment 66

1.01 Venture capital availability 73
1.02 Financial market sophistication 75
1.03 Availability of latest technologies 50
1.04 State of cluster development 92
1.05 Burden of government regulation 96
1.06 Extent and effect of taxation 83
1.07 Total tax rate, 2008* 72
1.08 Time required to start a business, 2009* 79
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 73
1.11 Freedom of the press 48

Political and regulatory environment 55

2.01 Effectiveness of law-making bodies 93
2.02 Laws relating to ICT 46
2.03 Judicial independence 71
2.04 Intellectual property protection 56
2.05 Efficiency of legal framework in settling disputes 76
2.06 Efficiency of legal framework in challenging regs 82
2.07 Property rights 61
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 7
2.10 Level of competition index, 2007* 59

Infrastructure environment 41

3.01 Number of telephone lines, 2008* 54
3.02 Secure Internet servers, 2008* 41
3.03 Electricity production, 2006* 57
3.04 Availability of scientists and engineers 70
3.05 Quality of scientific research institutions 46
3.06 Tertiary education enrollment, 2007* 11
3.07 Education expenditure, 2007* 46
3.08 Accessibility of digital content 33
3.09 Internet bandwidth, 2008* 25

Readiness component 61

Individual readiness 64

4.01 Quality of math and science education 37
4.02 Quality of the educational system 76
4.03 Buyer sophistication 87
4.04 Residential telephone connection charge, 2008* 99
4.05 Residential monthly telephone subscription, 2008* 72
4.06 Fixed broadband tariffs, 2008* 14
4.07 Mobile cellular tariffs, 2008* 43
4.08 Fixed telephone lines tariffs, 2008* 95

Business readiness 58

5.01 Extent of staff training 60
5.02 Local availability of research and training 51
5.03 Quality of management schools 60
5.04 Company spending on R&D 52
5.05 University-industry collaboration in R&D 45
5.06 Business telephone connection charge, 2008* 82
5.07 Business monthly telephone subscription, 2008* 50
5.08 Local supplier quality 44
5.09 Computer, comm., and other services imports, 2007* 98
5.10 Availability of new telephone lines 39

Government readiness 85

6.01 Government prioritization of ICT 78
6.02 Gov't procurement of advanced tech. products 100
6.03 Importance of ICT to gov't vision of the future 77

Usage component 34

Individual usage 32

7.01 Mobile telephone subscriptions, 2008* 7
7.02 Personal computers, 2008* 39
7.03 Broadband Internet subscribers, 2008* 31
7.04 Internet users, 2008* 36
7.05 Internet access in schools 32

Business usage 48

8.01 Prevalence of foreign technology licensing 81
8.02 Firm-level technology absorption 64
8.03 Capacity for innovation 53
8.04 Extent of business Internet use 22
8.05 Creative industries exports, 2006* 59
8.06 Utility patents, 2008* 34
8.07 High-tech exports, 2007* 30

Government usage 31

9.01 Government success in ICT promotion 69
9.02 Government Online Service Index, 2009* 29
9.03 ICT use and government efficiency 36
9.04 Presence of ICT in government agencies 35
9.05 E-Participation Index, 2009* 19

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Luxembourg

Key indicators

Networked Readiness Index

Environment component 13

Readiness component 20

Usage component 23

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Macedonia, FYR

Key indicators

Population (millions), 2008 ..... 2.0
GDP per capita (PPP $), 2008 9,164
Mobile phone subscriptions per 100 population, 2008 ..... 122.6
Internet users per 100 population, 2008 ..... 41.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.2
Utility patents per million population, 2008 ..... 0.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**73**
2008–2009 (134)	79
2007–2008 (127)	83

Global Competitiveness Index 2009–2010 (133) 84

Environment component 77

Market environment 83

1.01 Venture capital availability 61
1.02 Financial market sophistication 93
1.03 Availability of latest technologies 103
1.04 State of cluster development 109
1.05 Burden of government regulation 62
1.06 Extent and effect of taxation 41
1.07 Total tax rate, 2008* 10
1.08 Time required to start a business, 2009* 5
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 102
1.11 Freedom of the press 117

Political and regulatory environment 87

2.01 Effectiveness of law-making bodies 65
2.02 Laws relating to ICT 74
2.03 Judicial independence 105
2.04 Intellectual property protection 91
2.05 Efficiency of legal framework in settling disputes 92
2.06 Efficiency of legal framework in challenging regs 95
2.07 Property rights 95
2.08 No. of procedures to enforce a contract, 2009* 64
2.09 Time to enforce a contract, 2009* 21
2.10 Level of competition index, 2007* 82

Infrastructure environment 65

3.01 Number of telephone lines, 2008* 58
3.02 Secure Internet servers, 2008* 64
3.03 Electricity production, 2006* 60
3.04 Availability of scientists and engineers 81
3.05 Quality of scientific research institutions 90
3.06 Tertiary education enrollment, 2007* 60
3.07 Education expenditure, 2007* 39
3.08 Accessibility of digital content 91
3.09 Internet bandwidth, 2007* 113

Readiness component 75

Individual readiness 86

4.01 Quality of math and science education 57
4.02 Quality of the educational system 59
4.03 Buyer sophistication 104
4.04 Residential telephone connection charge, 2008* 62
4.05 Residential monthly telephone subscription, 2008* 113
4.06 Fixed broadband tariffs, 2008* 38
4.07 Mobile cellular tariffs, 2008* 107
4.08 Fixed telephone lines tariffs, 2008* 75

Business readiness 82

5.01 Extent of staff training 103
5.02 Local availability of research and training 101
5.03 Quality of management schools 78
5.04 Company spending on R&D 114
5.05 University-industry collaboration in R&D 78
5.06 Business telephone connection charge, 2008* 47
5.07 Business monthly telephone subscription, 2008* 116
5.08 Local supplier quality 85
5.09 Computer, comm., and other services imports, 2007* 26
5.10 Availability of new telephone lines 55

Government readiness 59

6.01 Government prioritization of ICT 43
6.02 Gov't procurement of advanced tech. products 106
6.03 Importance of ICT to gov't vision of the future 50

Usage component 65

Individual usage 44

7.01 Mobile telephone subscriptions, 2008* 25
7.02 Personal computers, 2007* 29
7.03 Broadband Internet subscribers, 2008* 45
7.04 Internet users, 2008* 46
7.05 Internet access in schools 61

Business usage 125

8.01 Prevalence of foreign technology licensing 101
8.02 Firm-level technology absorption 127
8.03 Capacity for innovation 86
8.04 Extent of business Internet use 128
8.05 Creative industries exports, 2006* 86
8.06 Utility patents, 2008* 61
8.07 High-tech exports, 2007* 83

Government usage 66

9.01 Government success in ICT promotion 72
9.02 Government Online Service Index, 2009* 68
9.03 ICT use and government efficiency 69
9.04 Presence of ICT in government agencies 72
9.05 E-Participation Index, 2009* 52

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Madagascar

Key indicators

Population (millions), 2008 ..... 19.1
GDP per capita (PPP $), 2008 996
Mobile phone subscriptions per 100 population, 2008 ..... 25.3
Internet users per 100 population, 2008 ..... 1.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**121**
2008–2009 (134)	112
2007–2008 (127)	104

Global Competitiveness Index 2009–2010 (133)	121

Environment component 119

Readiness component 118

Usage component 111

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Malawi

Key indicators

Population (millions), 2008 ..... 14.3
GDP per capita (PPP $), 2008 836
Mobile phone subscriptions per 100 population, 2008 ..... 12.0
Internet users per 100 population, 2008 ..... 2.1
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**119**
2008–2009 (134)	110
2007–2008 (127)	n/a

Global Competitiveness Index 2009–2010 (133)	119

Environment component 93

Market environment 89

1.01 Venture capital availability 121
1.02 Financial market sophistication 94
1.03 Availability of latest technologies 112
1.04 State of cluster development 83
1.05 Burden of government regulation 26
1.06 Extent and effect of taxation 100
1.07 Total tax rate, 2008* 21
1.08 Time required to start a business, 2009* 105
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 85
1.11 Freedom of the press 60

Political and regulatory environment 69

2.01 Effectiveness of law-making bodies 88
2.02 Laws relating to ICT 106
2.03 Judicial independence 39
2.04 Intellectual property protection 70
2.05 Efficiency of legal framework in settling disputes 63
2.06 Efficiency of legal framework in challenging regs 45
2.07 Property rights 75
2.08 No. of procedures to enforce a contract, 2009* 104
2.09 Time to enforce a contract, 2009* 42
2.10 Level of competition index, 2007* 82

Infrastructure environment 119

3.01 Number of telephone lines, 2008* 116
3.02 Secure Internet servers, 2008* 125
3.03 Electricity production, 2006* 122
3.04 Availability of scientists and engineers 105
3.05 Quality of scientific research institutions 89
3.06 Tertiary education enrollment, 2007* 133
3.07 Education expenditure, 2007* 88
3.08 Accessibility of digital content 110
3.09 Internet bandwidth, 2007* 123

Readiness component 125

Individual readiness 132

4.01 Quality of math and science education 102
4.02 Quality of the educational system 65
4.03 Buyer sophistication 120
4.04 Residential telephone connection charge* ..... n/a
4.05 Residential monthly telephone subscription* ..... n/a
4.06 Fixed broadband tariffs, 2008* 117
4.07 Mobile cellular tariffs, 2008* 117
4.08 Fixed telephone lines tariffs, 2008* 97

Business readiness 114

5.01 Extent of staff training 75
5.02 Local availability of research and training 97
5.03 Quality of management schools 116
5.04 Company spending on R&D 89
5.05 University-industry collaboration in R&D 83
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 107
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 125

Government readiness 79

6.01 Government prioritization of ICT 86
6.02 Gov't procurement of advanced tech. products 71
6.03 Importance of ICT to gov't vision of the future 81

Usage component 123

Individual usage 129

7.01 Mobile telephone subscriptions, 2008* 129
7.02 Personal computers, 2005* 125
7.03 Broadband Internet subscribers, 2008* 120
7.04 Internet users, 2008* 119
7.05 Internet access in schools 128

Business usage 120

8.01 Prevalence of foreign technology licensing 103
8.02 Firm-level technology absorption 118
8.03 Capacity for innovation 112
8.04 Extent of business Internet use 103
8.05 Creative industries exports, 2006* 101
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 98

Government usage 98

9.01 Government success in ICT promotion 84
9.02 Government Online Service Index, 2009* 130
9.03 ICT use and government efficiency 103
9.04 Presence of ICT in government agencies 100
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Malaysia

Key indicators

Population (millions), 2008 ..... 27.0
GDP per capita (PPP $), 2008 14,081
Mobile phone subscriptions per 100 population, 2008 ..... 102.6
Internet users per 100 population, 2008 ..... 55.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 23.7
Utility patents per million population, 2008 ..... 5.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**27**
2008–2009 (134)	28
2007–2008 (127)	26
Global Competitiveness Index 2009–2010 (133)	24

Environment component 37

Market environment 32

Political and regulatory environment 25

Infrastructure environment 51

Readiness component 11

Individual readiness 11

Business readiness 26

Government readiness 11

Usage component 28

Individual usage 46

Business usage 22

Government usage 12

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mali

Key indicators

Population (millions), 2008 ..... 12.7
GDP per capita (PPP $), 2008 1,129
Mobile phone subscriptions per 100 population, 2008 ..... 27.1
Internet users per 100 population, 2008 ..... 1.6
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.5
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**96**
2008–2009 (134)	107
2007–2008 (127)	99
Global Competitiveness Index 2009–2010 (133)	130

Environment component 101

Market environment 98

1.01 Venture capital availability 130
1.02 Financial market sophistication 118
1.03 Availability of latest technologies 106
1.04 State of cluster development 124
1.05 Burden of government regulation 47
1.06 Extent and effect of taxation 90
1.07 Total tax rate, 2008* 101
1.08 Time required to start a business, 2009* 52
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 77
1.11 Freedom of the press 64

Political and regulatory environment 79

2.01 Effectiveness of law-making bodies 50
2.02 Laws relating to ICT 84
2.03 Judicial independence 79
2.04 Intellectual property protection 83
2.05 Efficiency of legal framework in settling disputes 64
2.06 Efficiency of legal framework in challenging regs 68
2.07 Property rights 94
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 89
2.10 Level of competition index, 2007* 82

Infrastructure environment 114

3.01 Number of telephone lines, 2008* 124
3.02 Secure Internet servers, 2008* 110
3.03 Electricity production, 2006* 128
3.04 Availability of scientists and engineers 85
3.05 Quality of scientific research institutions 72
3.06 Tertiary education enrollment, 2007* 118
3.07 Education expenditure, 2007* 84
3.08 Accessibility of digital content 120
3.09 Internet bandwidth, 2008* 100

Readiness component 83

Individual readiness 98

4.01 Quality of math and science education 108
4.02 Quality of the educational system 121
4.03 Buyer sophistication 130
4.04 Residential telephone connection charge, 2008* 98
4.05 Residential monthly telephone subscription, 2008* 48
4.06 Fixed broadband tariffs, 2008* 97
4.07 Mobile cellular tariffs, 2008* 75
4.08 Fixed telephone lines tariffs, 2008* 84

Business readiness 109

5.01 Extent of staff training 124
5.02 Local availability of research and training 100
5.03 Quality of management schools 113
5.04 Company spending on R&D 82
5.05 University-industry collaboration in R&D 100
5.06 Business telephone connection charge, 2007* 86
5.07 Business monthly telephone subscription, 2007* 79
5.08 Local supplier quality 106
5.09 Computer, comm., and other services imports, 2007* 87
5.10 Availability of new telephone lines 95

Government readiness 40

6.01 Government prioritization of ICT 40
6.02 Gov't procurement of advanced tech. products 41
6.03 Importance of ICT to gov't vision of the future 44

Usage component 106

Individual usage 122

7.01 Mobile telephone subscriptions, 2008* 121
7.02 Personal computers, 2007* 116
7.03 Broadband Internet subscribers, 2008* 115
7.04 Internet users, 2008* 124
7.05 Internet access in schools 110

Business usage 108

8.01 Prevalence of foreign technology licensing 105
8.02 Firm-level technology absorption 80
8.03 Capacity for innovation 122
8.04 Extent of business Internet use 95
8.05 Creative industries exports, 2004* 112
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 101

Government usage 73

9.01 Government success in ICT promotion 44
9.02 Government Online Service Index, 2009* 102
9.03 ICT use and government efficiency 55
9.04 Presence of ICT in government agencies 49
9.05 E-Participation Index, 2009* 86

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Malta

Key indicators

Population (millions), 2008 ..... 0.4
GDP per capita (PPP $), 2008 23,971
Mobile phone subscriptions per 100 population, 2008 ..... 94.6
Internet users per 100 population, 2008 ..... 48.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 76.2
Utility patents per million population, 2008 ..... 4.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**26**
2008–2009 (134)	26
2007–2008 (127)	27

Global Competitiveness Index 2009–2010 (133)	52

Environment component 28

Market environment 47

1.01 Venture capital availability 43
1.02 Financial market sophistication 35
1.03 Availability of latest technologies 30
1.04 State of cluster development 68
1.05 Burden of government regulation 88
1.06 Extent and effect of taxation 33
1.07 Total tax rate* ..... n/a
1.08 Time required to start a business* ..... n/a
1.09 No. of procedures required to start a business* ..... n/a
1.10 Intensity of local competition 28
1.11 Freedom of the press 36

Political and regulatory environment 22

2.01 Effectiveness of law-making bodies 14
2.02 Laws relating to ICT 25
2.03 Judicial independence 31
2.04 Intellectual property protection 39
2.05 Efficiency of legal framework in settling disputes 41
2.06 Efficiency of legal framework in challenging regs 43
2.07 Property rights 33
2.08 No. of procedures to enforce a contract* ..... n/a
2.09 Time to enforce a contract* ..... n/a
2.10 Level of competition index, 2007* 1

Infrastructure environment 27

3.01 Number of telephone lines, 2008* 5
3.02 Secure Internet servers, 2008* 8
3.03 Electricity production, 2006* 40
3.04 Availability of scientists and engineers 82
3.05 Quality of scientific research institutions 69
3.06 Tertiary education enrollment, 2005* 69
3.07 Education expenditure, 2007* 50
3.08 Accessibility of digital content 26
3.09 Internet bandwidth, 2008* 28

Readiness component 15

Individual readiness 15

4.01 Quality of math and science education 28
4.02 Quality of the educational system 21
4.03 Buyer sophistication 59
4.04 Residential telephone connection charge, 2007* 30
4.05 Residential monthly telephone subscription, 2007* 18
4.06 Fixed broadband tariffs, 2008* 13
4.07 Mobile cellular tariffs, 2008* 36
4.08 Fixed telephone lines tariffs, 2008* 28

Business readiness 42

5.01 Extent of staff training 49
5.02 Local availability of research and training 58
5.03 Quality of management schools 42
5.04 Company spending on R&D 53
5.05 University-industry collaboration in R&D 57
5.06 Business telephone connection charge, 2007* 98
5.07 Business monthly telephone subscription, 2007* 99
5.08 Local supplier quality 63
5.09 Computer, comm., and other services imports, 2008* 14
5.10 Availability of new telephone lines 32

Government readiness 4

6.01 Government prioritization of ICT 2
6.02 Gov't procurement of advanced tech. products 21
6.03 Importance of ICT to gov't vision of the future 3

Usage component 25

Individual usage 27

7.01 Mobile telephone subscriptions, 2008* 64
7.02 Personal computers* ..... n/a
7.03 Broadband Internet subscribers, 2008* 17
7.04 Internet users, 2008* 41
7.05 Internet access in schools 22

Business usage 27

8.01 Prevalence of foreign technology licensing 42
8.02 Firm-level technology absorption 43
8.03 Capacity for innovation 61
8.04 Extent of business Internet use 36
8.05 Creative industries exports, 2006* 61
8.06 Utility patents, 2008* 31
8.07 High-tech exports, 2007* 2

Government usage 19

9.01 Government success in ICT promotion 3
9.02 Government Online Service Index, 2009* 34
9.03 ICT use and government efficiency 9
9.04 Presence of ICT in government agencies 17
9.05 E-Participation Index, 2009* 34

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mauritania

Key indicators

Population (millions), 2008 ..... 3.2
GDP per capita (PPP $), 2008 2,055
Mobile phone subscriptions per 100 population, 2008 ..... 65.1
Internet users per 100 population, 2008 ..... 1.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.8
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**102**
2008–2009 (134)	109
2007–2008 (127)	97
Global Competitiveness Index 2009–2010 (133)	127

Environment component 111

Market environment 97

1.01	Venture capital availability	106
1.02	Financial market sophistication	123
1.03	Availability of latest technologies	82
1.04	State of cluster development	115
1.05	Burden of government regulation	9
1.06	Extent and effect of taxation	54
1.07	Total tax rate, 2008*	127
1.08	Time required to start a business, 2009*	64
1.09	No. of procedures required to start a business, 2009*	83
1.10	Intensity of local competition	97
1.11	Freedom of the press	67

Political and regulatory environment 96

2.01	Effectiveness of law-making bodies	79
2.02	Laws relating to ICT	117
2.03	Judicial independence	107
2.04	Intellectual property protection	121
2.05	Efficiency of legal framework in settling disputes	89
2.06	Efficiency of legal framework in challenging regs	110
2.07	Property rights	114
2.08	No. of procedures to enforce a contract, 2009*	117
2.09	Time to enforce a contract, 2009*	21
2.10	Level of competition index, 2007*	1

Infrastructure environment 131

3.01	Number of telephone lines, 2008*	112
3.02	Secure Internet servers, 2008*	96
3.03	Electricity production, 2006*	118
3.04	Availability of scientists and engineers	116
3.05	Quality of scientific research institutions	131
3.06	Tertiary education enrollment, 2007*	119
3.07	Education expenditure, 2007*	108
3.08	Accessibility of digital content	108
3.09	Internet bandwidth, 2008*	98

Readiness component 101

Individual readiness 118

4.01	Quality of math and science education	95
4.02	Quality of the educational system	124
4.03	Buyer sophistication	125
4.04	Residential telephone connection charge, 2007*	28
4.05	Residential monthly telephone subscription, 2007*	54
4.06	Fixed broadband tariffs, 2008*	102
4.07	Mobile cellular tariffs, 2008*	94
4.08	Fixed telephone lines tariffs, 2008*	108

Business readiness 100

5.01	Extent of staff training	128
5.02	Local availability of research and training	126
5.03	Quality of management schools	131
5.04	Company spending on R&D	97
5.05	University-industry collaboration in R&D	129
5.06	Business telephone connection charge, 2007*	20
5.07	Business monthly telephone subscription, 2007*	27
5.08	Local supplier quality	118
5.09	Computer, comm., and other services imports*	n/a
5.10	Availability of new telephone lines	47

Government readiness 61

6.01	Government prioritization of ICT	53
6.02	Gov't procurement of advanced tech. products	109
6.03	Importance of ICT to gov't vision of the future	42

Usage component 98

Individual usage 108

7.01	Mobile telephone subscriptions, 2008*	94
7.02	Personal computers, 2006*	86
7.03	Broadband Internet subscribers, 2008*	100
7.04	Internet users, 2008*	120
7.05	Internet access in schools	120

Business usage 94

8.01	Prevalence of foreign technology licensing	128
8.02	Firm-level technology absorption	86
8.03	Capacity for innovation	105
8.04	Extent of business Internet use	96
8.05	Creative industries exports, 2006*	117
8.06	Utility patents, 2008*	90
8.07	High-tech exports*	n/a

Government usage 84

9.01	Government success in ICT promotion	56
9.02	Government Online Service Index, 2009*	122
9.03	ICT use and government efficiency	59
9.04	Presence of ICT in government agencies	38
9.05	E-Participation Index, 2009*	86

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mauritius

Key indicators

Population (millions), 2008 ..... 1.3
GDP per capita (PPP $), 2008 12,011
Mobile phone subscriptions per 100 population, 2008 ..... 80.7
Internet users per 100 population, 2008 ..... 22.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 3.6
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**53**
2008–2009 (134)	51
2007–2008 (127)	54

Global Competitiveness Index 2009–2010 (133) 57

Environment component 42

Market environment 31

1.01 Venture capital availability 45
1.02 Financial market sophistication 42
1.03 Availability of latest technologies 52
1.04 State of cluster development 44
1.05 Burden of government regulation 29
1.06 Extent and effect of taxation 6
1.07 Total tax rate, 2008* 17
1.08 Time required to start a business, 2009* 12
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 72
1.11 Freedom of the press 47

Political and regulatory environment 31

2.01 Effectiveness of law-making bodies 16
2.02 Laws relating to ICT 52
2.03 Judicial independence 33
2.04 Intellectual property protection 48
2.05 Efficiency of legal framework in settling disputes 35
2.06 Efficiency of legal framework in challenging regs 38
2.07 Property rights 36
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 99
2.10 Level of competition index, 2007* 1

Infrastructure environment 84

3.01 Number of telephone lines, 2008* 46
3.02 Secure Internet servers, 2008* 46
3.03 Electricity production, 2007* 80
3.04 Availability of scientists and engineers 107
3.05 Quality of scientific research institutions 85
3.06 Tertiary education enrollment, 2008* 97
3.07 Education expenditure, 2007* 90
3.08 Accessibility of digital content 80
3.09 Internet bandwidth, 2008* 81

Readiness component 45

Individual readiness 44

4.01 Quality of math and science education 65
4.02 Quality of the educational system 51
4.03 Buyer sophistication 61
4.04 Residential telephone connection charge, 2008* 57
4.05 Residential monthly telephone subscription, 2008* 29
4.06 Fixed broadband tariffs, 2008* 93
4.07 Mobile cellular tariffs, 2008* 24
4.08 Fixed telephone lines tariffs, 2008* 56

Business readiness 68

5.01 Extent of staff training 44
5.02 Local availability of research and training 93
5.03 Quality of management schools 91
5.04 Company spending on R&D 66
5.05 University-industry collaboration in R&D 91
5.06 Business telephone connection charge, 2008* 83
5.07 Business monthly telephone subscription, 2008* 53
5.08 Local supplier quality 72
5.09 Computer, comm., and other services imports, 2008* 39
5.10 Availability of new telephone lines 70

Government readiness 50

6.01 Government prioritization of ICT 26
6.02 Gov't procurement of advanced tech. products 73
6.03 Importance of ICT to gov't vision of the future 53

Usage component 75

Individual usage 70

7.01 Mobile telephone subscriptions, 2008* 80
7.02 Personal computers, 2006* 47
7.03 Broadband Internet subscribers, 2008* 52
7.04 Internet users, 2008* 78
7.05 Internet access in schools 78

Business usage 66

8.01 Prevalence of foreign technology licensing 62
8.02 Firm-level technology absorption 62
8.03 Capacity for innovation 94
8.04 Extent of business Internet use 72
8.05 Creative industries exports, 2006* 69
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 42

Government usage 77

9.01 Government success in ICT promotion 43
9.02 Government Online Service Index, 2009* 80
9.03 ICT use and government efficiency 63
9.04 Presence of ICT in government agencies 76
9.05 E-Participation Index, 2009* 104

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mexico

Key indicators

Population (millions), 2008 ..... 106.4
GDP per capita (PPP $), 2008 14,534
Mobile phone subscriptions per 100 population, 2008 ..... 69.4
Internet users per 100 population, 2008 ..... 21.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 2.8
Utility patents per million population, 2008 ..... 0.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**78**
2008–2009 (134)	67
2007–2008 (127)	58
Global Competitiveness Index 2009–2010 (133)	60

Environment component 73

Market environment 73

1.01 Venture capital availability 98
1.02 Financial market sophistication 53
1.03 Availability of latest technologies 79
1.04 State of cluster development 53
1.05 Burden of government regulation 117
1.06 Extent and effect of taxation 91
1.07 Total tax rate, 2008* 99
1.08 Time required to start a business, 2009* 41
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 94
1.11 Freedom of the press 50

Political and regulatory environment 70

2.01 Effectiveness of law-making bodies 105
2.02 Laws relating to ICT 67
2.03 Judicial independence 91
2.04 Intellectual property protection 81
2.05 Efficiency of legal framework in settling disputes 94
2.06 Efficiency of legal framework in challenging regs 80
2.07 Property rights 86
2.08 No. of procedures to enforce a contract, 2009* 69
2.09 Time to enforce a contract, 2009* 35
2.10 Level of competition index, 2007* 1

Infrastructure environment 67

3.01 Number of telephone lines, 2008* 67
3.02 Secure Internet servers, 2008* 60
3.03 Electricity production, 2006* 71
3.04 Availability of scientists and engineers 94
3.05 Quality of scientific research institutions 65
3.06 Tertiary education enrollment, 2007* 75
3.07 Education expenditure, 2007* 25
3.08 Accessibility of digital content 81
3.09 Internet bandwidth, 2008* 83

Readiness component 99

Individual readiness 109

4.01 Quality of math and science education 127
4.02 Quality of the educational system 115
4.03 Buyer sophistication 62
4.04 Residential telephone connection charge, 2008* 108
4.05 Residential monthly telephone subscription, 2008* 107
4.06 Fixed broadband tariffs, 2008* 73
4.07 Mobile cellular tariffs, 2008* 79
4.08 Fixed telephone lines tariffs, 2008* 100

Business readiness 85

5.01 Extent of staff training 78
5.02 Local availability of research and training 53
5.03 Quality of management schools 49
5.04 Company spending on R&D 78
5.05 University-industry collaboration in R&D 62
5.06 Business telephone connection charge, 2008* 91
5.07 Business monthly telephone subscription, 2008* 103
5.08 Local supplier quality 47
5.09 Computer, comm., and other services imports, 2008* 120
5.10 Availability of new telephone lines 60

Government readiness 88

6.01 Government prioritization of ICT 96
6.02 Gov't procurement of advanced tech. products 93
6.03 Importance of ICT to gov't vision of the future 74

Usage component 58

Individual usage 76

7.01 Mobile telephone subscriptions, 2008* 91
7.02 Personal computers, 2006* 54
7.03 Broadband Internet subscribers, 2008* 53
7.04 Internet users, 2008* 79
7.05 Internet access in schools 77

Business usage 42

8.01 Prevalence of foreign technology licensing 56
8.02 Firm-level technology absorption 77
8.03 Capacity for innovation 80
8.04 Extent of business Internet use 78
8.05 Creative industries exports, 2006* 17
8.06 Utility patents, 2008* 60
8.07 High-tech exports, 2007* 23

Government usage 50

9.01 Government success in ICT promotion 100
9.02 Government Online Service Index, 2009* 38
9.03 ICT use and government efficiency 65
9.04 Presence of ICT in government agencies 57
9.05 E-Participation Index, 2009* 32

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mongolia

Key indicators

Population (millions), 2008 ..... 2.6
GDP per capita (PPP $), 2008 3,547
Mobile phone subscriptions per 100 population, 2008 ..... 66.8
Internet users per 100 population, 2008 ..... 12.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 9.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**94**
2008–2009 (134)	93
2007–2008 (127)	87

Global Competitiveness Index 2009–2010 (133) 117

Environment component 94

Market environment 104

1.01 Venture capital availability 131
1.02 Financial market sophistication 124
1.03 Availability of latest technologies 94
1.04 State of cluster development 123
1.05 Burden of government regulation 109
1.06 Extent and effect of taxation 60
1.07 Total tax rate, 2008* 16
1.08 Time required to start a business, 2009* 41
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 98
1.11 Freedom of the press 79

Political and regulatory environment 102

2.01 Effectiveness of law-making bodies 111
2.02 Laws relating to ICT 120
2.03 Judicial independence 118
2.04 Intellectual property protection 118
2.05 Efficiency of legal framework in settling disputes 121
2.06 Efficiency of legal framework in challenging regs 96
2.07 Property rights 112
2.08 No. of procedures to enforce a contract, 2009* 32
2.09 Time to enforce a contract, 2009* 16
2.10 Level of competition index, 2007* 59

Infrastructure environment 76

3.01 Number of telephone lines, 2008* 99
3.02 Secure Internet servers, 2008* 72
3.03 Electricity production, 2006* 87
3.04 Availability of scientists and engineers 75
3.05 Quality of scientific research institutions 106
3.06 Tertiary education enrollment, 2007* 44
3.07 Education expenditure, 2007* 52
3.08 Accessibility of digital content 75
3.09 Internet bandwidth, 2008* 61

Readiness component 108

Individual readiness 104

4.01 Quality of math and science education 67
4.02 Quality of the educational system 132
4.03 Buyer sophistication 100
4.04 Residential telephone connection charge, 2006* 82
4.05 Residential monthly telephone subscription, 2006* 2
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 123

5.01 Extent of staff training 109
5.02 Local availability of research and training 133
5.03 Quality of management schools 130
5.04 Company spending on R&D 112
5.05 University-industry collaboration in R&D 98
5.06 Business telephone connection charge, 2006* 73
5.07 Business monthly telephone subscription, 2006* 30
5.08 Local supplier quality 128
5.09 Computer, comm., and other services imports, 2006* 106
5.10 Availability of new telephone lines 108

Government readiness 71

6.01 Government prioritization of ICT 54
6.02 Gov't procurement of advanced tech. products 84
6.03 Importance of ICT to gov't vision of the future 88

Usage component 78

Individual usage 86

7.01 Mobile telephone subscriptions, 2008* 92
7.02 Personal computers, 2008* 38
7.03 Broadband Internet subscribers, 2008* 83
7.04 Internet users, 2008* 90
7.05 Internet access in schools 94

Business usage 104

8.01 Prevalence of foreign technology licensing 121
8.02 Firm-level technology absorption 94
8.03 Capacity for innovation 79
8.04 Extent of business Internet use 87
8.05 Creative industries exports, 2006* 107
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 104

Government usage 43

9.01 Government success in ICT promotion 49
9.02 Government Online Service Index, 2009* 20
9.03 ICT use and government efficiency 88
9.04 Presence of ICT in government agencies 73
9.05 E-Participation Index, 2009* 28

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Montenegro

Key indicators

Population (millions), 2008.....0.6
GDP per capita (PPP $), 2008.....11,111
Mobile phone subscriptions per 100 population, 2008.....118.1
Internet users per 100 population, 2008.....47.2
Internet bandwidth (Mb/s) per 10,000 population, 2007.....12.5
Utility patents per million population, 2008.....0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**42**
2008–2009 (134)	71
2007–2008 (127)	n/a
Global Competitiveness Index 2009–2010 (133)	62

Environment component 43

Market environment 71

1.01 Venture capital availability.....22
1.02 Financial market sophistication.....59
1.03 Availability of latest technologies.....75
1.04 State of cluster development.....128
1.05 Burden of government regulation.....61
1.06 Extent and effect of taxation.....31
1.07 Total tax rate, 2008*.....27
1.08 Time required to start a business, 2009*.....41
1.09 No. of procedures required to start a business, 2009*.....108
1.10 Intensity of local competition.....99
1.11 Freedom of the press.....83

Political and regulatory environment 56

2.01 Effectiveness of law-making bodies.....61
2.02 Laws relating to ICT.....57
2.03 Judicial independence.....67
2.04 Intellectual property protection.....73
2.05 Efficiency of legal framework in settling disputes.....53
2.06 Efficiency of legal framework in challenging regs.....51
2.07 Property rights.....56
2.08 No. of procedures to enforce a contract, 2009*.....124
2.09 Time to enforce a contract, 2009*.....65
2.10 Level of competition index, 2007*.....1

Infrastructure environment 36

3.01 Number of telephone lines, 2008*.....8
3.02 Secure Internet servers*.....n/a
3.03 Electricity production, 2005*.....48
3.04 Availability of scientists and engineers.....65
3.05 Quality of scientific research institutions.....47
3.06 Tertiary education enrollment, 2007*.....52
3.07 Education expenditure, 2008*.....89
3.08 Accessibility of digital content.....48
3.09 Internet bandwidth, 2007*.....57

Readiness component 41

Individual readiness 26

4.01 Quality of math and science education.....32
4.02 Quality of the educational system.....43
4.03 Buyer sophistication.....54
4.04 Residential telephone connection charge, 2008*.....19
4.05 Residential monthly telephone subscription, 2008*.....87
4.06 Fixed broadband tariffs, 2008*.....46
4.07 Mobile cellular tariffs, 2008*.....32
4.08 Fixed telephone lines tariffs, 2008*.....11

Business readiness 50

5.01 Extent of staff training.....65
5.02 Local availability of research and training.....64
5.03 Quality of management schools.....64
5.04 Company spending on R&D.....59
5.05 University-industry collaboration in R&D.....54
5.06 Business telephone connection charge, 2008*.....12
5.07 Business monthly telephone subscription, 2008*.....58
5.08 Local supplier quality.....76
5.09 Computer, comm., and other services imports*.....n/a
5.10 Availability of new telephone lines.....71

Government readiness 51

6.01 Government prioritization of ICT.....70
6.02 Gov't procurement of advanced tech. products.....33
6.03 Importance of ICT to gov't vision of the future.....45

Usage component 46

Individual usage 41

7.01 Mobile telephone subscriptions, 2008*.....30
7.02 Personal computers*.....n/a
7.03 Broadband Internet subscribers, 2008*.....44
7.04 Internet users, 2008*.....42
7.05 Internet access in schools.....60

Business usage 45

8.01 Prevalence of foreign technology licensing.....67
8.02 Firm-level technology absorption.....92
8.03 Capacity for innovation.....71
8.04 Extent of business Internet use.....110
8.05 Creative industries exports*.....n/a
8.06 Utility patents, 2008*.....90
8.07 High-tech exports*.....n/a

Government usage 76

9.01 Government success in ICT promotion.....67
9.02 Government Online Service Index, 2009*.....71
9.03 ICT use and government efficiency.....81
9.04 Presence of ICT in government agencies.....80
9.05 E-Participation Index, 2009*.....71

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Morocco

Key indicators

Networked Readiness Index

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Mozambique

Key indicators

Population (millions), 2008 ..... 21.8
GDP per capita (PPP $), 2008 903
Mobile phone subscriptions per 100 population, 2008 ..... 19.7
Internet users per 100 population, 2008 ..... 1.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**116**
2008–2009 (134)	124
2007–2008 (127)	121

Global Competitiveness Index 2009–2010 (133) 129

Environment component 114

Market environment 111

1.01 Venture capital availability 113
1.02 Financial market sophistication 105
1.03 Availability of latest technologies 104
1.04 State of cluster development 95
1.05 Burden of government regulation 71
1.06 Extent and effect of taxation 93
1.07 Total tax rate, 2008* 46
1.08 Time required to start a business, 2009* 79
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 127
1.11 Freedom of the press 86

Political and regulatory environment 101

2.01 Effectiveness of law-making bodies 71
2.02 Laws relating to ICT 103
2.03 Judicial independence 104
2.04 Intellectual property protection 119
2.05 Efficiency of legal framework in settling disputes 75
2.06 Efficiency of legal framework in challenging regs 76
2.07 Property rights 117
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 101
2.10 Level of competition index, 2007* 82

Infrastructure environment 124

3.01 Number of telephone lines, 2008* 129
3.02 Secure Internet servers, 2008* 119
3.03 Electricity production, 2006* 100
3.04 Availability of scientists and engineers 125
3.05 Quality of scientific research institutions 99
3.06 Tertiary education enrollment, 2005* 130
3.07 Education expenditure, 2007* 78
3.08 Accessibility of digital content 123
3.09 Internet bandwidth, 2007* 126

Readiness component 115

Individual readiness 125

4.01 Quality of math and science education 122
4.02 Quality of the educational system 93
4.03 Buyer sophistication 119
4.04 Residential telephone connection charge, 2007* 26
4.05 Residential monthly telephone subscription, 2007* 96
4.06 Fixed broadband tariffs, 2008* 107
4.07 Mobile cellular tariffs, 2008* 96
4.08 Fixed telephone lines tariffs, 2008* 114

Business readiness 96

5.01 Extent of staff training 85
5.02 Local availability of research and training 123
5.03 Quality of management schools 123
5.04 Company spending on R&D 93
5.05 University-industry collaboration in R&D 70
5.06 Business telephone connection charge, 2007* 17
5.07 Business monthly telephone subscription, 2007* 66
5.08 Local supplier quality 131
5.09 Computer, comm., and other services imports, 2008* 46
5.10 Availability of new telephone lines 89

Government readiness 62

6.01 Government prioritization of ICT 65
6.02 Gov't procurement of advanced tech. products 56
6.03 Importance of ICT to gov't vision of the future 68

Usage component 118

Individual usage 126

7.01 Mobile telephone subscriptions, 2008* 124
7.02 Personal computers, 2005* 106
7.03 Broadband Internet subscribers, 2008* 112
7.04 Internet users, 2008* 125
7.05 Internet access in schools 119

Business usage 110

8.01 Prevalence of foreign technology licensing 91
8.02 Firm-level technology absorption 89
8.03 Capacity for innovation 118
8.04 Extent of business Internet use 118
8.05 Creative industries exports, 2006* 114
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 108

Government usage 96

9.01 Government success in ICT promotion 51
9.02 Government Online Service Index, 2009* 107
9.03 ICT use and government efficiency 87
9.04 Presence of ICT in government agencies 112
9.05 E-Participation Index, 2009* 86

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Namibia

Key indicators

Networked Readiness Index

Environment component 54

Readiness component 104

Usage component 104

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Nepal

Key indicators

Population (millions), 2008 ..... 28.6
GDP per capita (PPP $), 2008 1,144
Mobile phone subscriptions per 100 population, 2008 ..... 14.6
Internet users per 100 population, 2008 ..... 1.7
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**124**
2008–2009 (134)	127
2007–2008 (127)	119
Global Competitiveness Index 2009–2010 (133)	125

Environment component 123

Market environment 108

Political and regulatory environment 115

Infrastructure environment 130

Readiness component 107

Individual readiness 55

Business readiness 122

Government readiness 123

Usage component 129

Individual usage 125

Business usage 121

Government usage 124

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Netherlands

Key indicators

Population (millions), 2008 ..... 16.4
GDP per capita (PPP $), 2008 40,558
Mobile phone subscriptions per 100 population, 2008 ..... 124.8
Internet users per 100 population, 2008 ..... 86.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 779.8
Utility patents per million population, 2008 ..... 80.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**9**
2008–2009 (134)	9
2007–2008 (127)	7

Global Competitiveness Index 2009–2010 (133) 10

Environment component 8

Market environment 11

1.01 Venture capital availability 9
1.02 Financial market sophistication 9
1.03 Availability of latest technologies 10
1.04 State of cluster development 13
1.05 Burden of government regulation 91
1.06 Extent and effect of taxation 55
1.07 Total tax rate, 2008* 62
1.08 Time required to start a business, 2009* 31
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 4
1.11 Freedom of the press 4

Political and regulatory environment 10

2.01 Effectiveness of law-making bodies 23
2.02 Laws relating to ICT 21
2.03 Judicial independence 8
2.04 Intellectual property protection 9
2.05 Efficiency of legal framework in settling disputes 11
2.06 Efficiency of legal framework in challenging regs 12
2.07 Property rights 14
2.08 No. of procedures to enforce a contract, 2009* 4
2.09 Time to enforce a contract, 2009* 59
2.10 Level of competition index, 2007* 1

Infrastructure environment 9

3.01 Number of telephone lines, 2008* 24
3.02 Secure Internet servers, 2008* 3
3.03 Electricity production, 2006* 35
3.04 Availability of scientists and engineers 22
3.05 Quality of scientific research institutions 7
3.06 Tertiary education enrollment, 2007* 28
3.07 Education expenditure, 2007* 40
3.08 Accessibility of digital content 12
3.09 Internet bandwidth, 2007* 3

Readiness component 14

Individual readiness 14

4.01 Quality of math and science education 16
4.02 Quality of the educational system 15
4.03 Buyer sophistication 11
4.04 Residential telephone connection charge, 2008* 35
4.05 Residential monthly telephone subscription, 2008* 104
4.06 Fixed broadband tariffs, 2008* 32
4.07 Mobile cellular tariffs, 2008* 21
4.08 Fixed telephone lines tariffs, 2008* 48

Business readiness 7

5.01 Extent of staff training 10
5.02 Local availability of research and training 4
5.03 Quality of management schools 11
5.04 Company spending on R&D 12
5.05 University-industry collaboration in R&D 11
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription, 2007* 59
5.08 Local supplier quality 7
5.09 Computer, comm., and other services imports, 2008* 12
5.10 Availability of new telephone lines 15

Government readiness 44

6.01 Government prioritization of ICT 50
6.02 Gov't procurement of advanced tech. products 31
6.03 Importance of ICT to gov't vision of the future 49

Usage component 9

Individual usage 2

7.01 Mobile telephone subscriptions, 2008* 23
7.02 Personal computers, 2006* 3
7.03 Broadband Internet subscribers, 2008* 4
7.04 Internet users, 2008* 3
7.05 Internet access in schools 9

Business usage 14

8.01 Prevalence of foreign technology licensing 7
8.02 Firm-level technology absorption 25
8.03 Capacity for innovation 10
8.04 Extent of business Internet use 11
8.05 Creative industries exports, 2005* 13
8.06 Utility patents, 2008* 13
8.07 High-tech exports, 2007* 18

Government usage 17

9.01 Government success in ICT promotion 41
9.02 Government Online Service Index, 2009* 12
9.03 ICT use and government efficiency 37
9.04 Presence of ICT in government agencies 22
9.05 E-Participation Index, 2009* 15

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

New Zealand

Key indicators

Population (millions), 2008 ..... 4.3
GDP per capita (PPP $), 2008 27,083
Mobile phone subscriptions per 100 population, 2008 ..... 109.2
Internet users per 100 population, 2008 ..... 72.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 46.0
Utility patents per million population, 2008 ..... 25.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**19**
2008–2009 (134)	22
2007–2008 (127)	22
Global Competitiveness Index 2009–2010 (133)	20

Environment component 11

Market environment 18

1.01 Venture capital availability 24
1.02 Financial market sophistication 23
1.03 Availability of latest technologies 27
1.04 State of cluster development 56
1.05 Burden of government regulation 31
1.06 Extent and effect of taxation 53
1.07 Total tax rate, 2008* 41
1.08 Time required to start a business, 2009* 1
1.09 No. of procedures required to start a business, 2009* 1
1.10 Intensity of local competition 53
1.11 Freedom of the press 6

Political and regulatory environment 3

2.01 Effectiveness of law-making bodies 6
2.02 Laws relating to ICT 11
2.03 Judicial independence 1
2.04 Intellectual property protection 7
2.05 Efficiency of legal framework in settling disputes 4
2.06 Efficiency of legal framework in challenging regs 3
2.07 Property rights 11
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 2
2.10 Level of competition index, 2007* 1

Infrastructure environment 13

3.01 Number of telephone lines, 2008* 27
3.02 Secure Internet servers, 2008* 6
3.03 Electricity production, 2006* 12
3.04 Availability of scientists and engineers 59
3.05 Quality of scientific research institutions 14
3.06 Tertiary education enrollment, 2007* 8
3.07 Education expenditure, 2007* 11
3.08 Accessibility of digital content 38
3.09 Internet bandwidth, 2007* 37

Readiness component 29

Individual readiness 34

4.01 Quality of math and science education 9
4.02 Quality of the educational system 11
4.03 Buyer sophistication 29
4.04 Residential telephone connection charge, 2008* 15
4.05 Residential monthly telephone subscription, 2008* 125
4.06 Fixed broadband tariffs, 2008* 26
4.07 Mobile cellular tariffs, 2008* 92
4.08 Fixed telephone lines tariffs, 2008* 1

Business readiness 25

5.01 Extent of staff training 20
5.02 Local availability of research and training 19
5.03 Quality of management schools 20
5.04 Company spending on R&D 31
5.05 University-industry collaboration in R&D 18
5.06 Business telephone connection charge, 2008* 13
5.07 Business monthly telephone subscription, 2008* 107
5.08 Local supplier quality 14
5.09 Computer, comm., and other services imports, 2008* 53
5.10 Availability of new telephone lines 38

Government readiness 32

6.01 Government prioritization of ICT 24
6.02 Gov't procurement of advanced tech. products 57
6.03 Importance of ICT to gov't vision of the future 31

Usage component 24

Individual usage 23

7.01 Mobile telephone subscriptions, 2008* 46
7.02 Personal computers, 2006* 23
7.03 Broadband Internet subscribers, 2008* 25
7.04 Internet users, 2008* 17
7.05 Internet access in schools 18

Business usage 36

8.01 Prevalence of foreign technology licensing 15
8.02 Firm-level technology absorption 18
8.03 Capacity for innovation 24
8.04 Extent of business Internet use 24
8.05 Creative industries exports, 2005* 53
8.06 Utility patents, 2008* 24
8.07 High-tech exports, 2007* 63

Government usage 15

9.01 Government success in ICT promotion 59
9.02 Government Online Service Index, 2009* 15
9.03 ICT use and government efficiency 34
9.04 Presence of ICT in government agencies 16
9.05 E-Participation Index, 2009* 4

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Nicaragua

Key indicators

Networked Readiness Index

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Nigeria

Key indicators

Population (millions), 2008 ..... 151.3
GDP per capita (PPP $), 2008 2,162
Mobile phone subscriptions per 100 population, 2008 ..... 41.7
Internet users per 100 population, 2008 ..... 15.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**99**
2008–2009 (134)	90
2007–2008 (127)	94

Global Competitiveness Index 2009–2010 (133)	99

Environment component 97

Market environment 70

1.01 Venture capital availability 95
1.02 Financial market sophistication 74
1.03 Availability of latest technologies 85
1.04 State of cluster development 62
1.05 Burden of government regulation 75
1.06 Extent and effect of taxation 47
1.07 Total tax rate, 2008* 37
1.08 Time required to start a business, 2009* 90
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 34
1.11 Freedom of the press 87

Political and regulatory environment 85

2.01 Effectiveness of law-making bodies 70
2.02 Laws relating to ICT 77
2.03 Judicial independence 59
2.04 Intellectual property protection 88
2.05 Efficiency of legal framework in settling disputes 47
2.06 Efficiency of legal framework in challenging regs 85
2.07 Property rights 91
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 45
2.10 Level of competition index, 2007* 104

Infrastructure environment 127

3.01 Number of telephone lines, 2008* 120
3.02 Secure Internet servers, 2008* 107
3.03 Electricity production, 2006* 116
3.04 Availability of scientists and engineers 41
3.05 Quality of scientific research institutions 115
3.06 Tertiary education enrollment, 2005* 105
3.07 Education expenditure, 2007* 128
3.08 Accessibility of digital content 101
3.09 Internet bandwidth, 2007* 124

Readiness component 94

Individual readiness 116

4.01 Quality of math and science education 97
4.02 Quality of the educational system 48
4.03 Buyer sophistication 69
4.04 Residential telephone connection charge, 2008* 87
4.05 Residential monthly telephone subscription, 2008* 44
4.06 Fixed broadband tariffs, 2008* 115
4.07 Mobile cellular tariffs, 2008* 85
4.08 Fixed telephone lines tariffs, 2008* 93

Business readiness 51

5.01 Extent of staff training 88
5.02 Local availability of research and training 72
5.03 Quality of management schools 63
5.04 Company spending on R&D 40
5.05 University-industry collaboration in R&D 87
5.06 Business telephone connection charge, 2007* 77
5.07 Business monthly telephone subscription, 2007* 25
5.08 Local supplier quality 79
5.09 Computer, comm., and other services imports, 2007* 10
5.10 Availability of new telephone lines 76

Government readiness 101

6.01 Government prioritization of ICT 111
6.02 Gov't procurement of advanced tech. products 115
6.03 Importance of ICT to gov't vision of the future 78

Usage component 102

Individual usage 105

7.01 Mobile telephone subscriptions, 2008* 111
7.02 Personal computers, 2005* 114
7.03 Broadband Internet subscribers, 2008* 114
7.04 Internet users, 2008* 85
7.05 Internet access in schools 91

Business usage 83

8.01 Prevalence of foreign technology licensing 79
8.02 Firm-level technology absorption 74
8.03 Capacity for innovation 47
8.04 Extent of business Internet use 74
8.05 Creative industries exports, 2003* 103
8.06 Utility patents, 2008* 89
8.07 High-tech exports, 2007* 115

Government usage 113

9.01 Government success in ICT promotion 76
9.02 Government Online Service Index, 2009* 121
9.03 ICT use and government efficiency 83
9.04 Presence of ICT in government agencies 91
9.05 E-Participation Index, 2009* 118

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Norway

Key indicators

Networked Readiness Index

Environment component 3

Readiness component 17

Usage component 16

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Oman

Key indicators

Population (millions), 2008 ..... 2.8
GDP per capita (PPP $), 2008 24,674
Mobile phone subscriptions per 100 population, 2008 ..... 115.6
Internet users per 100 population, 2008 ..... 20.0
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 9.4
Utility patents per million population, 2008 ..... 1.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**50**
2008–2009 (134)	50
2007–2008 (127)	53
Global Competitiveness Index 2009–2010 (133)	41

Environment component 52

Market environment 34

1.01 Venture capital availability 20
1.02 Financial market sophistication 51
1.03 Availability of latest technologies 59
1.04 State of cluster development 54
1.05 Burden of government regulation 7
1.06 Extent and effect of taxation 5
1.07 Total tax rate, 2008* 14
1.08 Time required to start a business, 2009* 38
1.09 No. of procedures required to start a business, 2009* 22
1.10 Intensity of local competition 59
1.11 Freedom of the press 116

Political and regulatory environment 49

2.01 Effectiveness of law-making bodies 15
2.02 Laws relating to ICT 36
2.03 Judicial independence 29
2.04 Intellectual property protection 26
2.05 Efficiency of legal framework in settling disputes 19
2.06 Efficiency of legal framework in challenging regs 27
2.07 Property rights 26
2.08 No. of procedures to enforce a contract, 2009* 127
2.09 Time to enforce a contract, 2009* 82
2.10 Level of competition index, 2007* 123

Infrastructure environment 77

3.01 Number of telephone lines, 2008* 92
3.02 Secure Internet servers, 2008* 63
3.03 Electricity production, 2006* 45
3.04 Availability of scientists and engineers 102
3.05 Quality of scientific research institutions 63
3.06 Tertiary education enrollment, 2007* 77
3.07 Education expenditure, 2007* 73
3.08 Accessibility of digital content 61
3.09 Internet bandwidth, 2008* 62

Readiness component 48

Individual readiness 87

4.01 Quality of math and science education 71
4.02 Quality of the educational system 54
4.03 Buyer sophistication 52
4.04 Residential telephone connection charge, 2008* 14
4.05 Residential monthly telephone subscription, 2008* 110
4.06 Fixed broadband tariffs, 2008* 68
4.07 Mobile cellular tariffs, 2008* 30
4.08 Fixed telephone lines tariffs, 2008* 118

Business readiness 62

5.01 Extent of staff training 53
5.02 Local availability of research and training 94
5.03 Quality of management schools 110
5.04 Company spending on R&D 62
5.05 University-industry collaboration in R&D 53
5.06 Business telephone connection charge, 2008* 9
5.07 Business monthly telephone subscription, 2008* 84
5.08 Local supplier quality 62
5.09 Computer, comm., and other services imports, 2008* 38
5.10 Availability of new telephone lines 69

Government readiness 19

6.01 Government prioritization of ICT 25
6.02 Gov't procurement of advanced tech. products 12
6.03 Importance of ICT to gov't vision of the future 21

Usage component 55

Individual usage 56

7.01 Mobile telephone subscriptions, 2008* 34
7.02 Personal computers, 2007* 49
7.03 Broadband Internet subscribers, 2008* 86
7.04 Internet users, 2008* 81
7.05 Internet access in schools 48

Business usage 67

8.01 Prevalence of foreign technology licensing 41
8.02 Firm-level technology absorption 60
8.03 Capacity for innovation 87
8.04 Extent of business Internet use 62
8.05 Creative industries exports, 2006* 82
8.06 Utility patents, 2008* 40
8.07 High-tech exports, 2007* 118

Government usage 44

9.01 Government success in ICT promotion 19
9.02 Government Online Service Index, 2009* 53
9.03 ICT use and government efficiency 32
9.04 Presence of ICT in government agencies 39
9.05 E-Participation Index, 2009* 71

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Pakistan

Key indicators

Population (millions), 2008 ..... 166.0
GDP per capita (PPP $), 2008 2,624
Mobile phone subscriptions per 100 population, 2008 ..... 49.7
Internet users per 100 population, 2008 ..... 10.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**87**
2008–2009 (134)	98
2007–2008 (127)	89

Global Competitiveness Index 2009–2010 (133)	101

Environment component 98

Market environment 68

1.01 Venture capital availability 66
1.02 Financial market sophistication 79
1.03 Availability of latest technologies 91
1.04 State of cluster development 50
1.05 Burden of government regulation 59
1.06 Extent and effect of taxation 51
1.07 Total tax rate, 2008* 35
1.08 Time required to start a business, 2009* 67
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 87
1.11 Freedom of the press 61

Political and regulatory environment 97

2.01 Effectiveness of law-making bodies 97
2.02 Laws relating to ICT 95
2.03 Judicial independence 95
2.04 Intellectual property protection 95
2.05 Efficiency of legal framework in settling disputes 103
2.06 Efficiency of legal framework in challenging regs 103
2.07 Property rights 100
2.08 No. of procedures to enforce a contract, 2009* 120
2.09 Time to enforce a contract, 2009* 119
2.10 Level of competition index, 2007* 1

Infrastructure environment 115

3.01 Number of telephone lines, 2008* 111
3.02 Secure Internet servers, 2008* 111
3.03 Electricity production, 2006* 104
3.04 Availability of scientists and engineers 83
3.05 Quality of scientific research institutions 81
3.06 Tertiary education enrollment, 2007* 116
3.07 Education expenditure, 2007* 120
3.08 Accessibility of digital content 86
3.09 Internet bandwidth, 2007* 103

Readiness component 59

Individual readiness 39

4.01 Quality of math and science education 93
4.02 Quality of the educational system 99
4.03 Buyer sophistication 76
4.04 Residential telephone connection charge, 2008* 11
4.05 Residential monthly telephone subscription, 2008* 30
4.06 Fixed broadband tariffs, 2008* 75
4.07 Mobile cellular tariffs, 2008* 8
4.08 Fixed telephone lines tariffs, 2008* 45

Business readiness 70

5.01 Extent of staff training 112
5.02 Local availability of research and training 99
5.03 Quality of management schools 76
5.04 Company spending on R&D 80
5.05 University-industry collaboration in R&D 92
5.06 Business telephone connection charge, 2007* 15
5.07 Business monthly telephone subscription, 2007* 17
5.08 Local supplier quality 88
5.09 Computer, comm., and other services imports, 2007* 29
5.10 Availability of new telephone lines 84

Government readiness 90

6.01 Government prioritization of ICT 74
6.02 Gov't procurement of advanced tech. products 87
6.03 Importance of ICT to gov't vision of the future 99

Usage component 94

Individual usage 102

7.01 Mobile telephone subscriptions, 2008* 104
7.02 Personal computers, 2007* 121
7.03 Broadband Internet subscribers, 2008* 107
7.04 Internet users, 2008* 97
7.05 Internet access in schools 75

Business usage 80

8.01 Prevalence of foreign technology licensing 95
8.02 Firm-level technology absorption 99
8.03 Capacity for innovation 56
8.04 Extent of business Internet use 83
8.05 Creative industries exports, 2006* 27
8.06 Utility patents, 2008* 88
8.07 High-tech exports, 2007* 77

Government usage 91

9.01 Government success in ICT promotion 68
9.02 Government Online Service Index, 2009* 92
9.03 ICT use and government efficiency 94
9.04 Presence of ICT in government agencies 93
9.05 E-Participation Index, 2009* 64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Panama

Key indicators

Population (millions), 2008 ..... 3.4
GDP per capita (PPP $), 2008 11,362
Mobile phone subscriptions per 100 population, 2008 ..... 115.2
Internet users per 100 population, 2008 ..... 27.5
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 159.6
Utility patents per million population, 2008 ..... 0.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**58**
2008–2009 (134)	66
2007–2008 (127)	64

Global Competitiveness Index 2009–2010 (133) 59

Environment component 51

Market environment 39

1.01 Venture capital availability 16
1.02 Financial market sophistication 25
1.03 Availability of latest technologies 67
1.04 State of cluster development 43
1.05 Burden of government regulation 35
1.06 Extent and effect of taxation 69
1.07 Total tax rate, 2008* 97
1.08 Time required to start a business, 2009* 38
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 71
1.11 Freedom of the press 54

Political and regulatory environment 65

2.01 Effectiveness of law-making bodies 118
2.02 Laws relating to ICT 47
2.03 Judicial independence 103
2.04 Intellectual property protection 55
2.05 Efficiency of legal framework in settling disputes 87
2.06 Efficiency of legal framework in challenging regs 79
2.07 Property rights 50
2.08 No. of procedures to enforce a contract, 2009* 27
2.09 Time to enforce a contract, 2009* 95
2.10 Level of competition index, 2007* 59

Infrastructure environment 55

3.01 Number of telephone lines, 2008* 78
3.02 Secure Internet servers, 2008* 38
3.03 Electricity production, 2006* 81
3.04 Availability of scientists and engineers 90
3.05 Quality of scientific research institutions 62
3.06 Tertiary education enrollment, 2006* 48
3.07 Education expenditure, 2007* 57
3.08 Accessibility of digital content 73
3.09 Internet bandwidth, 2007* 17

Readiness component 60

Individual readiness 58

4.01 Quality of math and science education 113
4.02 Quality of the educational system 111
4.03 Buyer sophistication 44
4.04 Residential telephone connection charge, 2008* 37
4.05 Residential monthly telephone subscription, 2008* 57
4.06 Fixed broadband tariffs, 2008* 35
4.07 Mobile cellular tariffs, 2008* 29
4.08 Fixed telephone lines tariffs, 2008* 73

Business readiness 80

5.01 Extent of staff training 59
5.02 Local availability of research and training 76
5.03 Quality of management schools 102
5.04 Company spending on R&D 51
5.05 University-industry collaboration in R&D 84
5.06 Business telephone connection charge, 2007* 51
5.07 Business monthly telephone subscription, 2007* 104
5.08 Local supplier quality 51
5.09 Computer, comm., and other services imports, 2008* 108
5.10 Availability of new telephone lines 54

Government readiness 63

6.01 Government prioritization of ICT 83
6.02 Gov't procurement of advanced tech. products 50
6.03 Importance of ICT to gov't vision of the future 61

Usage component 66

Individual usage 64

7.01 Mobile telephone subscriptions, 2008* 36
7.02 Personal computers, 2008* 94
7.03 Broadband Internet subscribers, 2008* 56
7.04 Internet users, 2008* 67
7.05 Internet access in schools 82

Business usage 75

8.01 Prevalence of foreign technology licensing 48
8.02 Firm-level technology absorption 58
8.03 Capacity for innovation 100
8.04 Extent of business Internet use 66
8.05 Creative industries exports, 2006* 87
8.06 Utility patents, 2008* 52
8.07 High-tech exports, 2007* 125

Government usage 55

9.01 Government success in ICT promotion 78
9.02 Government Online Service Index, 2009* 83
9.03 ICT use and government efficiency 67
9.04 Presence of ICT in government agencies 84
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Paraguay

Key indicators

Networked Readiness Index

Environment component 116

Readiness component 128

Usage component 121

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Peru

Key indicators

Population (millions), 2008 ..... 28.8
GDP per capita (PPP $), 2008 8,594
Mobile phone subscriptions per 100 population, 2008 ..... 72.7
Internet users per 100 population, 2008 ..... 24.7
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 27.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**92**
2008–2009 (134)	89
2007–2008 (127)	84
Global Competitiveness Index 2009–2010 (133)	78

Environment component 88

Market environment 58

1.01 Venture capital availability 52
1.02 Financial market sophistication 49
1.03 Availability of latest technologies 95
1.04 State of cluster development 69
1.05 Burden of government regulation 119
1.06 Extent and effect of taxation 49
1.07 Total tax rate, 2008* 65
1.08 Time required to start a business, 2009* 109
1.09 No. of procedures required to start a business, 2009* 83
1.10 Intensity of local competition 70
1.11 Freedom of the press 21

Political and regulatory environment 92

2.01 Effectiveness of law-making bodies 125
2.02 Laws relating to ICT 81
2.03 Judicial independence 109
2.04 Intellectual property protection 116
2.05 Efficiency of legal framework in settling disputes 100
2.06 Efficiency of legal framework in challenging regs 92
2.07 Property rights 87
2.08 No. of procedures to enforce a contract, 2009* 99
2.09 Time to enforce a contract, 2009* 40
2.10 Level of competition index, 2007* 1

Infrastructure environment 101

3.01 Number of telephone lines, 2008* 90
3.02 Secure Internet servers, 2008* 67
3.03 Electricity production, 2006* 92
3.04 Availability of scientists and engineers 101
3.05 Quality of scientific research institutions 118
3.06 Tertiary education enrollment, 2006* 62
3.07 Education expenditure, 2007* 113
3.08 Accessibility of digital content 88
3.09 Internet bandwidth, 2007* 46

Readiness component 102

Individual readiness 97

4.01 Quality of math and science education 130
4.02 Quality of the educational system 130
4.03 Buyer sophistication 53
4.04 Residential telephone connection charge, 2008* 116
4.05 Residential monthly telephone subscription, 2008* 120
4.06 Fixed broadband tariffs, 2008* 86
4.07 Mobile cellular tariffs, 2008* 49
4.08 Fixed telephone lines tariffs, 2008* 50

Business readiness 87

5.01 Extent of staff training 80
5.02 Local availability of research and training 85
5.03 Quality of management schools 54
5.04 Company spending on R&D 90
5.05 University-industry collaboration in R&D 104
5.06 Business telephone connection charge, 2008* 109
5.07 Business monthly telephone subscription, 2008* 93
5.08 Local supplier quality 60
5.09 Computer, comm., and other services imports, 2007* 74
5.10 Availability of new telephone lines 52

Government readiness 114

6.01 Government prioritization of ICT 108
6.02 Gov't procurement of advanced tech. products 104
6.03 Importance of ICT to gov't vision of the future 115

Usage component 88

Individual usage 81

7.01 Mobile telephone subscriptions, 2008* 87
7.02 Personal computers, 2005* 61
7.03 Broadband Internet subscribers, 2008* 70
7.04 Internet users, 2008* 72
7.05 Internet access in schools 71

Business usage 96

8.01 Prevalence of foreign technology licensing 90
8.02 Firm-level technology absorption 84
8.03 Capacity for innovation 84
8.04 Extent of business Internet use 90
8.05 Creative industries exports, 2006* 49
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 97

Government usage 83

9.01 Government success in ICT promotion 110
9.02 Government Online Service Index, 2009* 44
9.03 ICT use and government efficiency 80
9.04 Presence of ICT in government agencies 92
9.05 E-Participation Index, 2009* 64

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Philippines

Key indicators

Population (millions), 2008 ..... 90.3
GDP per capita (PPP $), 2008 3,515
Mobile phone subscriptions per 100 population, 2008 ..... 75.4
Internet users per 100 population, 2008 ..... 6.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 1.1
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**85**
2008–2009 (134)	85
2007–2008 (127)	81

Global Competitiveness Index 2009–2010 (133) 87

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Poland

Key indicators

Population (millions), 2008 ..... 38.1
GDP per capita (PPP $), 2008 17,537
Mobile phone subscriptions per 100 population, 2008 ..... 115.3
Internet users per 100 population, 2008 ..... 49.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 27.5
Utility patents per million population, 2008 ..... 1.4

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**65**
2008–2009 (134)	69
2007–2008 (127)	62

Global Competitiveness Index 2009–2010 (133)	46

Environment component 67

Market environment 67

1.01 Venture capital availability 44
1.02 Financial market sophistication 69
1.03 Availability of latest technologies 80
1.04 State of cluster development 104
1.05 Burden of government regulation 111
1.06 Extent and effect of taxation 110
1.07 Total tax rate, 2008* 71
1.08 Time required to start a business, 2009* 93
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 33
1.11 Freedom of the press 52

Political and regulatory environment 103

2.01 Effectiveness of law-making bodies 98
2.02 Laws relating to ICT 79
2.03 Judicial independence 55
2.04 Intellectual property protection 64
2.05 Efficiency of legal framework in settling disputes 114
2.06 Efficiency of legal framework in challenging regs 106
2.07 Property rights 76
2.08 No. of procedures to enforce a contract, 2009* 69
2.09 Time to enforce a contract, 2009* 111
2.10 Level of competition index, 2007* 116

Infrastructure environment 45

3.01 Number of telephone lines, 2008* 50
3.02 Secure Internet servers, 2008* 39
3.03 Electricity production, 2006* 51
3.04 Availability of scientists and engineers 58
3.05 Quality of scientific research institutions 48
3.06 Tertiary education enrollment, 2007* 21
3.07 Education expenditure, 2007* 30
3.08 Accessibility of digital content 79
3.09 Internet bandwidth, 2007* 44

Readiness component 69

Individual readiness 67

4.01 Quality of math and science education 23
4.02 Quality of the educational system 45
4.03 Buyer sophistication 41
4.04 Residential telephone connection charge, 2006* 107
4.05 Residential monthly telephone subscription, 2008* 116
4.06 Fixed broadband tariffs, 2008* 41
4.07 Mobile cellular tariffs, 2008* 47
4.08 Fixed telephone lines tariffs, 2008* 96

Business readiness 46

5.01 Extent of staff training 63
5.02 Local availability of research and training 30
5.03 Quality of management schools 45
5.04 Company spending on R&D 57
5.05 University-industry collaboration in R&D 76
5.06 Business telephone connection charge, 2006* 89
5.07 Business monthly telephone subscription, 2006* 77
5.08 Local supplier quality 39
5.09 Computer, comm., and other services imports, 2008* 32
5.10 Availability of new telephone lines 79

Government readiness 113

6.01 Government prioritization of ICT 126
6.02 Gov't procurement of advanced tech. products 29
6.03 Importance of ICT to gov't vision of the future 122

Usage component 59

Individual usage 45

7.01 Mobile telephone subscriptions, 2008* 35
7.02 Personal computers, 2006* 48
7.03 Broadband Internet subscribers, 2008* 38
7.04 Internet users, 2008* 40
7.05 Internet access in schools 49

Business usage 53

8.01 Prevalence of foreign technology licensing 72
8.02 Firm-level technology absorption 67
8.03 Capacity for innovation 57
8.04 Extent of business Internet use 41
8.05 Creative industries exports, 2005* 22
8.06 Utility patents, 2008* 43
8.07 High-tech exports, 2007* 56

Government usage 105

9.01 Government success in ICT promotion 123
9.02 Government Online Service Index, 2009* 49
9.03 ICT use and government efficiency 128
9.04 Presence of ICT in government agencies 126
9.05 E-Participation Index, 2009* 49

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Portugal

Key indicators

Population (millions), 2008 ..... 10.6
GDP per capita (PPP $), 2008 22,232
Mobile phone subscriptions per 100 population, 2008 ..... 139.6
Internet users per 100 population, 2008 ..... 41.9
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 47.8
Utility patents per million population, 2008 ..... 1.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**33**
2008–2009 (134)	30
2007–2008 (127)	28

Global Competitiveness Index 2009–2010 (133) 43

Environment component 32

Market environment 38

1.01 Venture capital availability 56
1.02 Financial market sophistication 26
1.03 Availability of latest technologies 23
1.04 State of cluster development 57
1.05 Burden of government regulation 99
1.06 Extent and effect of taxation 102
1.07 Total tax rate, 2008* 73
1.08 Time required to start a business, 2009* 12
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 46
1.11 Freedom of the press 35

Political and regulatory environment 34

2.01 Effectiveness of law-making bodies 53
2.02 Laws relating to ICT 22
2.03 Judicial independence 45
2.04 Intellectual property protection 33
2.05 Efficiency of legal framework in settling disputes 107
2.06 Efficiency of legal framework in challenging regs 91
2.07 Property rights 41
2.08 No. of procedures to enforce a contract, 2009* 27
2.09 Time to enforce a contract, 2009* 66
2.10 Level of competition index, 2007* 1

Infrastructure environment 32

3.01 Number of telephone lines, 2008* 31
3.02 Secure Internet servers, 2008* 33
3.03 Electricity production, 2006* 50
3.04 Availability of scientists and engineers 46
3.05 Quality of scientific research institutions 31
3.06 Tertiary education enrollment, 2007* 33
3.07 Education expenditure, 2007* 27
3.08 Accessibility of digital content 25
3.09 Internet bandwidth, 2007* 36

Readiness component 39

Individual readiness 84

4.01 Quality of math and science education 104
4.02 Quality of the educational system 68
4.03 Buyer sophistication 68
4.04 Residential telephone connection charge, 2008* 93
4.05 Residential monthly telephone subscription, 2008* 106
4.06 Fixed broadband tariffs, 2008* 34
4.07 Mobile cellular tariffs, 2008* 102
4.08 Fixed telephone lines tariffs, 2008* 58

Business readiness 36

5.01 Extent of staff training 79
5.02 Local availability of research and training 34
5.03 Quality of management schools 38
5.04 Company spending on R&D 45
5.05 University-industry collaboration in R&D 33
5.06 Business telephone connection charge, 2008* 79
5.07 Business monthly telephone subscription, 2008* 20
5.08 Local supplier quality 57
5.09 Computer, comm., and other services imports, 2008* 33
5.10 Availability of new telephone lines 27

Government readiness 6

6.01 Government prioritization of ICT 8
6.02 Gov't procurement of advanced tech. products 17
6.03 Importance of ICT to gov't vision of the future 4

Usage component 32

Individual usage 37

7.01 Mobile telephone subscriptions, 2008* 11
7.02 Personal computers, 2008* 46
7.03 Broadband Internet subscribers, 2008* 35
7.04 Internet users, 2008* 45
7.05 Internet access in schools 27

Business usage 39

8.01 Prevalence of foreign technology licensing 20
8.02 Firm-level technology absorption 34
8.03 Capacity for innovation 38
8.04 Extent of business Internet use 33
8.05 Creative industries exports, 2005* 33
8.06 Utility patents, 2008* 48
8.07 High-tech exports, 2007* 34

Government usage 24

9.01 Government success in ICT promotion 8
9.02 Government Online Service Index, 2009* 49
9.03 ICT use and government efficiency 6
9.04 Presence of ICT in government agencies 18
9.05 E-Participation Index, 2009* 44

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Puerto Rico

Key indicators

Population (millions), 2008 ..... 4.0
GDP per capita (PPP $), 2008 17,800
Mobile phone subscriptions per 100 population, 2008 ..... 111.0
Internet users per 100 population, 2008 ..... 25.2
Internet bandwidth (Mb/s) per 10,000 population ..... n/a
Utility patents per million population, 2008 ..... 3.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**45**
2008–2009 (134)	42
2007–2008 (127)	39
Global Competitiveness Index 2009–2010 (133)	42

Environment component 36

Market environment 37

1.01 Venture capital availability 35
1.02 Financial market sophistication 21
1.03 Availability of latest technologies 22
1.04 State of cluster development 38
1.05 Burden of government regulation 131
1.06 Extent and effect of taxation 95
1.07 Total tax rate, 2008* 116
1.08 Time required to start a business, 2009* 20
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 18
1.11 Freedom of the press 17

Political and regulatory environment 39

2.01 Effectiveness of law-making bodies 119
2.02 Laws relating to ICT 35
2.03 Judicial independence 40
2.04 Intellectual property protection 11
2.05 Efficiency of legal framework in settling disputes 24
2.06 Efficiency of legal framework in challenging regs 33
2.07 Property rights 18
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 87
2.10 Level of competition index* ..... n/a

Infrastructure environment 39

3.01 Number of telephone lines, 2008* 49
3.02 Secure Internet servers, 2008* 49
3.03 Electricity production, 2006* 37
3.04 Availability of scientists and engineers 15
3.05 Quality of scientific research institutions 33
3.06 Tertiary education enrollment, 2007* 49
3.07 Education expenditure, 2008* 77
3.08 Accessibility of digital content 35
3.09 Internet bandwidth* ..... n/a

Readiness component 68

Individual readiness 79

4.01 Quality of math and science education 87
4.02 Quality of the educational system 53
4.03 Buyer sophistication 38
4.04 Residential telephone connection charge* ..... n/a
4.05 Residential monthly telephone subscription, 2007* 46
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 35

5.01 Extent of staff training 22
5.02 Local availability of research and training 23
5.03 Quality of management schools 55
5.04 Company spending on R&D 50
5.05 University-industry collaboration in R&D 28
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription, 2007* 91
5.08 Local supplier quality 18
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 75

Government readiness 100

6.01 Government prioritization of ICT 102
6.02 Gov't procurement of advanced tech. products 90
6.03 Importance of ICT to gov't vision of the future 108

Usage component 44

Individual usage 62

7.01 Mobile telephone subscriptions, 2008* 42
7.02 Personal computers, 2005* 115
7.03 Broadband Internet subscribers, 2008* 57
7.04 Internet users, 2008* 71
7.05 Internet access in schools 53

Business usage 23

8.01 Prevalence of foreign technology licensing 36
8.02 Firm-level technology absorption 23
8.03 Capacity for innovation 54
8.04 Extent of business Internet use 25
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 33
8.07 High-tech exports, 2008* 17

Government usage 51

9.01 Government success in ICT promotion 91
9.02 Government Online Service Index* ..... n/a
9.03 ICT use and government efficiency 101
9.04 Presence of ICT in government agencies 85
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Qatar

Key indicators

Population (millions), 2008 ..... 1.3
GDP per capita (PPP $), 2008 86,008
Mobile phone subscriptions per 100 population, 2008 ..... 131.4
Internet users per 100 population, 2008 ..... 34.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 27.7
Utility patents per million population, 2008 ..... 1.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**30**
2008–2009 (134)	29
2007–2008 (127)	32
Global Competitiveness Index 2009–2010 (133)	22

Environment component 29

Market environment 19

1.01 Venture capital availability 40
1.02 Financial market sophistication 37
1.03 Availability of latest technologies 25
1.04 State of cluster development 36
1.05 Burden of government regulation 10
1.06 Extent and effect of taxation 10
1.07 Total tax rate, 2008* 3
1.08 Time required to start a business, 2009* 12
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 14
1.11 Freedom of the press 57

Political and regulatory environment 27

2.01 Effectiveness of law-making bodies 10
2.02 Laws relating to ICT 40
2.03 Judicial independence 10
2.04 Intellectual property protection 36
2.05 Efficiency of legal framework in settling disputes 5
2.06 Efficiency of legal framework in challenging regs 32
2.07 Property rights 16
2.08 No. of procedures to enforce a contract, 2009* 107
2.09 Time to enforce a contract, 2009* 72
2.10 Level of competition index, 2007* 104

Infrastructure environment 37

3.01 Number of telephone lines, 2008* 63
3.02 Secure Internet servers, 2008* 43
3.03 Electricity production, 2006* 4
3.04 Availability of scientists and engineers 13
3.05 Quality of scientific research institutions 32
3.06 Tertiary education enrollment, 2007* 93
3.07 Education expenditure* ..... n/a
3.08 Accessibility of digital content 19
3.09 Internet bandwidth, 2007* 43

Readiness component 12

Individual readiness 27

4.01 Quality of math and science education 3
4.02 Quality of the educational system 10
4.03 Buyer sophistication 56
4.04 Residential telephone connection charge, 2007* 44
4.05 Residential monthly telephone subscription, 2007* 53
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 32

5.01 Extent of staff training 23
5.02 Local availability of research and training 52
5.03 Quality of management schools 8
5.04 Company spending on R&D 64
5.05 University-industry collaboration in R&D 38
5.06 Business telephone connection charge, 2007* 30
5.07 Business monthly telephone subscription, 2007* 112
5.08 Local supplier quality 23
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 37

Government readiness 3

6.01 Government prioritization of ICT 3
6.02 Gov't procurement of advanced tech. products 5
6.03 Importance of ICT to gov't vision of the future 5

Usage component 40

Individual usage 43

7.01 Mobile telephone subscriptions, 2008* 16
7.02 Personal computers, 2006* 52
7.03 Broadband Internet subscribers, 2008* 48
7.04 Internet users, 2008* 55
7.05 Internet access in schools 15

Business usage 56

8.01 Prevalence of foreign technology licensing 3
8.02 Firm-level technology absorption 19
8.03 Capacity for innovation 109
8.04 Extent of business Internet use 64
8.05 Creative industries exports, 2005* 91
8.06 Utility patents, 2008* 46
8.07 High-tech exports, 2006* 126

Government usage 33

9.01 Government success in ICT promotion 4
9.02 Government Online Service Index, 2009* 85
9.03 ICT use and government efficiency 3
9.04 Presence of ICT in government agencies 9
9.05 E-Participation Index, 2009* 77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Romania

Key indicators

Population (millions), 2008.....21.5
GDP per capita (PPP $), 2008.....12,600
Mobile phone subscriptions per 100 population, 2008.....114.5
Internet users per 100 population, 2008.....29.0
Internet bandwidth (Mb/s) per 10,000 population, 2008.....91.8
Utility patents per million population, 2008.....0.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**59**
2008–2009 (134)	58
2007–2008 (127)	61
Global Competitiveness Index 2009–2010 (133)	64

Environment component 58

Market environment 79

1.01 Venture capital availability.....58
1.02 Financial market sophistication.....82
1.03 Availability of latest technologies.....89
1.04 State of cluster development.....100
1.05 Burden of government regulation.....87
1.06 Extent and effect of taxation.....122
1.07 Total tax rate, 2008*.....78
1.08 Time required to start a business, 2009*.....31
1.09 No. of procedures required to start a business, 2009*.....32
1.10 Intensity of local competition.....69
1.11 Freedom of the press.....63

Political and regulatory environment 64

2.01 Effectiveness of law-making bodies.....87
2.02 Laws relating to ICT.....85
2.03 Judicial independence.....84
2.04 Intellectual property protection.....72
2.05 Efficiency of legal framework in settling disputes.....105
2.06 Efficiency of legal framework in challenging regs.....97
2.07 Property rights.....82
2.08 No. of procedures to enforce a contract, 2009*.....27
2.09 Time to enforce a contract, 2009*.....58
2.10 Level of competition index, 2007*.....1

Infrastructure environment 54

3.01 Number of telephone lines, 2008*.....55
3.02 Secure Internet servers, 2008*.....61
3.03 Electricity production, 2006*.....65
3.04 Availability of scientists and engineers.....56
3.05 Quality of scientific research institutions.....82
3.06 Tertiary education enrollment, 2007*.....31
3.07 Education expenditure, 2007*.....91
3.08 Accessibility of digital content.....68
3.09 Internet bandwidth, 2008*.....26

Readiness component 55

Individual readiness 37

4.01 Quality of math and science education.....29
4.02 Quality of the educational system.....77
4.03 Buyer sophistication.....47
4.04 Residential telephone connection charge, 2008*.....1
4.05 Residential monthly telephone subscription, 2008*.....91
4.06 Fixed broadband tariffs, 2008*.....30
4.07 Mobile cellular tariffs, 2008*.....55
4.08 Fixed telephone lines tariffs, 2008*.....49

Business readiness 64

5.01 Extent of staff training.....57
5.02 Local availability of research and training.....67
5.03 Quality of management schools.....85
5.04 Company spending on R&D.....74
5.05 University-industry collaboration in R&D.....73
5.06 Business telephone connection charge, 2008*.....32
5.07 Business monthly telephone subscription, 2008*.....95
5.08 Local supplier quality.....80
5.09 Computer, comm., and other services imports, 2008*.....21
5.10 Availability of new telephone lines.....82

Government readiness 94

6.01 Government prioritization of ICT.....107
6.02 Gov't procurement of advanced tech. products.....75
6.03 Importance of ICT to gov't vision of the future.....87

Usage component 63

Individual usage 49

7.01 Mobile telephone subscriptions, 2008*.....37
7.02 Personal computers, 2007*.....44
7.03 Broadband Internet subscribers, 2008*.....41
7.04 Internet users, 2008*.....62
7.05 Internet access in schools.....57

Business usage 72

8.01 Prevalence of foreign technology licensing.....66
8.02 Firm-level technology absorption.....90
8.03 Capacity for innovation.....64
8.04 Extent of business Internet use.....79
8.05 Creative industries exports, 2006*.....39
8.06 Utility patents, 2008*.....57
8.07 High-tech exports, 2007*.....55

Government usage 75

9.01 Government success in ICT promotion.....81
9.02 Government Online Service Index, 2009*.....41
9.03 ICT use and government efficiency.....108
9.04 Presence of ICT in government agencies.....74
9.05 E-Participation Index, 2009*.....60

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Russian Federation

Key indicators

Population (millions), 2008.....141.8
GDP per capita (PPP $), 2008.....15,948
Mobile phone subscriptions per 100 population, 2008.....141.1
Internet users per 100 population, 2008.....32.0
Internet bandwidth (Mb/s) per 10,000 population, 2007.....5.7
Utility patents per million population, 2008.....1.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**80**
2008–2009 (134)	74
2007–2008 (127)	72
Global Competitiveness Index 2009–2010 (133)	63

Environment component 86

Market environment 116

1.01 Venture capital availability.....86
1.02 Financial market sophistication.....92
1.03 Availability of latest technologies.....102
1.04 State of cluster development.....90
1.05 Burden of government regulation.....124
1.06 Extent and effect of taxation.....99
1.07 Total tax rate, 2008*.....91
1.08 Time required to start a business, 2009*.....88
1.09 No. of procedures required to start a business, 2009*.....83
1.10 Intensity of local competition.....106
1.11 Freedom of the press.....123

Political and regulatory environment 109

2.01 Effectiveness of law-making bodies.....82
2.02 Laws relating to ICT.....93
2.03 Judicial independence.....116
2.04 Intellectual property protection.....102
2.05 Efficiency of legal framework in settling disputes.....109
2.06 Efficiency of legal framework in challenging regs.....111
2.07 Property rights.....121
2.08 No. of procedures to enforce a contract, 2009*.....64
2.09 Time to enforce a contract, 2009*.....10
2.10 Level of competition index, 2007*.....104

Infrastructure environment 43

3.01 Number of telephone lines, 2008*.....38
3.02 Secure Internet servers, 2008*.....78
3.03 Electricity production, 2006*.....31
3.04 Availability of scientists and engineers.....48
3.05 Quality of scientific research institutions.....42
3.06 Tertiary education enrollment, 2007*.....14
3.07 Education expenditure, 2007*.....86
3.08 Accessibility of digital content.....56
3.09 Internet bandwidth, 2007*.....74

Readiness component 73

Individual readiness 60

4.01 Quality of math and science education.....42
4.02 Quality of the educational system.....56
4.03 Buyer sophistication.....60
4.04 Residential telephone connection charge, 2008*.....124
4.05 Residential monthly telephone subscription, 2008*.....78
4.06 Fixed broadband tariffs, 2008*.....11
4.07 Mobile cellular tariffs, 2008*.....54
4.08 Fixed telephone lines tariffs, 2008*.....20

Business readiness 78

5.01 Extent of staff training.....91
5.02 Local availability of research and training.....69
5.03 Quality of management schools.....93
5.04 Company spending on R&D.....46
5.05 University-industry collaboration in R&D.....48
5.06 Business telephone connection charge*.....n/a
5.07 Business monthly telephone subscription*.....n/a
5.08 Local supplier quality.....110
5.09 Computer, comm., and other services imports, 2008*.....20
5.10 Availability of new telephone lines.....94

Government readiness 99

6.01 Government prioritization of ICT.....101
6.02 Gov't procurement of advanced tech. products.....69
6.03 Importance of ICT to gov't vision of the future.....118

Usage component 71

Individual usage 52

7.01 Mobile telephone subscriptions, 2008*.....10
7.02 Personal computers, 2006*.....56
7.03 Broadband Internet subscribers, 2008*.....54
7.04 Internet users, 2008*.....60
7.05 Internet access in schools.....63

Business usage 71

8.01 Prevalence of foreign technology licensing.....99
8.02 Firm-level technology absorption.....104
8.03 Capacity for innovation.....42
8.04 Extent of business Internet use.....61
8.05 Creative industries exports, 2006*.....29
8.06 Utility patents, 2008*.....44
8.07 High-tech exports, 2007*.....73

Government usage 107

9.01 Government success in ICT promotion.....106
9.02 Government Online Service Index, 2009*.....65
9.03 ICT use and government efficiency.....118
9.04 Presence of ICT in government agencies.....121
9.05 E-Participation Index, 2009*.....77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Saudi Arabia

Key indicators

Population (millions), 2008 ..... 24.6
GDP per capita (PPP $), 2008 23,814
Mobile phone subscriptions per 100 population, 2008 ..... 142.9
Internet users per 100 population, 2008 ..... 30.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 11.9
Utility patents per million population, 2008 ..... 1.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**38**
2008–2009 (134)	40
2007–2008 (127)	48
Global Competitiveness Index 2009–2010 (133)	28

Environment component 38

Market environment 33

1.01 Venture capital availability 27
1.02 Financial market sophistication 50
1.03 Availability of latest technologies 43
1.04 State of cluster development 40
1.05 Burden of government regulation 20
1.06 Extent and effect of taxation 8
1.07 Total tax rate, 2008* 5
1.08 Time required to start a business, 2009* 8
1.09 No. of procedures required to start a business, 2009* 13
1.10 Intensity of local competition 37
1.11 Freedom of the press 111

Political and regulatory environment 35

2.01 Effectiveness of law-making bodies 41
2.02 Laws relating to ICT 45
2.03 Judicial independence 34
2.04 Intellectual property protection 31
2.05 Efficiency of legal framework in settling disputes 58
2.06 Efficiency of legal framework in challenging regs 44
2.07 Property rights 37
2.08 No. of procedures to enforce a contract, 2009* 107
2.09 Time to enforce a contract, 2009* 91
2.10 Level of competition index, 2007* 1

Infrastructure environment 48

3.01 Number of telephone lines, 2008* 75
3.02 Secure Internet servers, 2008* 75
3.03 Electricity production, 2006* 26
3.04 Availability of scientists and engineers 47
3.05 Quality of scientific research institutions 37
3.06 Tertiary education enrollment, 2006* 72
3.07 Education expenditure, 2007* 7
3.08 Accessibility of digital content 64
3.09 Internet bandwidth, 2008* 59

Readiness component 30

Individual readiness 46

4.01 Quality of math and science education 76
4.02 Quality of the educational system 60
4.03 Buyer sophistication 36
4.04 Residential telephone connection charge, 2008* 80
4.05 Residential monthly telephone subscription, 2008* 52
4.06 Fixed broadband tariffs, 2008* 77
4.07 Mobile cellular tariffs, 2008* 40
4.08 Fixed telephone lines tariffs, 2008* 23

Business readiness 28

5.01 Extent of staff training 45
5.02 Local availability of research and training 42
5.03 Quality of management schools 79
5.04 Company spending on R&D 34
5.05 University-industry collaboration in R&D 37
5.06 Business telephone connection charge, 2008* 65
5.07 Business monthly telephone subscription, 2008* 26
5.08 Local supplier quality 43
5.09 Computer, comm., and other services imports, 2007* 5
5.10 Availability of new telephone lines 51

Government readiness 25

6.01 Government prioritization of ICT 30
6.02 Gov't procurement of advanced tech. products 22
6.03 Importance of ICT to gov't vision of the future 28

Usage component 41

Individual usage 42

7.01 Mobile telephone subscriptions, 2008* 9
7.02 Personal computers, 2008* 11
7.03 Broadband Internet subscribers, 2008* 66
7.04 Internet users, 2008* 61
7.05 Internet access in schools 69

Business usage 49

8.01 Prevalence of foreign technology licensing 29
8.02 Firm-level technology absorption 40
8.03 Capacity for innovation 31
8.04 Extent of business Internet use 49
8.05 Creative industries exports, 2005* 47
8.06 Utility patents, 2008* 45
8.07 High-tech exports, 2007* 116

Government usage 52

9.01 Government success in ICT promotion 25
9.02 Government Online Service Index, 2009* 72
9.03 ICT use and government efficiency 28
9.04 Presence of ICT in government agencies 40
9.05 E-Participation Index, 2009* 90

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Senegal

Key indicators

Networked Readiness Index

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Serbia

Key indicators

Population (millions), 2008 ..... 7.4
GDP per capita (PPP $), 2008 10,810
Mobile phone subscriptions per 100 population, 2008 ..... 97.8
Internet users per 100 population, 2008 ..... 33.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 33.5
Utility patents per million population, 2008 ..... 0.4

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**84**
2008–2009 (134)	84
2007–2008 (127)	n/a
Global Competitiveness Index 2009–2010 (133)	93

Environment component 90

Market environment 114

1.01 Venture capital availability 80
1.02 Financial market sophistication 111
1.03 Availability of latest technologies 114
1.04 State of cluster development 117
1.05 Burden of government regulation 129
1.06 Extent and effect of taxation 97
1.07 Total tax rate, 2008* 44
1.08 Time required to start a business, 2009* 41
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 120
1.11 Freedom of the press 93

Political and regulatory environment 99

2.01 Effectiveness of law-making bodies 100
2.02 Laws relating to ICT 80
2.03 Judicial independence 110
2.04 Intellectual property protection 101
2.05 Efficiency of legal framework in settling disputes 124
2.06 Efficiency of legal framework in challenging regs 115
2.07 Property rights 111
2.08 No. of procedures to enforce a contract, 2009* 54
2.09 Time to enforce a contract, 2009* 91
2.10 Level of competition index, 2007* 59

Infrastructure environment 57

3.01 Number of telephone lines, 2008* 39
3.02 Secure Internet servers, 2008* 91
3.03 Electricity production, 2006* 47
3.04 Availability of scientists and engineers 77
3.05 Quality of scientific research institutions 54
3.06 Tertiary education enrollment, 2008* 59
3.07 Education expenditure, 2008* 61
3.08 Accessibility of digital content 97
3.09 Internet bandwidth, 2008* 42

Readiness component 66

Individual readiness 33

4.01 Quality of math and science education 43
4.02 Quality of the educational system 71
4.03 Buyer sophistication 111
4.04 Residential telephone connection charge, 2008* 104
4.05 Residential monthly telephone subscription, 2008* 34
4.06 Fixed broadband tariffs, 2008* 1
4.07 Mobile cellular tariffs, 2008* 19
4.08 Fixed telephone lines tariffs, 2008* 13

Business readiness 99

5.01 Extent of staff training 120
5.02 Local availability of research and training 90
5.03 Quality of management schools 90
5.04 Company spending on R&D 110
5.05 University-industry collaboration in R&D 81
5.06 Business telephone connection charge, 2007* 112
5.07 Business monthly telephone subscription, 2007* 3
5.08 Local supplier quality 103
5.09 Computer, comm., and other services imports, 2008* 37
5.10 Availability of new telephone lines 110

Government readiness 95

6.01 Government prioritization of ICT 100
6.02 Gov't procurement of advanced tech. products 86
6.03 Importance of ICT to gov't vision of the future 100

Usage component 84

Individual usage 60

7.01 Mobile telephone subscriptions, 2008* 58
7.02 Personal computers, 2008* 45
7.03 Broadband Internet subscribers, 2008* 62
7.04 Internet users, 2008* 56
7.05 Internet access in schools 83

Business usage 93

8.01 Prevalence of foreign technology licensing 107
8.02 Firm-level technology absorption 125
8.03 Capacity for innovation 82
8.04 Extent of business Internet use 119
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 67
8.07 High-tech exports, 2006* 58

Government usage 106

9.01 Government success in ICT promotion 108
9.02 Government Online Service Index, 2009* 98
9.03 ICT use and government efficiency 78
9.04 Presence of ICT in government agencies 97
9.05 E-Participation Index, 2009* 110

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Singapore

Key indicators

Population (millions), 2008 ..... 4.8
GDP per capita (PPP $), 2008 51,226
Mobile phone subscriptions per 100 population, 2008 ..... 138.1
Internet users per 100 population, 2008 ..... 73.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 235.7
Utility patents per million population, 2008 ..... 88.7

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**2**
2008–2009 (134)	4
2007–2008 (127)	5

Global Competitiveness Index 2009–2010 (133) 3

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Slovak Republic

Key indicators

Population (millions), 2008.....5.4
GDP per capita (PPP $), 2008.....22,097
Mobile phone subscriptions per 100 population, 2008.....102.2
Internet users per 100 population, 2008.....66.0
Internet bandwidth (Mb/s) per 10,000 population, 2007.....55.6
Utility patents per million population, 2008.....0.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**55**
2008–2009 (134)	43
2007–2008 (127)	43

Global Competitiveness Index 2009–2010 (133)	47

Environment component 46

Market environment 45

1.01 Venture capital availability.....41
1.02 Financial market sophistication.....41
1.03 Availability of latest technologies.....44
1.04 State of cluster development.....67
1.05 Burden of government regulation.....90
1.06 Extent and effect of taxation.....18
1.07 Total tax rate, 2008*.....93
1.08 Time required to start a business, 2009*.....57
1.09 No. of procedures required to start a business, 2009*.....32
1.10 Intensity of local competition.....25
1.11 Freedom of the press.....73

Political and regulatory environment 58

2.01 Effectiveness of law-making bodies.....86
2.02 Laws relating to ICT.....66
2.03 Judicial independence.....81
2.04 Intellectual property protection.....57
2.05 Efficiency of legal framework in settling disputes.....102
2.06 Efficiency of legal framework in challenging regs.....123
2.07 Property rights.....59
2.08 No. of procedures to enforce a contract, 2009*.....15
2.09 Time to enforce a contract, 2009*.....69
2.10 Level of competition index, 2007*.....1

Infrastructure environment 49

3.01 Number of telephone lines, 2008*.....65
3.02 Secure Internet servers, 2008*.....47
3.03 Electricity production, 2006*.....39
3.04 Availability of scientists and engineers.....52
3.05 Quality of scientific research institutions.....86
3.06 Tertiary education enrollment, 2007*.....41
3.07 Education expenditure, 2007*.....76
3.08 Accessibility of digital content.....40
3.09 Internet bandwidth, 2007*.....34

Readiness component 89

Individual readiness 102

4.01 Quality of math and science education.....51
4.02 Quality of the educational system.....89
4.03 Buyer sophistication.....75
4.04 Residential telephone connection charge, 2008*.....54
4.05 Residential monthly telephone subscription, 2008*.....60
4.06 Fixed broadband tariffs, 2008*.....52
4.07 Mobile cellular tariffs, 2008*.....91
4.08 Fixed telephone lines tariffs, 2008*.....115

Business readiness 47

5.01 Extent of staff training.....51
5.02 Local availability of research and training.....50
5.03 Quality of management schools.....100
5.04 Company spending on R&D.....55
5.05 University-industry collaboration in R&D.....80
5.06 Business telephone connection charge, 2007*.....37
5.07 Business monthly telephone subscription, 2007*.....88
5.08 Local supplier quality.....49
5.09 Computer, comm., and other services imports, 2007*.....36
5.10 Availability of new telephone lines.....23

Government readiness 102

6.01 Government prioritization of ICT.....105
6.02 Gov't procurement of advanced tech. products.....111
6.03 Importance of ICT to gov't vision of the future.....95

Usage component 45

Individual usage 33

7.01 Mobile telephone subscriptions, 2008*.....51
7.02 Personal computers, 2008*.....17
7.03 Broadband Internet subscribers, 2008*.....42
7.04 Internet users, 2008*.....24
7.05 Internet access in schools.....36

Business usage 50

8.01 Prevalence of foreign technology licensing.....43
8.02 Firm-level technology absorption.....45
8.03 Capacity for innovation.....55
8.04 Extent of business Internet use.....47
8.05 Creative industries exports, 2005*.....42
8.06 Utility patents, 2008*.....49
8.07 High-tech exports, 2007*.....45

Government usage 95

9.01 Government success in ICT promotion.....120
9.02 Government Online Service Index, 2009*.....60
9.03 ICT use and government efficiency.....96
9.04 Presence of ICT in government agencies.....77
9.05 E-Participation Index, 2009*.....100

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Slovenia

Key indicators

Networked Readiness Index

Environment component 30

Readiness component 35

Usage component 31

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

South Africa

Key indicators

Population (millions), 2008 ..... 48.7
GDP per capita (PPP $), 2008 10,136
Mobile phone subscriptions per 100 population, 2008 ..... 90.6
Internet users per 100 population, 2008 ..... 8.4
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.7
Utility patents per million population, 2008 ..... 1.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**62**
2008–2009 (134)	52
2007–2008 (127)	51
Global Competitiveness Index 2009–2010 (133)	45

Environment component 39

Market environment 29

1.01 Venture capital availability 33
1.02 Financial market sophistication 6
1.03 Availability of latest technologies 37
1.04 State of cluster development 33
1.05 Burden of government regulation 65
1.06 Extent and effect of taxation 27
1.07 Total tax rate, 2008* 30
1.08 Time required to start a business, 2009* 71
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 60
1.11 Freedom of the press 27

Political and regulatory environment 21

2.01 Effectiveness of law-making bodies 32
2.02 Laws relating to ICT 31
2.03 Judicial independence 38
2.04 Intellectual property protection 24
2.05 Efficiency of legal framework in settling disputes 18
2.06 Efficiency of legal framework in challenging regs 22
2.07 Property rights 20
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 83
2.10 Level of competition index, 2007* 59

Infrastructure environment 72

3.01 Number of telephone lines, 2008* 96
3.02 Secure Internet servers, 2008* 52
3.03 Electricity production, 2006* 44
3.04 Availability of scientists and engineers 123
3.05 Quality of scientific research institutions 29
3.06 Tertiary education enrollment, 2006* 94
3.07 Education expenditure, 2007* 32
3.08 Accessibility of digital content 82
3.09 Internet bandwidth, 2007* 99

Readiness component 84

Individual readiness 115

4.01 Quality of math and science education 133
4.02 Quality of the educational system 119
4.03 Buyer sophistication 23
4.04 Residential telephone connection charge, 2008* 78
4.05 Residential monthly telephone subscription, 2008* 121
4.06 Fixed broadband tariffs, 2008* 65
4.07 Mobile cellular tariffs, 2008* 99
4.08 Fixed telephone lines tariffs, 2008* 106

Business readiness 43

5.01 Extent of staff training 21
5.02 Local availability of research and training 40
5.03 Quality of management schools 30
5.04 Company spending on R&D 35
5.05 University-industry collaboration in R&D 25
5.06 Business telephone connection charge, 2007* 59
5.07 Business monthly telephone subscription, 2007* 111
5.08 Local supplier quality 22
5.09 Computer, comm., and other services imports, 2008* 67
5.10 Availability of new telephone lines 116

Government readiness 78

6.01 Government prioritization of ICT 85
6.02 Gov't procurement of advanced tech. products 78
6.03 Importance of ICT to gov't vision of the future 70

Usage component 76

Individual usage 89

7.01 Mobile telephone subscriptions, 2008* 69
7.02 Personal computers, 2005* 70
7.03 Broadband Internet subscribers, 2008* 89
7.04 Internet users, 2008* 101
7.05 Internet access in schools 100

Business usage 44

8.01 Prevalence of foreign technology licensing 22
8.02 Firm-level technology absorption 33
8.03 Capacity for innovation 36
8.04 Extent of business Internet use 44
8.05 Creative industries exports, 2006* 43
8.06 Utility patents, 2008* 39
8.07 High-tech exports, 2007* 61

Government usage 71

9.01 Government success in ICT promotion 92
9.02 Government Online Service Index, 2009* 74
9.03 ICT use and government efficiency 75
9.04 Presence of ICT in government agencies 52
9.05 E-Participation Index, 2009* 60

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Spain

Key indicators

Population (millions), 2008 ..... 45.6
GDP per capita (PPP $), 2008 30,589
Mobile phone subscriptions per 100 population, 2008 ..... 111.7
Internet users per 100 population, 2008 ..... 56.7
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 111.6
Utility patents per million population, 2008 ..... 6.8

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**34**
2008–2009 (134)	34
2007–2008 (127)	31

Global Competitiveness Index 2009–2010 (133) 33

Environment component 34

Market environment 46

1.01 Venture capital availability 48
1.02 Financial market sophistication 24
1.03 Availability of latest technologies 41
1.04 State of cluster development 32
1.05 Burden of government regulation 105
1.06 Extent and effect of taxation 87
1.07 Total tax rate, 2008* 106
1.08 Time required to start a business, 2009* 112
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 22
1.11 Freedom of the press 38

Political and regulatory environment 40

2.01 Effectiveness of law-making bodies 48
2.02 Laws relating to ICT 38
2.03 Judicial independence 60
2.04 Intellectual property protection 40
2.05 Efficiency of legal framework in settling disputes 68
2.06 Efficiency of legal framework in challenging regs 66
2.07 Property rights 43
2.08 No. of procedures to enforce a contract, 2009* 80
2.09 Time to enforce a contract, 2009* 60
2.10 Level of competition index, 2007* 1

Infrastructure environment 29

3.01 Number of telephone lines, 2008* 20
3.02 Secure Internet servers, 2008* 29
3.03 Electricity production, 2006* 32
3.04 Availability of scientists and engineers 37
3.05 Quality of scientific research institutions 44
3.06 Tertiary education enrollment, 2007* 18
3.07 Education expenditure, 2007* 72
3.08 Accessibility of digital content 36
3.09 Internet bandwidth, 2007* 22

Readiness component 54

Individual readiness 81

4.01 Quality of math and science education 99
4.02 Quality of the educational system 78
4.03 Buyer sophistication 35
4.04 Residential telephone connection charge, 2008* 83
4.05 Residential monthly telephone subscription, 2008* 112
4.06 Fixed broadband tariffs, 2008* 23
4.07 Mobile cellular tariffs, 2008* 104
4.08 Fixed telephone lines tariffs, 2008* 46

Business readiness 29

5.01 Extent of staff training 73
5.02 Local availability of research and training 27
5.03 Quality of management schools 6
5.04 Company spending on R&D 39
5.05 University-industry collaboration in R&D 49
5.06 Business telephone connection charge, 2007* 53
5.07 Business monthly telephone subscription, 2007* 67
5.08 Local supplier quality 32
5.09 Computer, comm., and other services imports, 2008* 13
5.10 Availability of new telephone lines 61

Government readiness 72

6.01 Government prioritization of ICT 88
6.02 Gov't procurement of advanced tech. products 66
6.03 Importance of ICT to gov't vision of the future 66

Usage component 29

Individual usage 35

7.01 Mobile telephone subscriptions, 2008* 40
7.02 Personal computers, 2007* 26
7.03 Broadband Internet subscribers, 2008* 28
7.04 Internet users, 2008* 32
7.05 Internet access in schools 44

Business usage 31

8.01 Prevalence of foreign technology licensing 37
8.02 Firm-level technology absorption 49
8.03 Capacity for innovation 34
8.04 Extent of business Internet use 70
8.05 Creative industries exports, 2005* 11
8.06 Utility patents, 2008* 27
8.07 High-tech exports, 2007* 48

Government usage 18

9.01 Government success in ICT promotion 102
9.02 Government Online Service Index, 2009* 5
9.03 ICT use and government efficiency 51
9.04 Presence of ICT in government agencies 50
9.05 E-Participation Index, 2009* 3

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Sri Lanka

Key indicators

Population (millions), 2008 ..... 20.2
GDP per capita (PPP $), 2008 4,589
Mobile phone subscriptions per 100 population, 2008 ..... 55.2
Internet users per 100 population, 2008 ..... 5.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 2.0
Utility patents per million population, 2008 ..... 0.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**72**
2008–2009 (134)	72
2007–2008 (127)	79
Global Competitiveness Index 2009–2010 (133)	79

Environment component 84

Readiness component 44

Usage component 82

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Suriname

Key indicators

Population (millions), 2008 ..... 0.5
GDP per capita (PPP $), 2008 8,188
Mobile phone subscriptions per 100 population, 2008 ..... 80.8
Internet users per 100 population, 2008 ..... 9.7
Internet bandwidth (Mb/s) per 10,000 population, 2006 ..... 4.4
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**126**
2008–2009 (134)	117
2007–2008 (127)	117

Global Competitiveness Index 2009–2010 (133) 102

Environment component 129

Market environment 123

1.01 Venture capital availability 119
1.02 Financial market sophistication 104
1.03 Availability of latest technologies 120
1.04 State of cluster development 102
1.05 Burden of government regulation 122
1.06 Extent and effect of taxation 105
1.07 Total tax rate, 2008* 25
1.08 Time required to start a business, 2009* 130
1.09 No. of procedures required to start a business, 2009* 115
1.10 Intensity of local competition 90
1.11 Freedom of the press 55

Political and regulatory environment 129

2.01 Effectiveness of law-making bodies 124
2.02 Laws relating to ICT 132
2.03 Judicial independence 56
2.04 Intellectual property protection 125
2.05 Efficiency of legal framework in settling disputes 112
2.06 Efficiency of legal framework in challenging regs 125
2.07 Property rights 104
2.08 No. of procedures to enforce a contract, 2009* 111
2.09 Time to enforce a contract, 2009* 130
2.10 Level of competition index, 2007* 104

Infrastructure environment 109

3.01 Number of telephone lines, 2008* 77
3.02 Secure Internet servers, 2008* 73
3.03 Electricity production, 2006* 63
3.04 Availability of scientists and engineers 111
3.05 Quality of scientific research institutions 116
3.06 Tertiary education enrollment, 2002* 98
3.07 Education expenditure* ..... n/a
3.08 Accessibility of digital content 100
3.09 Internet bandwidth, 2006* 80

Readiness component 113

Individual readiness 78

4.01 Quality of math and science education 68
4.02 Quality of the educational system 86
4.03 Buyer sophistication 99
4.04 Residential telephone connection charge* ..... n/a
4.05 Residential monthly telephone subscription* ..... n/a
4.06 Fixed broadband tariffs, 2008* 103
4.07 Mobile cellular tariffs, 2008* 57
4.08 Fixed telephone lines tariffs, 2008* 40

Business readiness 88

5.01 Extent of staff training 108
5.02 Local availability of research and training 117
5.03 Quality of management schools 87
5.04 Company spending on R&D 102
5.05 University-industry collaboration in R&D 106
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 108
5.09 Computer, comm., and other services imports, 2007* 4
5.10 Availability of new telephone lines 112

Government readiness 130

6.01 Government prioritization of ICT 130
6.02 Gov't procurement of advanced tech. products 123
6.03 Importance of ICT to gov't vision of the future 132

Usage component 124

Individual usage 94

7.01 Mobile telephone subscriptions, 2008* 79
7.02 Personal computers, 2005* 88
7.03 Broadband Internet subscribers, 2008* 87
7.04 Internet users, 2008* 98
7.05 Internet access in schools 108

Business usage 128

8.01 Prevalence of foreign technology licensing 129
8.02 Firm-level technology absorption 117
8.03 Capacity for innovation 98
8.04 Extent of business Internet use 112
8.05 Creative industries exports, 2006* 117
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 92

Government usage 132

9.01 Government success in ICT promotion 126
9.02 Government Online Service Index, 2009* 128
9.03 ICT use and government efficiency 131
9.04 Presence of ICT in government agencies 133
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Sweden

Key indicators

Population (millions), 2008.....9.2
GDP per capita (PPP $), 2008.....37,334
Mobile phone subscriptions per 100 population, 2008.....118.3
Internet users per 100 population, 2008.....87.8
Internet bandwidth (Mb/s) per 10,000 population, 2007.....499.9
Utility patents per million population, 2008.....115.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**1**
2008–2009 (134)	2
2007–2008 (127)	2

Global Competitiveness Index 2009–2010 (133)	4

Environment component 1

Market environment 5

Political and regulatory environment 2

Infrastructure environment 1

Readiness component 4

Individual readiness 6

Business readiness 3

Government readiness 12

Usage component 3

Individual usage 1

Business usage 13

Government usage 14

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Switzerland

Key indicators

Networked Readiness Index

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Syria

Key indicators

Population (millions), 2008 ..... 21.2
GDP per capita (PPP $), 2008 4,757
Mobile phone subscriptions per 100 population, 2008 ..... 33.2
Internet users per 100 population, 2008 ..... 16.8
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 1.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**105**
2008–2009 (134)	94
2007–2008 (127)	110

Global Competitiveness Index 2009–2010 (133) 94

Environment component 113

Market environment 115

1.01 Venture capital availability 100
1.02 Financial market sophistication 126
1.03 Availability of latest technologies 99
1.04 State of cluster development 119
1.05 Burden of government regulation 94
1.06 Extent and effect of taxation 34
1.07 Total tax rate, 2008* 73
1.08 Time required to start a business, 2009* 59
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 67
1.11 Freedom of the press 125

Political and regulatory environment 114

2.01 Effectiveness of law-making bodies 68
2.02 Laws relating to ICT 126
2.03 Judicial independence 86
2.04 Intellectual property protection 59
2.05 Efficiency of legal framework in settling disputes 110
2.06 Efficiency of legal framework in challenging regs 108
2.07 Property rights 46
2.08 No. of procedures to enforce a contract, 2009* 129
2.09 Time to enforce a contract, 2009* 116
2.10 Level of competition index, 2007* 116

Infrastructure environment 105

3.01 Number of telephone lines, 2008* 72
3.02 Secure Internet servers, 2008* 124
3.03 Electricity production, 2006* 78
3.04 Availability of scientists and engineers 43
3.05 Quality of scientific research institutions 110
3.06 Tertiary education enrollment, 2008* 84
3.07 Education expenditure, 2007* 112
3.08 Accessibility of digital content 127
3.09 Internet bandwidth, 2008* 96

Readiness component 88

Individual readiness 59

4.01 Quality of math and science education 61
4.02 Quality of the educational system 96
4.03 Buyer sophistication 116
4.04 Residential telephone connection charge, 2006* 56
4.05 Residential monthly telephone subscription, 2006* 3
4.06 Fixed broadband tariffs, 2008* 99
4.07 Mobile cellular tariffs, 2008* 50
4.08 Fixed telephone lines tariffs, 2008* 12

Business readiness 110

5.01 Extent of staff training 123
5.02 Local availability of research and training 96
5.03 Quality of management schools 107
5.04 Company spending on R&D 131
5.05 University-industry collaboration in R&D 123
5.06 Business telephone connection charge, 2006* 39
5.07 Business monthly telephone subscription, 2006* 2
5.08 Local supplier quality 94
5.09 Computer, comm., and other services imports, 2006* 104
5.10 Availability of new telephone lines 97

Government readiness 105

6.01 Government prioritization of ICT 104
6.02 Gov't procurement of advanced tech. products 110
6.03 Importance of ICT to gov't vision of the future 103

Usage component 119

Individual usage 112

7.01 Mobile telephone subscriptions, 2008* 113
7.02 Personal computers, 2007* 69
7.03 Broadband Internet subscribers, 2008* 110
7.04 Internet users, 2008* 83
7.05 Internet access in schools 126

Business usage 95

8.01 Prevalence of foreign technology licensing 93
8.02 Firm-level technology absorption 81
8.03 Capacity for innovation 128
8.04 Extent of business Internet use 131
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 94

Government usage 126

9.01 Government success in ICT promotion 98
9.02 Government Online Service Index, 2009* 126
9.03 ICT use and government efficiency 109
9.04 Presence of ICT in government agencies 124
9.05 E-Participation Index, 2009* 118

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Taiwan, China

Key indicators

Population (millions), 2008 ..... 22.9
GDP per capita (PPP $), 2008 30,912
Mobile phone subscriptions per 100 population, 2008 ..... 110.3
Internet users per 100 population, 2008 ..... 65.7
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 102.1
Utility patents per million population, 2008 ..... 279.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**11**
2008–2009 (134)	13
2007–2008 (127)	17

Global Competitiveness Index 2009–2010 (133) 12

Environment component 21

Market environment 13

1.01 Venture capital availability 8
1.02 Financial market sophistication 39
1.03 Availability of latest technologies 33
1.04 State of cluster development 6
1.05 Burden of government regulation 37
1.06 Extent and effect of taxation 24
1.07 Total tax rate, 2008* 66
1.08 Time required to start a business, 2009* 73
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 2
1.11 Freedom of the press 20

Political and regulatory environment 44

2.01 Effectiveness of law-making bodies 75
2.02 Laws relating to ICT 23
2.03 Judicial independence 49
2.04 Intellectual property protection 27
2.05 Efficiency of legal framework in settling disputes 45
2.06 Efficiency of legal framework in challenging regs 49
2.07 Property rights 35
2.08 No. of procedures to enforce a contract, 2009* 120
2.09 Time to enforce a contract, 2009* 55
2.10 Level of competition index* ..... n/a

Infrastructure environment 11

3.01 Number of telephone lines, 2008* 3
3.02 Secure Internet servers, 2008* 22
3.03 Electricity production, 2008* 13
3.04 Availability of scientists and engineers 7
3.05 Quality of scientific research institutions 18
3.06 Tertiary education enrollment, 2008* 5
3.07 Education expenditure, 2008* 18
3.08 Accessibility of digital content 24
3.09 Internet bandwidth, 2008* 24

Readiness component 10

Individual readiness 22

4.01 Quality of math and science education 6
4.02 Quality of the educational system 17
4.03 Buyer sophistication 4
4.04 Residential telephone connection charge* ..... n/a
4.05 Residential monthly telephone subscription* ..... n/a
4.06 Fixed broadband tariffs, 2008* 6
4.07 Mobile cellular tariffs, 2008* 90
4.08 Fixed telephone lines tariffs, 2008* 43

Business readiness 17

5.01 Extent of staff training 19
5.02 Local availability of research and training 22
5.03 Quality of management schools 31
5.04 Company spending on R&D 9
5.05 University-industry collaboration in R&D 12
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 17
5.09 Computer, comm., and other services imports, 2008* 44
5.10 Availability of new telephone lines 17

Government readiness 8

6.01 Government prioritization of ICT 10
6.02 Gov't procurement of advanced tech. products 7
6.03 Importance of ICT to gov't vision of the future 9

Usage component 5

Individual usage 14

7.01 Mobile telephone subscriptions, 2008* 43
7.02 Personal computers, 2008* 5
7.03 Broadband Internet subscribers, 2008* 23
7.04 Internet users, 2008* 25
7.05 Internet access in schools 13

Business usage 6

8.01 Prevalence of foreign technology licensing 14
8.02 Firm-level technology absorption 12
8.03 Capacity for innovation 13
8.04 Extent of business Internet use 14
8.05 Creative industries exports, 2005* 30
8.06 Utility patents, 2008* 1
8.07 High-tech exports, 2007* 3

Government usage 3

9.01 Government success in ICT promotion 5
9.02 Government Online Service Index* ..... n/a
9.03 ICT use and government efficiency 10
9.04 Presence of ICT in government agencies 11
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Tajikistan

Key indicators

Population (millions), 2008.....6.8
GDP per capita (PPP $), 2008.....2,023
Mobile phone subscriptions per 100 population, 2008.....53.7
Internet users per 100 population, 2008.....8.8
Internet bandwidth (Mb/s) per 10,000 population, 2007.....0.4
Utility patents per million population, 2008.....0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**109**
2008–2009 (134)	104
2007–2008 (127)	98
Global Competitiveness Index 2009–2010 (133)	122

Environment component 115

Market environment 127

1.01 Venture capital availability.....83
1.02 Financial market sophistication.....119
1.03 Availability of latest technologies.....121
1.04 State of cluster development.....125
1.05 Burden of government regulation.....58
1.06 Extent and effect of taxation.....88
1.07 Total tax rate, 2008*.....126
1.08 Time required to start a business, 2009*.....77
1.09 No. of procedures required to start a business, 2009*.....108
1.10 Intensity of local competition.....117
1.11 Freedom of the press.....119

Political and regulatory environment 111

2.01 Effectiveness of law-making bodies.....51
2.02 Laws relating to ICT.....101
2.03 Judicial independence.....85
2.04 Intellectual property protection.....85
2.05 Efficiency of legal framework in settling disputes.....77
2.06 Efficiency of legal framework in challenging regs.....73
2.07 Property rights.....99
2.08 No. of procedures to enforce a contract, 2009*.....41
2.09 Time to enforce a contract, 2009*.....41
2.10 Level of competition index, 2007*.....126

Infrastructure environment 95

3.01 Number of telephone lines, 2008*.....105
3.02 Secure Internet servers*.....n/a
3.03 Electricity production, 2006*.....69
3.04 Availability of scientists and engineers.....108
3.05 Quality of scientific research institutions.....88
3.06 Tertiary education enrollment, 2007*.....83
3.07 Education expenditure, 2007*.....95
3.08 Accessibility of digital content.....98
3.09 Internet bandwidth, 2007*.....105

Readiness component 119

Individual readiness 124

4.01 Quality of math and science education.....119
4.02 Quality of the educational system.....106
4.03 Buyer sophistication.....96
4.04 Residential telephone connection charge*.....n/a
4.05 Residential monthly telephone subscription*.....n/a
4.06 Fixed broadband tariffs*.....n/a
4.07 Mobile cellular tariffs*.....n/a
4.08 Fixed telephone lines tariffs*.....n/a

Business readiness 97

5.01 Extent of staff training.....116
5.02 Local availability of research and training.....129
5.03 Quality of management schools.....126
5.04 Company spending on R&D.....119
5.05 University-industry collaboration in R&D.....88
5.06 Business telephone connection charge*.....n/a
5.07 Business monthly telephone subscription*.....n/a
5.08 Local supplier quality.....122
5.09 Computer, comm., and other services imports, 2007*.....3
5.10 Availability of new telephone lines.....92

Government readiness 75

6.01 Government prioritization of ICT.....72
6.02 Gov't procurement of advanced tech. products.....67
6.03 Importance of ICT to gov't vision of the future.....86

Usage component 99

Individual usage 104

7.01 Mobile telephone subscriptions, 2008*.....100
7.02 Personal computers, 2005*.....107
7.03 Broadband Internet subscribers, 2008*.....109
7.04 Internet users, 2008*.....99
7.05 Internet access in schools.....92

Business usage 65

8.01 Prevalence of foreign technology licensing.....117
8.02 Firm-level technology absorption.....119
8.03 Capacity for innovation.....72
8.04 Extent of business Internet use.....98
8.05 Creative industries exports*.....n/a
8.06 Utility patents, 2008*.....90
8.07 High-tech exports*.....n/a

Government usage 114

9.01 Government success in ICT promotion.....73
9.02 Government Online Service Index, 2009*.....122
9.03 ICT use and government efficiency.....93
9.04 Presence of ICT in government agencies.....88
9.05 E-Participation Index, 2009*.....116

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Tanzania

Key indicators

Population (millions), 2008 ..... 42.5
GDP per capita (PPP $), 2008 1,353
Mobile phone subscriptions per 100 population, 2008 ..... 30.6
Internet users per 100 population, 2008 ..... 1.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 0.0
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**120**
2008–2009 (134)	119
2007–2008 (127)	100

Global Competitiveness Index 2009–2010 (133)	100

Environment component 103

Readiness component 123

Usage component 122

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Thailand

Key indicators

Population (millions), 2008 ..... 67.4
GDP per capita (PPP $), 2008 8,239
Mobile phone subscriptions per 100 population, 2008 ..... 92.0
Internet users per 100 population, 2008 ..... 23.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 8.6
Utility patents per million population, 2008 ..... 0.3

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**47**
2008–2009 (134)	47
2007–2008 (127)	40
Global Competitiveness Index 2009–2010 (133)	36

Environment component 50

Market environment 42

1.01 Venture capital availability 49
1.02 Financial market sophistication 33
1.03 Availability of latest technologies 53
1.04 State of cluster development 35
1.05 Burden of government regulation 50
1.06 Extent and effect of taxation 40
1.07 Total tax rate, 2008* 55
1.08 Time required to start a business, 2009* 93
1.09 No. of procedures required to start a business, 2009* 55
1.10 Intensity of local competition 41
1.11 Freedom of the press 69

Political and regulatory environment 51

2.01 Effectiveness of law-making bodies 76
2.02 Laws relating to ICT 68
2.03 Judicial independence 54
2.04 Intellectual property protection 77
2.05 Efficiency of legal framework in settling disputes 42
2.06 Efficiency of legal framework in challenging regs 50
2.07 Property rights 73
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 50
2.10 Level of competition index, 2007* 1

Infrastructure environment 64

3.01 Number of telephone lines, 2008* 89
3.02 Secure Internet servers, 2008* 70
3.03 Electricity production, 2006* 75
3.04 Availability of scientists and engineers 54
3.05 Quality of scientific research institutions 60
3.06 Tertiary education enrollment, 2008* 43
3.07 Education expenditure, 2007* 44
3.08 Accessibility of digital content 55
3.09 Internet bandwidth, 2008* 64

Readiness component 46

Individual readiness 38

4.01 Quality of math and science education 62
4.02 Quality of the educational system 67
4.03 Buyer sophistication 46
4.04 Residential telephone connection charge, 2008* 118
4.05 Residential monthly telephone subscription, 2008* 27
4.06 Fixed broadband tariffs, 2008* 54
4.07 Mobile cellular tariffs, 2008* 2
4.08 Fixed telephone lines tariffs, 2008* 76

Business readiness 54

5.01 Extent of staff training 62
5.02 Local availability of research and training 61
5.03 Quality of management schools 59
5.04 Company spending on R&D 47
5.05 University-industry collaboration in R&D 44
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 40
5.09 Computer, comm., and other services imports, 2007* 49
5.10 Availability of new telephone lines 45

Government readiness 65

6.01 Government prioritization of ICT 76
6.02 Gov't procurement of advanced tech. products 58
6.03 Importance of ICT to gov't vision of the future 59

Usage component 50

Individual usage 67

7.01 Mobile telephone subscriptions, 2008* 67
7.02 Personal computers, 2005* 77
7.03 Broadband Internet subscribers, 2008* 82
7.04 Internet users, 2008* 74
7.05 Internet access in schools 41

Business usage 33

8.01 Prevalence of foreign technology licensing 45
8.02 Firm-level technology absorption 61
8.03 Capacity for innovation 59
8.04 Extent of business Internet use 67
8.05 Creative industries exports, 2005* 15
8.06 Utility patents, 2008* 68
8.07 High-tech exports, 2007* 12

Government usage 60

9.01 Government success in ICT promotion 46
9.02 Government Online Service Index, 2009* 64
9.03 ICT use and government efficiency 45
9.04 Presence of ICT in government agencies 47
9.05 E-Participation Index, 2009* 94

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Timor-Leste

Key indicators

Networked Readiness Index

Environment component 125

Readiness component 133

Usage component 130

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Trinidad and Tobago

Key indicators

Population (millions), 2008.....1.3
GDP per capita (PPP $), 2008.....20,338
Mobile phone subscriptions per 100 population, 2008.....112.9
Internet users per 100 population, 2008.....17.0
Internet bandwidth (Mb/s) per 10,000 population, 2007.....6.8
Utility patents per million population, 2008.....0.8

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**79**
2008–2009 (134)	81
2007–2008 (127)	82

Global Competitiveness Index 2009–2010 (133) 86

Environment component 68

Market environment 53

1.01 Venture capital availability.....70
1.02 Financial market sophistication.....52
1.03 Availability of latest technologies.....62
1.04 State of cluster development.....61
1.05 Burden of government regulation.....56
1.06 Extent and effect of taxation.....16
1.07 Total tax rate, 2008*.....43
1.08 Time required to start a business, 2009*.....110
1.09 No. of procedures required to start a business, 2009*.....83
1.10 Intensity of local competition.....58
1.11 Freedom of the press.....53

Political and regulatory environment 80

2.01 Effectiveness of law-making bodies.....73
2.02 Laws relating to ICT.....100
2.03 Judicial independence.....52
2.04 Intellectual property protection.....80
2.05 Efficiency of legal framework in settling disputes.....56
2.06 Efficiency of legal framework in challenging regs.....46
2.07 Property rights.....62
2.08 No. of procedures to enforce a contract, 2009*.....104
2.09 Time to enforce a contract, 2009*.....124
2.10 Level of competition index, 2007*.....59

Infrastructure environment 66

3.01 Number of telephone lines, 2008*.....56
3.02 Secure Internet servers, 2008*.....50
3.03 Electricity production, 2006*.....43
3.04 Availability of scientists and engineers.....45
3.05 Quality of scientific research institutions.....61
3.06 Tertiary education enrollment, 2005*.....101
3.07 Education expenditure, 2007*.....69
3.08 Accessibility of digital content.....66
3.09 Internet bandwidth, 2007*.....72

Readiness component 70

Individual readiness 41

4.01 Quality of math and science education.....27
4.02 Quality of the educational system.....35
4.03 Buyer sophistication.....55
4.04 Residential telephone connection charge, 2008*.....17
4.05 Residential monthly telephone subscription, 2008*.....105
4.06 Fixed broadband tariffs, 2008*.....8
4.07 Mobile cellular tariffs, 2008*.....52
4.08 Fixed telephone lines tariffs, 2008*.....77

Business readiness 91

5.01 Extent of staff training.....55
5.02 Local availability of research and training.....65
5.03 Quality of management schools.....33
5.04 Company spending on R&D.....98
5.05 University-industry collaboration in R&D.....65
5.06 Business telephone connection charge, 2007*.....23
5.07 Business monthly telephone subscription, 2007*.....120
5.08 Local supplier quality.....71
5.09 Computer, comm., and other services imports, 2007*.....94
5.10 Availability of new telephone lines.....100

Government readiness 96

6.01 Government prioritization of ICT.....79
6.02 Gov't procurement of advanced tech. products.....117
6.03 Importance of ICT to gov't vision of the future.....92

Usage component 85

Individual usage 65

7.01 Mobile telephone subscriptions, 2008*.....39
7.02 Personal computers, 2007*.....57
7.03 Broadband Internet subscribers, 2008*.....63
7.04 Internet users, 2008*.....82
7.05 Internet access in schools.....72

Business usage 100

8.01 Prevalence of foreign technology licensing.....74
8.02 Firm-level technology absorption.....78
8.03 Capacity for innovation.....131
8.04 Extent of business Internet use.....94
8.05 Creative industries exports, 2005*.....90
8.06 Utility patents, 2008*.....55
8.07 High-tech exports, 2007*.....86

Government usage 93

9.01 Government success in ICT promotion.....71
9.02 Government Online Service Index, 2009*.....63
9.03 ICT use and government efficiency.....104
9.04 Presence of ICT in government agencies.....114
9.05 E-Participation Index, 2009*.....77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Tunisia

Key indicators

Population (millions), 2008 ..... 10.3
GDP per capita (PPP $), 2008 8,002
Mobile phone subscriptions per 100 population, 2008 ..... 84.6
Internet users per 100 population, 2008 ..... 27.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 11.0
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**39**
2008–2009 (134)	38
2007–2008 (127)	35

Global Competitiveness Index 2009–2010 (133) 40

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Turkey

Key indicators

Population (millions), 2008 ..... 73.9
GDP per capita (PPP $), 2008 13,139
Mobile phone subscriptions per 100 population, 2008 ..... 89.1
Internet users per 100 population, 2008 ..... 34.4
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 27.2
Utility patents per million population, 2008 ..... 0.2

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**69**
2008–2009 (134)	61
2007–2008 (127)	55
Global Competitiveness Index 2009–2010 (133)	61

Environment component 59

Market environment 64

1.01 Venture capital availability 107
1.02 Financial market sophistication 40
1.03 Availability of latest technologies 47
1.04 State of cluster development 52
1.05 Burden of government regulation 93
1.06 Extent and effect of taxation 121
1.07 Total tax rate, 2008* 77
1.08 Time required to start a business, 2009* 12
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 32
1.11 Freedom of the press 124

Political and regulatory environment 63

2.01 Effectiveness of law-making bodies 47
2.02 Laws relating to ICT 49
2.03 Judicial independence 74
2.04 Intellectual property protection 105
2.05 Efficiency of legal framework in settling disputes 83
2.06 Efficiency of legal framework in challenging regs 71
2.07 Property rights 89
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 38
2.10 Level of competition index, 2007* 59

Infrastructure environment 62

3.01 Number of telephone lines, 2008* 53
3.02 Secure Internet servers, 2008* 48
3.03 Electricity production, 2006* 70
3.04 Availability of scientists and engineers 51
3.05 Quality of scientific research institutions 71
3.06 Tertiary education enrollment, 2007* 57
3.07 Education expenditure, 2007* 81
3.08 Accessibility of digital content 50
3.09 Internet bandwidth, 2008* 45

Readiness component 90

Individual readiness 94

4.01 Quality of math and science education 74
4.02 Quality of the educational system 79
4.03 Buyer sophistication 97
4.04 Residential telephone connection charge, 2008* 5
4.05 Residential monthly telephone subscription, 2008* 77
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 79

5.01 Extent of staff training 84
5.02 Local availability of research and training 75
5.03 Quality of management schools 81
5.04 Company spending on R&D 76
5.05 University-industry collaboration in R&D 67
5.06 Business telephone connection charge, 2008* 2
5.07 Business monthly telephone subscription, 2008* 114
5.08 Local supplier quality 52
5.09 Computer, comm., and other services imports, 2008* 92
5.10 Availability of new telephone lines 57

Government readiness 83

6.01 Government prioritization of ICT 90
6.02 Gov't procurement of advanced tech. products 89
6.03 Importance of ICT to gov't vision of the future 76

Usage component 62

Individual usage 55

7.01 Mobile telephone subscriptions, 2008* 70
7.02 Personal computers, 2006* 80
7.03 Broadband Internet subscribers, 2008* 50
7.04 Internet users, 2008* 53
7.05 Internet access in schools 54

Business usage 54

8.01 Prevalence of foreign technology licensing 46
8.02 Firm-level technology absorption 52
8.03 Capacity for innovation 46
8.04 Extent of business Internet use 48
8.05 Creative industries exports, 2006* 31
8.06 Utility patents, 2008* 74
8.07 High-tech exports, 2007* 93

Government usage 57

9.01 Government success in ICT promotion 87
9.02 Government Online Service Index, 2009* 60
9.03 ICT use and government efficiency 39
9.04 Presence of ICT in government agencies 60
9.05 E-Participation Index, 2009* 52

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Uganda

Key indicators

Population (millions), 2008 ..... 31.7
GDP per capita (PPP $), 2008 1,147
Mobile phone subscriptions per 100 population, 2008 ..... 27.0
Internet users per 100 population, 2008 ..... 7.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**115**
2008–2009 (134)	120
2007–2008 (127)	109

Global Competitiveness Index 2009–2010 (133) 108

Environment component 102

Readiness component 124

Usage component 113

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Ukraine

Key indicators

Population (millions), 2008 ..... 46.3
GDP per capita (PPP $), 2008 7,342
Mobile phone subscriptions per 100 population, 2008 ..... 121.1
Internet users per 100 population, 2008 ..... 10.6
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 2.1
Utility patents per million population, 2008 ..... 0.5

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**82**
2008–2009 (134)	62
2007–2008 (127)	70

Global Competitiveness Index 2009–2010 (133)	82

Environment component 85

Market environment 112

1.01 Venture capital availability 91
1.02 Financial market sophistication 100
1.03 Availability of latest technologies 90
1.04 State of cluster development 86
1.05 Burden of government regulation 108
1.06 Extent and effect of taxation 128
1.07 Total tax rate, 2008* 107
1.08 Time required to start a business, 2009* 81
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 111
1.11 Freedom of the press 81

Political and regulatory environment 107

2.01 Effectiveness of law-making bodies 122
2.02 Laws relating to ICT 90
2.03 Judicial independence 123
2.04 Intellectual property protection 108
2.05 Efficiency of legal framework in settling disputes 130
2.06 Efficiency of legal framework in challenging regs 128
2.07 Property rights 127
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 19
2.10 Level of competition index, 2007* 59

Infrastructure environment 46

3.01 Number of telephone lines, 2008* 43
3.02 Secure Internet servers, 2008* 87
3.03 Electricity production, 2006* 52
3.04 Availability of scientists and engineers 50
3.05 Quality of scientific research institutions 56
3.06 Tertiary education enrollment, 2007* 9
3.07 Education expenditure, 2007* 60
3.08 Accessibility of digital content 49
3.09 Internet bandwidth, 2007* 89

Readiness component 76

Individual readiness 36

4.01 Quality of math and science education 41
4.02 Quality of the educational system 49
4.03 Buyer sophistication 71
4.04 Residential telephone connection charge, 2008* 39
4.05 Residential monthly telephone subscription, 2008* 25
4.06 Fixed broadband tariffs, 2008* 61
4.07 Mobile cellular tariffs, 2008* 67
4.08 Fixed telephone lines tariffs, 2008* 25

Business readiness 98

5.01 Extent of staff training 110
5.02 Local availability of research and training 74
5.03 Quality of management schools 95
5.04 Company spending on R&D 68
5.05 University-industry collaboration in R&D 64
5.06 Business telephone connection charge, 2006* 114
5.07 Business monthly telephone subscription, 2006* 43
5.08 Local supplier quality 95
5.09 Computer, comm., and other services imports, 2008* 70
5.10 Availability of new telephone lines 85

Government readiness 118

6.01 Government prioritization of ICT 115
6.02 Gov't procurement of advanced tech. products 85
6.03 Importance of ICT to gov't vision of the future 121

Usage component 79

Individual usage 74

7.01 Mobile telephone subscriptions, 2008* 27
7.02 Personal computers, 2006* 85
7.03 Broadband Internet subscribers, 2008* 69
7.04 Internet users, 2008* 95
7.05 Internet access in schools 70

Business usage 78

8.01 Prevalence of foreign technology licensing 114
8.02 Firm-level technology absorption 97
8.03 Capacity for innovation 32
8.04 Extent of business Internet use 58
8.05 Creative industries exports, 2006* 51
8.06 Utility patents, 2008* 64
8.07 High-tech exports, 2007* 59

Government usage 80

9.01 Government success in ICT promotion 103
9.02 Government Online Service Index, 2009* 60
9.03 ICT use and government efficiency 111
9.04 Presence of ICT in government agencies 75
9.05 E-Participation Index, 2009* 46

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

United Arab Emirates

Key indicators

Population (millions), 2008 ..... 4.5
GDP per capita (PPP $), 2008 38,894
Mobile phone subscriptions per 100 population, 2008 ..... 208.6
Internet users per 100 population, 2008 ..... 65.2
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 86.5
Utility patents per million population, 2008 ..... 2.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**23**
2008–2009 (134)	27
2007–2008 (127)	29

Global Competitiveness Index 2009–2010 (133)	23

Environment component 24

Market environment 12

1.01 Venture capital availability 13
1.02 Financial market sophistication 30
1.03 Availability of latest technologies 8
1.04 State of cluster development 25
1.05 Burden of government regulation 6
1.06 Extent and effect of taxation 3
1.07 Total tax rate, 2008* 4
1.08 Time required to start a business, 2009* 52
1.09 No. of procedures required to start a business, 2009* 70
1.10 Intensity of local competition 9
1.11 Freedom of the press 80

Political and regulatory environment 29

2.01 Effectiveness of law-making bodies 18
2.02 Laws relating to ICT 10
2.03 Judicial independence 32
2.04 Intellectual property protection 15
2.05 Efficiency of legal framework in settling disputes 9
2.06 Efficiency of legal framework in challenging regs 15
2.07 Property rights 34
2.08 No. of procedures to enforce a contract, 2009* 124
2.09 Time to enforce a contract, 2009* 62
2.10 Level of competition index, 2007* 104

Infrastructure environment 31

3.01 Number of telephone lines, 2008* 36
3.02 Secure Internet servers, 2008* 32
3.03 Electricity production, 2006* 5
3.04 Availability of scientists and engineers 28
3.05 Quality of scientific research institutions 53
3.06 Tertiary education enrollment, 2008* 81
3.07 Education expenditure* ..... n/a
3.08 Accessibility of digital content 22
3.09 Internet bandwidth, 2008* 27

Readiness component 5

Individual readiness 5

4.01 Quality of math and science education 20
4.02 Quality of the educational system 20
4.03 Buyer sophistication 28
4.04 Residential telephone connection charge, 2008* 21
4.05 Residential monthly telephone subscription, 2008* 6
4.06 Fixed broadband tariffs, 2008* 45
4.07 Mobile cellular tariffs, 2008* 10
4.08 Fixed telephone lines tariffs, 2008* 26

Business readiness 18

5.01 Extent of staff training 30
5.02 Local availability of research and training 21
5.03 Quality of management schools 22
5.04 Company spending on R&D 30
5.05 University-industry collaboration in R&D 39
5.06 Business telephone connection charge, 2008* 14
5.07 Business monthly telephone subscription, 2008* 24
5.08 Local supplier quality 24
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 22

Government readiness 2

6.01 Government prioritization of ICT 4
6.02 Gov't procurement of advanced tech. products 2
6.03 Importance of ICT to gov't vision of the future 2

Usage component 30

Individual usage 29

7.01 Mobile telephone subscriptions, 2008* 1
7.02 Personal computers, 2006* 32
7.03 Broadband Internet subscribers, 2008* 39
7.04 Internet users, 2008* 26
7.05 Internet access in schools 26

Business usage 32

8.01 Prevalence of foreign technology licensing 4
8.02 Firm-level technology absorption 4
8.03 Capacity for innovation 39
8.04 Extent of business Internet use 28
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 38
8.07 High-tech exports, 2006* 122

Government usage 29

9.01 Government success in ICT promotion 2
9.02 Government Online Service Index, 2009* 91
9.03 ICT use and government efficiency 2
9.04 Presence of ICT in government agencies 8
9.05 E-Participation Index, 2009* 77

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

United Kingdom

Key indicators

Population (millions), 2008 ..... 61.4
GDP per capita (PPP $), 2008 36,358
Mobile phone subscriptions per 100 population, 2008 ..... 126.3
Internet users per 100 population, 2008 ..... 76.2
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 398.0
Utility patents per million population, 2008 ..... 50.7

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**13**
2008–2009 (134)	15
2007–2008 (127)	12
Global Competitiveness Index 2009–2010 (133)	13

Environment component 12

Market environment 17

1.01 Venture capital availability 26
1.02 Financial market sophistication 7
1.03 Availability of latest technologies 18
1.04 State of cluster development 12
1.05 Burden of government regulation 86
1.06 Extent and effect of taxation 84
1.07 Total tax rate, 2008* 52
1.08 Time required to start a business, 2009* 41
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 6
1.11 Freedom of the press 22

Political and regulatory environment 16

2.01 Effectiveness of law-making bodies 12
2.02 Laws relating to ICT 20
2.03 Judicial independence 16
2.04 Intellectual property protection 21
2.05 Efficiency of legal framework in settling disputes 10
2.06 Efficiency of legal framework in challenging regs 14
2.07 Property rights 28
2.08 No. of procedures to enforce a contract, 2009* 15
2.09 Time to enforce a contract, 2009* 31
2.10 Level of competition index, 2007* 1

Infrastructure environment 10

3.01 Number of telephone lines, 2008* 12
3.02 Secure Internet servers, 2008* 11
3.03 Electricity production, 2006* 34
3.04 Availability of scientists and engineers 32
3.05 Quality of scientific research institutions 4
3.06 Tertiary education enrollment, 2007* 30
3.07 Education expenditure, 2007* 38
3.08 Accessibility of digital content 17
3.09 Internet bandwidth, 2007* 5

Readiness component 33

Individual readiness 42

4.01 Quality of math and science education 52
4.02 Quality of the educational system 30
4.03 Buyer sophistication 10
4.04 Residential telephone connection charge, 2008* 112
4.05 Residential monthly telephone subscription, 2008* 93
4.06 Fixed broadband tariffs, 2008* 16
4.07 Mobile cellular tariffs, 2008* 44
4.08 Fixed telephone lines tariffs, 2008* 74

Business readiness 22

5.01 Extent of staff training 26
5.02 Local availability of research and training 9
5.03 Quality of management schools 16
5.04 Company spending on R&D 14
5.05 University-industry collaboration in R&D 7
5.06 Business telephone connection charge, 2008* 90
5.07 Business monthly telephone subscription, 2008* 121
5.08 Local supplier quality 27
5.09 Computer, comm., and other services imports, 2007* 43
5.10 Availability of new telephone lines 31

Government readiness 39

6.01 Government prioritization of ICT 45
6.02 Gov't procurement of advanced tech. products 43
6.03 Importance of ICT to gov't vision of the future 41

Usage component 10

Individual usage 8

7.01 Mobile telephone subscriptions, 2008* 21
7.02 Personal computers, 2006* 6
7.03 Broadband Internet subscribers, 2008* 13
7.04 Internet users, 2008* 10
7.05 Internet access in schools 17

Business usage 11

8.01 Prevalence of foreign technology licensing 17
8.02 Firm-level technology absorption 22
8.03 Capacity for innovation 16
8.04 Extent of business Internet use 8
8.05 Creative industries exports, 2006* 6
8.06 Utility patents, 2008* 20
8.07 High-tech exports, 2007* 21

Government usage 11

9.01 Government success in ICT promotion 50
9.02 Government Online Service Index, 2009* 4
9.03 ICT use and government efficiency 52
9.04 Presence of ICT in government agencies 20
9.05 E-Participation Index, 2009* 4

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

United States

Key indicators

Population (millions), 2008 ..... 304.1
GDP per capita (PPP $), 2008 47,440
Mobile phone subscriptions per 100 population, 2008 ..... 86.8
Internet users per 100 population, 2008 ..... 74.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 111.2
Utility patents per million population, 2008 ..... 250.9

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**5**
2008–2009 (134)	3
2007–2008 (127)	4

Global Competitiveness Index 2009–2010 (133) 2

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Uruguay

Key indicators

Population (millions), 2008 ..... 3.3
GDP per capita (PPP $), 2008 12,785
Mobile phone subscriptions per 100 population, 2008 ..... 104.7
Internet users per 100 population, 2008 ..... 40.0
Internet bandwidth (Mb/s) per 10,000 population, 2007 ..... 9.0
Utility patents per million population, 2008 ..... 0.6

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**57**
2008–2009 (134)	65
2007–2008 (127)	65
Global Competitiveness Index 2009–2010 (133)	65

Environment component 64

Market environment 96

1.01 Venture capital availability 99
1.02 Financial market sophistication 89
1.03 Availability of latest technologies 77
1.04 State of cluster development 88
1.05 Burden of government regulation 83
1.06 Extent and effect of taxation 114
1.07 Total tax rate, 2008* 86
1.08 Time required to start a business, 2009* 121
1.09 No. of procedures required to start a business, 2009* 104
1.10 Intensity of local competition 114
1.11 Freedom of the press 40

Political and regulatory environment 52

2.01 Effectiveness of law-making bodies 80
2.02 Laws relating to ICT 69
2.03 Judicial independence 30
2.04 Intellectual property protection 52
2.05 Efficiency of legal framework in settling disputes 67
2.06 Efficiency of legal framework in challenging regs 54
2.07 Property rights 53
2.08 No. of procedures to enforce a contract, 2009* 92
2.09 Time to enforce a contract, 2009* 99
2.10 Level of competition index, 2007* 59

Infrastructure environment 61

3.01 Number of telephone lines, 2008* 44
3.02 Secure Internet servers, 2008* 51
3.03 Electricity production, 2006* 82
3.04 Availability of scientists and engineers 87
3.05 Quality of scientific research institutions 76
3.06 Tertiary education enrollment, 2007* 23
3.07 Education expenditure, 2007* 110
3.08 Accessibility of digital content 44
3.09 Internet bandwidth, 2007* 63

Readiness component 58

Individual readiness 70

4.01 Quality of math and science education 88
4.02 Quality of the educational system 61
4.03 Buyer sophistication 67
4.04 Residential telephone connection charge, 2008* 51
4.05 Residential monthly telephone subscription, 2008* 69
4.06 Fixed broadband tariffs, 2008* 49
4.07 Mobile cellular tariffs, 2008* 77
4.08 Fixed telephone lines tariffs, 2008* 86

Business readiness 66

5.01 Extent of staff training 92
5.02 Local availability of research and training 56
5.03 Quality of management schools 43
5.04 Company spending on R&D 69
5.05 University-industry collaboration in R&D 66
5.06 Business telephone connection charge, 2007* 42
5.07 Business monthly telephone subscription, 2008* 85
5.08 Local supplier quality 75
5.09 Computer, comm., and other services imports, 2008* 86
5.10 Availability of new telephone lines 30

Government readiness 57

6.01 Government prioritization of ICT 39
6.02 Gov't procurement of advanced tech. products 70
6.03 Importance of ICT to gov't vision of the future 72

Usage component 53

Individual usage 51

7.01 Mobile telephone subscriptions, 2008* 49
7.02 Personal computers, 2005* 55
7.03 Broadband Internet subscribers, 2008* 51
7.04 Internet users, 2008* 47
7.05 Internet access in schools 43

Business usage 86

8.01 Prevalence of foreign technology licensing 73
8.02 Firm-level technology absorption 96
8.03 Capacity for innovation 65
8.04 Extent of business Internet use 68
8.05 Creative industries exports, 2005* 74
8.06 Utility patents, 2008* 56
8.07 High-tech exports, 2007* 79

Government usage 47

9.01 Government success in ICT promotion 37
9.02 Government Online Service Index, 2009* 31
9.03 ICT use and government efficiency 62
9.04 Presence of ICT in government agencies 67
9.05 E-Participation Index, 2009* 46

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Venezuela

Key indicators

Networked Readiness Index

Environment component 128

Readiness component 117

Usage component 96

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Vietnam

Key indicators

Population (millions), 2008 ..... 86.2
GDP per capita (PPP $), 2008 2,794
Mobile phone subscriptions per 100 population, 2008 ..... 80.4
Internet users per 100 population, 2008 ..... 23.9
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 5.7
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**54**
2008–2009 (134)	70
2007–2008 (127)	73
Global Competitiveness Index 2009–2010 (133)	75

Environment component 69

Market environment 85

1.01 Venture capital availability 50
1.02 Financial market sophistication 98
1.03 Availability of latest technologies 81
1.04 State of cluster development 18
1.05 Burden of government regulation 106
1.06 Extent and effect of taxation 48
1.07 Total tax rate, 2008* 64
1.08 Time required to start a business, 2009* 113
1.09 No. of procedures required to start a business, 2009* 104
1.10 Intensity of local competition 62
1.11 Freedom of the press 104

Political and regulatory environment 48

2.01 Effectiveness of law-making bodies 39
2.02 Laws relating to ICT 70
2.03 Judicial independence 68
2.04 Intellectual property protection 93
2.05 Efficiency of legal framework in settling disputes 49
2.06 Efficiency of legal framework in challenging regs 48
2.07 Property rights 66
2.08 No. of procedures to enforce a contract, 2009* 41
2.09 Time to enforce a contract, 2009* 13
2.10 Level of competition index, 2007* 1

Infrastructure environment 80

3.01 Number of telephone lines, 2008* 35
3.02 Secure Internet servers, 2008* 99
3.03 Electricity production, 2006* 101
3.04 Availability of scientists and engineers 62
3.05 Quality of scientific research institutions 64
3.06 Tertiary education enrollment, 2001* 107
3.07 Education expenditure, 2007* 103
3.08 Accessibility of digital content 60
3.09 Internet bandwidth, 2008* 75

Readiness component 37

Individual readiness 43

4.01 Quality of math and science education 53
4.02 Quality of the educational system 85
4.03 Buyer sophistication 43
4.04 Residential telephone connection charge, 2006* 72
4.05 Residential monthly telephone subscription, 2008* 15
4.06 Fixed broadband tariffs, 2008* 71
4.07 Mobile cellular tariffs, 2008* 66
4.08 Fixed telephone lines tariffs, 2008* 31

Business readiness 52

5.01 Extent of staff training 46
5.02 Local availability of research and training 89
5.03 Quality of management schools 111
5.04 Company spending on R&D 27
5.05 University-industry collaboration in R&D 59
5.06 Business telephone connection charge, 2006* 56
5.07 Business monthly telephone subscription, 2006* 10
5.08 Local supplier quality 92
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 67

Government readiness 24

6.01 Government prioritization of ICT 34
6.02 Gov't procurement of advanced tech. products 11
6.03 Importance of ICT to gov't vision of the future 29

Usage component 67

Individual usage 75

7.01 Mobile telephone subscriptions, 2008* 81
7.02 Personal computers, 2006* 64
7.03 Broadband Internet subscribers, 2008* 72
7.04 Internet users, 2008* 73
7.05 Internet access in schools 58

Business usage 46

8.01 Prevalence of foreign technology licensing 112
8.02 Firm-level technology absorption 51
8.03 Capacity for innovation 33
8.04 Extent of business Internet use 65
8.05 Creative industries exports* ..... n/a
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2006* 53

Government usage 68

9.01 Government success in ICT promotion 54
9.02 Government Online Service Index, 2009* 76
9.03 ICT use and government efficiency 44
9.04 Presence of ICT in government agencies 68
9.05 E-Participation Index, 2009* 94

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Zambia

Key indicators

Population (millions), 2008 ..... 12.6
GDP per capita (PPP $), 2008 1,482
Mobile phone subscriptions per 100 population, 2008 ..... 28.0
Internet users per 100 population, 2008 ..... 5.5
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**97**
2008–2009 (134)	102
2007–2008 (127)	112

Global Competitiveness Index 2009–2010 (133)	112

Environment component 92

Market environment 74

1.01 Venture capital availability 103
1.02 Financial market sophistication 91
1.03 Availability of latest technologies 97
1.04 State of cluster development 73
1.05 Burden of government regulation 30
1.06 Extent and effect of taxation 98
1.07 Total tax rate, 2008* 9
1.08 Time required to start a business, 2009* 61
1.09 No. of procedures required to start a business, 2009* 32
1.10 Intensity of local competition 95
1.11 Freedom of the press 78

Political and regulatory environment 66

2.01 Effectiveness of law-making bodies 55
2.02 Laws relating to ICT 87
2.03 Judicial independence 70
2.04 Intellectual property protection 62
2.05 Efficiency of legal framework in settling disputes 65
2.06 Efficiency of legal framework in challenging regs 78
2.07 Property rights 64
2.08 No. of procedures to enforce a contract, 2009* 47
2.09 Time to enforce a contract, 2009* 49
2.10 Level of competition index, 2007* 82

Infrastructure environment 123

3.01 Number of telephone lines, 2008* 123
3.02 Secure Internet servers, 2008* 118
3.03 Electricity production, 2006* 97
3.04 Availability of scientists and engineers 76
3.05 Quality of scientific research institutions 84
3.06 Tertiary education enrollment, 2000* 127
3.07 Education expenditure, 2007* 119
3.08 Accessibility of digital content 105
3.09 Internet bandwidth, 2008* 118

Readiness component 98

Individual readiness 110

4.01 Quality of math and science education 90
4.02 Quality of the educational system 58
4.03 Buyer sophistication 94
4.04 Residential telephone connection charge, 2008* 7
4.05 Residential monthly telephone subscription, 2008* 28
4.06 Fixed broadband tariffs, 2008* 101
4.07 Mobile cellular tariffs, 2008* 80
4.08 Fixed telephone lines tariffs, 2008* 117

Business readiness 83

5.01 Extent of staff training 98
5.02 Local availability of research and training 92
5.03 Quality of management schools 82
5.04 Company spending on R&D 113
5.05 University-industry collaboration in R&D 74
5.06 Business telephone connection charge, 2007* 27
5.07 Business monthly telephone subscription, 2007* 45
5.08 Local supplier quality 99
5.09 Computer, comm., and other services imports, 2007* 34
5.10 Availability of new telephone lines 119

Government readiness 87

6.01 Government prioritization of ICT 91
6.02 Gov't procurement of advanced tech. products 101
6.03 Importance of ICT to gov't vision of the future 71

Usage component 107

Individual usage 118

7.01 Mobile telephone subscriptions, 2008* 119
7.02 Personal computers, 2005* 109
7.03 Broadband Internet subscribers, 2008* 113
7.04 Internet users, 2008* 110
7.05 Internet access in schools 116

Business usage 105

8.01 Prevalence of foreign technology licensing 92
8.02 Firm-level technology absorption 103
8.03 Capacity for innovation 115
8.04 Extent of business Internet use 93
8.05 Creative industries exports, 2006* 94
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 103

Government usage 78

9.01 Government success in ICT promotion 80
9.02 Government Online Service Index, 2009* 118
9.03 ICT use and government efficiency 85
9.04 Presence of ICT in government agencies 83
9.05 E-Participation Index* ..... n/a

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Zimbabwe

Key indicators

Population (millions), 2008 ..... 12.5
GDP per capita (PPP $), 2008 8
Mobile phone subscriptions per 100 population, 2008 ..... 13.3
Internet users per 100 population, 2008 ..... 11.4
Internet bandwidth (Mb/s) per 10,000 population, 2008 ..... 0.1
Utility patents per million population, 2008 ..... 0.0

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	**132**
2008–2009 (134)	132
2007–2008 (127)	125

Global Competitiveness Index 2009–2010 (133)	132

Environment component 130

Market environment 131

1.01 Venture capital availability 124
1.02 Financial market sophistication 90
1.03 Availability of latest technologies 132
1.04 State of cluster development 107
1.05 Burden of government regulation 118
1.06 Extent and effect of taxation 127
1.07 Total tax rate, 2008* 63
1.08 Time required to start a business, 2009* 126
1.09 No. of procedures required to start a business, 2009* 93
1.10 Intensity of local competition 129
1.11 Freedom of the press 133

Political and regulatory environment 118

2.01 Effectiveness of law-making bodies 108
2.02 Laws relating to ICT 119
2.03 Judicial independence 129
2.04 Intellectual property protection 99
2.05 Efficiency of legal framework in settling disputes 93
2.06 Efficiency of legal framework in challenging regs 130
2.07 Property rights 133
2.08 No. of procedures to enforce a contract, 2009* 69
2.09 Time to enforce a contract, 2009* 34
2.10 Level of competition index, 2007* 59

Infrastructure environment 108

3.01 Number of telephone lines, 2008* 110
3.02 Secure Internet servers, 2008* 113
3.03 Electricity production, 2006* 94
3.04 Availability of scientists and engineers 126
3.05 Quality of scientific research institutions 105
3.06 Tertiary education enrollment, 2003* 120
3.07 Education expenditure, 2007* 10
3.08 Accessibility of digital content 129
3.09 Internet bandwidth, 2008* 116

Readiness component 131

Individual readiness 119

4.01 Quality of math and science education 75
4.02 Quality of the educational system 46
4.03 Buyer sophistication 108
4.04 Residential telephone connection charge* ..... n/a
4.05 Residential monthly telephone subscription* ..... n/a
4.06 Fixed broadband tariffs* ..... n/a
4.07 Mobile cellular tariffs* ..... n/a
4.08 Fixed telephone lines tariffs* ..... n/a

Business readiness 131

5.01 Extent of staff training 66
5.02 Local availability of research and training 116
5.03 Quality of management schools 84
5.04 Company spending on R&D 111
5.05 University-industry collaboration in R&D 108
5.06 Business telephone connection charge* ..... n/a
5.07 Business monthly telephone subscription* ..... n/a
5.08 Local supplier quality 125
5.09 Computer, comm., and other services imports* ..... n/a
5.10 Availability of new telephone lines 133

Government readiness 131

6.01 Government prioritization of ICT 129
6.02 Gov't procurement of advanced tech. products 132
6.03 Importance of ICT to gov't vision of the future 130

Usage component 133

Individual usage 120

7.01 Mobile telephone subscriptions, 2008* 128
7.02 Personal computers, 2008* 73
7.03 Broadband Internet subscribers, 2008* 104
7.04 Internet users, 2008* 92
7.05 Internet access in schools 125

Business usage 129

8.01 Prevalence of foreign technology licensing 115
8.02 Firm-level technology absorption 123
8.03 Capacity for innovation 132
8.04 Extent of business Internet use 126
8.05 Creative industries exports, 2004* 67
8.06 Utility patents, 2008* 90
8.07 High-tech exports, 2007* 70

Government usage 133

9.01 Government success in ICT promotion 127
9.02 Government Online Service Index, 2009* 116
9.03 ICT use and government efficiency 133
9.04 Presence of ICT in government agencies 132
9.05 E-Participation Index, 2009* 116

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Part 4

Data Tables

How to Read the Data Tables

The following pages present the data by variable and for all 133 economies included in *The Global Information Technology Report 2009–2010.*

The tables are organized in nine sections, which correspond to the nine pillars of the Networked Readiness Index (NRI).

Environment

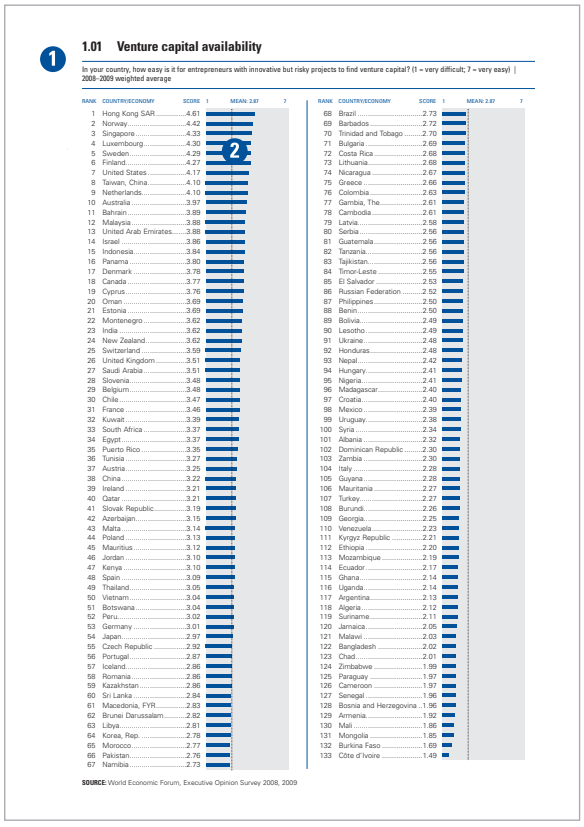
1. Market environment
2. Political and regulatory environment
3. Infrastructure environment

Readiness

4. Individual readiness
5. Business readiness
6. Government readiness

Usage

7. Individual usage
8. Business usage
9. Government usage



1 **1.01 Venture capital availability**

In your country, how easy is it for entrepreneurs with innovative but risky projects to find venture capital? (1 = very difficult; 7 = very easy) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE	1	MEAN: 2.87	7
1	Hong Kong SAR	4.61			
2	Norway	4.42			
3	Singapore	4.33			
4	Luxembourg	4.30			
5	Sweden	4.29			
6	Finland	4.27			
7	United States	4.17			
8	Taiwan, China	4.10			
9	Netherlands	4.10			
10	Australia	3.97			
11	Bahrain	3.89			
12	Malaysia	3.88			
13	United Arab Emirates	3.88			
14	Israel	3.86			
15	Indonesia	3.84			
16	Panama	3.80			
17	Denmark	3.78			
18	Canada	3.77			
19	Cyprus	3.76			
20	Oman	3.69			
21	Estonia	3.69			
22	Montenegro	3.62			
23	India	3.62			
24	New Zealand	3.62			
25	Switzerland	3.59			
26	United Kingdom	3.51			
27	Saudi Arabia	3.51			
28	Slovenia	3.48			
29	Belgium	3.48			
30	Chile	3.47			
31	France	3.46			
32	Kuwait	3.39			
33	South Africa	3.37			
34	Egypt	3.37			
35	Puerto Rico	3.35			
36	Tunisia	3.27			
37	Austria	3.25			
38	China	3.22			
39	Ireland	3.21			
40	Qatar	3.21			
41	Slovak Republic	3.19			
42	Azerbaijan	3.15			
43	Malta	3.14			
44	Poland	3.13			
45	Mauritius	3.12			
46	Jordan	3.10			
47	Kenya	3.10			
48	Spain	3.09			
49	Thailand	3.05			
50	Vietnam	3.04			
51	Botswana	3.04			
52	Peru	3.02			
53	Germany	3.01			
54	Japan	2.97			
55	Czech Republic	2.92			
56	Portugal	2.87			
57	Iceland	2.86			
58	Romania	2.86			
59	Kazakhstan	2.86			
60	Sri Lanka	2.84			
61	Macedonia, FYR	2.83			
62	Brunei Darussalam	2.82			
63	Libya	2.81			
64	Korea, Rep.	2.78			
65	Morocco	2.77			
66	Pakistan	2.76			
67	Namibia	2.73			
68	Brazil	2.73			
69	Barbados	2.72			
70	Trinidad and Tobago	2.70			
71	Bulgaria	2.69			
72	Costa Rica	2.68			
73	Lithuania	2.68			
74	Nicaragua	2.67			
75	Greece	2.66			
76	Colombia	2.63			
77	Gambia, The	2.61			
78	Cambodia	2.61			
79	Latvia	2.58			
80	Serbia	2.56			
81	Guatemala	2.56			
82	Tanzania	2.56			
83	Tajikistan	2.56			
84	Timor-Leste	2.55			
85	El Salvador	2.53			
86	Russian Federation	2.52			
87	Philippines	2.50			
88	Benin	2.50			
89	Bolivia	2.49			
90	Lesotho	2.49			
91	Ukraine	2.48			
92	Honduras	2.48			
93	Nepal	2.42			
94	Hungary	2.41			
95	Nigeria	2.41			
96	Madagascar	2.40			
97	Croatia	2.40			
98	Mexico	2.39			
99	Uruguay	2.38			
100	Syria	2.34			
101	Albania	2.32			
102	Dominican Republic	2.30			
103	Zambia	2.30			
104	Italy	2.28			
105	Guyana	2.28			
106	Mauritania	2.27			
107	Turkey	2.27			
108	Burundi	2.26			
109	Georgia	2.25			
110	Venezuela	2.23			
111	Kyrgyz Republic	2.21			
112	Ethiopia	2.20			
113	Mozambique	2.19			
114	Ecuador	2.17			
115	Ghana	2.14			
116	Uganda	2.14			
117	Argentina	2.13			
118	Algeria	2.12			
119	Suriname	2.11			
120	Jamaica	2.05			
121	Malawi	2.03			
122	Bangladesh	2.02			
123	Chad	2.01			
124	Zimbabwe	1.99			
125	Paraguay	1.97			
126	Cameroon	1.97			
127	Senegal	1.96			
128	Bosnia and Herzegovina	1.96			
129	Armenia	1.92			
130	Mali	1.86			
131	Mongolia	1.85			
132	Burkina Faso	1.69			
133	Côte d'Ivoire	1.49			

2

SOURCE World Economic Forum, Executive Opinion Survey 2008, 2009

Two types of data are used in the NRI:

- **Survey data:** These data are the results drawn from the World Economic Forum's Executive Opinion Survey.
- **Hard data:** These data are indicators obtained from a variety of other sources.

Survey data

1 Data yielded from the World Economic Forum's Executive Opinion Survey are presented in blue-colored bar graphs. Survey questions ask for responses on a scale of 1 to 7, where an answer of 1 corresponds to the lowest possible score and an answer of 7 corresponds to the highest possible score. For each Survey question, individual responses from the 2008 and 2009 editions of the Survey are combined and aggregated at the country level in order to produce country scores. For more information on the Executive Opinion Survey, please refer to Chapter 1.1.

For each Survey variable, the corresponding question and the two extreme answers are shown. Scores are reported with a precision of two decimal points, although the exact figures are used to determine rankings.

For example, in the case of variable 1.03 on the availability of latest technologies, although Netherlands, ranked 10th, and Hong Kong SAR, ranked 11th, are listed with the same rounded score of 6.34, their rankings are based on the exact figures (6.3435090 and 6.3420717, respectively).

2 A dotted line on the graph indicates the mean score across the sample of 133 economies.

3 **1.07 Total tax rate (hard data)**

Sum of profit tax, labor tax and social contributions, property taxes, turnover taxes, and other taxes, as a share of commercial profits | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Timor-Leste	0.20
2	Namibia	9.60
3	Qatar	11.30
4	United Arab Emirates	14.10
5	Saudi Arabia	14.50
6	Bahrain	15.00
7	Georgia	15.30
8	Kuwait	15.50
9	Zambia	16.10
10	Macedonia, FYR	16.40
11	Botswana	17.10
12	Lesotho	18.50
13	Luxembourg	20.90
14	Oman	21.60
15	Cambodia	22.70
16	Mongolia	22.80
17	Mauritius	22.90
18	Hong Kong SAR	24.20
19	Iceland	25.00
20	Chile	25.30
21	Malawi	25.80
22	Ireland	26.50
23	Bosnia and Herzegovina	27.10
24	Singapore	27.80
25	Suriname	27.90
26	Cyprus	28.80
27	Montenegro	28.90
28	Denmark	29.20
29	Switzerland	29.70
30	South Africa	30.20
31	Brunei Darussalam	30.30
32	Ethiopia	31.10
32	Jordan	31.10
34	Bulgaria	31.40
35	Pakistan	31.60
36	Korea, Rep.	31.90
37	Nigeria	32.20
38	Croatia	32.50
39	Israel	32.60
40	Ghana	32.70
41	New Zealand	32.80
42	Latvia	33.00
43	Trinidad and Tobago	33.10
44	Serbia	34.00
45	Malaysia	34.20
46	Mozambique	34.30
47	Ecuador	34.90
48	Bangladesh	35.00
48	El Salvador	35.00
48	Paraguay	35.00
51	Uganda	35.70
52	Kazakhstan	35.90
52	United Kingdom	35.90
54	Armenia	36.20
55	Thailand	37.20
56	Slovenia	37.50
57	Indonesia	37.60
58	Nepal	38.80
59	Guyana	38.90
60	Dominican Republic	39.00
61	Madagascar	39.20
62	Netherlands	39.30
63	Zimbabwe	39.40
64	Vietnam	40.10
65	Peru	40.30
66	Taiwan, China	40.40
67	Azerbaijan	40.90
67	Guatemala	40.90
69	Norway	41.60
70	Morocco	41.70
71	Poland	42.50
72	Lithuania	42.70
73	Portugal	42.90
73	Syria	42.90
75	Egypt	43.00
76	Canada	43.60
77	Turkey	44.50
78	Romania	44.60
79	Côte d'Ivoire	44.70
80	Albania	44.90
80	Burkina Faso	44.90
80	Germany	44.90
83	Tanzania	45.20
84	Senegal	46.00
85	United States	46.30
86	Uruguay	46.70
87	Czech Republic	47.20
88	Greece	47.40
89	Finland	47.70
90	Australia	48.00
91	Honduras	48.30
91	Russian Federation	48.30
93	Slovak Republic	48.60
94	Estonia	49.10
95	Philippines	49.40
96	Kenya	49.70
97	Panama	50.10
98	Cameroon	50.50
99	Mexico	51.00
100	Jamaica	51.30
101	Mali	52.10
102	Sweden	54.60
103	Costa Rica	54.80
104	Austria	55.50
105	Japan	55.70
106	Spain	56.90
107	Ukraine	57.20
108	Belgium	57.30
109	Hungary	57.50
110	Kyrgyz Republic	59.40
111	Chad	60.90
112	Venezuela	61.10
113	Tunisia	62.80
114	Nicaragua	63.20
115	Sri Lanka	63.70
116	India	64.70
116	Puerto Rico	64.70
118	France	65.80
119	Italy	68.40
120	Brazil	69.20
121	Algeria	72.00
122	Benin	73.30
123	China	78.50
124	Colombia	78.70
125	Bolivia	80.00
126	Tajikistan	85.90
127	Mauritania	86.10
128	Argentina	108.10
129	Burundi	278.60
130	Gambia, The	292.40
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a

SOURCE: The World Bank Group, *Doing Business 2010*

Hard data

3 While Survey data provide qualitative information, hard data provide an objective measure of a quantity (for example, gross domestic product, mobile cellular tariffs, number of Internet users, number of procedures required to start a business, and so on). We use the latest data available from international organizations (such as the International Telecommunication Union, the World Bank, and various United Nations agencies), completed, if necessary, by national sources. In the following pages, hard data variables are presented in black-shaded bar graphs. A short description of the indicator appears at the top of the page. The base year (i.e., the year when a majority of the data was collected) follows the description. When for a particular country the year differs from the base year, this is indicated in a footnote.

The section "Technical Notes and Sources" at the end of this *Report* provides further details on each indicator, including definition, method of computation, and full sources.

When data are not available or too outdated, "n/a" is used in lieu of the rank and the value.

In the case of hard data, true ties between two or more countries are possible. In such cases, shared rankings are indicated accordingly. For example, the time required to start a business is the same—4 days—in Belgium and Hungary. Therefore, in Table 1.08 the two countries are shown sharing the fifth place and listed in alphabetical order.

Index of Data Tables

Subindex A **Environment component**

Subindex B **Readiness component**

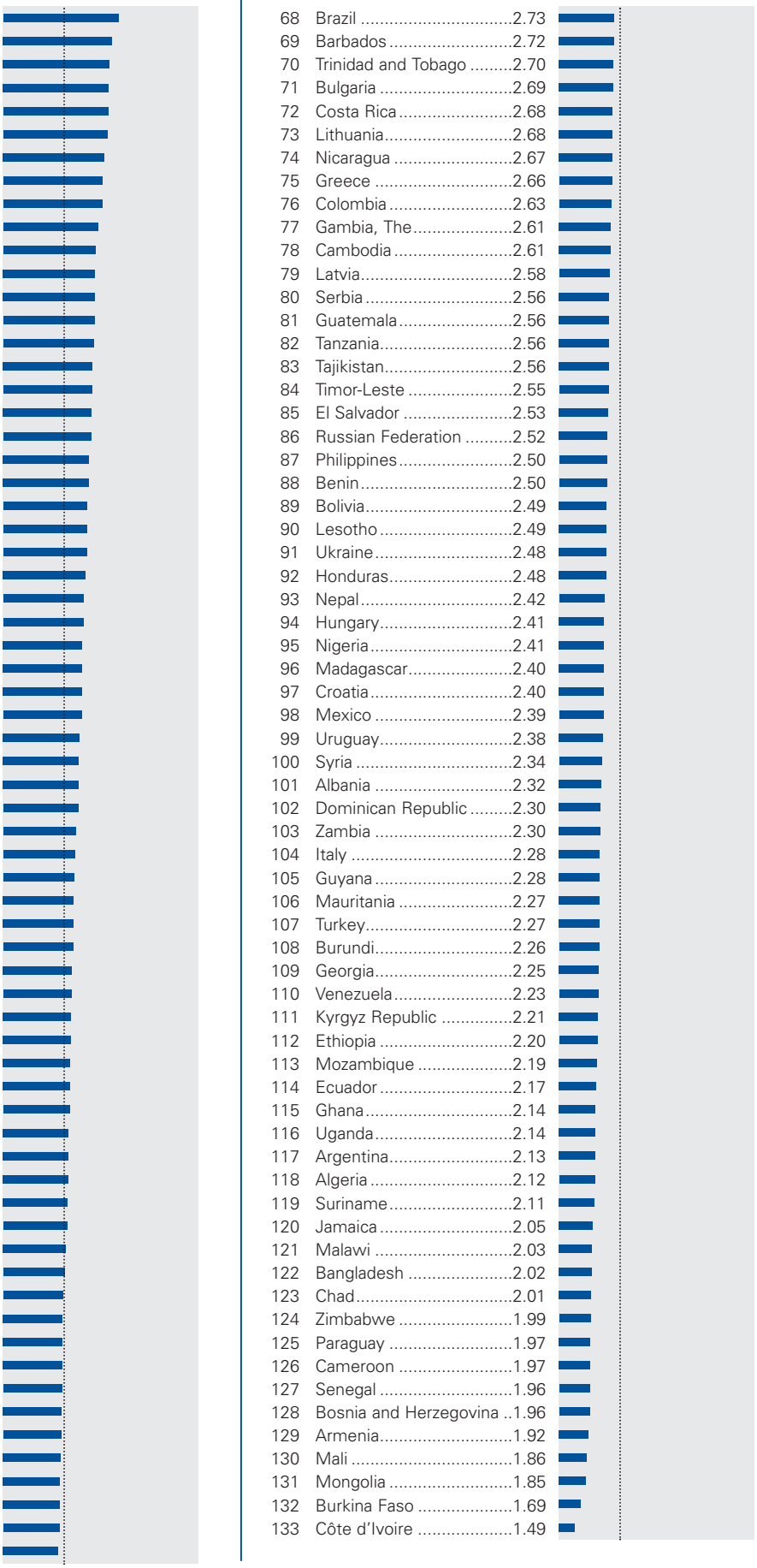
Subindex C **Usage component**

1st pillar
Market environment

1.01 Venture capital availability

In your country, how easy is it for entrepreneurs with innovative but risky projects to find venture capital? (1 = very difficult; 7 = very easy) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Hong Kong SAR	4.61
2	Norway	4.42
3	Singapore	4.33
4	Luxembourg	4.30
5	Sweden	4.29
6	Finland	4.27
7	United States	4.17
8	Taiwan, China	4.10
9	Netherlands	4.10
10	Australia	3.97
11	Bahrain	3.89
12	Malaysia	3.88
13	United Arab Emirates	3.88
14	Israel	3.86
15	Indonesia	3.84
16	Panama	3.80
17	Denmark	3.78
18	Canada	3.77
19	Cyprus	3.76
20	Oman	3.69
21	Estonia	3.69
22	Montenegro	3.62
23	India	3.62
24	New Zealand	3.62
25	Switzerland	3.59
26	United Kingdom	3.51
27	Saudi Arabia	3.51
28	Slovenia	3.48
29	Belgium	3.48
30	Chile	3.47
31	France	3.46
32	Kuwait	3.39
33	South Africa	3.37
34	Egypt	3.37
35	Puerto Rico	3.35
36	Tunisia	3.27
37	Austria	3.25
38	China	3.22
39	Ireland	3.21
40	Qatar	3.21
41	Slovak Republic	3.19
42	Azerbaijan	3.15
43	Malta	3.14
44	Poland	3.13
45	Mauritius	3.12
46	Jordan	3.10
47	Kenya	3.10
48	Spain	3.09
49	Thailand	3.05
50	Vietnam	3.04
51	Botswana	3.04
52	Peru	3.02
53	Germany	3.01
54	Japan	2.97
55	Czech Republic	2.92
56	Portugal	2.87
57	Iceland	2.86
58	Romania	2.86
59	Kazakhstan	2.86
60	Sri Lanka	2.84
61	Macedonia, FYR	2.83
62	Brunei Darussalam	2.82
63	Libya	2.81
64	Korea, Rep.	2.78
65	Morocco	2.77
66	Pakistan	2.76
67	Namibia	2.73
68	Brazil	2.73
69	Barbados	2.72
70	Trinidad and Tobago	2.70
71	Bulgaria	2.69
72	Costa Rica	2.68
73	Lithuania	2.68
74	Nicaragua	2.67
75	Greece	2.66
76	Colombia	2.63
77	Gambia, The	2.61
78	Cambodia	2.61
79	Latvia	2.58
80	Serbia	2.56
81	Guatemala	2.56
82	Tanzania	2.56
83	Tajikistan	2.56
84	Timor-Leste	2.55
85	El Salvador	2.53
86	Russian Federation	2.52
87	Philippines	2.50
88	Benin	2.50
89	Bolivia	2.49
90	Lesotho	2.49
91	Ukraine	2.48
92	Honduras	2.48
93	Nepal	2.42
94	Hungary	2.41
95	Nigeria	2.41
96	Madagascar	2.40
97	Croatia	2.40
98	Mexico	2.39
99	Uruguay	2.38
100	Syria	2.34
101	Albania	2.32
102	Dominican Republic	2.30
103	Zambia	2.30
104	Italy	2.28
105	Guyana	2.28
106	Mauritania	2.27
107	Turkey	2.27
108	Burundi	2.26
109	Georgia	2.25
110	Venezuela	2.23
111	Kyrgyz Republic	2.21
112	Ethiopia	2.20
113	Mozambique	2.19
114	Ecuador	2.17
115	Ghana	2.14
116	Uganda	2.14
117	Argentina	2.13
118	Algeria	2.12
119	Suriname	2.11
120	Jamaica	2.05
121	Malawi	2.03
122	Bangladesh	2.02
123	Chad	2.01
124	Zimbabwe	1.99
125	Paraguay	1.97
126	Cameroon	1.97
127	Senegal	1.96
128	Bosnia and Herzegovina	1.96
129	Armenia	1.92
130	Mali	1.86
131	Mongolia	1.85
132	Burkina Faso	1.69
133	Côte d'Ivoire	1.49

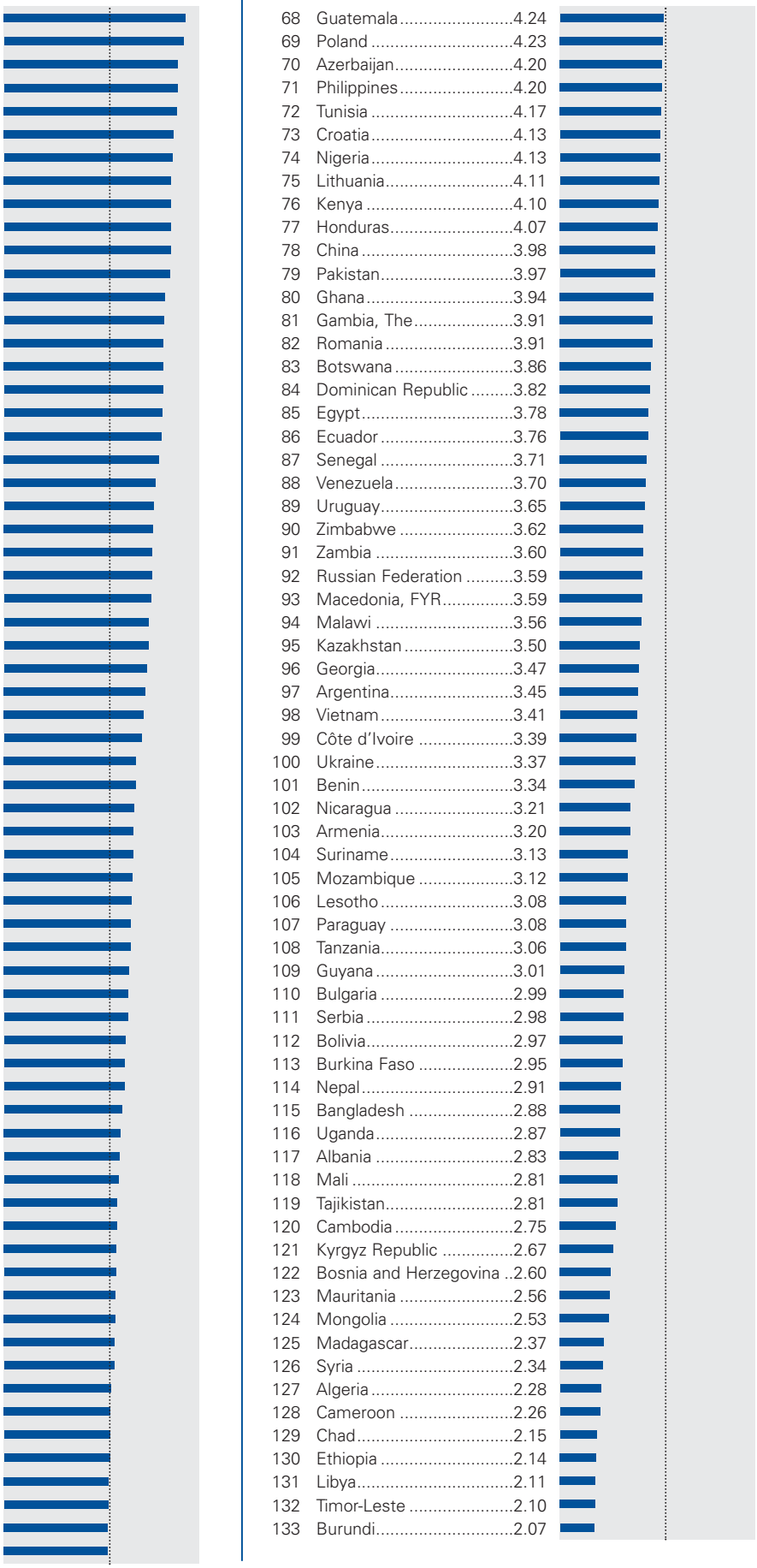


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.02 Financial market sophistication

How would you assess the level of sophistication of financial markets in your country? (1 = poor by international standards; 7 = excellent by international standards) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Luxembourg	6.69
2	Switzerland	6.62
3	Canada	6.45
4	Sweden	6.44
5	Hong Kong SAR	6.42
6	South Africa	6.32
7	United Kingdom	6.28
8	Singapore	6.24
9	Netherlands	6.24
10	France	6.22
11	United States	6.22
12	Australia	6.20
13	Brazil	6.05
14	Finland	6.01
15	Denmark	6.00
16	Norway	6.00
17	Germany	5.98
18	Austria	5.95
19	Belgium	5.93
20	Chile	5.86
21	Puerto Rico	5.75
22	Israel	5.69
23	New Zealand	5.67
24	Spain	5.64
25	Panama	5.64
26	Portugal	5.61
27	Estonia	5.53
28	Bahrain	5.52
29	Ireland	5.47
30	United Arab Emirates	5.43
31	Malaysia	5.38
32	India	5.31
33	Thailand	5.14
34	Cyprus	5.14
35	Malta	5.08
36	Namibia	5.05
37	Qatar	5.04
38	El Salvador	5.03
39	Taiwan, China	5.00
40	Turkey	4.98
41	Slovak Republic	4.97
42	Mauritius	4.93
43	Jamaica	4.90
44	Japan	4.88
45	Czech Republic	4.80
46	Jordan	4.78
47	Barbados	4.78
48	Slovenia	4.70
49	Peru	4.66
50	Saudi Arabia	4.61
51	Oman	4.59
52	Trinidad and Tobago	4.55
53	Mexico	4.55
54	Kuwait	4.52
55	Sri Lanka	4.51
56	Indonesia	4.50
57	Korea, Rep.	4.49
58	Greece	4.46
59	Montenegro	4.45
60	Morocco	4.36
61	Hungary	4.34
62	Colombia	4.32
63	Costa Rica	4.32
64	Brunei Darussalam	4.28
65	Iceland	4.26
66	Latvia	4.25
67	Italy	4.25
68	Guatemala	4.24
69	Poland	4.23
70	Azerbaijan	4.20
71	Philippines	4.20
72	Tunisia	4.17
73	Croatia	4.13
74	Nigeria	4.13
75	Lithuania	4.11
76	Kenya	4.10
77	Honduras	4.07
78	China	3.98
79	Pakistan	3.97
80	Ghana	3.94
81	Gambia, The	3.91
82	Romania	3.91
83	Botswana	3.86
84	Dominican Republic	3.82
85	Egypt	3.78
86	Ecuador	3.76
87	Senegal	3.71
88	Venezuela	3.70
89	Uruguay	3.65
90	Zimbabwe	3.62
91	Zambia	3.60
92	Russian Federation	3.59
93	Macedonia, FYR	3.59
94	Malawi	3.56
95	Kazakhstan	3.50
96	Georgia	3.47
97	Argentina	3.45
98	Vietnam	3.41
99	Côte d'Ivoire	3.39
100	Ukraine	3.37
101	Benin	3.34
102	Nicaragua	3.21
103	Armenia	3.20
104	Suriname	3.13
105	Mozambique	3.12
106	Lesotho	3.08
107	Paraguay	3.08
108	Tanzania	3.06
109	Guyana	3.01
110	Bulgaria	2.99
111	Serbia	2.98
112	Bolivia	2.97
113	Burkina Faso	2.95
114	Nepal	2.91
115	Bangladesh	2.88
116	Uganda	2.87
117	Albania	2.83
118	Mali	2.81
119	Tajikistan	2.81
120	Cambodia	2.75
121	Kyrgyz Republic	2.67
122	Bosnia and Herzegovina	2.60
123	Mauritania	2.56
124	Mongolia	2.53
125	Madagascar	2.37
126	Syria	2.34
127	Algeria	2.28
128	Cameroon	2.26
129	Chad	2.15
130	Ethiopia	2.14
131	Libya	2.11
132	Timor-Leste	2.10
133	Burundi	2.07

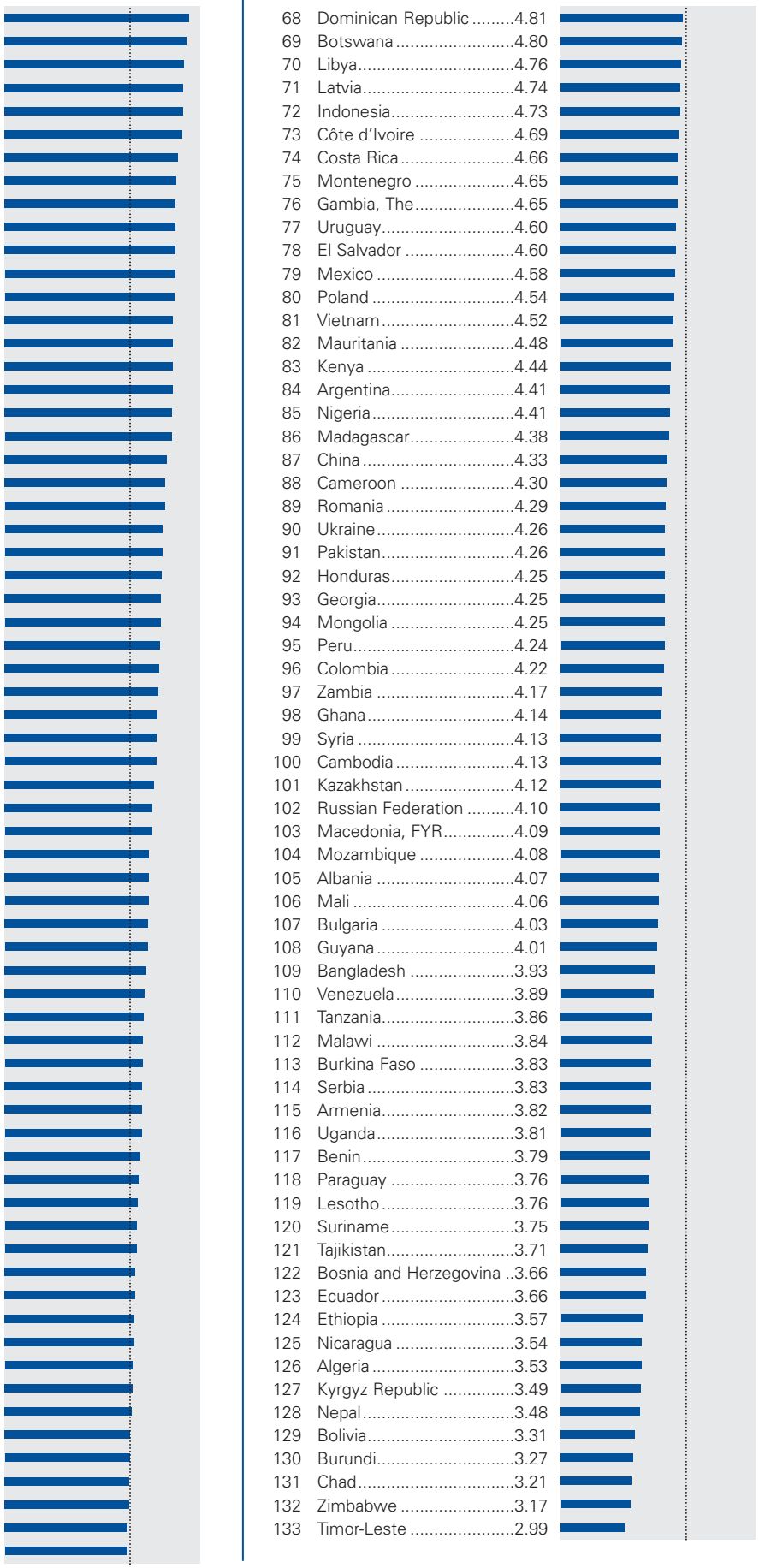


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.03 Availability of latest technologies

To what extent are the latest technologies available in your country? (1 = not available; 7 = widely available) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Iceland	6.77
2	Sweden	6.70
3	Finland	6.62
4	Norway	6.59
5	United States	6.58
6	Switzerland	6.56
7	Denmark	6.43
8	United Arab Emirates	6.37
9	Canada	6.35
10	Netherlands	6.34
11	Hong Kong SAR	6.34
12	Japan	6.33
13	Austria	6.30
14	Singapore	6.27
15	Israel	6.27
16	Germany	6.27
17	France	6.26
18	United Kingdom	6.24
19	Belgium	6.22
20	Luxembourg	6.07
21	Australia	6.02
22	Puerto Rico	6.01
23	Portugal	5.93
24	Korea, Rep.	5.93
25	Qatar	5.90
26	Estonia	5.89
27	New Zealand	5.87
28	Bahrain	5.86
29	Barbados	5.84
30	Malta	5.81
31	Cyprus	5.78
32	Chile	5.75
33	Taiwan, China	5.74
34	Ireland	5.68
35	Jordan	5.62
36	Malaysia	5.61
37	South Africa	5.51
38	Slovenia	5.51
39	India	5.50
40	Tunisia	5.48
41	Spain	5.47
42	Senegal	5.44
43	Saudi Arabia	5.38
44	Slovak Republic	5.36
45	Namibia	5.32
46	Jamaica	5.31
47	Turkey	5.30
48	Czech Republic	5.30
49	Brazil	5.29
50	Lithuania	5.25
51	Brunei Darussalam	5.22
52	Mauritius	5.16
53	Thailand	5.12
54	Hungary	5.12
55	Kuwait	5.09
56	Guatemala	5.09
57	Philippines	5.06
58	Sri Lanka	5.06
59	Oman	5.02
60	Azerbaijan	5.01
61	Croatia	4.98
62	Trinidad and Tobago	4.93
63	Morocco	4.91
64	Greece	4.90
65	Italy	4.89
66	Egypt	4.84
67	Panama	4.83
68	Dominican Republic	4.81
69	Botswana	4.80
70	Libya	4.76
71	Latvia	4.74
72	Indonesia	4.73
73	Côte d'Ivoire	4.69
74	Costa Rica	4.66
75	Montenegro	4.65
76	Gambia, The	4.65
77	Uruguay	4.60
78	El Salvador	4.60
79	Mexico	4.58
80	Poland	4.54
81	Vietnam	4.52
82	Mauritania	4.48
83	Kenya	4.44
84	Argentina	4.41
85	Nigeria	4.41
86	Madagascar	4.38
87	China	4.33
88	Cameroon	4.30
89	Romania	4.29
90	Ukraine	4.26
91	Pakistan	4.26
92	Honduras	4.25
93	Georgia	4.25
94	Mongolia	4.25
95	Peru	4.24
96	Colombia	4.22
97	Zambia	4.17
98	Ghana	4.14
99	Syria	4.13
100	Cambodia	4.13
101	Kazakhstan	4.12
102	Russian Federation	4.10
103	Macedonia, FYR	4.09
104	Mozambique	4.08
105	Albania	4.07
106	Mali	4.06
107	Bulgaria	4.03
108	Guyana	4.01
109	Bangladesh	3.93
110	Venezuela	3.89
111	Tanzania	3.86
112	Malawi	3.84
113	Burkina Faso	3.83
114	Serbia	3.83
115	Armenia	3.82
116	Uganda	3.81
117	Benin	3.79
118	Paraguay	3.76
119	Lesotho	3.76
120	Suriname	3.75
121	Tajikistan	3.71
122	Bosnia and Herzegovina	3.66
123	Ecuador	3.66
124	Ethiopia	3.57
125	Nicaragua	3.54
126	Algeria	3.53
127	Kyrgyz Republic	3.49
128	Nepal	3.48
129	Bolivia	3.31
130	Burundi	3.27
131	Chad	3.21
132	Zimbabwe	3.17
133	Timor-Leste	2.99

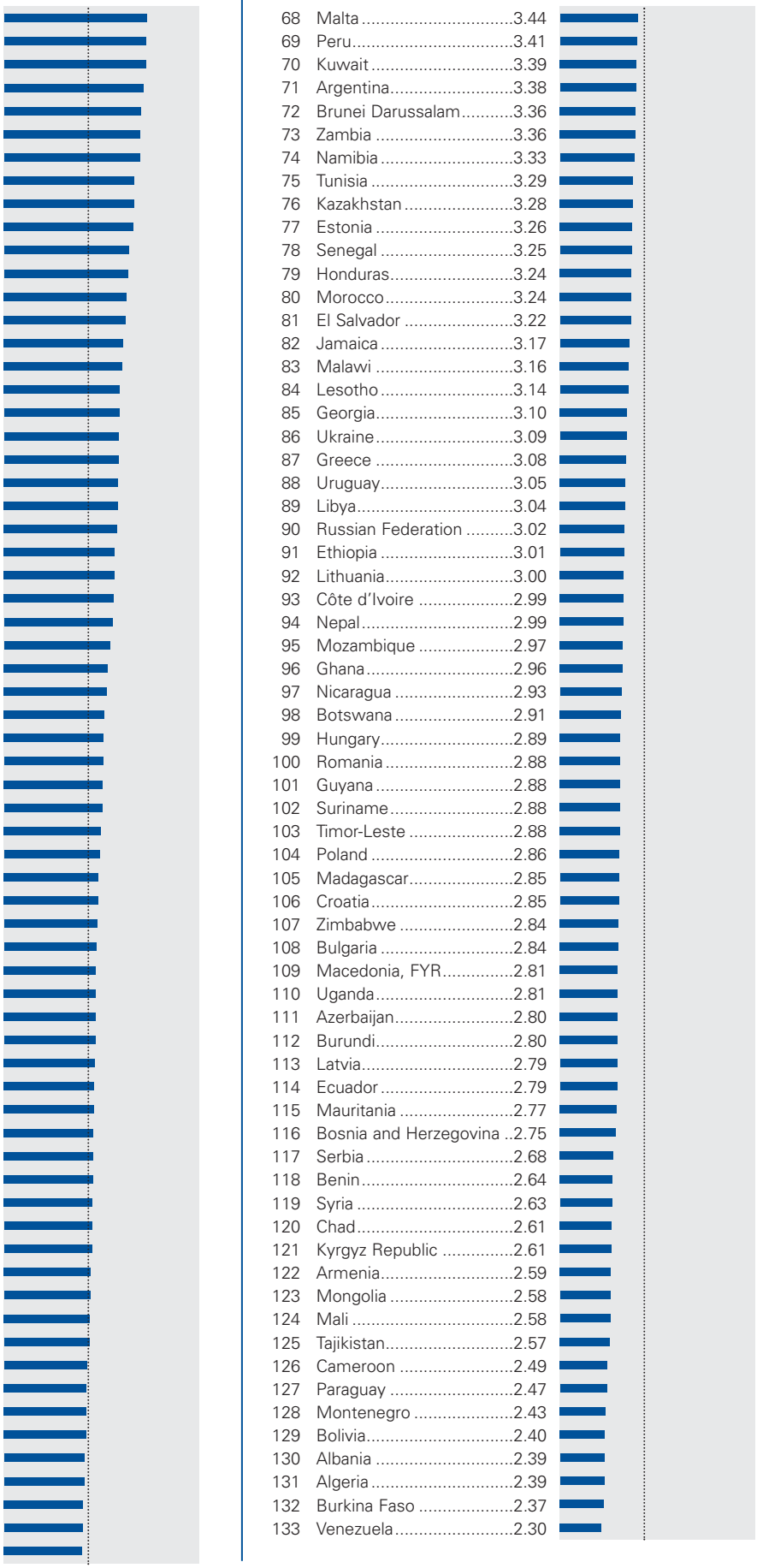


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.04 State of cluster development

In your country's economy, how prevalent are well-developed and deep clusters? (1 = nonexistent; 7 = widespread in many fields) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Japan	5.47
2	United States	5.45
3	Italy	5.45
4	Hong Kong SAR	5.36
5	Singapore	5.29
6	Taiwan, China	5.27
7	Finland	5.26
8	Canada	5.08
9	Switzerland	5.08
10	Sweden	5.05
11	Germany	4.91
12	United Kingdom	4.88
13	Netherlands	4.84
14	Denmark	4.82
15	Bahrain	4.73
16	China	4.71
17	Malaysia	4.63
18	Vietnam	4.61
19	Luxembourg	4.59
20	India	4.59
21	Norway	4.58
22	Austria	4.57
23	Korea, Rep.	4.54
24	Indonesia	4.47
25	United Arab Emirates	4.47
26	France	4.44
27	Belgium	4.40
28	Ireland	4.32
29	Brazil	4.25
30	Cyprus	4.22
31	Sri Lanka	4.15
32	Spain	4.12
33	South Africa	4.10
34	Czech Republic	4.09
35	Thailand	4.08
36	Qatar	4.04
37	Australia	4.00
38	Puerto Rico	3.96
39	Kenya	3.95
40	Saudi Arabia	3.92
41	Egypt	3.89
42	Slovenia	3.88
43	Panama	3.87
44	Mauritius	3.87
45	Chile	3.86
46	Jordan	3.85
47	Guatemala	3.82
48	Iceland	3.82
49	Israel	3.80
50	Pakistan	3.80
51	Colombia	3.79
52	Turkey	3.77
53	Mexico	3.76
54	Oman	3.76
55	Cambodia	3.71
56	New Zealand	3.70
57	Portugal	3.69
58	Gambia, The	3.68
59	Philippines	3.60
60	Costa Rica	3.58
61	Trinidad and Tobago	3.58
62	Nigeria	3.58
63	Dominican Republic	3.52
64	Tanzania	3.52
65	Bangladesh	3.48
66	Barbados	3.46
67	Slovak Republic	3.45
68	Malta	3.44
69	Peru	3.41
70	Kuwait	3.39
71	Argentina	3.38
72	Brunei Darussalam	3.36
73	Zambia	3.36
74	Namibia	3.33
75	Tunisia	3.29
76	Kazakhstan	3.28
77	Estonia	3.26
78	Senegal	3.25
79	Honduras	3.24
80	Morocco	3.24
81	El Salvador	3.22
82	Jamaica	3.17
83	Malawi	3.16
84	Lesotho	3.14
85	Georgia	3.10
86	Ukraine	3.09
87	Greece	3.08
88	Uruguay	3.05
89	Libya	3.04
90	Russian Federation	3.02
91	Ethiopia	3.01
92	Lithuania	3.00
93	Côte d'Ivoire	2.99
94	Nepal	2.99
95	Mozambique	2.97
96	Ghana	2.96
97	Nicaragua	2.93
98	Botswana	2.91
99	Hungary	2.89
100	Romania	2.88
101	Guyana	2.88
102	Suriname	2.88
103	Timor-Leste	2.88
104	Poland	2.86
105	Madagascar	2.85
106	Croatia	2.85
107	Zimbabwe	2.84
108	Bulgaria	2.84
109	Macedonia, FYR	2.81
110	Uganda	2.81
111	Azerbaijan	2.80
112	Burundi	2.80
113	Latvia	2.79
114	Ecuador	2.79
115	Mauritania	2.77
116	Bosnia and Herzegovina	2.75
117	Serbia	2.68
118	Benin	2.64
119	Syria	2.63
120	Chad	2.61
121	Kyrgyz Republic	2.61
122	Armenia	2.59
123	Mongolia	2.58
124	Mali	2.58
125	Tajikistan	2.57
126	Cameroon	2.49
127	Paraguay	2.47
128	Montenegro	2.43
129	Bolivia	2.40
130	Albania	2.39
131	Algeria	2.39
132	Burkina Faso	2.37
133	Venezuela	2.30

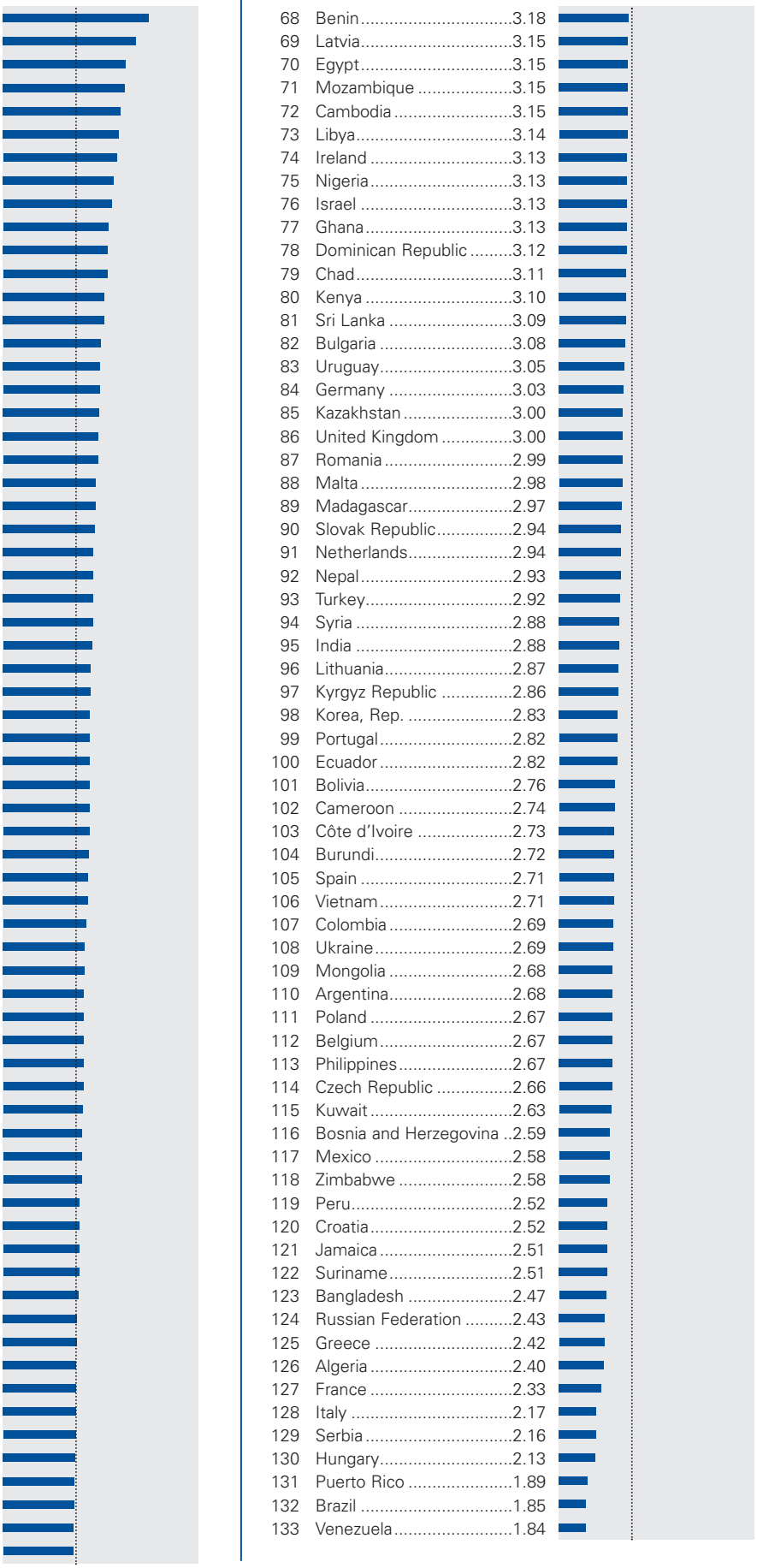


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.05 Burden of government regulation

How burdensome is it for businesses in your country to comply with governmental administrative requirements (e.g., permits, regulations, reporting)? (1 = extremely burdensome; 7 = not burdensome at all) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	5.57
2	Hong Kong SAR	5.17
3	Georgia	4.84
4	Gambia, The	4.81
5	Iceland	4.68
6	United Arab Emirates	4.63
7	Oman	4.56
8	Estonia	4.46
9	Mauritania	4.40
10	Qatar	4.29
11	Switzerland	4.28
12	Finland	4.27
13	Luxembourg	4.18
14	Azerbaijan	4.17
15	Malaysia	4.05
16	Cyprus	4.04
17	Barbados	4.02
18	Jordan	4.01
19	Sweden	3.99
20	Saudi Arabia	3.97
21	China	3.91
22	Japan	3.90
23	Indonesia	3.88
24	Tunisia	3.83
25	Slovenia	3.83
26	Malawi	3.82
27	Denmark	3.82
28	Ethiopia	3.78
29	Mauritius	3.75
30	Zambia	3.75
31	New Zealand	3.72
32	Bahrain	3.72
33	Honduras	3.71
34	Namibia	3.71
35	Panama	3.71
36	Uganda	3.70
37	Taiwan, China	3.69
38	Guatemala	3.67
39	Brunei Darussalam	3.67
40	Botswana	3.60
41	Chile	3.56
42	Canada	3.55
43	Guyana	3.53
44	Burkina Faso	3.53
45	Austria	3.53
46	Lesotho	3.51
47	Mali	3.51
48	El Salvador	3.49
49	Norway	3.48
50	Thailand	3.46
51	Paraguay	3.46
52	Morocco	3.40
53	United States	3.39
54	Albania	3.38
55	Timor-Leste	3.38
56	Trinidad and Tobago	3.37
57	Nicaragua	3.31
58	Tajikistan	3.31
59	Pakistan	3.29
60	Tanzania	3.28
61	Montenegro	3.28
62	Macedonia, FYR	3.27
63	Costa Rica	3.26
64	Armenia	3.24
65	South Africa	3.23
66	Australia	3.20
67	Senegal	3.19
68	Benin	3.18
69	Latvia	3.15
70	Egypt	3.15
71	Mozambique	3.15
72	Cambodia	3.15
73	Libya	3.14
74	Ireland	3.13
75	Nigeria	3.13
76	Israel	3.13
77	Ghana	3.13
78	Dominican Republic	3.12
79	Chad	3.11
80	Kenya	3.10
81	Sri Lanka	3.09
82	Bulgaria	3.08
83	Uruguay	3.05
84	Germany	3.03
85	Kazakhstan	3.00
86	United Kingdom	3.00
87	Romania	2.99
88	Malta	2.98
89	Madagascar	2.97
90	Slovak Republic	2.94
91	Netherlands	2.94
92	Nepal	2.93
93	Turkey	2.92
94	Syria	2.88
95	India	2.88
96	Lithuania	2.87
97	Kyrgyz Republic	2.86
98	Korea, Rep.	2.83
99	Portugal	2.82
100	Ecuador	2.82
101	Bolivia	2.76
102	Cameroon	2.74
103	Côte d'Ivoire	2.73
104	Burundi	2.72
105	Spain	2.71
106	Vietnam	2.71
107	Colombia	2.69
108	Ukraine	2.69
109	Mongolia	2.68
110	Argentina	2.68
111	Poland	2.67
112	Belgium	2.67
113	Philippines	2.67
114	Czech Republic	2.66
115	Kuwait	2.63
116	Bosnia and Herzegovina	2.59
117	Mexico	2.58
118	Zimbabwe	2.58
119	Peru	2.52
120	Croatia	2.52
121	Jamaica	2.51
122	Suriname	2.51
123	Bangladesh	2.47
124	Russian Federation	2.43
125	Greece	2.42
126	Algeria	2.40
127	France	2.33
128	Italy	2.17
129	Serbia	2.16
130	Hungary	2.13
131	Puerto Rico	1.89
132	Brazil	1.85
133	Venezuela	1.84

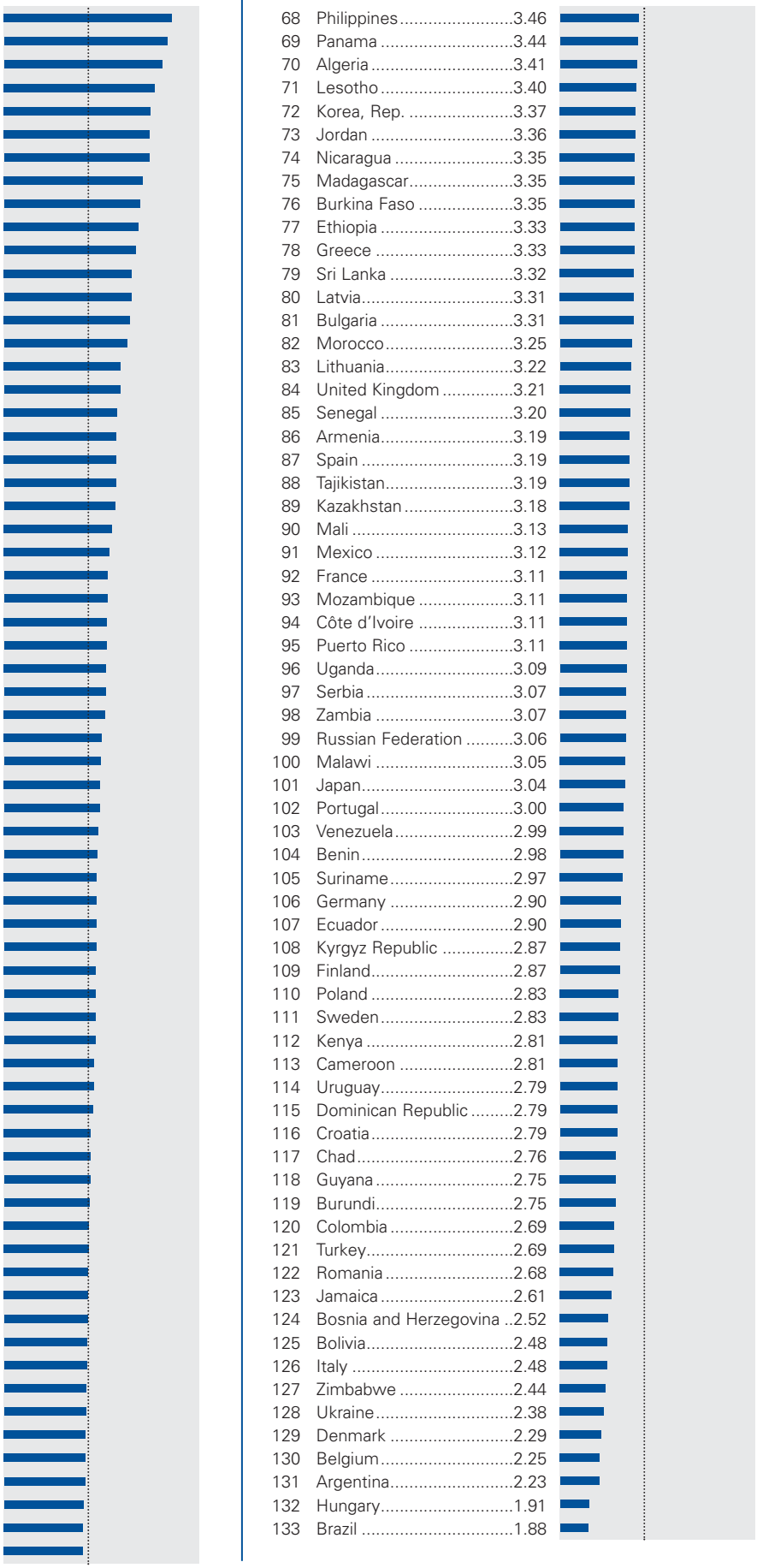


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.06 Extent and effect of taxation

What impact does the level of taxes in your country have on incentives to work or invest? (1 = significantly limits incentives to work or invest; 7 = has no impact on incentives to work or invest) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Bahrain	6.27
2	Hong Kong SAR	6.11
3	United Arab Emirates	5.96
4	Singapore	5.73
5	Oman	5.60
6	Mauritius	5.57
7	Luxembourg	5.55
8	Saudi Arabia	5.35
9	Kuwait	5.26
10	Qatar	5.22
11	Iceland	5.12
12	Switzerland	5.01
13	Cyprus	4.99
14	Brunei Darussalam	4.95
15	Estonia	4.85
16	Trinidad and Tobago	4.65
17	Tunisia	4.64
18	Slovak Republic	4.54
19	Georgia	4.52
20	Botswana	4.52
21	Paraguay	4.51
22	Indonesia	4.48
23	Libya	4.38
24	Taiwan, China	4.30
25	El Salvador	4.24
26	Ireland	4.24
27	South Africa	4.23
28	Barbados	4.21
29	India	4.20
30	Malaysia	4.18
31	Montenegro	4.17
32	China	4.06
33	Malta	4.02
34	Syria	4.01
35	Timor-Leste	4.00
36	Gambia, The	3.95
37	Honduras	3.92
38	Azerbaijan	3.91
39	Namibia	3.90
40	Thailand	3.90
41	Macedonia, FYR	3.89
42	Chile	3.88
43	Costa Rica	3.86
44	Guatemala	3.86
45	Czech Republic	3.86
46	Norway	3.83
47	Nigeria	3.82
48	Vietnam	3.80
49	Peru	3.72
50	Cambodia	3.71
51	Pakistan	3.70
52	Egypt	3.68
53	New Zealand	3.66
54	Mauritania	3.66
55	Netherlands	3.64
56	Slovenia	3.63
57	Albania	3.62
58	Nepal	3.60
59	United States	3.59
60	Mongolia	3.57
61	Ghana	3.57
62	Tanzania	3.56
63	Bangladesh	3.55
64	Israel	3.54
65	Canada	3.49
66	Australia	3.48
67	Austria	3.47
68	Philippines	3.46
69	Panama	3.44
70	Algeria	3.41
71	Lesotho	3.40
72	Korea, Rep.	3.37
73	Jordan	3.36
74	Nicaragua	3.35
75	Madagascar	3.35
76	Burkina Faso	3.35
77	Ethiopia	3.33
78	Greece	3.33
79	Sri Lanka	3.32
80	Latvia	3.31
81	Bulgaria	3.31
82	Morocco	3.25
83	Lithuania	3.22
84	United Kingdom	3.21
85	Senegal	3.20
86	Armenia	3.19
87	Spain	3.19
88	Tajikistan	3.19
89	Kazakhstan	3.18
90	Mali	3.13
91	Mexico	3.12
92	France	3.11
93	Mozambique	3.11
94	Côte d'Ivoire	3.11
95	Puerto Rico	3.11
96	Uganda	3.09
97	Serbia	3.07
98	Zambia	3.07
99	Russian Federation	3.06
100	Malawi	3.05
101	Japan	3.04
102	Portugal	3.00
103	Venezuela	2.99
104	Benin	2.98
105	Suriname	2.97
106	Germany	2.90
107	Ecuador	2.90
108	Kyrgyz Republic	2.87
109	Finland	2.87
110	Poland	2.83
111	Sweden	2.83
112	Kenya	2.81
113	Cameroon	2.81
114	Uruguay	2.79
115	Dominican Republic	2.79
116	Croatia	2.79
117	Chad	2.76
118	Guyana	2.75
119	Burundi	2.75
120	Colombia	2.69
121	Turkey	2.69
122	Romania	2.68
123	Jamaica	2.61
124	Bosnia and Herzegovina	2.52
125	Bolivia	2.48
126	Italy	2.48
127	Zimbabwe	2.44
128	Ukraine	2.38
129	Denmark	2.29
130	Belgium	2.25
131	Argentina	2.23
132	Hungary	1.91
133	Brazil	1.88



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.07 Total tax rate (hard data)

Sum of profit tax, labor tax and social contributions, property taxes, turnover taxes, and other taxes, as a share of commercial profits | 2008

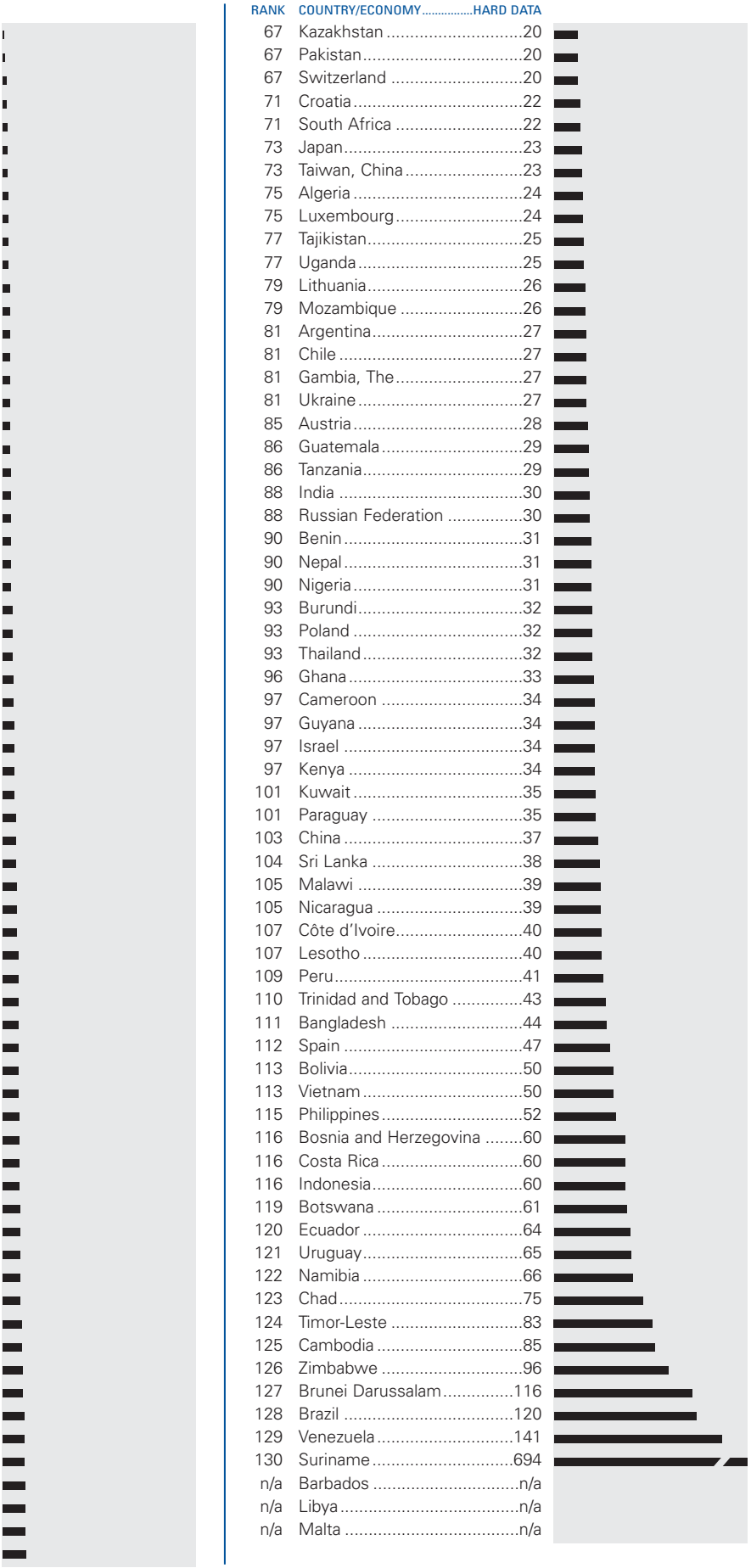
RANK	COUNTRY/ECONOMY	HARD DATA
1	Timor-Leste	0.20
2	Namibia	9.60
3	Qatar	11.30
4	United Arab Emirates	14.10
5	Saudi Arabia	14.50
6	Bahrain	15.00
7	Georgia	15.30
8	Kuwait	15.50
9	Zambia	16.10
10	Macedonia, FYR	16.40
11	Botswana	17.10
12	Lesotho	18.50
13	Luxembourg	20.90
14	Oman	21.60
15	Cambodia	22.70
16	Mongolia	22.80
17	Mauritius	22.90
18	Hong Kong SAR	24.20
19	Iceland	25.00
20	Chile	25.30
21	Malawi	25.80
22	Ireland	26.50
23	Bosnia and Herzegovina	27.10
24	Singapore	27.80
25	Suriname	27.90
26	Cyprus	28.80
27	Montenegro	28.90
28	Denmark	29.20
29	Switzerland	29.70
30	South Africa	30.20
31	Brunei Darussalam	30.30
32	Ethiopia	31.10
32	Jordan	31.10
34	Bulgaria	31.40
35	Pakistan	31.60
36	Korea, Rep.	31.90
37	Nigeria	32.20
38	Croatia	32.50
39	Israel	32.60
40	Ghana	32.70
41	New Zealand	32.80
42	Latvia	33.00
43	Trinidad and Tobago	33.10
44	Serbia	34.00
45	Malaysia	34.20
46	Mozambique	34.30
47	Ecuador	34.90
48	Bangladesh	35.00
48	El Salvador	35.00
48	Paraguay	35.00
51	Uganda	35.70
52	Kazakhstan	35.90
52	United Kingdom	35.90
54	Armenia	36.20
55	Thailand	37.20
56	Slovenia	37.50
57	Indonesia	37.60
58	Nepal	38.80
59	Guyana	38.90
60	Dominican Republic	39.00
61	Madagascar	39.20
62	Netherlands	39.30
63	Zimbabwe	39.40
64	Vietnam	40.10
65	Peru	40.30
66	Taiwan, China	40.40
67	Azerbaijan	40.90
67	Guatemala	40.90
69	Norway	41.60
70	Morocco	41.70
71	Poland	42.50
72	Lithuania	42.70
73	Portugal	42.90
73	Syria	42.90
75	Egypt	43.00
76	Canada	43.60
77	Turkey	44.50
78	Romania	44.60
79	Côte d'Ivoire	44.70
80	Albania	44.90
80	Burkina Faso	44.90
80	Germany	44.90
83	Tanzania	45.20
84	Senegal	46.00
85	United States	46.30
86	Uruguay	46.70
87	Czech Republic	47.20
88	Greece	47.40
89	Finland	47.70
90	Australia	48.00
91	Honduras	48.30
91	Russian Federation	48.30
93	Slovak Republic	48.60
94	Estonia	49.10
95	Philippines	49.40
96	Kenya	49.70
97	Panama	50.10
98	Cameroon	50.50
99	Mexico	51.00
100	Jamaica	51.30
101	Mali	52.10
102	Sweden	54.60
103	Costa Rica	54.80
104	Austria	55.50
105	Japan	55.70
106	Spain	56.90
107	Ukraine	57.20
108	Belgium	57.30
109	Hungary	57.50
110	Kyrgyz Republic	59.40
111	Chad	60.90
112	Venezuela	61.10
113	Tunisia	62.80
114	Nicaragua	63.20
115	Sri Lanka	63.70
116	India	64.70
116	Puerto Rico	64.70
118	France	65.80
119	Italy	68.40
120	Brazil	69.20
121	Algeria	72.00
122	Benin	73.30
123	China	78.50
124	Colombia	78.70
125	Bolivia	80.00
126	Tajikistan	85.90
127	Mauritania	86.10
128	Argentina	108.10
129	Burundi	278.60
130	Gambia, The	292.40
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a

SOURCE: The World Bank Group, *Doing Business 2010*

1.08 Time required to start a business (hard data)

Number of days required to start a business | 2009

RANK	COUNTRY/ECONOMY	HARD DATA
1	New Zealand	1
2	Australia	2
3	Georgia	3
3	Singapore	3
5	Belgium	4
5	Hungary	4
5	Macedonia, FYR	4
8	Albania	5
8	Canada	5
8	Iceland	5
8	Saudi Arabia	5
12	Denmark	6
12	Hong Kong SAR	6
12	Mauritius	6
12	Portugal	6
12	Qatar	6
12	Slovenia	6
12	Turkey	6
12	United States	6
20	Egypt	7
20	Estonia	7
20	France	7
20	Madagascar	7
20	Norway	7
20	Puerto Rico	7
26	Cyprus	8
26	Jamaica	8
26	Senegal	8
29	Bahrain	9
29	Ethiopia	9
31	Azerbaijan	10
31	Italy	10
31	Netherlands	10
31	Romania	10
35	Kyrgyz Republic	11
35	Malaysia	11
35	Tunisia	11
38	Morocco	12
38	Oman	12
38	Panama	12
41	Ireland	13
41	Jordan	13
41	Mexico	13
41	Mongolia	13
41	Montenegro	13
41	Serbia	13
41	United Kingdom	13
48	Burkina Faso	14
48	Finland	14
48	Honduras	14
48	Korea, Rep.	14
52	Armenia	15
52	Czech Republic	15
52	Mali	15
52	Sweden	15
52	United Arab Emirates	15
57	Latvia	16
57	Slovak Republic	16
59	El Salvador	17
59	Syria	17
61	Bulgaria	18
61	Germany	18
61	Zambia	18
64	Dominican Republic	19
64	Greece	19
64	Mauritania	19
67	Colombia	20
67	Kazakhstan	20
67	Pakistan	20
67	Switzerland	20
71	Croatia	22
71	South Africa	22
73	Japan	23
73	Taiwan, China	23
75	Algeria	24
75	Luxembourg	24
77	Tajikistan	25
77	Uganda	25
79	Lithuania	26
79	Mozambique	26
81	Argentina	27
81	Chile	27
81	Gambia, The	27
81	Ukraine	27
85	Austria	28
86	Guatemala	29
86	Tanzania	29
88	India	30
88	Russian Federation	30
90	Benin	31
90	Nepal	31
90	Nigeria	31
93	Burundi	32
93	Poland	32
93	Thailand	32
96	Ghana	33
97	Cameroon	34
97	Guyana	34
97	Israel	34
97	Kenya	34
101	Kuwait	35
101	Paraguay	35
103	China	37
104	Sri Lanka	38
105	Malawi	39
105	Nicaragua	39
107	Côte d'Ivoire	40
107	Lesotho	40
109	Peru	41
110	Trinidad and Tobago	43
111	Bangladesh	44
112	Spain	47
113	Bolivia	50
113	Vietnam	50
115	Philippines	52
116	Bosnia and Herzegovina	60
116	Costa Rica	60
116	Indonesia	60
119	Botswana	61
120	Ecuador	64
121	Uruguay	65
122	Namibia	66
123	Chad	75
124	Timor-Leste	83
125	Cambodia	85
126	Zimbabwe	96
127	Brunei Darussalam	116
128	Brazil	120
129	Venezuela	141
130	Suriname	694
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a



SOURCE: The World Bank Group, *Doing Business 2010*

1.09 Number of procedures required to start a business (hard data)

Number of procedures required to start a business | 2009

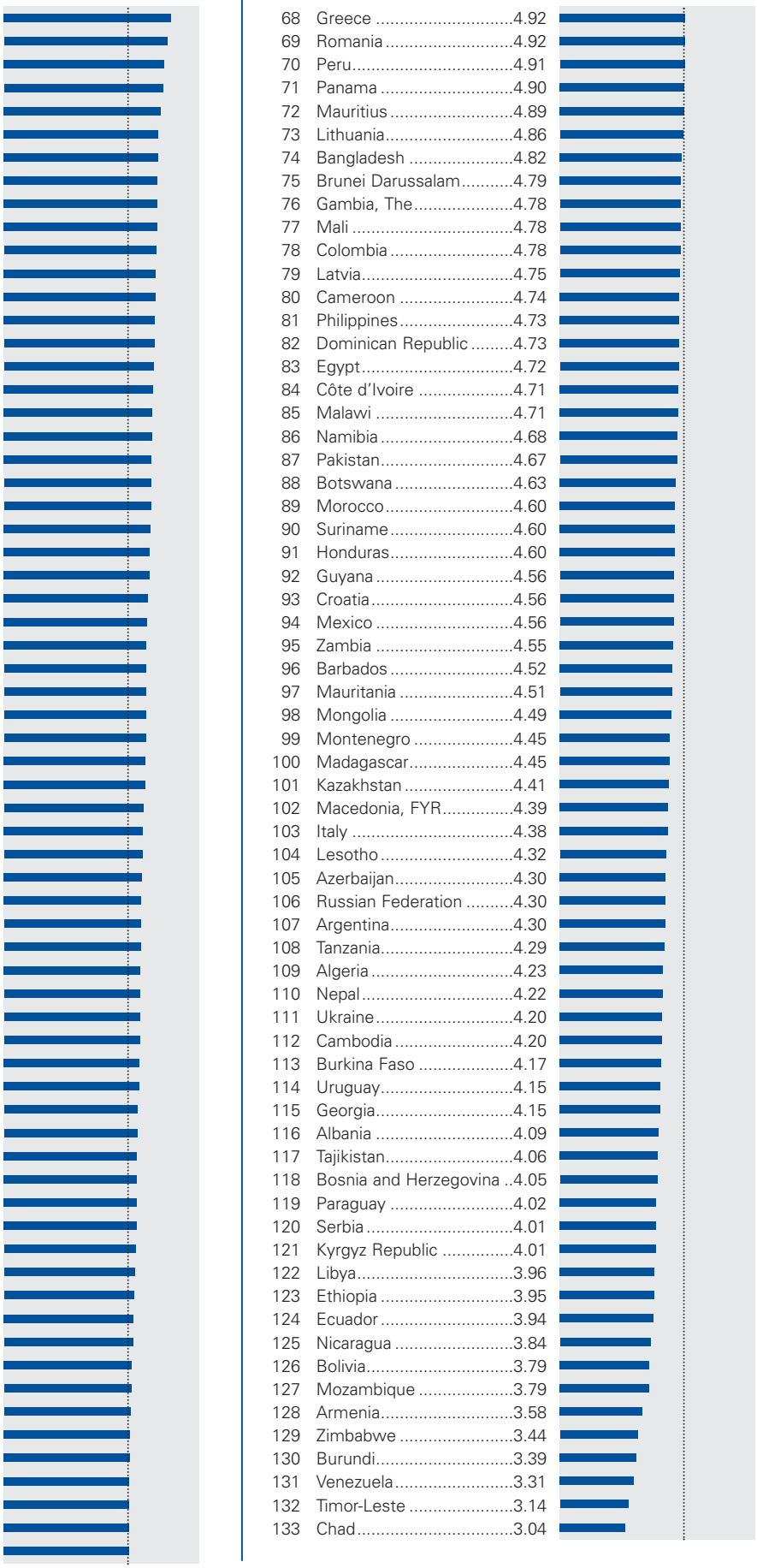
RANK	COUNTRY/ECONOMY	HARD DATA
1	Canada	1
1	New Zealand	1
3	Australia	2
3	Madagascar	2
5	Belgium	3
5	Finland	3
5	Georgia	3
5	Hong Kong SAR	3
5	Kyrgyz Republic	3
5	Singapore	3
5	Slovenia	3
5	Sweden	3
13	Bulgaria	4
13	Burkina Faso	4
13	Denmark	4
13	Hungary	4
13	Ireland	4
13	Macedonia, FYR	4
13	Saudi Arabia	4
13	Senegal	4
13	Sri Lanka	4
22	Albania	5
22	Estonia	5
22	Ethiopia	5
22	France	5
22	Iceland	5
22	Israel	5
22	Latvia	5
22	Mauritius	5
22	Norway	5
22	Oman	5
32	Armenia	6
32	Azerbaijan	6
32	Cyprus	6
32	Egypt	6
32	Italy	6
32	Jamaica	6
32	Luxembourg	6
32	Morocco	6
32	Netherlands	6
32	Nicaragua	6
32	Panama	6
32	Poland	6
32	Portugal	6
32	Qatar	6
32	Romania	6
32	Slovak Republic	6
32	South Africa	6
32	Switzerland	6
32	Taiwan, China	6
32	Turkey	6
32	United Kingdom	6
32	United States	6
32	Zambia	6
55	Bahrain	7
55	Bangladesh	7
55	Benin	7
55	Croatia	7
55	Kazakhstan	7
55	Lesotho	7
55	Lithuania	7
55	Mali	7
55	Mongolia	7
55	Nepal	7
55	Paraguay	7
55	Puerto Rico	7
55	Serbia	7
55	Syria	7
55	Thailand	7
70	Austria	8
70	Czech Republic	8
70	Dominican Republic	8
70	El Salvador	8
70	Gambia, The	8
70	Ghana	8
70	Guyana	8
70	Japan	8
70	Jordan	8
70	Korea, Rep.	8
70	Mexico	8
70	Nigeria	8
70	United Arab Emirates	8
83	Cambodia	9
83	Chile	9
83	Colombia	9
83	Germany	9
83	Indonesia	9
83	Malaysia	9
83	Mauritania	9
83	Peru	9
83	Russian Federation	9
83	Trinidad and Tobago	9
93	Botswana	10
93	Côte d'Ivoire	10
93	Malawi	10
93	Mozambique	10
93	Namibia	10
93	Pakistan	10
93	Spain	10
93	Timor-Leste	10
93	Tunisia	10
93	Ukraine	10
93	Zimbabwe	10
104	Burundi	11
104	Guatemala	11
104	Uruguay	11
104	Vietnam	11
108	Bosnia and Herzegovina	12
108	Cameroon	12
108	Costa Rica	12
108	Kenya	12
108	Montenegro	12
108	Tajikistan	12
108	Tanzania	12
115	Ecuador	13
115	Honduras	13
115	India	13
115	Kuwait	13
115	Suriname	13
120	Algeria	14
120	China	14
122	Argentina	15
122	Bolivia	15
122	Greece	15
122	Philippines	15
126	Brazil	16
126	Venezuela	16
128	Brunei Darussalam	18
128	Uganda	18
130	Chad	19
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a

SOURCE: The World Bank Group, *Doing Business 2010*

1.10 Intensity of local competition

How would you assess the intensity of competition in the local markets in your country? (1 = limited in most industries; 7 = intense in most industries) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Germany	6.24
2	Taiwan, China	6.12
3	Austria	6.02
4	Netherlands	5.98
5	United States	5.91
6	United Kingdom	5.84
7	Belgium	5.84
8	Japan	5.81
9	United Arab Emirates	5.80
10	Czech Republic	5.80
11	Denmark	5.77
12	India	5.75
13	China	5.75
14	Qatar	5.72
15	France	5.71
16	Cyprus	5.69
17	Australia	5.68
18	Puerto Rico	5.65
19	Norway	5.65
20	Sweden	5.62
21	Singapore	5.61
22	Spain	5.61
23	Chile	5.59
24	Canada	5.57
25	Slovak Republic	5.57
26	Estonia	5.51
27	Switzerland	5.49
28	Malta	5.46
29	Israel	5.45
30	Jordan	5.45
31	Finland	5.44
32	Turkey	5.44
33	Poland	5.43
34	Nigeria	5.43
35	Hong Kong SAR	5.36
36	Sri Lanka	5.35
37	Saudi Arabia	5.34
38	Senegal	5.32
39	Korea, Rep.	5.30
40	Tunisia	5.29
41	Thailand	5.29
42	Malaysia	5.27
43	El Salvador	5.26
44	Hungary	5.26
45	Kuwait	5.26
46	Portugal	5.25
47	Indonesia	5.25
48	Jamaica	5.18
49	Ireland	5.18
50	Guatemala	5.17
51	Bahrain	5.16
52	Brazil	5.16
53	New Zealand	5.16
54	Costa Rica	5.12
55	Uganda	5.10
56	Slovenia	5.07
57	Iceland	5.06
58	Trinidad and Tobago	5.04
59	Oman	5.00
60	South Africa	4.99
61	Kenya	4.96
62	Vietnam	4.95
63	Benin	4.95
64	Luxembourg	4.93
65	Ghana	4.93
66	Bulgaria	4.93
67	Syria	4.93
68	Greece	4.92
69	Romania	4.92
70	Peru	4.91
71	Panama	4.90
72	Mauritius	4.89
73	Lithuania	4.86
74	Bangladesh	4.82
75	Brunei Darussalam	4.79
76	Gambia, The	4.78
77	Mali	4.78
78	Colombia	4.78
79	Latvia	4.75
80	Cameroon	4.74
81	Philippines	4.73
82	Dominican Republic	4.73
83	Egypt	4.72
84	Côte d'Ivoire	4.71
85	Malawi	4.71
86	Namibia	4.68
87	Pakistan	4.67
88	Botswana	4.63
89	Morocco	4.60
90	Suriname	4.60
91	Honduras	4.60
92	Guyana	4.56
93	Croatia	4.56
94	Mexico	4.56
95	Zambia	4.55
96	Barbados	4.52
97	Mauritania	4.51
98	Mongolia	4.49
99	Montenegro	4.45
100	Madagascar	4.45
101	Kazakhstan	4.41
102	Macedonia, FYR	4.39
103	Italy	4.38
104	Lesotho	4.32
105	Azerbaijan	4.30
106	Russian Federation	4.30
107	Argentina	4.30
108	Tanzania	4.29
109	Algeria	4.23
110	Nepal	4.22
111	Ukraine	4.20
112	Cambodia	4.20
113	Burkina Faso	4.17
114	Uruguay	4.15
115	Georgia	4.15
116	Albania	4.09
117	Tajikistan	4.06
118	Bosnia and Herzegovina	4.05
119	Paraguay	4.02
120	Serbia	4.01
121	Kyrgyz Republic	4.01
122	Libya	3.96
123	Ethiopia	3.95
124	Ecuador	3.94
125	Nicaragua	3.84
126	Bolivia	3.79
127	Mozambique	3.79
128	Armenia	3.58
129	Zimbabwe	3.44
130	Burundi	3.39
131	Venezuela	3.31
132	Timor-Leste	3.14
133	Chad	3.04

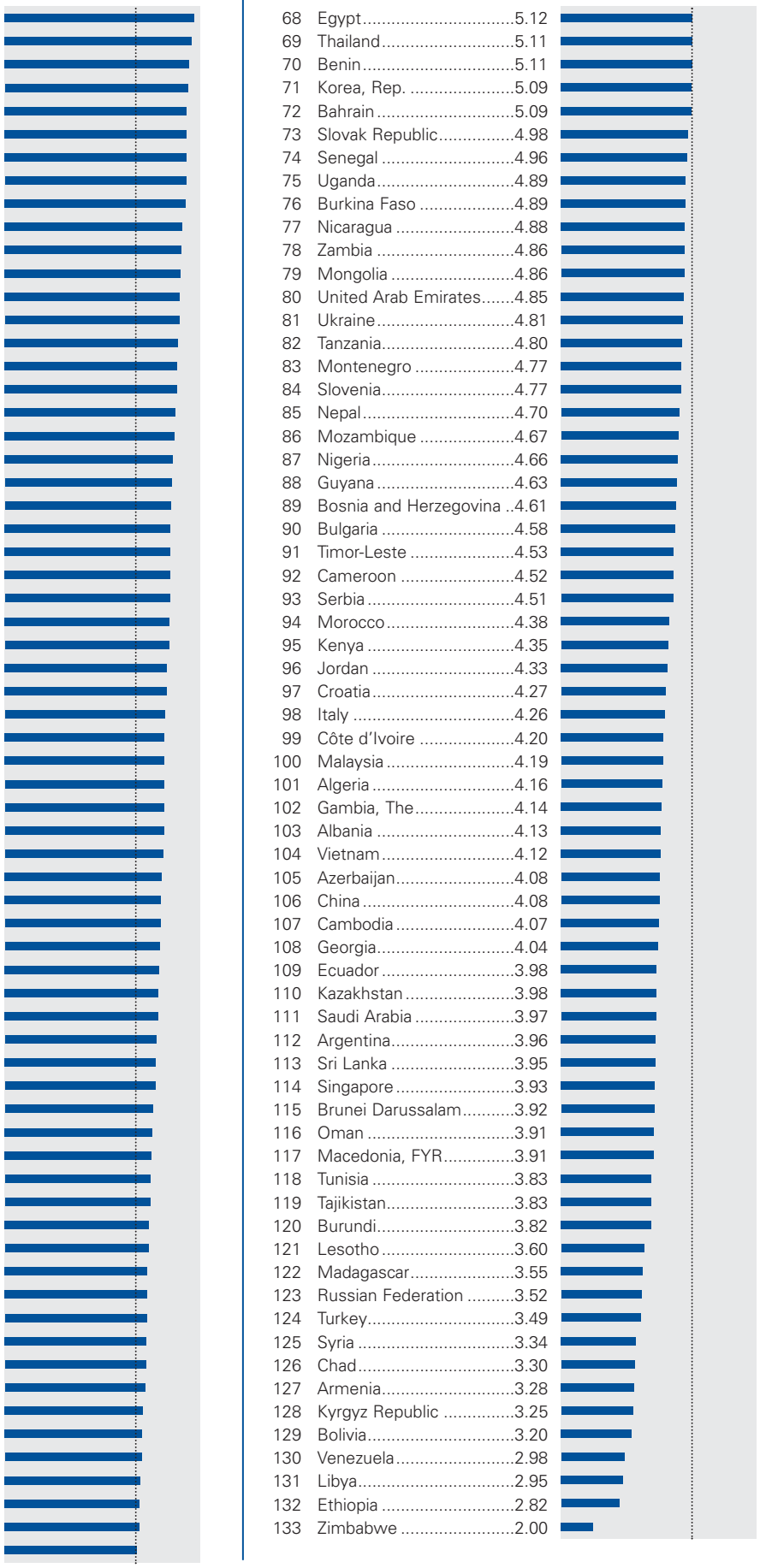


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

1.11 Freedom of the press

How free is the press in your country? (1 = totally restricted; 7 = completely free) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Denmark	6.94
2	Sweden	6.86
3	Norway	6.77
4	Netherlands	6.73
5	Switzerland	6.70
6	New Zealand	6.70
7	Israel	6.69
8	Finland	6.68
9	Germany	6.67
10	Canada	6.56
11	Luxembourg	6.53
12	Belgium	6.51
13	Costa Rica	6.48
14	Ireland	6.47
15	Chile	6.42
16	Australia	6.39
17	Puerto Rico	6.39
18	India	6.34
19	Austria	6.32
20	Taiwan, China	6.26
21	Peru	6.22
22	United Kingdom	6.20
23	United States	6.18
24	Ghana	6.18
25	Greece	6.18
26	Estonia	6.17
27	South Africa	6.16
28	Cyprus	6.14
29	Japan	6.07
30	Brazil	6.07
31	Iceland	6.01
32	El Salvador	5.99
33	Guatemala	5.99
34	Namibia	5.98
35	Portugal	5.98
36	Malta	5.98
37	Barbados	5.95
38	Spain	5.92
39	France	5.89
40	Uruguay	5.88
41	Kuwait	5.85
42	Jamaica	5.84
43	Paraguay	5.81
44	Bangladesh	5.80
45	Honduras	5.74
46	Philippines	5.72
47	Mauritius	5.71
48	Lithuania	5.63
49	Czech Republic	5.62
50	Mexico	5.60
51	Hong Kong SAR	5.55
52	Poland	5.55
53	Trinidad and Tobago	5.51
54	Panama	5.50
55	Suriname	5.46
56	Latvia	5.46
57	Qatar	5.45
58	Indonesia	5.43
59	Botswana	5.42
60	Malawi	5.39
61	Pakistan	5.33
62	Hungary	5.30
63	Romania	5.29
64	Mali	5.25
65	Colombia	5.22
66	Dominican Republic	5.21
67	Mauritania	5.14
68	Egypt	5.12
69	Thailand	5.11
70	Benin	5.11
71	Korea, Rep.	5.09
72	Bahrain	5.09
73	Slovak Republic	4.98
74	Senegal	4.96
75	Uganda	4.89
76	Burkina Faso	4.89
77	Nicaragua	4.88
78	Zambia	4.86
79	Mongolia	4.86
80	United Arab Emirates	4.85
81	Ukraine	4.81
82	Tanzania	4.80
83	Montenegro	4.77
84	Slovenia	4.77
85	Nepal	4.70
86	Mozambique	4.67
87	Nigeria	4.66
88	Guyana	4.63
89	Bosnia and Herzegovina	4.61
90	Bulgaria	4.58
91	Timor-Leste	4.53
92	Cameroon	4.52
93	Serbia	4.51
94	Morocco	4.38
95	Kenya	4.35
96	Jordan	4.33
97	Croatia	4.27
98	Italy	4.26
99	Côte d'Ivoire	4.20
100	Malaysia	4.19
101	Algeria	4.16
102	Gambia, The	4.14
103	Albania	4.13
104	Vietnam	4.12
105	Azerbaijan	4.08
106	China	4.08
107	Cambodia	4.07
108	Georgia	4.04
109	Ecuador	3.98
110	Kazakhstan	3.98
111	Saudi Arabia	3.97
112	Argentina	3.96
113	Sri Lanka	3.95
114	Singapore	3.93
115	Brunei Darussalam	3.92
116	Oman	3.91
117	Macedonia, FYR	3.91
118	Tunisia	3.83
119	Tajikistan	3.83
120	Burundi	3.82
121	Lesotho	3.60
122	Madagascar	3.55
123	Russian Federation	3.52
124	Turkey	3.49
125	Syria	3.34
126	Chad	3.30
127	Armenia	3.28
128	Kyrgyz Republic	3.25
129	Bolivia	3.20
130	Venezuela	2.98
131	Libya	2.95
132	Ethiopia	2.82
133	Zimbabwe	2.00



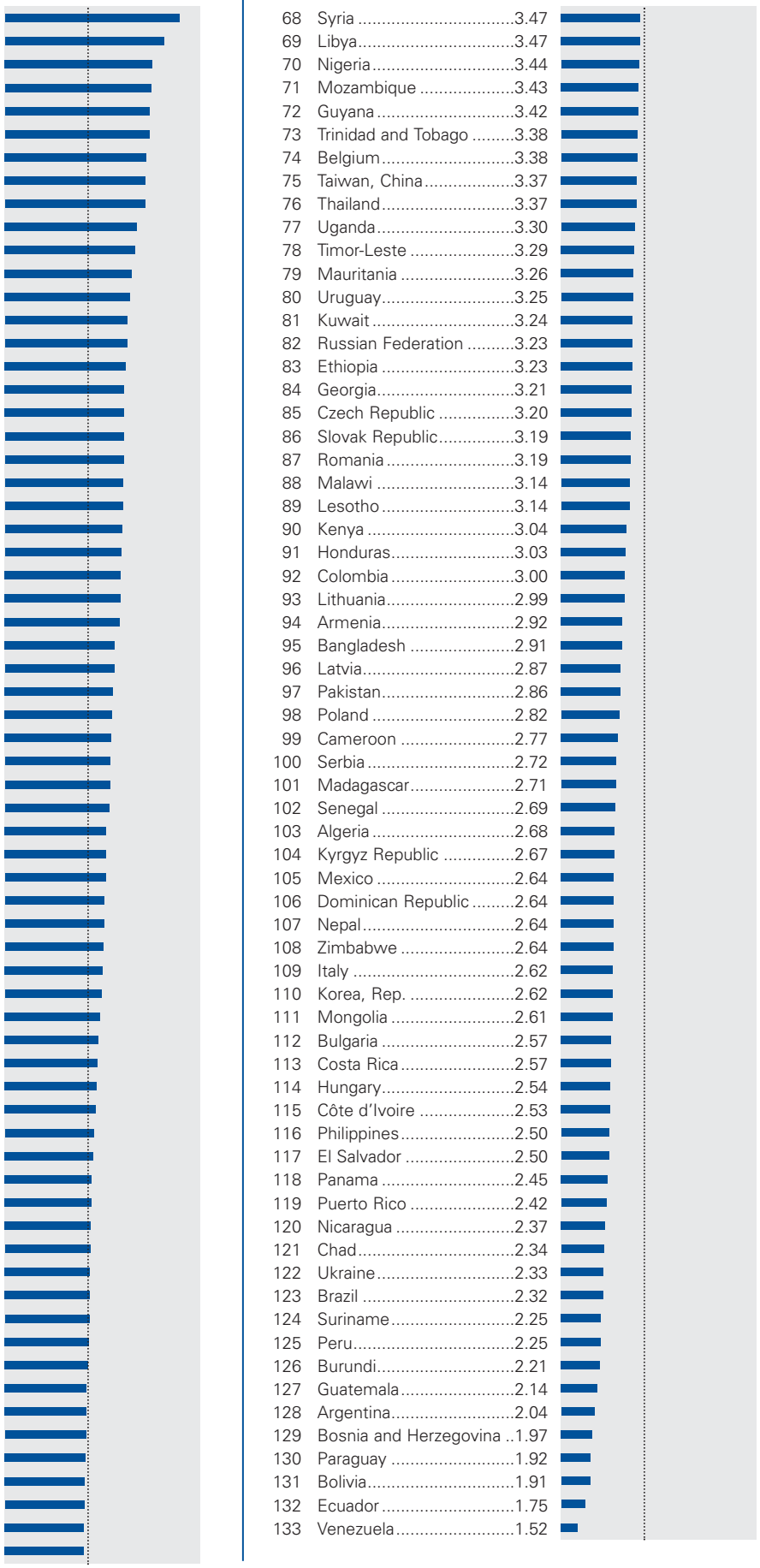
SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2nd pillar
Political and regulatory environment

2.01 Effectiveness of law-making bodies

How effective is your national parliament/congress as a law-making institution? (1 = very ineffective; 7 = very effective, among the best in the world) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.46
2	Denmark	5.98
3	Sweden	5.62
4	Australia	5.58
5	Luxembourg	5.53
6	New Zealand	5.53
7	Barbados	5.43
8	Norway	5.40
9	Finland	5.39
10	Qatar	5.14
11	Canada	5.08
12	United Kingdom	4.97
13	Switzerland	4.93
14	Malta	4.83
15	Oman	4.83
16	Mauritius	4.79
17	Malaysia	4.74
18	United Arab Emirates	4.74
19	Cyprus	4.72
20	France	4.72
21	Gambia, The	4.70
22	Botswana	4.69
23	Netherlands	4.67
24	India	4.64
25	Iceland	4.63
26	Tunisia	4.62
27	Germany	4.60
28	Ireland	4.44
29	Namibia	4.43
30	China	4.39
31	Brunei Darussalam	4.36
32	South Africa	4.34
33	Austria	4.29
34	Japan	4.29
35	Ghana	4.27
36	Azerbaijan	4.18
37	United States	4.17
38	Israel	4.16
39	Vietnam	4.10
40	Estonia	4.10
41	Saudi Arabia	4.08
42	Hong Kong SAR	4.06
43	Tanzania	4.03
44	Benin	3.98
45	Slovenia	3.93
46	Albania	3.91
47	Turkey	3.88
48	Spain	3.85
49	Sri Lanka	3.78
50	Mali	3.77
51	Tajikistan	3.72
52	Kazakhstan	3.71
53	Portugal	3.69
54	Bahrain	3.68
55	Zambia	3.66
56	Jordan	3.66
57	Greece	3.65
58	Chile	3.64
59	Burkina Faso	3.61
60	Jamaica	3.56
61	Montenegro	3.56
62	Indonesia	3.54
63	Croatia	3.53
64	Cambodia	3.50
65	Macedonia, FYR	3.49
66	Egypt	3.48
67	Morocco	3.47
68	Syria	3.47
69	Libya	3.47
70	Nigeria	3.44
71	Mozambique	3.43
72	Guyana	3.42
73	Trinidad and Tobago	3.38
74	Belgium	3.38
75	Taiwan, China	3.37
76	Thailand	3.37
77	Uganda	3.30
78	Timor-Leste	3.29
79	Mauritania	3.26
80	Uruguay	3.25
81	Kuwait	3.24
82	Russian Federation	3.23
83	Ethiopia	3.23
84	Georgia	3.21
85	Czech Republic	3.20
86	Slovak Republic	3.19
87	Romania	3.19
88	Malawi	3.14
89	Lesotho	3.14
90	Kenya	3.04
91	Honduras	3.03
92	Colombia	3.00
93	Lithuania	2.99
94	Armenia	2.92
95	Bangladesh	2.91
96	Latvia	2.87
97	Pakistan	2.86
98	Poland	2.82
99	Cameroon	2.77
100	Serbia	2.72
101	Madagascar	2.71
102	Senegal	2.69
103	Algeria	2.68
104	Kyrgyz Republic	2.67
105	Mexico	2.64
106	Dominican Republic	2.64
107	Nepal	2.64
108	Zimbabwe	2.64
109	Italy	2.62
110	Korea, Rep.	2.62
111	Mongolia	2.61
112	Bulgaria	2.57
113	Costa Rica	2.57
114	Hungary	2.54
115	Côte d'Ivoire	2.53
116	Philippines	2.50
117	El Salvador	2.50
118	Panama	2.45
119	Puerto Rico	2.42
120	Nicaragua	2.37
121	Chad	2.34
122	Ukraine	2.33
123	Brazil	2.32
124	Suriname	2.25
125	Peru	2.25
126	Burundi	2.21
127	Guatemala	2.14
128	Argentina	2.04
129	Bosnia and Herzegovina	1.97
130	Paraguay	1.92
131	Bolivia	1.91
132	Ecuador	1.75
133	Venezuela	1.52

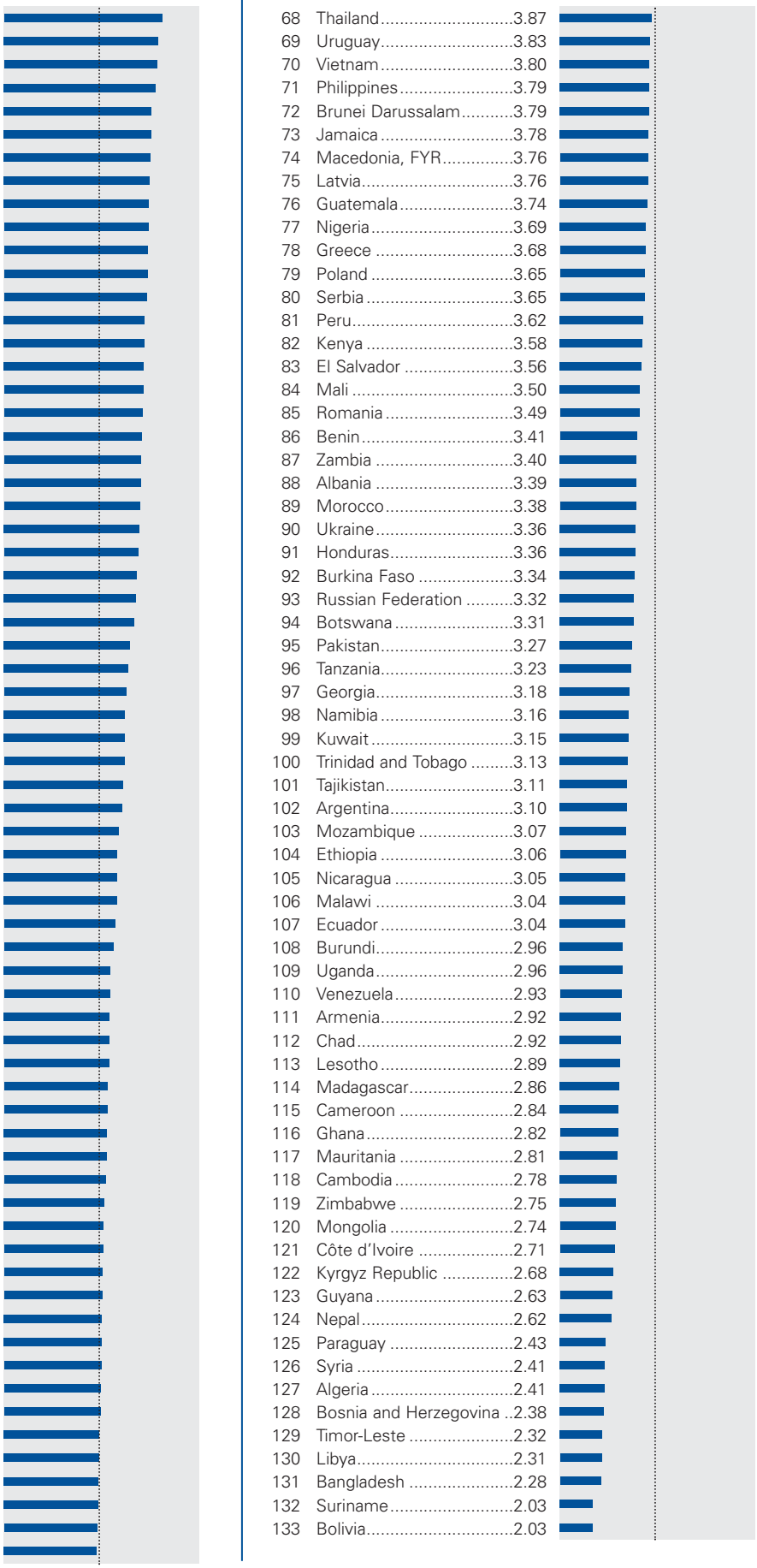


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.02 Laws relating to ICT

How would you assess your country's laws relating to the use of information and communication technologies (e.g., electronic commerce, digital signatures, consumer protection)? (1 = nonexistent; 7 = well developed) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	5.96
2	Denmark	5.84
3	Estonia	5.79
4	Sweden	5.76
5	Austria	5.62
6	Norway	5.62
7	Korea, Rep.	5.60
8	Australia	5.56
9	United States	5.54
10	United Arab Emirates	5.52
11	New Zealand	5.50
12	Canada	5.50
13	Hong Kong SAR	5.47
14	Iceland	5.41
15	Finland	5.41
16	Luxembourg	5.38
17	Switzerland	5.37
18	Germany	5.34
19	France	5.32
20	United Kingdom	5.29
21	Netherlands	5.29
22	Portugal	5.26
23	Taiwan, China	5.24
24	Slovenia	5.20
25	Malta	5.17
26	Malaysia	5.14
27	Chile	5.08
28	Bahrain	4.95
29	Ireland	4.90
30	Belgium	4.83
31	South Africa	4.79
32	Czech Republic	4.79
33	Japan	4.77
34	Tunisia	4.73
35	Puerto Rico	4.69
36	Oman	4.60
37	Cyprus	4.55
38	Spain	4.54
39	India	4.54
40	Qatar	4.48
41	Brazil	4.43
42	Barbados	4.33
43	Bulgaria	4.32
44	Azerbaijan	4.31
45	Saudi Arabia	4.30
46	Lithuania	4.29
47	Panama	4.24
48	China	4.24
49	Turkey	4.23
50	Colombia	4.22
51	Egypt	4.18
52	Mauritius	4.15
53	Sri Lanka	4.12
54	Croatia	4.10
55	Kazakhstan	4.08
56	Israel	4.08
57	Montenegro	4.07
58	Costa Rica	4.06
59	Jordan	4.05
60	Gambia, The	4.03
61	Senegal	4.02
62	Dominican Republic	3.99
63	Italy	3.98
64	Hungary	3.95
65	Indonesia	3.95
66	Slovak Republic	3.92
67	Mexico	3.90
68	Thailand	3.87
69	Uruguay	3.83
70	Vietnam	3.80
71	Philippines	3.79
72	Brunei Darussalam	3.79
73	Jamaica	3.78
74	Macedonia, FYR	3.76
75	Latvia	3.76
76	Guatemala	3.74
77	Nigeria	3.69
78	Greece	3.68
79	Poland	3.65
80	Serbia	3.65
81	Peru	3.62
82	Kenya	3.58
83	El Salvador	3.56
84	Mali	3.50
85	Romania	3.49
86	Benin	3.41
87	Zambia	3.40
88	Albania	3.39
89	Morocco	3.38
90	Ukraine	3.36
91	Honduras	3.36
92	Burkina Faso	3.34
93	Russian Federation	3.32
94	Botswana	3.31
95	Pakistan	3.27
96	Tanzania	3.23
97	Georgia	3.18
98	Namibia	3.16
99	Kuwait	3.15
100	Trinidad and Tobago	3.13
101	Tajikistan	3.11
102	Argentina	3.10
103	Mozambique	3.07
104	Ethiopia	3.06
105	Nicaragua	3.05
106	Malawi	3.04
107	Ecuador	3.04
108	Burundi	2.96
109	Uganda	2.96
110	Venezuela	2.93
111	Armenia	2.92
112	Chad	2.92
113	Lesotho	2.89
114	Madagascar	2.86
115	Cameroon	2.84
116	Ghana	2.82
117	Mauritania	2.81
118	Cambodia	2.78
119	Zimbabwe	2.75
120	Mongolia	2.74
121	Côte d'Ivoire	2.71
122	Kyrgyz Republic	2.68
123	Guyana	2.63
124	Nepal	2.62
125	Paraguay	2.43
126	Syria	2.41
127	Algeria	2.41
128	Bosnia and Herzegovina	2.38
129	Timor-Leste	2.32
130	Libya	2.31
131	Bangladesh	2.28
132	Suriname	2.03
133	Bolivia	2.03

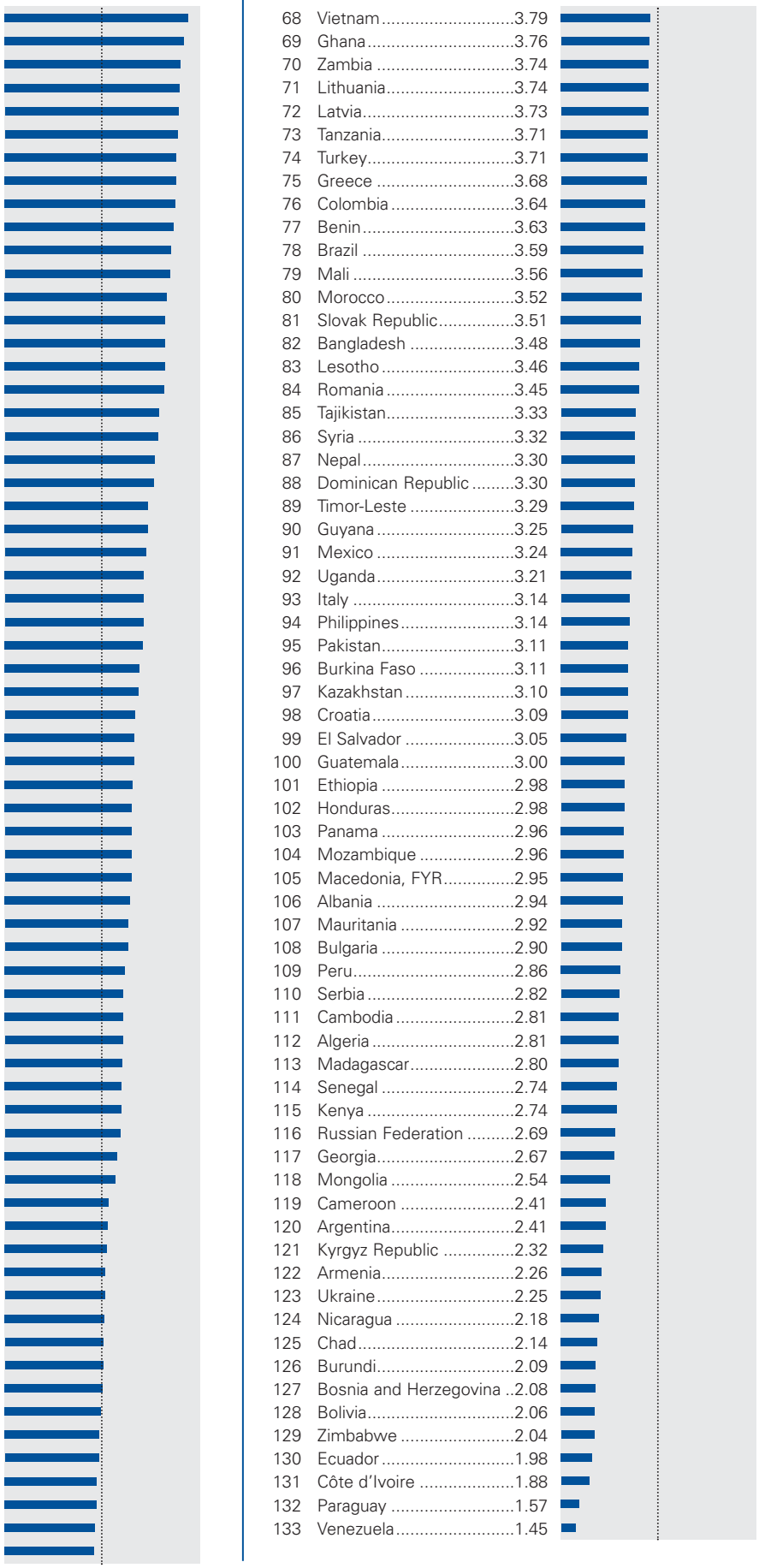


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.03 Judicial independence

To what extent is the judiciary in your country independent from influences of members of government, citizens, or firms? (1 = heavily influenced; 7 = entirely independent) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	New Zealand	6.74
2	Sweden	6.61
3	Denmark	6.50
4	Finland	6.48
5	Australia	6.44
6	Germany	6.41
7	Switzerland	6.37
8	Netherlands	6.37
9	Ireland	6.34
10	Qatar	6.29
11	Canada	6.21
12	Norway	6.17
13	Austria	6.08
14	Hong Kong SAR	6.03
15	Israel	6.03
16	United Kingdom	6.02
17	Luxembourg	5.99
18	Iceland	5.84
19	Singapore	5.79
20	Barbados	5.70
21	Namibia	5.67
22	Estonia	5.49
23	Japan	5.49
24	Cyprus	5.42
25	Belgium	5.36
26	United States	5.34
27	Botswana	5.34
28	Costa Rica	5.32
29	Oman	5.21
30	Uruguay	5.19
31	Malta	5.07
32	United Arab Emirates	5.05
33	Mauritius	5.04
34	Saudi Arabia	5.00
35	Jordan	4.97
36	Bahrain	4.96
37	India	4.96
38	South Africa	4.96
39	Malawi	4.92
40	Puerto Rico	4.86
41	Gambia, The	4.86
42	France	4.76
43	Chile	4.71
44	Tunisia	4.71
45	Portugal	4.70
46	Brunei Darussalam	4.67
47	Jamaica	4.65
48	Kuwait	4.64
49	Taiwan, China	4.61
50	Sri Lanka	4.52
51	Slovenia	4.45
52	Trinidad and Tobago	4.26
53	Malaysia	4.21
54	Thailand	4.20
55	Poland	4.14
56	Suriname	4.13
57	Hungary	4.12
58	Korea, Rep.	4.08
59	Nigeria	4.08
60	Spain	4.07
61	Czech Republic	4.01
62	China	3.95
63	Libya	3.94
64	Egypt	3.88
65	Azerbaijan	3.87
66	Indonesia	3.83
67	Montenegro	3.79
68	Vietnam	3.79
69	Ghana	3.76
70	Zambia	3.74
71	Lithuania	3.74
72	Latvia	3.73
73	Tanzania	3.71
74	Turkey	3.71
75	Greece	3.68
76	Colombia	3.64
77	Benin	3.63
78	Brazil	3.59
79	Mali	3.56
80	Morocco	3.52
81	Slovak Republic	3.51
82	Bangladesh	3.48
83	Lesotho	3.46
84	Romania	3.45
85	Tajikistan	3.33
86	Syria	3.32
87	Nepal	3.30
88	Dominican Republic	3.30
89	Timor-Leste	3.29
90	Guyana	3.25
91	Mexico	3.24
92	Uganda	3.21
93	Italy	3.14
94	Philippines	3.14
95	Pakistan	3.11
96	Burkina Faso	3.11
97	Kazakhstan	3.10
98	Croatia	3.09
99	El Salvador	3.05
100	Guatemala	3.00
101	Ethiopia	2.98
102	Honduras	2.98
103	Panama	2.96
104	Mozambique	2.96
105	Macedonia, FYR	2.95
106	Albania	2.94
107	Mauritania	2.92
108	Bulgaria	2.90
109	Peru	2.86
110	Serbia	2.82
111	Cambodia	2.81
112	Algeria	2.81
113	Madagascar	2.80
114	Senegal	2.74
115	Kenya	2.74
116	Russian Federation	2.69
117	Georgia	2.67
118	Mongolia	2.54
119	Cameroon	2.41
120	Argentina	2.41
121	Kyrgyz Republic	2.32
122	Armenia	2.26
123	Ukraine	2.25
124	Nicaragua	2.18
125	Chad	2.14
126	Burundi	2.09
127	Bosnia and Herzegovina	2.08
128	Bolivia	2.06
129	Zimbabwe	2.04
130	Ecuador	1.98
131	Côte d'Ivoire	1.88
132	Paraguay	1.57
133	Venezuela	1.45

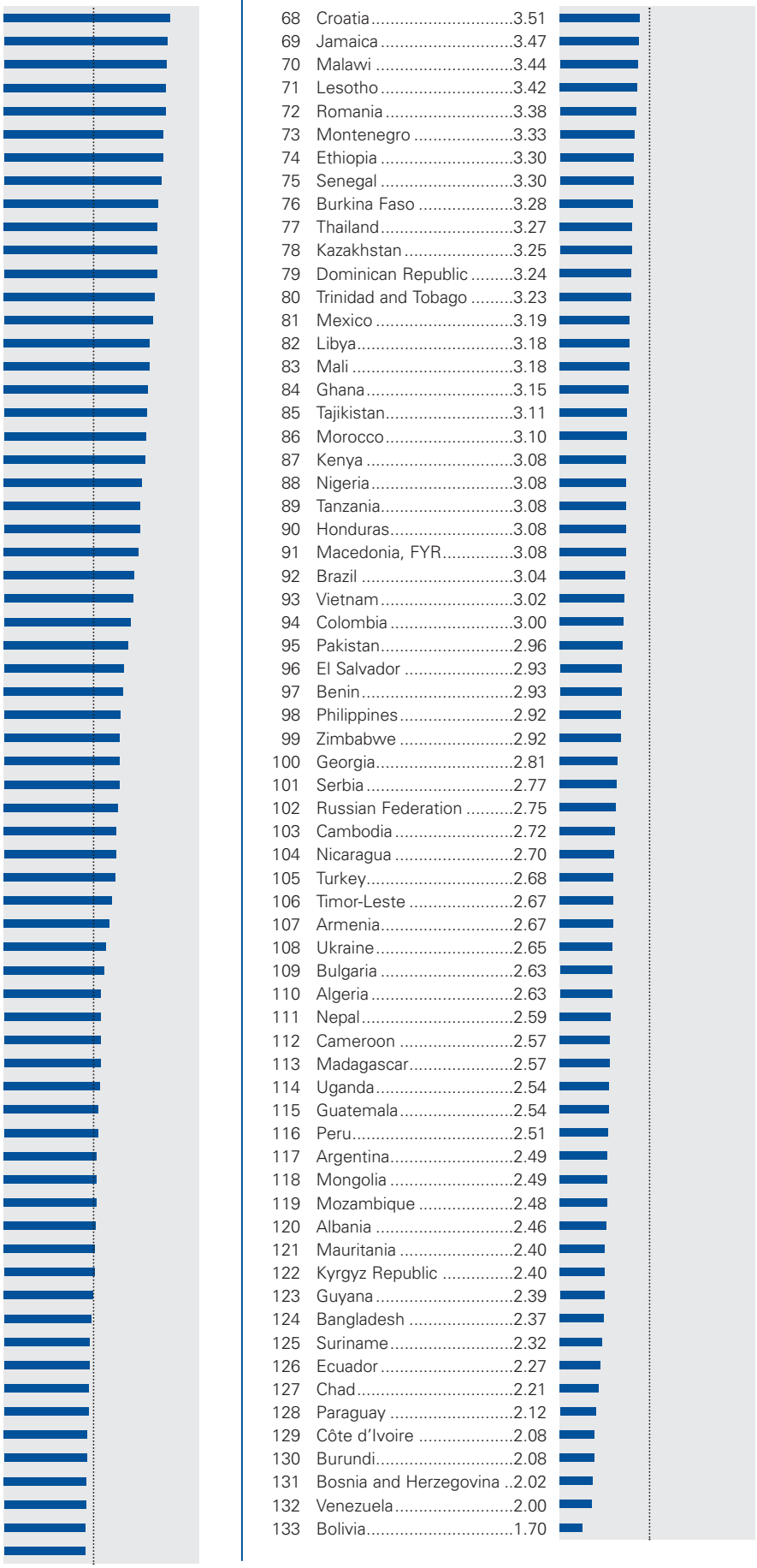


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.04 Intellectual property protection

How would you rate intellectual property protection, including anti-counterfeiting measures, in your country? (1 = very weak; 7 = very strong) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.21
2	Sweden	6.11
3	Finland	6.09
4	Switzerland	6.08
5	Austria	6.07
6	Denmark	5.99
7	New Zealand	5.98
8	Luxembourg	5.93
9	Netherlands	5.84
10	France	5.81
11	Puerto Rico	5.81
12	Australia	5.79
13	Germany	5.72
14	Norway	5.66
15	United Arab Emirates	5.57
16	Ireland	5.57
17	Iceland	5.51
18	Canada	5.47
19	United States	5.44
20	Japan	5.43
21	United Kingdom	5.33
22	Belgium	5.27
23	Hong Kong SAR	5.26
24	South Africa	5.22
25	Bahrain	5.08
26	Oman	5.04
27	Taiwan, China	4.96
28	Barbados	4.89
29	Cyprus	4.75
30	Jordan	4.74
31	Saudi Arabia	4.64
32	Namibia	4.61
33	Portugal	4.61
34	Estonia	4.61
35	Gambia, The	4.58
36	Qatar	4.52
37	Malaysia	4.51
38	Slovenia	4.49
39	Malta	4.39
40	Spain	4.31
41	Korea, Rep.	4.20
42	Greece	4.14
43	Tunisia	4.04
44	Israel	4.03
45	China	4.02
46	Czech Republic	4.02
47	Kuwait	4.01
48	Mauritius	3.96
49	Botswana	3.94
50	Italy	3.91
51	Brunei Darussalam	3.91
52	Uruguay	3.90
53	Hungary	3.88
54	Azerbaijan	3.85
55	Panama	3.84
56	Lithuania	3.80
57	Slovak Republic	3.73
58	Egypt	3.67
59	Syria	3.67
60	Latvia	3.65
61	India	3.65
62	Zambia	3.61
63	Sri Lanka	3.60
64	Poland	3.58
65	Chile	3.57
66	Costa Rica	3.54
67	Indonesia	3.54
68	Croatia	3.51
69	Jamaica	3.47
70	Malawi	3.44
71	Lesotho	3.42
72	Romania	3.38
73	Montenegro	3.33
74	Ethiopia	3.30
75	Senegal	3.30
76	Burkina Faso	3.28
77	Thailand	3.27
78	Kazakhstan	3.25
79	Dominican Republic	3.24
80	Trinidad and Tobago	3.23
81	Mexico	3.19
82	Libya	3.18
83	Mali	3.18
84	Ghana	3.15
85	Tajikistan	3.11
86	Morocco	3.10
87	Kenya	3.08
88	Nigeria	3.08
89	Tanzania	3.08
90	Honduras	3.08
91	Macedonia, FYR	3.08
92	Brazil	3.04
93	Vietnam	3.02
94	Colombia	3.00
95	Pakistan	2.96
96	El Salvador	2.93
97	Benin	2.93
98	Philippines	2.92
99	Zimbabwe	2.92
100	Georgia	2.81
101	Serbia	2.77
102	Russian Federation	2.75
103	Cambodia	2.72
104	Nicaragua	2.70
105	Turkey	2.68
106	Timor-Leste	2.67
107	Armenia	2.67
108	Ukraine	2.65
109	Bulgaria	2.63
110	Algeria	2.63
111	Nepal	2.59
112	Cameroon	2.57
113	Madagascar	2.57
114	Uganda	2.54
115	Guatemala	2.54
116	Peru	2.51
117	Argentina	2.49
118	Mongolia	2.49
119	Mozambique	2.48
120	Albania	2.46
121	Mauritania	2.40
122	Kyrgyz Republic	2.40
123	Guyana	2.39
124	Bangladesh	2.37
125	Suriname	2.32
126	Ecuador	2.27
127	Chad	2.21
128	Paraguay	2.12
129	Côte d'Ivoire	2.08
130	Burundi	2.08
131	Bosnia and Herzegovina	2.02
132	Venezuela	2.00
133	Bolivia	1.70

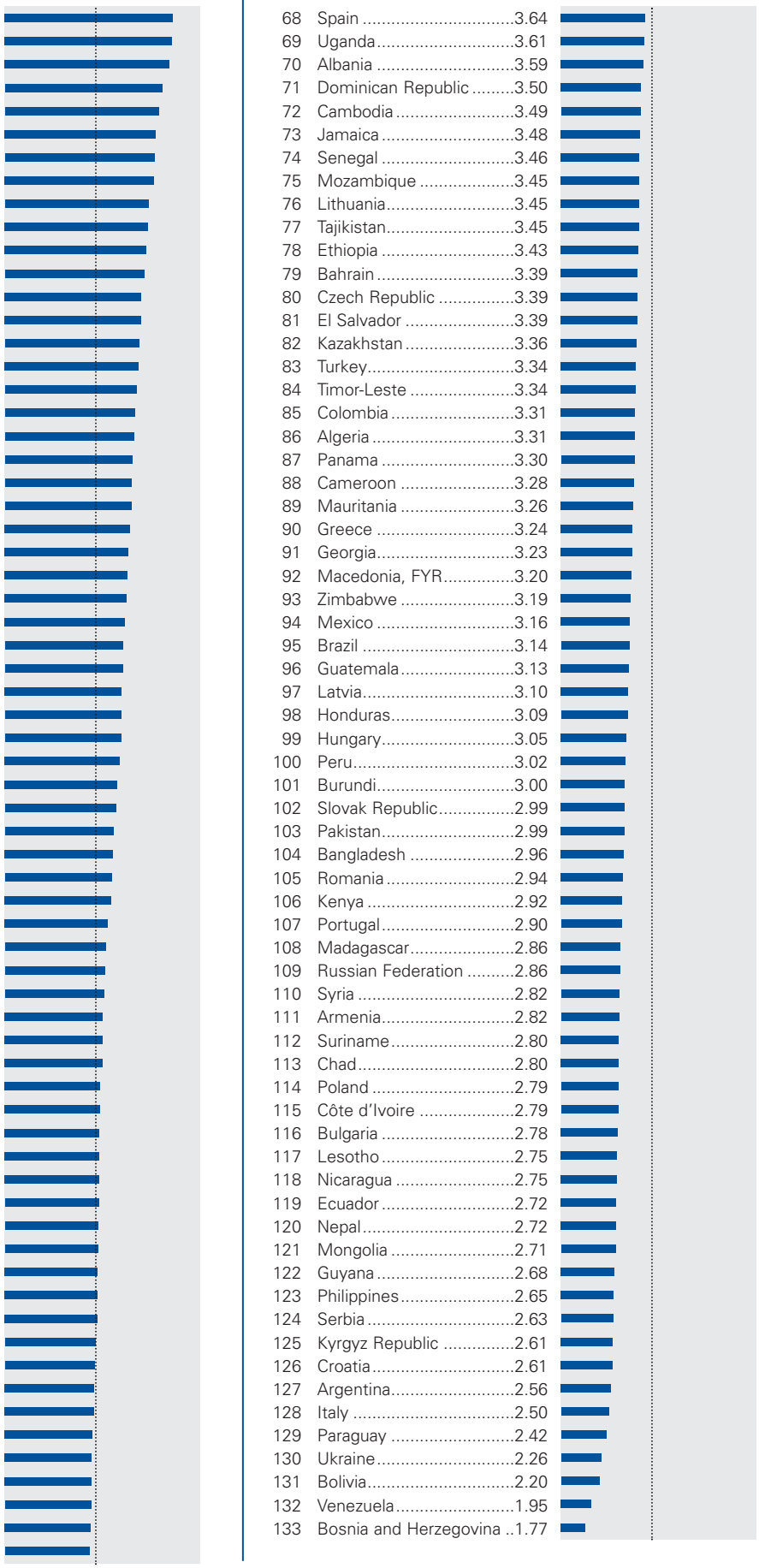


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.05 Efficiency of legal framework in settling disputes

How efficient is the legal framework in your country for private businesses to settle disputes? (1 = extremely inefficient; 7 = highly efficient) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.26
2	Hong Kong SAR	6.23
3	Sweden	6.16
4	New Zealand	5.93
5	Qatar	5.82
6	Denmark	5.73
7	Norway	5.69
8	Luxembourg	5.67
9	United Arab Emirates	5.50
10	United Kingdom	5.49
11	Netherlands	5.43
12	Australia	5.37
13	Switzerland	5.27
14	Austria	5.27
15	Finland	5.20
16	Canada	5.19
17	Germany	5.12
18	South Africa	5.07
19	Oman	5.04
20	Gambia, The	4.99
21	Iceland	4.96
22	Barbados	4.96
23	Tunisia	4.93
24	Puerto Rico	4.87
25	Cyprus	4.84
26	Chile	4.82
27	France	4.77
28	Jordan	4.70
29	Namibia	4.70
30	Ireland	4.65
31	Japan	4.64
32	Brunei Darussalam	4.64
33	United States	4.60
34	Botswana	4.52
35	Mauritius	4.48
36	Malaysia	4.40
37	India	4.39
38	Kuwait	4.35
39	Egypt	4.34
40	Estonia	4.22
41	Malta	4.16
42	Thailand	4.13
43	China	4.11
44	Israel	4.07
45	Taiwan, China	4.07
46	Benin	4.07
47	Nigeria	3.99
48	Belgium	3.99
49	Vietnam	3.96
50	Slovenia	3.96
51	Sri Lanka	3.95
52	Libya	3.94
53	Montenegro	3.92
54	Burkina Faso	3.92
55	Costa Rica	3.91
56	Trinidad and Tobago	3.91
57	Morocco	3.90
58	Saudi Arabia	3.84
59	Indonesia	3.81
60	Tanzania	3.80
61	Azerbaijan	3.80
62	Korea, Rep.	3.75
63	Malawi	3.72
64	Mali	3.71
65	Zambia	3.70
66	Ghana	3.69
67	Uruguay	3.65
68	Spain	3.64
69	Uganda	3.61
70	Albania	3.59
71	Dominican Republic	3.50
72	Cambodia	3.49
73	Jamaica	3.48
74	Senegal	3.46
75	Mozambique	3.45
76	Lithuania	3.45
77	Tajikistan	3.45
78	Ethiopia	3.43
79	Bahrain	3.39
80	Czech Republic	3.39
81	El Salvador	3.39
82	Kazakhstan	3.36
83	Turkey	3.34
84	Timor-Leste	3.34
85	Colombia	3.31
86	Algeria	3.31
87	Panama	3.30
88	Cameroon	3.28
89	Mauritania	3.26
90	Greece	3.24
91	Georgia	3.23
92	Macedonia, FYR	3.20
93	Zimbabwe	3.19
94	Mexico	3.16
95	Brazil	3.14
96	Guatemala	3.13
97	Latvia	3.10
98	Honduras	3.09
99	Hungary	3.05
100	Peru	3.02
101	Burundi	3.00
102	Slovak Republic	2.99
103	Pakistan	2.99
104	Bangladesh	2.96
105	Romania	2.94
106	Kenya	2.92
107	Portugal	2.90
108	Madagascar	2.86
109	Russian Federation	2.86
110	Syria	2.82
111	Armenia	2.82
112	Suriname	2.80
113	Chad	2.80
114	Poland	2.79
115	Côte d'Ivoire	2.79
116	Bulgaria	2.78
117	Lesotho	2.75
118	Nicaragua	2.75
119	Ecuador	2.72
120	Nepal	2.72
121	Mongolia	2.71
122	Guyana	2.68
123	Philippines	2.65
124	Serbia	2.63
125	Kyrgyz Republic	2.61
126	Croatia	2.61
127	Argentina	2.56
128	Italy	2.50
129	Paraguay	2.42
130	Ukraine	2.26
131	Bolivia	2.20
132	Venezuela	1.95
133	Bosnia and Herzegovina	1.77

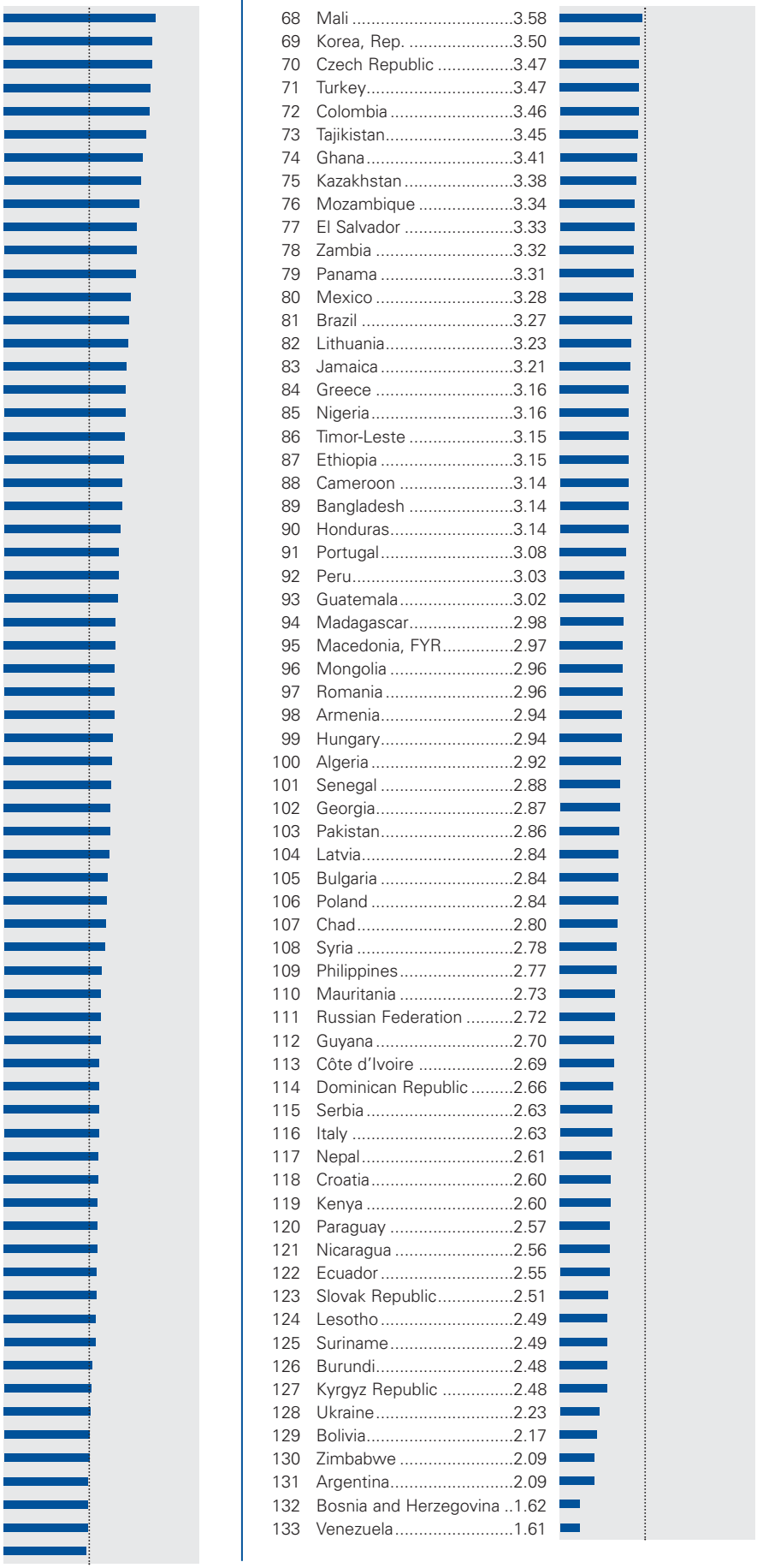


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.06 Efficiency of legal framework in challenging regulations

How efficient is the legal framework in your country for private businesses to challenge the legality of government actions and/or regulations? (1 = extremely inefficient; 7 = highly efficient) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Sweden	5.75
2	Luxembourg	5.65
3	New Zealand	5.64
4	Singapore	5.59
5	Hong Kong SAR	5.57
6	Denmark	5.44
7	Austria	5.34
8	Switzerland	5.29
9	Finland	5.24
10	Germany	5.17
11	Norway	5.15
12	Netherlands	5.13
13	Iceland	4.97
14	United Kingdom	4.92
15	United Arab Emirates	4.90
16	Canada	4.84
17	France	4.82
18	Barbados	4.80
19	Namibia	4.79
20	Australia	4.75
21	India	4.71
22	South Africa	4.70
23	Israel	4.64
24	Ireland	4.59
25	Cyprus	4.59
26	Botswana	4.56
27	Oman	4.50
28	Tunisia	4.50
29	Chile	4.46
30	Benin	4.45
31	Bahrain	4.45
32	Qatar	4.40
33	Puerto Rico	4.38
34	Kuwait	4.36
35	United States	4.33
36	Jordan	4.33
37	Gambia, The	4.30
38	Mauritius	4.25
39	Costa Rica	4.22
40	Malaysia	4.19
41	Japan	4.16
42	Azerbaijan	4.05
43	Malta	4.03
44	Saudi Arabia	4.03
45	Malawi	4.03
46	Trinidad and Tobago	3.99
47	Estonia	3.98
48	Vietnam	3.98
49	Taiwan, China	3.97
50	Thailand	3.96
51	Montenegro	3.95
52	Indonesia	3.93
53	Morocco	3.93
54	Uruguay	3.93
55	Brunei Darussalam	3.91
56	Belgium	3.91
57	China	3.88
58	Sri Lanka	3.86
59	Burkina Faso	3.77
60	Slovenia	3.73
61	Libya	3.72
62	Albania	3.67
63	Egypt	3.67
64	Uganda	3.64
65	Cambodia	3.64
66	Spain	3.63
67	Tanzania	3.58
68	Mali	3.58
69	Korea, Rep.	3.50
70	Czech Republic	3.47
71	Turkey	3.47
72	Colombia	3.46
73	Tajikistan	3.45
74	Ghana	3.41
75	Kazakhstan	3.38
76	Mozambique	3.34
77	El Salvador	3.33
78	Zambia	3.32
79	Panama	3.31
80	Mexico	3.28
81	Brazil	3.27
82	Lithuania	3.23
83	Jamaica	3.21
84	Greece	3.16
85	Nigeria	3.16
86	Timor-Leste	3.15
87	Ethiopia	3.15
88	Cameroon	3.14
89	Bangladesh	3.14
90	Honduras	3.14
91	Portugal	3.08
92	Peru	3.03
93	Guatemala	3.02
94	Madagascar	2.98
95	Macedonia, FYR	2.97
96	Mongolia	2.96
97	Romania	2.96
98	Armenia	2.94
99	Hungary	2.94
100	Algeria	2.92
101	Senegal	2.88
102	Georgia	2.87
103	Pakistan	2.86
104	Latvia	2.84
105	Bulgaria	2.84
106	Poland	2.84
107	Chad	2.80
108	Syria	2.78
109	Philippines	2.77
110	Mauritania	2.73
111	Russian Federation	2.72
112	Guyana	2.70
113	Côte d'Ivoire	2.69
114	Dominican Republic	2.66
115	Serbia	2.63
116	Italy	2.63
117	Nepal	2.61
118	Croatia	2.60
119	Kenya	2.60
120	Paraguay	2.57
121	Nicaragua	2.56
122	Ecuador	2.55
123	Slovak Republic	2.51
124	Lesotho	2.49
125	Suriname	2.49
126	Burundi	2.48
127	Kyrgyz Republic	2.48
128	Ukraine	2.23
129	Bolivia	2.17
130	Zimbabwe	2.09
131	Argentina	2.09
132	Bosnia and Herzegovina	1.62
133	Venezuela	1.61

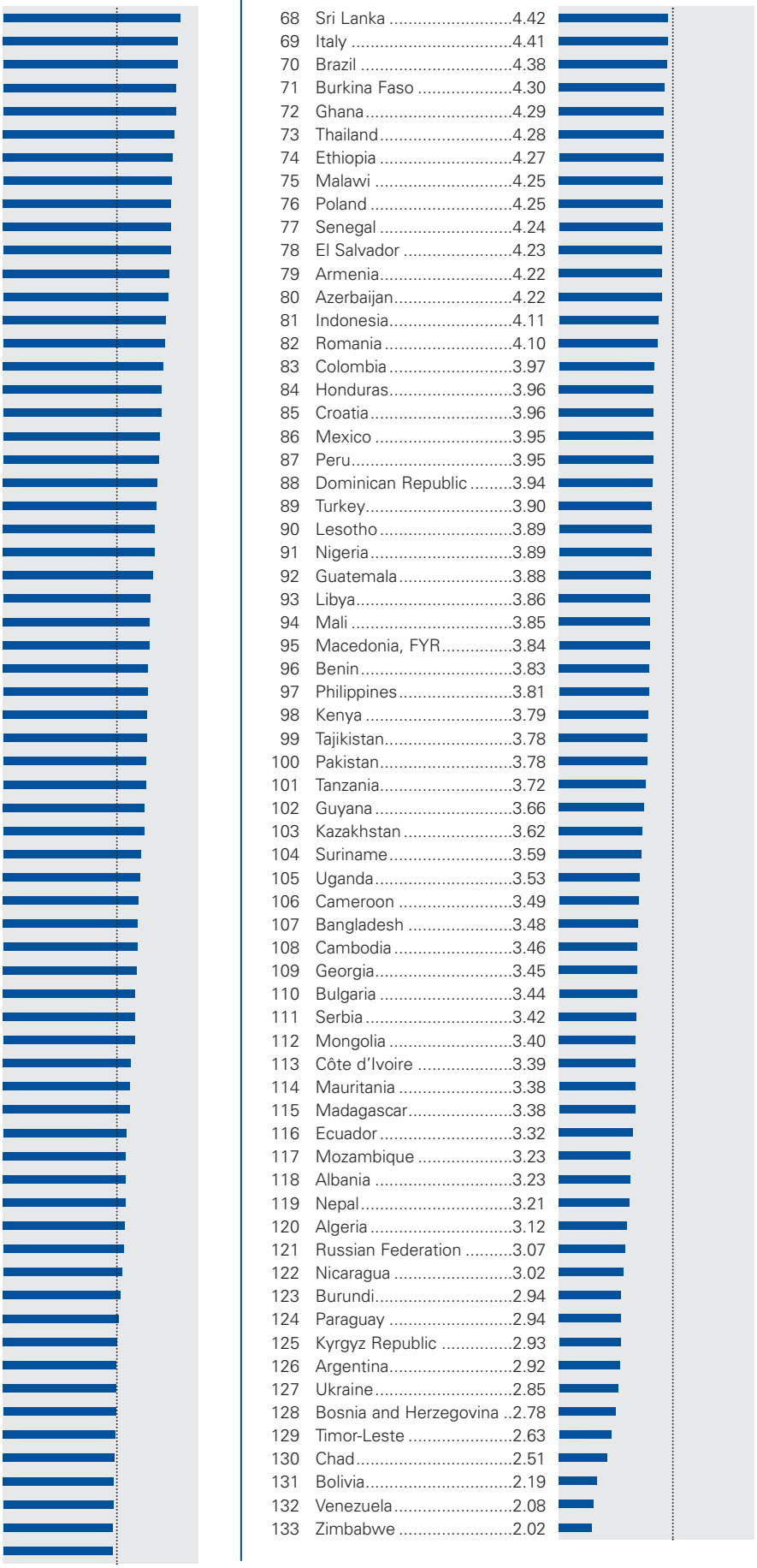


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.07 Property rights

How would you rate the protection of property rights, including financial assets, in your country? (1 = very weak; 7 = very strong) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Switzerland	6.55
2	Denmark	6.48
3	Finland	6.46
4	Singapore	6.41
5	Sweden	6.41
6	Austria	6.37
7	Luxembourg	6.32
8	Hong Kong SAR	6.28
9	Germany	6.27
10	Norway	6.27
11	New Zealand	6.25
12	Canada	6.21
13	Australia	6.17
14	Netherlands	6.11
15	Ireland	6.06
16	Qatar	6.02
17	Iceland	5.97
18	Puerto Rico	5.96
19	Japan	5.90
20	South Africa	5.87
21	Namibia	5.84
22	France	5.80
23	Belgium	5.76
24	Jordan	5.75
25	Barbados	5.70
26	Oman	5.61
27	Estonia	5.59
28	United Kingdom	5.59
29	Cyprus	5.54
30	United States	5.53
31	Chile	5.51
32	Bahrain	5.50
33	Malta	5.47
34	United Arab Emirates	5.47
35	Taiwan, China	5.44
36	Mauritius	5.42
37	Saudi Arabia	5.31
38	Botswana	5.30
39	China	5.25
40	Malaysia	5.21
41	Portugal	5.20
42	Tunisia	5.19
43	Spain	5.14
44	Gambia, The	5.13
45	Kuwait	5.12
46	Syria	5.00
47	Greece	4.98
48	Korea, Rep.	4.97
49	Brunei Darussalam	4.86
50	Panama	4.85
51	Slovenia	4.85
52	Latvia	4.84
53	Uruguay	4.82
54	India	4.78
55	Czech Republic	4.72
56	Montenegro	4.68
57	Hungary	4.62
58	Morocco	4.58
59	Slovak Republic	4.55
60	Jamaica	4.55
61	Lithuania	4.53
62	Trinidad and Tobago	4.52
63	Costa Rica	4.49
64	Zambia	4.47
65	Israel	4.45
66	Vietnam	4.43
67	Egypt	4.43
68	Sri Lanka	4.42
69	Italy	4.41
70	Brazil	4.38
71	Burkina Faso	4.30
72	Ghana	4.29
73	Thailand	4.28
74	Ethiopia	4.27
75	Malawi	4.25
76	Poland	4.25
77	Senegal	4.24
78	El Salvador	4.23
79	Armenia	4.22
80	Azerbaijan	4.22
81	Indonesia	4.11
82	Romania	4.10
83	Colombia	3.97
84	Honduras	3.96
85	Croatia	3.96
86	Mexico	3.95
87	Peru	3.95
88	Dominican Republic	3.94
89	Turkey	3.90
90	Lesotho	3.89
91	Nigeria	3.89
92	Guatemala	3.88
93	Libya	3.86
94	Mali	3.85
95	Macedonia, FYR	3.84
96	Benin	3.83
97	Philippines	3.81
98	Kenya	3.79
99	Tajikistan	3.78
100	Pakistan	3.78
101	Tanzania	3.72
102	Guyana	3.66
103	Kazakhstan	3.62
104	Suriname	3.59
105	Uganda	3.53
106	Cameroon	3.49
107	Bangladesh	3.48
108	Cambodia	3.46
109	Georgia	3.45
110	Bulgaria	3.44
111	Serbia	3.42
112	Mongolia	3.40
113	Côte d'Ivoire	3.39
114	Mauritania	3.38
115	Madagascar	3.38
116	Ecuador	3.32
117	Mozambique	3.23
118	Albania	3.23
119	Nepal	3.21
120	Algeria	3.12
121	Russian Federation	3.07
122	Nicaragua	3.02
123	Burundi	2.94
124	Paraguay	2.94
125	Kyrgyz Republic	2.93
126	Argentina	2.92
127	Ukraine	2.85
128	Bosnia and Herzegovina	2.78
129	Timor-Leste	2.63
130	Chad	2.51
131	Bolivia	2.19
132	Venezuela	2.08
133	Zimbabwe	2.02



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

2.08 Number of procedures to enforce a contract (hard data)

Number of procedures from the moment the plaintiff files a lawsuit in court until the moment of payment | 2009

RANK	COUNTRY/ECONOMY	HARD DATA
1	Ireland	20
2	Singapore	21
3	Hong Kong SAR	24
4	Austria	25
4	Belgium	25
4	Netherlands	25
7	Iceland	26
7	Luxembourg	26
9	Czech Republic	27
9	Latvia	27
11	Australia	28
12	Botswana	29
12	France	29
12	Venezuela	29
15	El Salvador	30
15	Germany	30
15	Japan	30
15	Lithuania	30
15	Malaysia	30
15	Mozambique	30
15	New Zealand	30
15	Slovak Republic	30
15	South Africa	30
15	Sweden	30
15	Ukraine	30
15	United Kingdom	30
27	Guatemala	31
27	Panama	31
27	Portugal	31
27	Romania	31
27	Switzerland	31
32	Finland	32
32	Gambia, The	32
32	Mongolia	32
32	Slovenia	32
32	United States	32
37	Côte d'Ivoire	33
37	Hungary	33
37	Namibia	33
37	Norway	33
41	China	34
41	Colombia	34
41	Denmark	34
41	Dominican Republic	34
41	Tajikistan	34
41	Vietnam	34
47	Israel	35
47	Jamaica	35
47	Korea, Rep.	35
47	Nicaragua	35
47	Thailand	35
47	Turkey	35
47	Zambia	35
54	Argentina	36
54	Canada	36
54	Chile	36
54	Estonia	36
54	Georgia	36
54	Ghana	36
54	Guyana	36
54	Mali	36
54	Mauritius	36
54	Serbia	36
64	Burkina Faso	37
64	Ethiopia	37
64	Macedonia, FYR	37
64	Philippines	37
64	Russian Federation	37
69	Bosnia and Herzegovina	38
69	Croatia	38
69	Jordan	38
69	Kazakhstan	38
69	Madagascar	38
69	Mexico	38
69	Paraguay	38
69	Poland	38
69	Tanzania	38
69	Uganda	38
69	Zimbabwe	38
80	Albania	39
80	Azerbaijan	39
80	Bulgaria	39
80	Ecuador	39
80	Greece	39
80	Indonesia	39
80	Kyrgyz Republic	39
80	Nepal	39
80	Nigeria	39
80	Puerto Rico	39
80	Spain	39
80	Tunisia	39
92	Bolivia	40
92	Costa Rica	40
92	Italy	40
92	Kenya	40
92	Morocco	40
92	Sri Lanka	40
92	Uruguay	40
99	Bangladesh	41
99	Chad	41
99	Egypt	41
99	Lesotho	41
99	Peru	41
104	Benin	42
104	Malawi	42
104	Trinidad and Tobago	42
107	Cameroon	43
107	Cyprus	43
107	Qatar	43
107	Saudi Arabia	43
111	Burundi	44
111	Cambodia	44
111	Senegal	44
111	Suriname	44
115	Brazil	45
115	Honduras	45
117	Algeria	46
117	India	46
117	Mauritania	46
120	Pakistan	47
120	Taiwan, China	47
122	Armenia	48
122	Bahrain	48
124	Montenegro	49
124	United Arab Emirates	49
126	Kuwait	50
127	Oman	51
127	Timor-Leste	51
129	Syria	55
130	Brunei Darussalam	58
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a

SOURCE: The World Bank Group, *Doing Business 2010*

2.09 Time to enforce a contract (hard data)

Number of days required to resolve a dispute | 2009

RANK	COUNTRY/ECONOMY	HARD DATA
1	Singapore	150
2	New Zealand	216
3	Korea, Rep.	230
4	Azerbaijan	237
5	Kyrgyz Republic	260
6	Namibia	270
7	Lithuania	275
8	Hong Kong SAR	280
8	Norway	280
10	Russian Federation	281
11	Armenia	285
11	Georgia	285
13	Vietnam	295
14	United States	300
15	Latvia	309
16	Mongolia	314
17	Luxembourg	321
18	France	331
19	Ukraine	345
20	Japan	360
21	Macedonia, FYR	370
21	Mauritania	370
23	Finland	375
24	Denmark	380
25	Albania	390
25	Kazakhstan	390
27	Germany	394
28	Australia	395
28	Hungary	395
30	Austria	397
31	United Kingdom	399
32	Cambodia	401
33	China	406
34	Zimbabwe	410
35	Mexico	415
36	Iceland	417
36	Switzerland	417
38	Turkey	420
39	Estonia	425
40	Peru	428
41	Tajikistan	430
42	Malawi	432
43	Gambia, The	434
44	Burkina Faso	446
45	Nigeria	457
46	Dominican Republic	460
47	Tanzania	462
48	Kenya	465
49	Zambia	471
50	Thailand	479
51	Chile	480
52	Ghana	487
53	Belgium	505
54	Sweden	508
55	Taiwan, China	510
55	Uganda	510
55	Venezuela	510
58	Romania	512
59	Netherlands	514
60	Ireland	515
60	Spain	515
62	United Arab Emirates	537
63	Brunei Darussalam	540
63	Nicaragua	540
65	Montenegro	545
66	Portugal	547
67	Croatia	561
68	Bulgaria	564
69	Slovak Republic	565
69	Tunisia	565
71	Kuwait	566
72	Canada	570
72	Indonesia	570
72	Qatar	570
75	Guyana	581
76	Malaysia	585
77	Ecuador	588
78	Argentina	590
79	Bolivia	591
79	Paraguay	591
81	Bosnia and Herzegovina	595
82	Oman	598
83	South Africa	600
84	Czech Republic	611
85	Morocco	615
86	Brazil	616
87	Ethiopia	620
87	Puerto Rico	620
89	Mali	626
90	Algeria	630
91	Bahrain	635
91	Saudi Arabia	635
91	Serbia	635
94	Jamaica	655
95	Panama	686
96	Botswana	687
97	Jordan	689
98	Lesotho	695
99	Mauritius	720
99	Uruguay	720
101	Mozambique	730
102	Cyprus	735
102	Nepal	735
104	Chad	743
105	Côte d'Ivoire	770
106	Senegal	780
107	El Salvador	786
108	Cameroon	800
109	Greece	819
110	Benin	825
111	Poland	830
112	Burundi	832
113	Philippines	842
114	Costa Rica	852
115	Madagascar	871
116	Syria	872
117	Israel	890
118	Honduras	900
119	Pakistan	976
120	Egypt	1,010
121	Italy	1,210
122	Slovenia	1,290
123	Sri Lanka	1,318
124	Trinidad and Tobago	1,340
125	Colombia	1,346
126	India	1,420
127	Timor-Leste	1,435
128	Bangladesh	1,442
129	Guatemala	1,459
130	Suriname	1,715
n/a	Barbados	n/a
n/a	Libya	n/a
n/a	Malta	n/a

SOURCE: The World Bank Group, *Doing Business 2010*

2.10 Level of competition index (hard data)

Level of competition for Internet service, international long-distance service, and mobile telephone service (0 = monopoly; 1 = partial competition; 2 = competition) | 2007 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Argentina	6
1	Australia	6
1	Bosnia and Herzegovina	6
1	Brazil	6
1	Burundi	6
1	Canada	6
1	Chile	6
1	Colombia	6
1	Croatia	6
1	Dominican Republic	6
1	Ecuador	6
1	El Salvador	6
1	Finland	6
1	France	6
1	Georgia	6
1	Germany	6
1	Guatemala	6
1	Iceland	6
1	India	6
1	Ireland	6
1	Italy	6
1	Japan	6
1	Jordan	6
1	Korea, Rep.	6
1	Kyrgyz Republic	6
1	Latvia	6
1	Lesotho	6
1	Luxembourg	6
1	Malaysia	6
1	Malta	6
1	Mauritania	6
1	Mauritius	6
1	Mexico	6
1	Montenegro	6
1	Morocco	6
1	Netherlands	6
1	New Zealand	6
1	Nicaragua	6
1	Norway	6
1	Pakistan	6
1	Peru	6
1	Philippines	6
1	Portugal	6
1	Romania	6
1	Saudi Arabia	6
1	Senegal	6
1	Singapore	6
1	Slovak Republic	6
1	Slovenia	6
1	Spain	6
1	Sweden	6
1	Switzerland	6
1	Thailand	6
1	Uganda	6
1	United Kingdom	6
1	United States	6
1	Venezuela	6
1	Vietnam	6
59	Austria	5
59	Bahrain	5
59	Belgium	5
59	Cyprus	5
59	Czech Republic	5
59	Denmark	5
59	Estonia	5
59	Gambia, The	5
59	Greece	5
59	Hungary	5
59	Indonesia	5
59	Jamaica	5
59	Kenya	5
59	Lithuania	5
59	Mongolia	5
59	Panama	5
59	Serbia	5
59	South Africa	5
59	Trinidad and Tobago	5
59	Turkey	5
59	Ukraine	5
59	Uruguay	5
59	Zimbabwe	5
82	Albania	4
82	Algeria	4
82	Azerbaijan	4
82	Bangladesh	4
82	Bolivia	4
82	Bulgaria	4
82	Burkina Faso	4
82	Cameroon	4
82	China	4
82	Côte d'Ivoire	4
82	Egypt	4
82	Ghana	4
82	Israel	4
82	Macedonia, FYR	4
82	Madagascar	4
82	Malawi	4
82	Mali	4
82	Mozambique	4
82	Nepal	4
82	Paraguay	4
82	Tanzania	4
82	Zambia	4
104	Armenia	3
104	Barbados	3
104	Botswana	3
104	Cambodia	3
104	Kazakhstan	3
104	Namibia	3
104	Nigeria	3
104	Qatar	3
104	Russian Federation	3
104	Suriname	3
104	Tunisia	3
104	United Arab Emirates	3
116	Benin	2
116	Brunei Darussalam	2
116	Chad	2
116	Guyana	2
116	Poland	2
116	Sri Lanka	2
116	Syria	2
123	Costa Rica	1
123	Kuwait	1
123	Oman	1
126	Ethiopia	0
126	Honduras	0
126	Libya	0
126	Tajikistan	0
n/a	Hong Kong SAR	n/a
n/a	Puerto Rico	n/a
n/a	Taiwan, China	n/a
n/a	Timor-Leste	n/a

SOURCE: The World Bank Group, *Information and Communications for Development Online Database* (retrieved October 14, 2009)

3rd pillar
Infrastructure environment

3.01 Number of telephone lines (hard data)

Main telephone lines per 100 population | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Switzerland	64.11
2	Germany	62.48
3	Taiwan, China	61.96
4	Iceland	61.34
5	Malta	59.18
6	Barbados	58.78
7	Hong Kong SAR	58.72
8	Montenegro	58.17
9	Sweden	57.83
10	France	56.42
11	Canada	54.87
12	United Kingdom	54.24
13	Luxembourg	54.22
14	Greece	53.65
15	Slovenia	50.11
16	Ireland	49.66
17	United States	49.62
18	Israel	45.72
19	Denmark	45.64
20	Spain	45.41
21	Cyprus	45.08
22	Australia	44.46
23	Korea, Rep.	44.29
24	Netherlands	44.27
25	Croatia	42.47
26	Belgium	42.08
27	New Zealand	41.37
28	Singapore	40.24
29	Norway	39.78
30	Austria	39.40
31	Portugal	38.50
32	Japan	38.04
33	Estonia	37.14
34	Italy	35.65
35	Vietnam	33.98
36	United Arab Emirates	33.63
37	Costa Rica	31.81
38	Russian Federation	31.75
39	Serbia	31.35
40	Finland	31.11
41	Hungary	30.90
42	Bulgaria	28.84
43	Ukraine	28.65
44	Uruguay	28.64
45	Latvia	28.51
46	Mauritius	28.48
47	Bahrain	28.42
48	Bosnia and Herzegovina	27.33
49	Puerto Rico	26.18
50	Poland	25.49
51	China	25.48
52	Argentina	24.43
53	Turkey	23.68
54	Lithuania	23.64
55	Romania	23.58
56	Trinidad and Tobago	23.02
57	Venezuela	22.42
58	Macedonia, FYR	22.39
59	Kazakhstan	22.28
60	Czech Republic	21.94
61	Brazil	21.43
62	Chile	20.99
63	Qatar	20.56
64	Armenia	20.34
65	Slovak Republic	20.33
66	Brunei Darussalam	19.53
67	Mexico	19.04
68	Kuwait	18.53
69	Colombia	17.89
70	El Salvador	17.56
71	Sri Lanka	17.18
72	Syria	17.12
73	Libya	16.41
74	Guyana	16.37
75	Saudi Arabia	16.27
76	Malaysia	15.89
77	Suriname	15.82
78	Panama	15.42
79	Azerbaijan	15.01
80	Egypt	14.64
81	Georgia	14.35
82	Ecuador	14.12
83	Indonesia	13.36
84	Tunisia	12.18
85	Jamaica	11.69
86	Honduras	11.28
87	Albania	10.93
88	Guatemala	10.59
89	Thailand	10.42
90	Peru	9.98
91	Dominican Republic	9.90
92	Oman	9.84
93	Algeria	9.64
94	Morocco	9.46
95	Kyrgyz Republic	9.13
96	South Africa	8.91
97	Jordan	8.46
98	Paraguay	7.87
99	Mongolia	7.59
100	Botswana	7.41
101	Bolivia	7.12
102	Namibia	6.57
103	Nicaragua	5.51
104	Philippines	4.51
105	Tajikistan	4.20
106	India	3.21
107	Lesotho	3.18
108	Gambia, The	2.94
109	Nepal	2.79
110	Zimbabwe	2.79
111	Pakistan	2.50
112	Mauritania	2.37
113	Senegal	1.95
114	Benin	1.84
115	Côte d'Ivoire	1.73
116	Malawi	1.18
117	Ethiopia	1.11
118	Cameroon	1.04
119	Burkina Faso	0.95
120	Nigeria	0.86
121	Madagascar	0.86
122	Bangladesh	0.84
123	Zambia	0.72
124	Mali	0.64
125	Kenya	0.63
126	Ghana	0.62
127	Uganda	0.53
128	Burundi	0.38
129	Mozambique	0.35
130	Cambodia	0.30
131	Tanzania	0.29
132	Timor-Leste	0.22
133	Chad	0.12

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

3.02 Secure Internet servers (hard data)

Secure Internet servers per million population | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Iceland	1,561.71
2	United States	1,173.66
3	Netherlands	1,105.19
4	Denmark	1,036.47
5	Australia	993.22
6	New Zealand	980.18
7	Switzerland	977.12
8	Malta	940.57
9	Luxembourg	912.35
10	Canada	906.60
11	United Kingdom	904.96
12	Norway	844.99
13	Sweden	772.04
14	Korea, Rep.	695.70
15	Finland	684.20
16	Ireland	672.94
17	Germany	549.59
18	Austria	480.57
19	Japan	471.62
20	Cyprus	428.43
21	Singapore	390.34
22	Taiwan, China	311.80
23	Hong Kong SAR	287.46
24	Estonia	279.72
25	Israel	272.69
26	Belgium	250.19
27	Barbados	227.15
28	France	171.69
29	Spain	170.14
30	Slovenia	170.13
31	Czech Republic	150.46
32	United Arab Emirates	125.77
33	Portugal	115.20
34	Costa Rica	98.75
35	Latvia	97.97
36	Italy	92.76
37	Croatia	92.01
38	Panama	86.90
39	Poland	84.70
40	Hungary	83.49
41	Lithuania	83.37
42	Bahrain	78.23
43	Qatar	76.37
44	Kuwait	64.88
45	Greece	61.22
46	Mauritius	59.90
47	Slovak Republic	57.90
48	Turkey	56.54
49	Puerto Rico	53.56
50	Trinidad and Tobago	45.60
51	Uruguay	42.59
52	South Africa	36.81
53	Chile	35.15
54	Jamaica	31.61
55	Brunei Darussalam	30.25
56	Malaysia	27.34
57	Bulgaria	26.24
58	Brazil	23.67
59	Argentina	18.26
60	Mexico	15.67
61	Romania	15.53
62	Dominican Republic	13.21
63	Oman	12.06
64	Macedonia, FYR	11.78
65	Tunisia	10.65
66	Colombia	10.60
67	Peru	10.24
68	Ecuador	10.09
69	El Salvador	9.93
70	Thailand	9.56
71	Jordan	8.80
72	Mongolia	8.74
73	Suriname	8.69
74	Namibia	8.51
75	Saudi Arabia	8.28
76	Guatemala	7.97
77	Bosnia and Herzegovina	7.43
78	Russian Federation	7.33
79	Venezuela	6.76
80	Nicaragua	6.69
81	Honduras	6.35
82	Georgia	6.19
83	Paraguay	5.62
84	Albania	4.70
85	Armenia	4.65
86	Philippines	4.61
87	Ukraine	4.28
88	Guyana	4.06
89	Bolivia	3.82
90	Sri Lanka	3.19
91	Serbia	2.44
92	Kazakhstan	1.98
93	Gambia, The	1.71
94	Azerbaijan	1.62
95	Botswana	1.57
96	Mauritania	1.56
97	Morocco	1.41
98	India	1.28
99	Vietnam	1.11
100	Kenya	1.06
101	Egypt	1.05
102	Indonesia	1.03
103	Senegal	1.02
104	China	0.93
105	Nepal	0.91
106	Cambodia	0.82
107	Nigeria	0.79
108	Ghana	0.67
109	Kyrgyz Republic	0.57
110	Mali	0.55
111	Pakistan	0.54
112	Algeria	0.52
113	Zimbabwe	0.52
114	Côte d'Ivoire	0.51
115	Lesotho	0.50
116	Libya	0.48
117	Cameroon	0.37
118	Zambia	0.33
119	Mozambique	0.23
120	Uganda	0.22
121	Benin	0.22
122	Madagascar	0.20
123	Tanzania	0.19
124	Syria	0.15
125	Malawi	0.14
126	Burkina Faso	0.13
127	Burundi	0.11
128	Bangladesh	0.09
129	Ethiopia	0.04
n/a	Chad	n/a
n/a	Montenegro	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a

SOURCE: The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); national sources

3.03 Electricity production (hard data)

Electricity production (kWh) per capita | 2006 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Iceland	32,240.26
2	Norway	25,956.55
3	Canada	18,827.09
4	Qatar	18,287.59
5	United Arab Emirates	15,788.13
6	Sweden	15,778.33
7	Finland	15,629.32
8	Kuwait	14,956.64
9	United States	14,309.62
10	Bahrain	13,113.48
11	Australia	12,040.39
12	New Zealand	10,381.44
13	Taiwan, China[3]	9,779.92
14	France	9,242.38
15	Paraguay	9,092.81
16	Singapore	8,962.05
17	Brunei Darussalam	8,724.87
18	Japan	8,536.85
19	Switzerland	8,523.95
20	Denmark	8,423.81
21	Korea, Rep.	8,329.09
22	Czech Republic	8,149.44
23	Belgium	7,968.63
24	Germany	7,646.09
25	Israel	7,606.96
26	Saudi Arabia	7,586.70
27	Slovenia	7,519.90
28	Luxembourg	7,456.66
29	Austria	7,348.30
30	Estonia	7,234.94
31	Russian Federation	6,959.84
32	Spain	6,783.77
33	Ireland	6,528.77
34	United Kingdom	6,510.87
35	Netherlands	6,019.39
36	Cyprus	6,016.82
37	Puerto Rico	5,960.00
38	Bulgaria	5,925.51
39	Slovak Republic	5,793.66
40	Malta	5,655.17
41	Hong Kong SAR	5,588.42
42	Greece	5,427.89
43	Trinidad and Tobago	5,427.58
44	South Africa	5,315.57
45	Oman	5,271.63
46	Italy	5,265.51
47	Serbia	4,921.88
48	Montenegro[1]	4,710.77
49	Kazakhstan	4,653.70
50	Portugal	4,595.65
51	Poland	4,214.99
52	Ukraine	4,158.59
53	Venezuela	4,093.36
54	Libya	4,018.76
55	Barbados[2]	3,660.58
56	Hungary	3,558.50
57	Lithuania	3,558.34
58	Chile	3,506.46
59	Malaysia	3,469.35
60	Macedonia, FYR	3,429.27
61	Bosnia & Herzegovina	3,378.73
62	Kyrgyz Republic	3,287.53
63	Suriname	3,079.15
64	Argentina	2,950.66
65	Romania	2,897.41
66	Jamaica	2,795.74
67	Croatia	2,771.62
68	Azerbaijan	2,767.02
69	Tajikistan	2,652.25
70	Turkey	2,587.57
71	Mexico	2,380.84
72	Brazil	2,259.80
73	China	2,178.96
74	Latvia	2,131.15
75	Thailand	2,125.34
76	Jordan	2,064.29
77	Costa Rica	1,997.70
78	Syria	1,968.38
79	Armenia	1,844.46
80	Mauritius[2]	1,840.60
81	Panama	1,823.69
82	Uruguay	1,695.53
83	Georgia	1,655.76
84	Dominican Republic	1,635.65
85	Egypt	1,618.61
86	Albania	1,617.66
87	Mongolia	1,414.89
88	Tunisia	1,394.35
89	Colombia	1,160.97
90	Ecuador	1,137.81
91	Algeria	1,042.19
92	Peru	989.80
93	El Salvador	981.07
94	Zimbabwe	833.28
95	Honduras	813.32
96	Namibia	806.22
97	Zambia	790.45
98	Guyana[2]	787.40
99	Morocco	756.72
100	Mozambique	738.99
101	Vietnam	671.30
102	Philippines	652.27
103	India	645.87
104	Pakistan	633.01
105	Guatemala	608.03
106	Indonesia	597.57
107	Botswana	597.13
108	Bolivia	549.81
109	Nicaragua	500.34
110	Sri Lanka	474.84
111	Ghana	393.46
112	Côte d'Ivoire	282.58
113	Cameroon	215.58
114	Senegal	204.31
115	Kenya	190.24
116	Nigeria	165.07
117	Bangladesh	156.03
118	Mauritania	142.57
119	Gambia, The[2]	125.99
120	Nepal	99.00
121	Cambodia	87.20
122	Malawi	86.11
123	Lesotho	84.60
124	Tanzania	72.67
125	Madagascar[2]	53.09
126	Burkina Faso[2]	44.55
127	Ethiopia	43.55
128	Mali	39.56
129	Uganda	38.89
130	Benin	16.68
131	Burundi	11.39
132	Chad	10.26
n/a	Timor-Leste	n/a

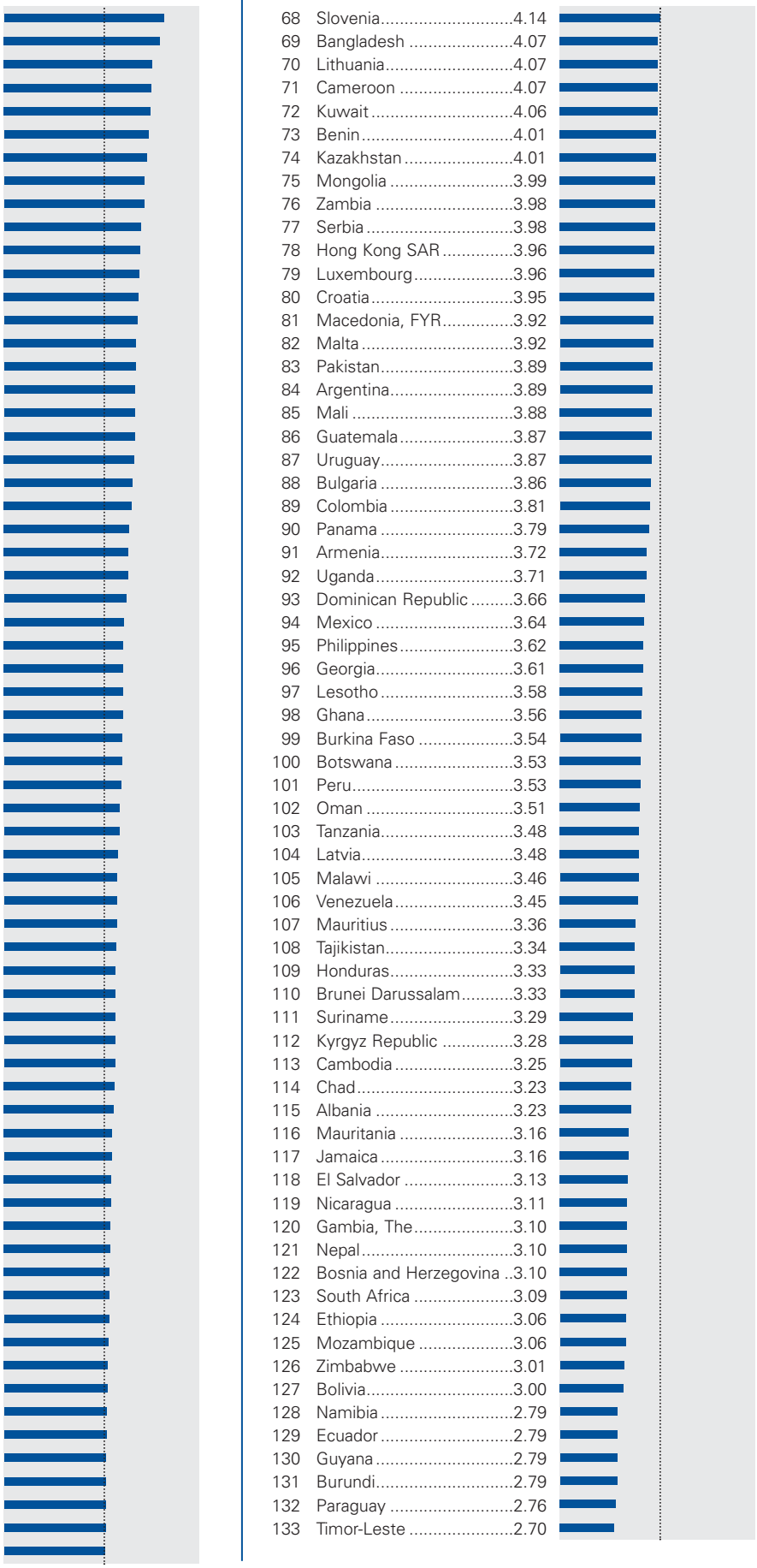
SOURCE: The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); US Central Intelligence Agency, *The World Factbook* (retrieved October 15, 2009)

1 2005 2 2007 3 2008

3.04 Availability of scientists and engineers

To what extent are scientists and engineers available in your country? (1 = not at all; 7 = widely available) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Finland	6.01
2	Japan	5.89
3	Sweden	5.65
4	India	5.62
5	United States	5.60
6	Canada	5.52
7	Taiwan, China	5.49
8	Iceland	5.39
9	Tunisia	5.39
10	Switzerland	5.29
11	France	5.27
12	Ireland	5.25
13	Qatar	5.22
14	Singapore	5.18
15	Puerto Rico	5.14
16	Israel	5.12
17	Belgium	5.10
18	Denmark	5.10
19	Norway	5.10
20	Greece	5.08
21	Cyprus	5.02
22	Netherlands	5.00
23	Chile	4.92
24	Czech Republic	4.89
25	Korea, Rep.	4.88
26	Jordan	4.83
27	Côte d'Ivoire	4.75
28	United Arab Emirates	4.74
29	Costa Rica	4.74
30	Austria	4.74
31	Indonesia	4.73
32	United Kingdom	4.71
33	Malaysia	4.70
34	Australia	4.68
35	Germany	4.63
36	China	4.61
37	Spain	4.57
38	Senegal	4.55
39	Italy	4.53
40	Hungary	4.53
41	Nigeria	4.51
42	Bahrain	4.50
43	Syria	4.49
44	Sri Lanka	4.49
45	Trinidad and Tobago	4.48
46	Portugal	4.48
47	Saudi Arabia	4.47
48	Russian Federation	4.44
49	Azerbaijan	4.39
50	Ukraine	4.37
51	Turkey	4.36
52	Slovak Republic	4.36
53	Egypt	4.34
54	Thailand	4.34
55	Kenya	4.31
56	Romania	4.30
57	Algeria	4.29
58	Poland	4.28
59	New Zealand	4.25
60	Brazil	4.24
61	Madagascar	4.21
62	Vietnam	4.21
63	Barbados	4.19
64	Morocco	4.19
65	Montenegro	4.19
66	Libya	4.18
67	Estonia	4.16
68	Slovenia	4.14
69	Bangladesh	4.07
70	Lithuania	4.07
71	Cameroon	4.07
72	Kuwait	4.06
73	Benin	4.01
74	Kazakhstan	4.01
75	Mongolia	3.99
76	Zambia	3.98
77	Serbia	3.98
78	Hong Kong SAR	3.96
79	Luxembourg	3.96
80	Croatia	3.95
81	Macedonia, FYR	3.92
82	Malta	3.92
83	Pakistan	3.89
84	Argentina	3.89
85	Mali	3.88
86	Guatemala	3.87
87	Uruguay	3.87
88	Bulgaria	3.86
89	Colombia	3.81
90	Panama	3.79
91	Armenia	3.72
92	Uganda	3.71
93	Dominican Republic	3.66
94	Mexico	3.64
95	Philippines	3.62
96	Georgia	3.61
97	Lesotho	3.58
98	Ghana	3.56
99	Burkina Faso	3.54
100	Botswana	3.53
101	Peru	3.53
102	Oman	3.51
103	Tanzania	3.48
104	Latvia	3.48
105	Malawi	3.46
106	Venezuela	3.45
107	Mauritius	3.36
108	Tajikistan	3.34
109	Honduras	3.33
110	Brunei Darussalam	3.33
111	Suriname	3.29
112	Kyrgyz Republic	3.28
113	Cambodia	3.25
114	Chad	3.23
115	Albania	3.23
116	Mauritania	3.16
117	Jamaica	3.16
118	El Salvador	3.13
119	Nicaragua	3.11
120	Gambia, The	3.10
121	Nepal	3.10
122	Bosnia and Herzegovina	3.10
123	South Africa	3.09
124	Ethiopia	3.06
125	Mozambique	3.06
126	Zimbabwe	3.01
127	Bolivia	3.00
128	Namibia	2.79
129	Ecuador	2.79
130	Guyana	2.79
131	Burundi	2.79
132	Paraguay	2.76
133	Timor-Leste	2.70

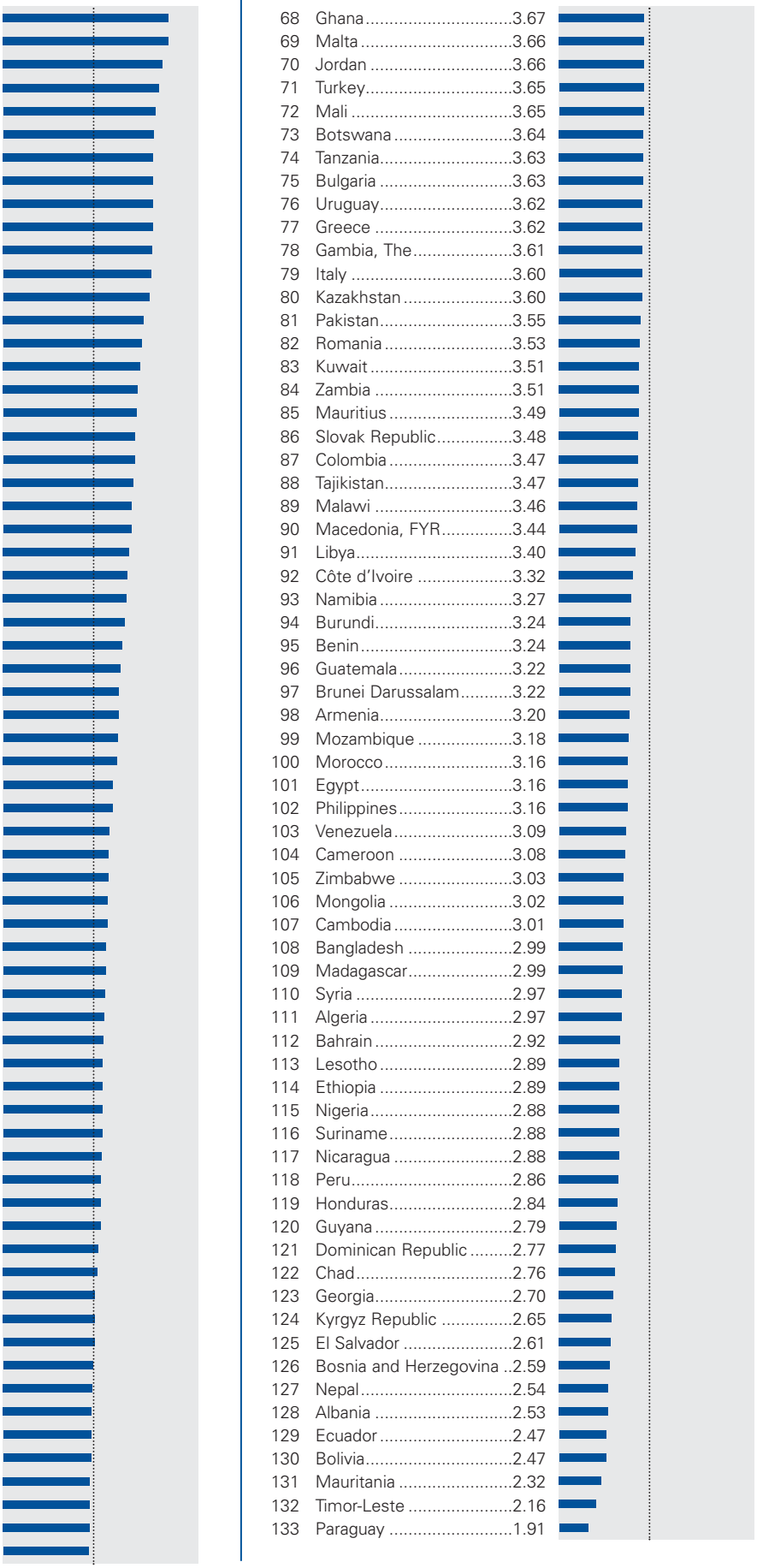


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

3.05 Quality of scientific research institutions

How would you assess the quality of scientific research institutions in your country? (1 = very poor; 7 = the best in their field internationally) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Switzerland	6.19
2	United States	6.18
3	Israel	5.99
4	United Kingdom	5.89
5	Germany	5.77
6	Sweden	5.71
7	Netherlands	5.70
8	Belgium	5.70
9	Denmark	5.70
10	Australia	5.70
11	Canada	5.68
12	Singapore	5.63
13	Finland	5.58
14	New Zealand	5.40
15	Japan	5.34
16	Ireland	5.30
17	France	5.22
18	Taiwan, China	5.18
19	Czech Republic	5.14
20	Norway	5.12
21	Austria	5.08
22	Korea, Rep.	5.03
23	Hungary	5.02
24	Iceland	4.95
25	India	4.89
26	Slovenia	4.87
27	Estonia	4.80
28	Malaysia	4.73
29	South Africa	4.68
30	Costa Rica	4.63
31	Portugal	4.61
32	Qatar	4.59
33	Puerto Rico	4.57
34	Hong Kong SAR	4.43
35	China	4.43
36	Luxembourg	4.32
37	Saudi Arabia	4.31
38	Barbados	4.30
39	Azerbaijan	4.28
40	Kenya	4.27
41	Brazil	4.22
42	Russian Federation	4.21
43	Indonesia	4.20
44	Spain	4.18
45	Sri Lanka	4.14
46	Lithuania	4.11
47	Montenegro	4.11
48	Poland	4.10
49	Tunisia	4.10
50	Croatia	4.09
51	Jamaica	4.07
52	Cyprus	4.06
53	United Arab Emirates	4.06
54	Serbia	3.98
55	Senegal	3.95
56	Ukraine	3.88
57	Chile	3.87
58	Burkina Faso	3.86
59	Argentina	3.81
60	Thailand	3.80
61	Trinidad and Tobago	3.77
62	Panama	3.76
63	Oman	3.76
64	Vietnam	3.72
65	Mexico	3.71
66	Latvia	3.71
67	Uganda	3.68
68	Ghana	3.67
69	Malta	3.66
70	Jordan	3.66
71	Turkey	3.65
72	Mali	3.65
73	Botswana	3.64
74	Tanzania	3.63
75	Bulgaria	3.63
76	Uruguay	3.62
77	Greece	3.62
78	Gambia, The	3.61
79	Italy	3.60
80	Kazakhstan	3.60
81	Pakistan	3.55
82	Romania	3.53
83	Kuwait	3.51
84	Zambia	3.51
85	Mauritius	3.49
86	Slovak Republic	3.48
87	Colombia	3.47
88	Tajikistan	3.47
89	Malawi	3.46
90	Macedonia, FYR	3.44
91	Libya	3.40
92	Côte d'Ivoire	3.32
93	Namibia	3.27
94	Burundi	3.24
95	Benin	3.24
96	Guatemala	3.22
97	Brunei Darussalam	3.22
98	Armenia	3.20
99	Mozambique	3.18
100	Morocco	3.16
101	Egypt	3.16
102	Philippines	3.16
103	Venezuela	3.09
104	Cameroon	3.08
105	Zimbabwe	3.03
106	Mongolia	3.02
107	Cambodia	3.01
108	Bangladesh	2.99
109	Madagascar	2.99
110	Syria	2.97
111	Algeria	2.97
112	Bahrain	2.92
113	Lesotho	2.89
114	Ethiopia	2.89
115	Nigeria	2.88
116	Suriname	2.88
117	Nicaragua	2.88
118	Peru	2.86
119	Honduras	2.84
120	Guyana	2.79
121	Dominican Republic	2.77
122	Chad	2.76
123	Georgia	2.70
124	Kyrgyz Republic	2.65
125	El Salvador	2.61
126	Bosnia and Herzegovina	2.59
127	Nepal	2.54
128	Albania	2.53
129	Ecuador	2.47
130	Bolivia	2.47
131	Mauritania	2.32
132	Timor-Leste	2.16
133	Paraguay	1.91



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

3.06 Tertiary education enrollment (hard data)

Gross tertiary education enrollment rate | 2007 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Korea, Rep.	94.67
2	Finland	93.81
3	Greece	90.81
4	Slovenia	85.53
5	Taiwan, China[8]	83.18
6	United States	81.68
7	Denmark	80.30
8	New Zealand	79.84
9	Ukraine	76.39
10	Norway	76.24
11	Lithuania	75.56
12	Sweden	75.18
13	Australia	75.06
14	Russian Federation	74.72
15	Iceland	73.43
16	Latvia	71.31
17	Hungary	69.10
18	Spain	68.91
19	Italy	68.12
20	Argentina	67.13
21	Poland	66.95
22	Estonia	65.04
23	Uruguay	64.27
24	Belgium	62.48
25	Canada[5]	62.36
26	Ireland	61.06
27	Israel	60.41
28	Netherlands	60.32
29	Singapore[8]	59.80
30	United Kingdom	59.10
31	Romania	58.26
32	Japan	58.06
33	Portugal	55.96
34	Libya[4]	55.75
35	France	55.57
36	Czech Republic	54.82
37	Barbados	53.13
38	Chile	52.06
39	Venezuela[7]	51.96
40	Austria	51.07
41	Slovak Republic	50.85
42	Bulgaria	49.52
43	Thailand[8]	48.26
44	Mongolia	47.69
45	Kazakhstan[8]	47.01
46	Switzerland	47.00
47	Croatia	45.78
48	Panama[7]	44.93
49	Puerto Rico	43.80
50	Germany[7]	43.60
51	Kyrgyz Republic	42.80
52	Montenegro	41.07
53	Bolivia[5]	40.62
54	Jordan	39.91
55	Georgia	37.26
56	Bosnia and Herzegovina	36.85
57	Turkey	36.30
58	Cyprus	36.17
59	Serbia[8]	35.80
60	Macedonia, FYR	35.51
61	Ecuador	35.32
62	Peru[7]	35.06
63	Egypt[6]	34.75
64	Dominican Republic[5]	34.51
65	Armenia	34.21
66	Hong Kong SAR	33.84
67	Bahrain[7]	32.05
68	Colombia	31.80
69	Malta[6]	31.60
70	Tunisia	30.81
71	Malaysia[7]	30.24
72	Saudi Arabia[7]	30.24
73	Brazil	29.99
74	Philippines[7]	28.47
75	Mexico	26.93
76	Paraguay[6]	25.50
77	Oman	25.49
78	Costa Rica[6]	25.34
79	Algeria	24.02
80	China	22.89
81	United Arab Emirates[8]	22.85
82	El Salvador	21.69
83	Tajikistan	19.75
84	Syria[8]	19.40
85	Albania[5]	19.09
86	Jamaica[4]	18.99
87	Nicaragua[4]	18.09
88	Guatemala	17.71
89	Kuwait[7]	17.57
90	Indonesia	17.46
91	Honduras[5]	17.15
92	Sri Lanka	17.10
93	Qatar	15.93
94	South Africa[7]	15.41
95	Brunei Darussalam	15.37
96	Azerbaijan	15.24
97	Mauritius[8]	13.96
98	Suriname[3]	12.43
99	Guyana	12.32
100	India[7]	11.85
101	Trinidad and Tobago[6]	11.39
102	Nepal	11.33
103	Morocco	11.31
104	Luxembourg[7]	10.21
105	Nigeria[6]	10.15
106	Timor-Leste[3]	9.62
107	Vietnam[2]	9.52
108	Côte d'Ivoire	7.89
109	Senegal[8]	7.72
110	Bangladesh	7.25
111	Cameroon	7.15
112	Namibia[7]	6.38
113	Ghana	5.84
114	Cambodia	5.35
115	Botswana[6]	5.12
116	Pakistan	5.12
117	Benin[7]	5.11
118	Mali	4.42
119	Mauritania	3.97
120	Zimbabwe[4]	3.64
121	Lesotho[7]	3.64
122	Uganda[5]	3.47
123	Kenya	3.47
124	Madagascar	3.18
125	Burkina Faso[8]	3.05
126	Ethiopia	2.75
127	Zambia[1]	2.34
128	Burundi	1.90
129	Tanzania	1.48
130	Mozambique[6]	1.46
131	Chad[6]	1.16
132	Gambia, The[5]	1.15
133	Malawi	0.00

SOURCE: UNESCO Institute for Statistics (retrieved June 1,2009); The World Bank, *World Development Indicators Online* (retrieved June 23, 2009); national sources

1 2000 2 2001 3 2002 4 2003 5 2004 6 2005 7 2006 8 2008

3.07 Education expenditure (hard data)

Adjusted savings: Public education expenditure as percentage of GNI | 2007 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Timor-Leste[1]	11.00
2	Lesotho	10.02
3	Guyana	7.84
4	Denmark	7.82
5	Namibia	7.28
6	Iceland	7.22
7	Saudi Arabia	7.19
8	Sweden	7.16
9	Barbados	6.97
10	Zimbabwe	6.87
11	New Zealand	6.67
12	Tunisia	6.67
13	Kenya	6.63
14	Botswana	6.58
15	Norway	6.47
16	Bolivia	6.33
17	Israel	6.04
18	Taiwan, China[1]	5.91
19	Finland	5.88
20	Belgium	5.84
21	Cyprus	5.72
22	Jordan	5.61
23	Latvia	5.57
24	Malaysia	5.51
25	Mexico	5.47
26	Slovenia	5.46
27	Portugal	5.44
28	Jamaica	5.41
29	Hungary	5.38
30	Poland	5.32
31	Austria	5.30
32	South Africa	5.27
33	Morocco	5.22
34	Kyrgyz Republic	5.18
35	Ireland	5.15
36	France	5.12
37	Burundi	5.10
38	United Kingdom	5.03
39	Macedonia, FYR	4.90
40	Netherlands	4.85
41	Switzerland	4.85
42	Australia	4.83
43	Colombia	4.82
44	Thailand	4.79
45	United States	4.79
46	Lithuania	4.78
47	Canada	4.78
48	Ghana	4.74
49	Côte d'Ivoire	4.67
50	Malta	4.64
51	Estonia	4.61
52	Mongolia	4.61
53	Senegal	4.49
54	Algeria	4.47
55	Brazil	4.44
56	Germany	4.43
57	Panama	4.42
58	Kazakhstan	4.41
59	Egypt	4.41
60	Ukraine	4.41
61	Serbia[1]	4.40
62	Bahrain	4.36
63	Croatia	4.34
64	Burkina Faso	4.28
65	Italy	4.19
66	Bulgaria	4.11
67	Costa Rica	4.06
68	Czech Republic	4.02
69	Trinidad and Tobago	4.01
70	Uganda	4.00
71	Argentina	3.98
72	Spain	3.92
73	Oman	3.89
74	Paraguay	3.87
75	Korea, Rep.	3.85
76	Slovak Republic	3.81
77	Puerto Rico[1]	3.80
78	Mozambique	3.75
79	Luxembourg	3.72
80	Ethiopia	3.71
81	Turkey	3.68
82	Brunei Darussalam	3.64
83	Benin	3.63
84	Mali	3.58
85	Honduras	3.55
86	Russian Federation	3.54
87	Dominican Republic	3.54
88	Malawi	3.51
89	Montenegro[1]	3.45
90	Mauritius	3.41
91	Romania	3.40
92	Venezuela	3.38
93	Chile	3.37
94	India	3.23
95	Tajikistan	3.20
96	Japan	3.17
97	Madagascar	3.07
98	Kuwait	3.02
99	Hong Kong SAR	2.97
100	Nicaragua	2.96
101	Albania	2.84
102	Azerbaijan	2.83
103	Vietnam	2.81
104	Georgia	2.78
105	Guatemala	2.77
106	El Salvador	2.76
107	Greece	2.75
108	Mauritania	2.75
109	Singapore	2.70
110	Uruguay	2.65
111	Cameroon	2.62
112	Syria	2.60
113	Peru	2.59
114	Sri Lanka	2.55
115	Nepal	2.40
116	Tanzania	2.39
117	Armenia	2.22
118	Philippines	2.19
119	Zambia	2.13
120	Pakistan	2.07
121	Gambia, The	2.04
122	Bangladesh	1.84
123	China	1.80
124	Cambodia	1.66
125	Ecuador	1.38
126	Chad	1.17
127	Indonesia	1.15
128	Nigeria	0.85
n/a	Bosnia and Herzegovina	n/a
n/a	Libya	n/a
n/a	Qatar	n/a
n/a	Suriname	n/a
n/a	United Arab Emirates	n/a

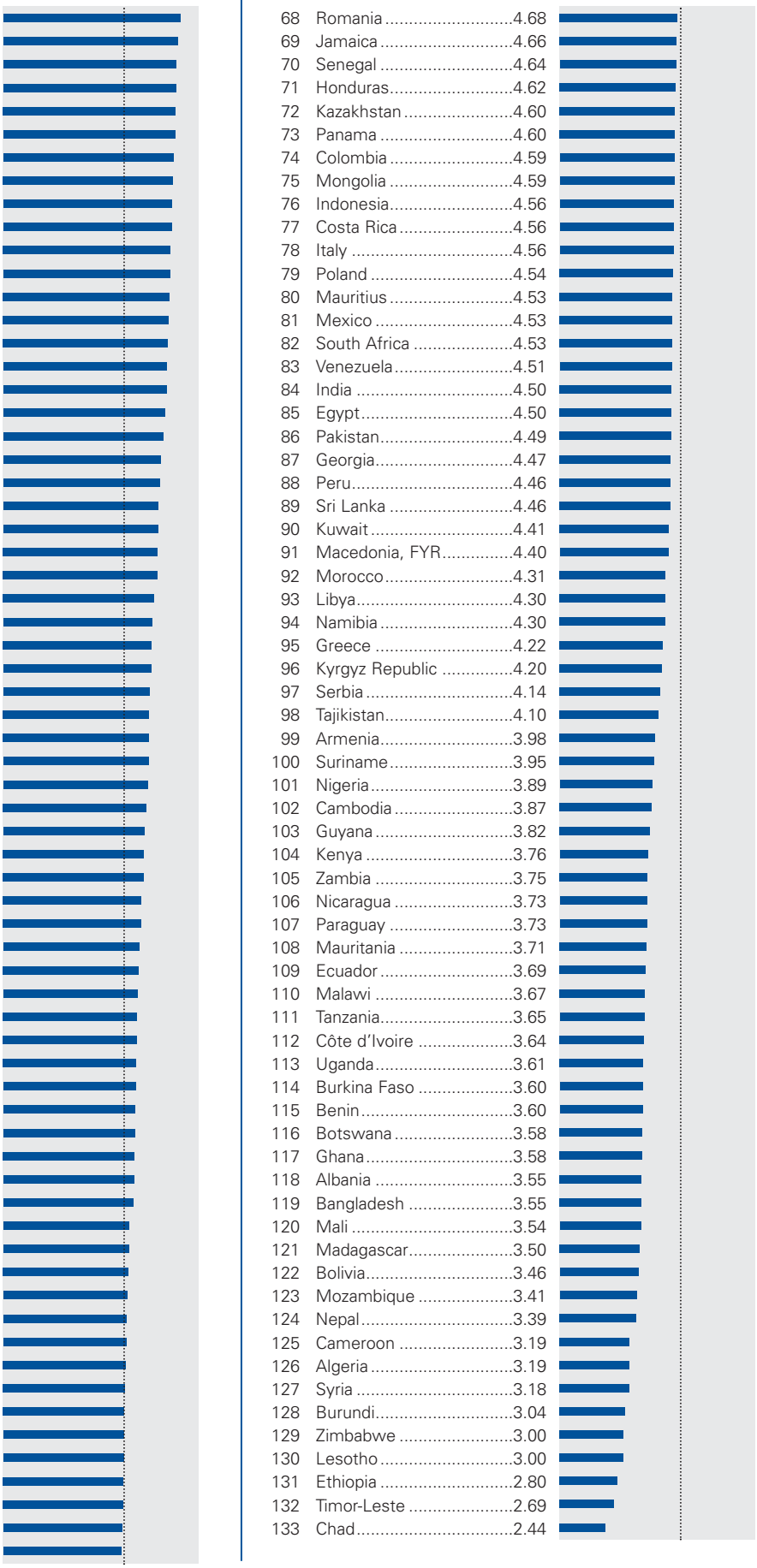
SOURCE: The World Bank, *World Development Indicators Online* (retrieved September 7, 2009); national sources

[1] 2008

3.08 Accessibility of digital content

In your country, how accessible is digital content (e.g., text and audiovisual content, software products) via multiple platforms (e.g., fixed-line Internet, wireless Internet, mobile network, satellite, etc.)? (1 = not accessible at all; 7 = widely accessible) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Estonia	6.54
2	Switzerland	6.46
3	Iceland	6.41
4	Sweden	6.41
5	Austria	6.39
6	Finland	6.38
7	United States	6.33
8	Korea, Rep.	6.32
9	Denmark	6.28
10	Norway	6.28
11	Singapore	6.23
12	Netherlands	6.22
13	Canada	6.21
14	Japan	6.18
15	Hong Kong SAR	6.16
16	Israel	6.12
17	United Kingdom	6.11
18	Germany	6.06
19	Qatar	6.01
20	Czech Republic	5.93
21	Belgium	5.90
22	United Arab Emirates	5.85
23	Luxembourg	5.85
24	Taiwan, China	5.84
25	Portugal	5.84
26	Malta	5.72
27	France	5.66
28	Slovenia	5.64
29	Australia	5.63
30	Chile	5.58
31	Bahrain	5.57
32	Hungary	5.56
33	Lithuania	5.55
34	China	5.53
35	Puerto Rico	5.48
36	Spain	5.42
37	Guatemala	5.41
38	New Zealand	5.41
39	Barbados	5.33
40	Slovak Republic	5.32
41	Cyprus	5.26
42	Dominican Republic	5.25
43	Jordan	5.20
44	Uruguay	5.19
45	Malaysia	5.19
46	Latvia	5.16
47	Ireland	5.15
48	Montenegro	5.12
49	Ukraine	5.12
50	Turkey	5.11
51	Bosnia and Herzegovina	5.10
52	El Salvador	5.07
53	Azerbaijan	4.94
54	Brunei Darussalam	4.94
55	Thailand	4.92
56	Russian Federation	4.88
57	Croatia	4.85
58	Brazil	4.85
59	Gambia, The	4.84
60	Vietnam	4.81
61	Oman	4.79
62	Argentina	4.77
63	Tunisia	4.77
64	Saudi Arabia	4.76
65	Bulgaria	4.76
66	Trinidad and Tobago	4.72
67	Philippines	4.69
68	Romania	4.68
69	Jamaica	4.66
70	Senegal	4.64
71	Honduras	4.62
72	Kazakhstan	4.60
73	Panama	4.60
74	Colombia	4.59
75	Mongolia	4.59
76	Indonesia	4.56
77	Costa Rica	4.56
78	Italy	4.56
79	Poland	4.54
80	Mauritius	4.53
81	Mexico	4.53
82	South Africa	4.53
83	Venezuela	4.51
84	India	4.50
85	Egypt	4.50
86	Pakistan	4.49
87	Georgia	4.47
88	Peru	4.46
89	Sri Lanka	4.46
90	Kuwait	4.41
91	Macedonia, FYR	4.40
92	Morocco	4.31
93	Libya	4.30
94	Namibia	4.30
95	Greece	4.22
96	Kyrgyz Republic	4.20
97	Serbia	4.14
98	Tajikistan	4.10
99	Armenia	3.98
100	Suriname	3.95
101	Nigeria	3.89
102	Cambodia	3.87
103	Guyana	3.82
104	Kenya	3.76
105	Zambia	3.75
106	Nicaragua	3.73
107	Paraguay	3.73
108	Mauritania	3.71
109	Ecuador	3.69
110	Malawi	3.67
111	Tanzania	3.65
112	Côte d'Ivoire	3.64
113	Uganda	3.61
114	Burkina Faso	3.60
115	Benin	3.60
116	Botswana	3.58
117	Ghana	3.58
118	Albania	3.55
119	Bangladesh	3.55
120	Mali	3.54
121	Madagascar	3.50
122	Bolivia	3.46
123	Mozambique	3.41
124	Nepal	3.39
125	Cameroon	3.19
126	Algeria	3.19
127	Syria	3.18
128	Burundi	3.04
129	Zimbabwe	3.00
130	Lesotho	3.00
131	Ethiopia	2.80
132	Timor-Leste	2.69
133	Chad	2.44



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

3.09 Internet bandwidth (hard data)

International Internet bandwidth (Mb/s) per 10,000 population | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Luxembourg	74,142.18
2	Hong Kong SAR	5,256.41
3	Netherlands[2]	779.79
4	Sweden[2]	499.87
5	United Kingdom[2]	398.02
6	Bulgaria	378.54
7	Denmark[2]	346.29
8	Switzerland[2]	296.77
9	France[2]	294.95
10	Norway[2]	269.67
11	Germany[2]	255.51
12	Belgium[2]	253.47
13	Singapore[2]	235.66
14	Austria[2]	201.78
15	Finland[2]	172.59
16	Canada[2]	162.42
17	Panama[2]	159.64
18	Croatia	154.86
19	Ireland[2]	154.60
20	Italy	131.84
21	Estonia	120.25
22	Spain[2]	111.57
23	United States[2]	111.22
24	Taiwan, China	102.05
25	Lithuania	97.13
26	Romania	91.83
27	United Arab Emirates	86.52
28	Malta	76.19
29	Iceland[2]	73.09
30	Czech Republic[2]	71.78
31	Slovenia[2]	67.75
32	Hungary	60.00
33	Japan	57.60
34	Slovak Republic[2]	55.62
35	Australia[2]	55.44
36	Portugal[2]	47.84
37	New Zealand[2]	45.98
38	Greece[2]	45.56
39	Korea, Rep.	45.49
40	Chile[2]	40.65
41	Latvia[2]	35.35
42	Serbia	33.53
43	Qatar[2]	27.66
44	Poland[2]	27.50
45	Turkey	27.23
46	Peru[2]	27.03
47	Bahrain[2]	25.44
48	Malaysia	23.73
49	Argentina[2]	23.18
50	Colombia	21.51
51	Brazil	20.83
52	Israel[2]	20.76
53	Barbados[2]	17.66
54	Cyprus[2]	16.03
55	Brunei Darussalam	15.57
56	Dominican Republic	14.14
57	Montenegro[2]	12.54
58	Azerbaijan	12.00
59	Saudi Arabia	11.93
60	Tunisia	11.03
61	Mongolia	9.42
62	Oman	9.39
63	Uruguay[2]	8.99
64	Thailand	8.57
65	Costa Rica	8.55
66	Kuwait[2]	8.13
67	Morocco	7.95
68	Jordan	7.54
69	Georgia[2]	7.46
70	Jamaica	7.33
71	Kazakhstan	7.08
72	Trinidad and Tobago[2]	6.75
73	Venezuela[2]	6.24
74	Russian Federation[2]	5.71
75	Vietnam	5.65
76	Bosnia and Herzegovina[2]	5.08
77	Paraguay	4.81
78	China	4.79
79	Ecuador	4.43
80	Suriname[1]	4.42
81	Mauritius	3.63
82	Egypt	3.52
83	Mexico	2.81
84	Honduras[2]	2.44
85	Senegal	2.29
86	Bolivia	2.25
87	Botswana	2.22
88	Albania[2]	2.16
89	Ukraine[2]	2.07
90	Sri Lanka	1.97
91	Guatemala[2]	1.86
92	Nicaragua[2]	1.44
93	Indonesia	1.16
94	Philippines[2]	1.14
95	Kyrgyz Republic	1.11
96	Syria	1.03
97	Ghana	0.84
98	Mauritania	0.76
99	South Africa[2]	0.70
100	Mali	0.51
101	Libya[2]	0.50
102	Guyana[2]	0.49
103	Pakistan[2]	0.43
104	Côte d'Ivoire[2]	0.42
105	Tajikistan[2]	0.37
106	Gambia, The[2]	0.36
107	India[2]	0.31
108	El Salvador	0.29
109	Namibia[2]	0.27
110	Kenya	0.21
111	Cambodia[2]	0.19
112	Benin[2]	0.17
113	Macedonia, FYR[2]	0.17
114	Burkina Faso[2]	0.15
115	Uganda	0.12
116	Zimbabwe	0.09
117	Timor-Leste[2]	0.09
118	Zambia	0.08
119	Cameroon	0.08
120	Madagascar	0.08
121	Lesotho	0.05
122	Nepal[2]	0.05
123	Malawi[2]	0.05
124	Nigeria[2]	0.05
125	Bangladesh[2]	0.04
126	Mozambique[2]	0.03
127	Ethiopia[2]	0.03
128	Tanzania[2]	0.02
129	Burundi	0.02
130	Chad[2]	0.01
n/a	Algeria	n/a
n/a	Armenia	n/a
n/a	Puerto Rico	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

[1] 2006 [2] 2007

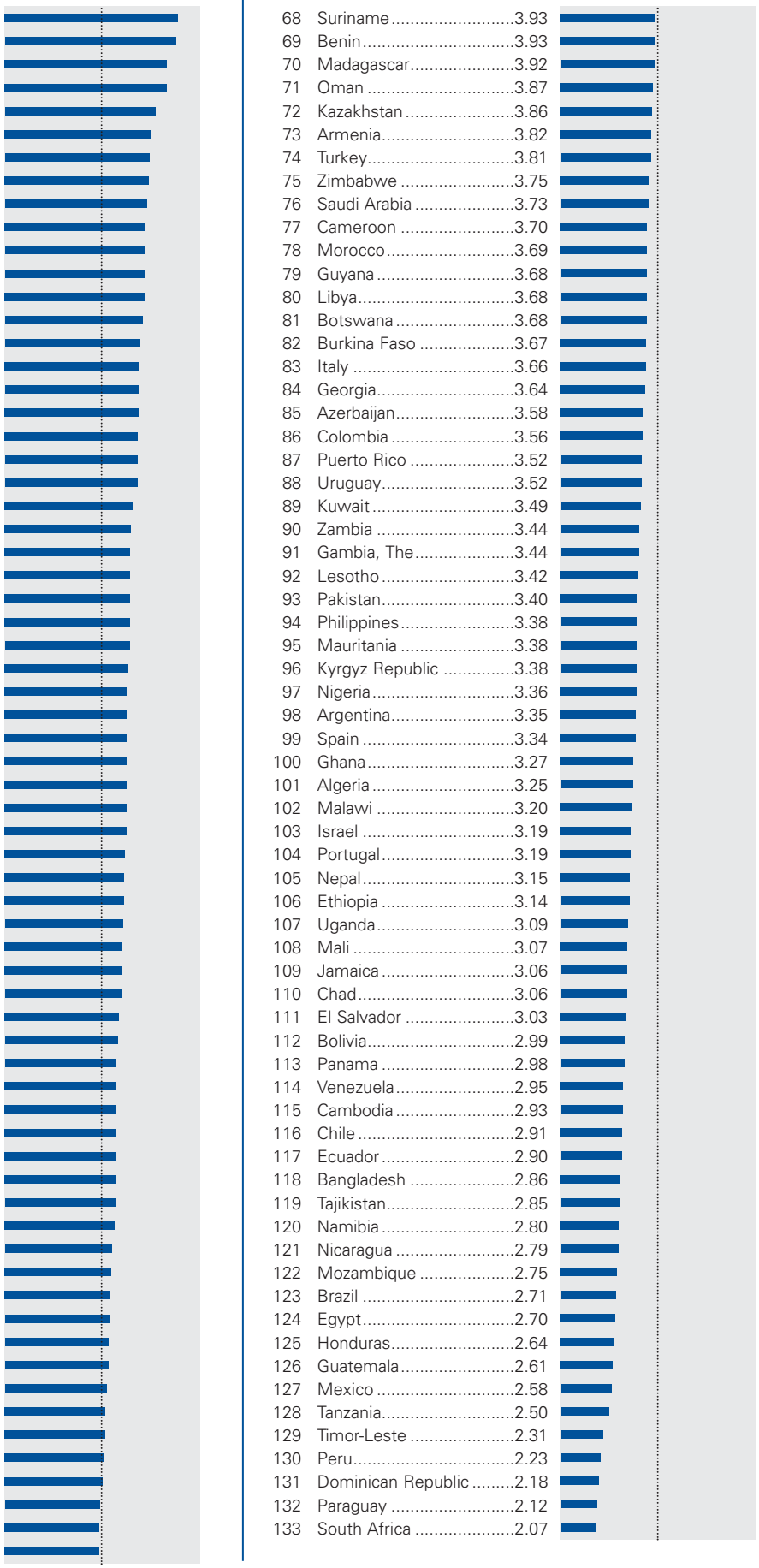
4th pillar

Individual readiness

4.01 Quality of math and science education

How would you assess the quality of math and science education in your country's schools? (1 = poor; 7 = excellent—among the best in the world) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.43
2	Finland	6.36
3	Qatar	6.08
4	Belgium	6.08
5	Switzerland	5.71
6	Taiwan, China	5.56
7	Tunisia	5.53
8	France	5.51
9	New Zealand	5.45
10	Czech Republic	5.41
11	Hong Kong SAR	5.39
12	Barbados	5.39
13	Cyprus	5.38
14	Canada	5.31
15	Denmark	5.23
16	Netherlands	5.21
17	Estonia	5.20
18	Korea, Rep.	5.19
19	Slovenia	5.17
20	United Arab Emirates	5.15
21	Iceland	5.15
22	India	5.03
23	Poland	4.95
24	Ireland	4.93
25	Japan	4.93
26	Hungary	4.93
27	Trinidad and Tobago	4.92
28	Malta	4.91
29	Romania	4.87
30	Australia	4.85
31	Bosnia and Herzegovina	4.84
32	Montenegro	4.82
33	Croatia	4.82
34	Malaysia	4.81
35	China	4.81
36	Sweden	4.81
37	Lithuania	4.76
38	Jordan	4.74
39	Austria	4.73
40	Brunei Darussalam	4.70
41	Ukraine	4.68
42	Russian Federation	4.68
43	Serbia	4.67
44	Sri Lanka	4.57
45	Germany	4.53
46	Luxembourg	4.48
47	Greece	4.47
48	United States	4.47
49	Senegal	4.46
50	Indonesia	4.46
51	Slovak Republic	4.46
52	United Kingdom	4.45
53	Vietnam	4.44
54	Bahrain	4.35
55	Costa Rica	4.34
56	Bulgaria	4.30
57	Macedonia, FYR	4.29
58	Norway	4.24
59	Albania	4.24
60	Latvia	4.19
61	Syria	4.15
62	Thailand	4.14
63	Burundi	4.09
64	Kenya	4.07
65	Mauritius	3.97
66	Côte d'Ivoire	3.96
67	Mongolia	3.96
68	Suriname	3.93
69	Benin	3.93
70	Madagascar	3.92
71	Oman	3.87
72	Kazakhstan	3.86
73	Armenia	3.82
74	Turkey	3.81
75	Zimbabwe	3.75
76	Saudi Arabia	3.73
77	Cameroon	3.70
78	Morocco	3.69
79	Guyana	3.68
80	Libya	3.68
81	Botswana	3.68
82	Burkina Faso	3.67
83	Italy	3.66
84	Georgia	3.64
85	Azerbaijan	3.58
86	Colombia	3.56
87	Puerto Rico	3.52
88	Uruguay	3.52
89	Kuwait	3.49
90	Zambia	3.44
91	Gambia, The	3.44
92	Lesotho	3.42
93	Pakistan	3.40
94	Philippines	3.38
95	Mauritania	3.38
96	Kyrgyz Republic	3.38
97	Nigeria	3.36
98	Argentina	3.35
99	Spain	3.34
100	Ghana	3.27
101	Algeria	3.25
102	Malawi	3.20
103	Israel	3.19
104	Portugal	3.19
105	Nepal	3.15
106	Ethiopia	3.14
107	Uganda	3.09
108	Mali	3.07
109	Jamaica	3.06
110	Chad	3.06
111	El Salvador	3.03
112	Bolivia	2.99
113	Panama	2.98
114	Venezuela	2.95
115	Cambodia	2.93
116	Chile	2.91
117	Ecuador	2.90
118	Bangladesh	2.86
119	Tajikistan	2.85
120	Namibia	2.80
121	Nicaragua	2.79
122	Mozambique	2.75
123	Brazil	2.71
124	Egypt	2.70
125	Honduras	2.64
126	Guatemala	2.61
127	Mexico	2.58
128	Tanzania	2.50
129	Timor-Leste	2.31
130	Peru	2.23
131	Dominican Republic	2.18
132	Paraguay	2.12
133	South Africa	2.07

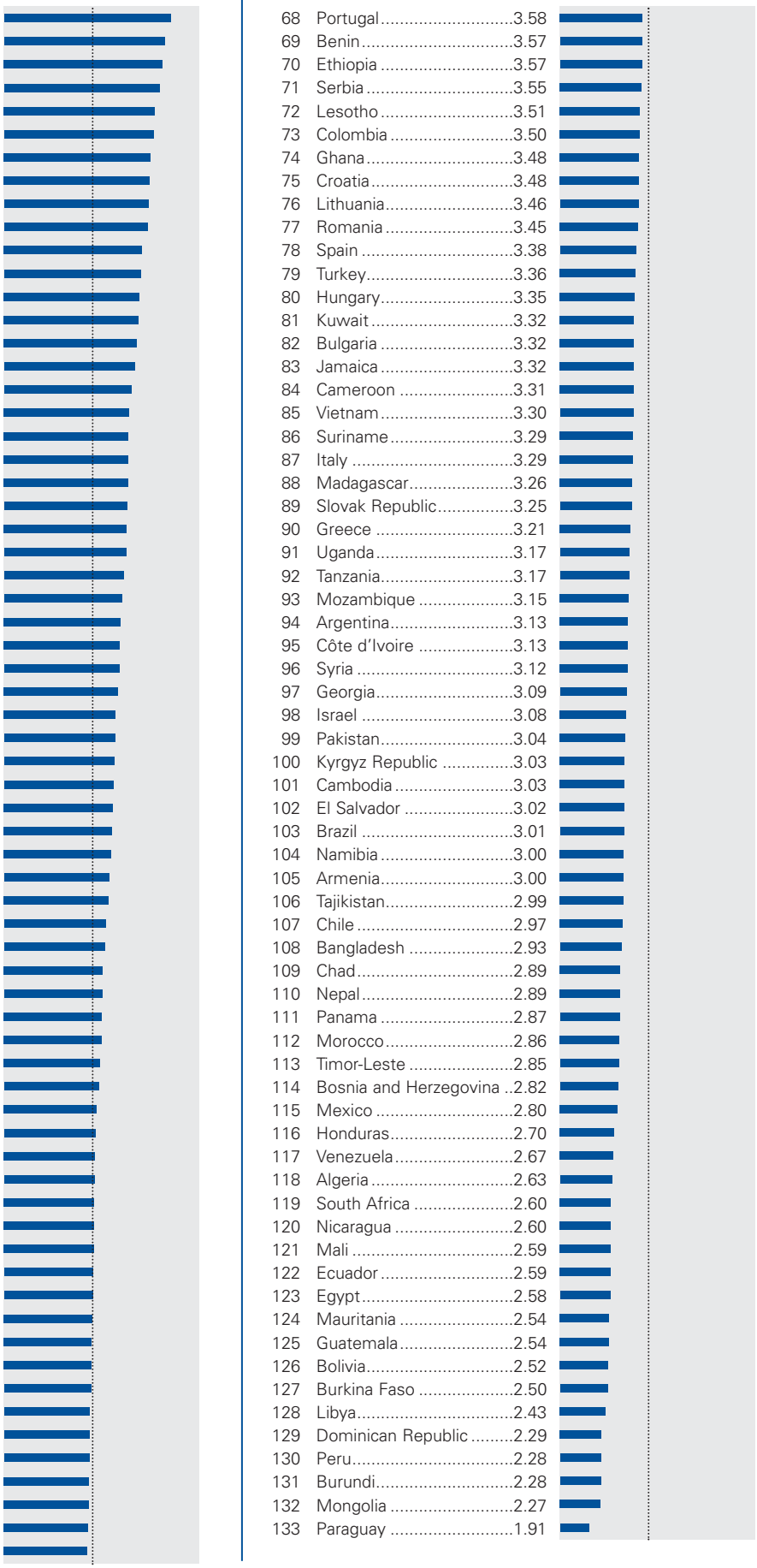


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

4.02 Quality of the educational system

How well does the educational system in your country meet the needs of a competitive economy? (1 = not well at all; 7 = very well) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.22
2	Switzerland	6.03
3	Iceland	5.97
4	Finland	5.87
5	Canada	5.73
6	Denmark	5.69
7	Belgium	5.60
8	Ireland	5.56
9	Cyprus	5.53
10	Qatar	5.50
11	New Zealand	5.32
12	Sweden	5.28
13	Barbados	5.24
14	Australia	5.21
15	Netherlands	5.17
16	Norway	5.10
17	Taiwan, China	4.99
18	Austria	4.92
19	Tunisia	4.89
20	United Arab Emirates	4.89
21	Malta	4.89
22	United States	4.85
23	Malaysia	4.84
24	France	4.83
25	Czech Republic	4.75
26	Costa Rica	4.69
27	Germany	4.66
28	Hong Kong SAR	4.63
29	Gambia, The	4.61
30	United Kingdom	4.57
31	Japan	4.49
32	Slovenia	4.48
33	Jordan	4.45
34	Kenya	4.43
35	Trinidad and Tobago	4.42
36	Estonia	4.39
37	India	4.36
38	Luxembourg	4.29
39	Brunei Darussalam	4.28
40	Bahrain	4.19
41	Sri Lanka	4.16
42	Botswana	4.09
43	Montenegro	4.08
44	Indonesia	4.07
45	Poland	4.06
46	Zimbabwe	4.01
47	Korea, Rep.	3.97
48	Nigeria	3.90
49	Ukraine	3.86
50	Philippines	3.85
51	Mauritius	3.84
52	China	3.83
53	Puerto Rico	3.82
54	Oman	3.82
55	Senegal	3.78
56	Russian Federation	3.78
57	Latvia	3.77
58	Zambia	3.75
59	Macedonia, FYR	3.75
60	Saudi Arabia	3.73
61	Uruguay	3.68
62	Guyana	3.68
63	Albania	3.68
64	Azerbaijan	3.66
65	Malawi	3.66
66	Kazakhstan	3.63
67	Thailand	3.61
68	Portugal	3.58
69	Benin	3.57
70	Ethiopia	3.57
71	Serbia	3.55
72	Lesotho	3.51
73	Colombia	3.50
74	Ghana	3.48
75	Croatia	3.48
76	Lithuania	3.46
77	Romania	3.45
78	Spain	3.38
79	Turkey	3.36
80	Hungary	3.35
81	Kuwait	3.32
82	Bulgaria	3.32
83	Jamaica	3.32
84	Cameroon	3.31
85	Vietnam	3.30
86	Suriname	3.29
87	Italy	3.29
88	Madagascar	3.26
89	Slovak Republic	3.25
90	Greece	3.21
91	Uganda	3.17
92	Tanzania	3.17
93	Mozambique	3.15
94	Argentina	3.13
95	Côte d'Ivoire	3.13
96	Syria	3.12
97	Georgia	3.09
98	Israel	3.08
99	Pakistan	3.04
100	Kyrgyz Republic	3.03
101	Cambodia	3.03
102	El Salvador	3.02
103	Brazil	3.01
104	Namibia	3.00
105	Armenia	3.00
106	Tajikistan	2.99
107	Chile	2.97
108	Bangladesh	2.93
109	Chad	2.89
110	Nepal	2.89
111	Panama	2.87
112	Morocco	2.86
113	Timor-Leste	2.85
114	Bosnia and Herzegovina	2.82
115	Mexico	2.80
116	Honduras	2.70
117	Venezuela	2.67
118	Algeria	2.63
119	South Africa	2.60
120	Nicaragua	2.60
121	Mali	2.59
122	Ecuador	2.59
123	Egypt	2.58
124	Mauritania	2.54
125	Guatemala	2.54
126	Bolivia	2.52
127	Burkina Faso	2.50
128	Libya	2.43
129	Dominican Republic	2.29
130	Peru	2.28
131	Burundi	2.28
132	Mongolia	2.27
133	Paraguay	1.91

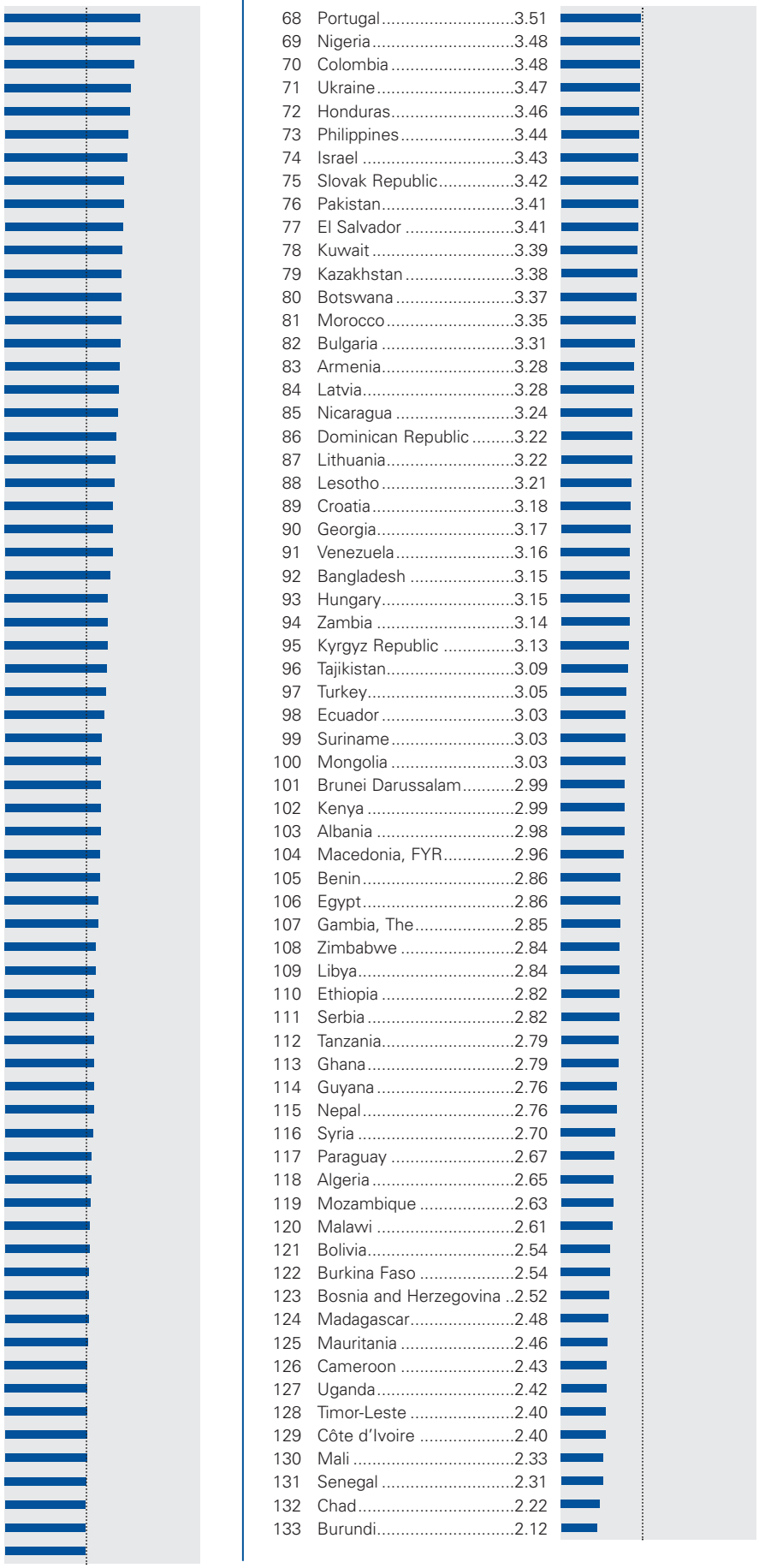


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

4.03 Buyer sophistication

In your country, how do buyers make purchasing decisions? (1 = based solely on the lowest price; 7 = based on a sophisticated analysis of performance attributes) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Japan	5.25
2	Switzerland	5.24
3	Sweden	5.06
4	Taiwan, China	4.95
5	Luxembourg	4.92
6	Singapore	4.86
7	Hong Kong SAR	4.85
8	Denmark	4.74
9	United States	4.74
10	United Kingdom	4.70
11	Netherlands	4.68
12	Australia	4.66
13	China	4.66
14	Canada	4.64
15	Korea, Rep.	4.62
16	Belgium	4.59
17	Norway	4.57
18	Finland	4.54
19	Austria	4.49
20	Cyprus	4.46
21	France	4.43
22	Germany	4.39
23	South Africa	4.38
24	Ireland	4.37
25	Malaysia	4.29
26	Chile	4.23
27	Iceland	4.23
28	United Arab Emirates	4.22
29	New Zealand	4.19
30	Indonesia	4.16
31	Czech Republic	4.12
32	Sri Lanka	4.02
33	India	4.01
34	Bahrain	4.01
35	Spain	4.00
36	Saudi Arabia	4.00
37	Barbados	3.99
38	Puerto Rico	3.97
39	Costa Rica	3.93
40	Italy	3.92
41	Poland	3.85
42	Argentina	3.84
43	Vietnam	3.80
44	Panama	3.80
45	Azerbaijan	3.80
46	Thailand	3.78
47	Romania	3.78
48	Slovenia	3.78
49	Tunisia	3.76
50	Greece	3.71
51	Jamaica	3.70
52	Oman	3.69
53	Peru	3.66
54	Montenegro	3.65
55	Trinidad and Tobago	3.64
56	Qatar	3.63
57	Brazil	3.62
58	Cambodia	3.61
59	Malta	3.59
60	Russian Federation	3.58
61	Mauritius	3.58
62	Mexico	3.57
63	Estonia	3.57
64	Namibia	3.55
65	Guatemala	3.52
66	Jordan	3.51
67	Uruguay	3.51
68	Portugal	3.51
69	Nigeria	3.48
70	Colombia	3.48
71	Ukraine	3.47
72	Honduras	3.46
73	Philippines	3.44
74	Israel	3.43
75	Slovak Republic	3.42
76	Pakistan	3.41
77	El Salvador	3.41
78	Kuwait	3.39
79	Kazakhstan	3.38
80	Botswana	3.37
81	Morocco	3.35
82	Bulgaria	3.31
83	Armenia	3.28
84	Latvia	3.28
85	Nicaragua	3.24
86	Dominican Republic	3.22
87	Lithuania	3.22
88	Lesotho	3.21
89	Croatia	3.18
90	Georgia	3.17
91	Venezuela	3.16
92	Bangladesh	3.15
93	Hungary	3.15
94	Zambia	3.14
95	Kyrgyz Republic	3.13
96	Tajikistan	3.09
97	Turkey	3.05
98	Ecuador	3.03
99	Suriname	3.03
100	Mongolia	3.03
101	Brunei Darussalam	2.99
102	Kenya	2.99
103	Albania	2.98
104	Macedonia, FYR	2.96
105	Benin	2.86
106	Egypt	2.86
107	Gambia, The	2.85
108	Zimbabwe	2.84
109	Libya	2.84
110	Ethiopia	2.82
111	Serbia	2.82
112	Tanzania	2.79
113	Ghana	2.79
114	Guyana	2.76
115	Nepal	2.76
116	Syria	2.70
117	Paraguay	2.67
118	Algeria	2.65
119	Mozambique	2.63
120	Malawi	2.61
121	Bolivia	2.54
122	Burkina Faso	2.54
123	Bosnia and Herzegovina	2.52
124	Madagascar	2.48
125	Mauritania	2.46
126	Cameroon	2.43
127	Uganda	2.42
128	Timor-Leste	2.40
129	Côte d'Ivoire	2.40
130	Mali	2.33
131	Senegal	2.31
132	Chad	2.22
133	Burundi	2.12



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

4.04 Residential telephone connection charge (hard data)

One-time residential telephone connection charge (PPP $) | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Estonia	0.00
1	Hong Kong SAR	0.00
1	Romania	0.00
4	Guyana	4.11
5	Turkey	7.46
6	Jamaica	12.47
7	Zambia	15.96
8	India	19.19
9	Iceland	23.07
10	Switzerland	26.38
11	Pakistan	27.79
12	Burundi[1]	28.80
13	Malaysia	29.50
14	Oman	29.64
15	New Zealand	32.32
16	Côte d'Ivoire	32.43
17	Trinidad and Tobago	33.04
18	Tunisia	33.36
19	Montenegro	33.89
20	Bulgaria	33.99
21	United Arab Emirates	34.64
22	Venezuela	35.29
23	Senegal	36.58
24	Australia	37.18
25	United States	39.00
26	Mozambique[2]	40.21
27	Czech Republic	41.42
28	Mauritania[2]	42.04
29	Tanzania	43.78
30	Malta[2]	43.81
31	Greece	47.27
32	Brunei Darussalam	48.01
33	Singapore	49.56
34	Dominican Republic	50.99
35	Netherlands	54.35
36	Namibia	55.58
37	Panama	56.26
38	Honduras[2]	56.93
39	Ukraine	59.02
40	Kenya	59.03
41	Luxembourg	59.48
42	France	59.62
43	Colombia	59.85
44	Qatar[2]	61.43
45	Armenia	61.47
46	Libya[1]	61.74
47	Nepal	65.02
48	Bahrain	67.57
49	Costa Rica	67.75
50	Israel[1]	68.40
51	Uruguay	68.70
52	Timor-Leste[2]	69.34
53	Barbados	69.85
54	Slovak Republic	69.96
55	Germany	70.29
56	Syria[1]	70.50
57	Mauritius	71.61
58	Belgium	71.70
59	Botswana	72.90
60	Sweden	73.54
61	Algeria	73.74
62	Macedonia, FYR	75.09
63	El Salvador	75.38
64	Brazil	76.86
65	Madagascar	77.18
66	Jordan	78.76
67	Bangladesh	78.80
68	Korea, Rep.	79.58
69	Canada	80.45
70	Lesotho	80.48
71	Argentina	83.04
72	Vietnam[1]	83.09
73	Ethiopia	84.05
74	Philippines	85.39
75	Ghana[2]	89.19
76	Bosnia and Herzegovina	90.21
77	Gambia, The[2]	90.88
78	South Africa	91.59
79	Finland	99.15
80	Saudi Arabia	100.86
81	Bolivia	102.99
82	Mongolia[1]	104.23
83	Spain	106.79
84	Latvia[1]	106.91
85	Norway	108.16
86	Denmark	109.44
87	Nigeria	112.77
88	Italy	112.84
89	Kuwait	113.20
90	Morocco	122.90
91	Burkina Faso	124.06
92	Ireland	124.88
93	Portugal	127.49
94	Chile	131.80
95	Slovenia	134.89
96	Ecuador	137.98
97	Guatemala	138.08
98	Mali	141.53
99	Lithuania	141.64
100	Cyprus[2]	146.43
101	Paraguay	147.22
102	Cambodia	148.05
103	Croatia	150.86
104	Serbia	150.93
105	Cameroon	159.82
106	Azerbaijan	160.05
107	Poland[1]	160.15
108	Mexico	165.74
109	Uganda	176.98
110	Austria	186.94
111	Kazakhstan[2]	188.15
112	United Kingdom	189.01
113	Georgia	201.66
114	Kyrgyz Republic[2]	223.52
115	Egypt[2]	228.82
116	Peru	235.03
117	Nicaragua	235.16
118	Thailand	238.14
119	Hungary	245.99
120	Chad[1]	248.03
121	Albania	282.13
122	Sri Lanka	291.77
123	Japan	331.60
124	Russian Federation	400.89
125	Benin	410.60
n/a	China	n/a
n/a	Indonesia	n/a
n/a	Malawi	n/a
n/a	Puerto Rico	n/a
n/a	Suriname	n/a
n/a	Taiwan, China	n/a
n/a	Tajikistan	n/a
n/a	Zimbabwe	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved January 14, 2010); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

[1] 2006 [2] 2007

4.05 Residential monthly telephone subscription (hard data)

Residential monthly telephone subscription (PPP $) | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Burundi[1]	1.21
2	Mongolia[1]	1.33
3	Syria[1]	1.88
4	Libya[1]	2.06
5	Ethiopia	2.20
6	United Arab Emirates	2.89
7	Bangladesh	3.15
8	Algeria	3.69
9	Bahrain	3.92
10	Gambia, The[2]	3.92
11	Azerbaijan	4.00
12	Guyana	4.11
13	Kyrgyz Republic[2]	4.13
14	Kazakhstan[2]	4.28
15	Vietnam	4.38
16	Tunisia	4.45
17	Georgia	4.48
18	Malta[2]	4.77
19	China	5.26
20	Colombia	5.48
21	Egypt[2]	5.55
22	Ghana[2]	5.57
23	Armenia	5.64
24	Albania	5.64
25	Ukraine	5.78
26	Indonesia	5.93
27	Thailand	5.98
28	Zambia	6.38
29	Mauritius	6.44
30	Pakistan	6.45
31	Costa Rica	6.78
32	Venezuela	6.86
33	Korea, Rep.	6.90
34	Serbia	6.95
35	Sri Lanka	7.19
36	Nepal	7.22
37	Argentina	7.32
38	Malaysia	7.67
39	India	7.68
40	Kuwait	8.09
41	Singapore	8.26
42	Finland	8.37
43	Latvia	8.44
44	Nigeria	8.77
45	Nicaragua	8.94
46	Puerto Rico[2]	8.95
47	Paraguay	9.25
48	Mali	9.72
49	Guatemala	9.90
50	United States	10.00
51	Hong Kong SAR	10.05
52	Saudi Arabia	10.09
53	Qatar[2]	10.14
54	Mauritania[2]	10.93
55	Tanzania	10.94
56	Estonia	10.99
57	Panama	11.53
58	Israel[1]	11.58
59	Benin	11.82
60	Slovak Republic	11.83
61	Lesotho	11.95
62	Cameroon	11.99
63	Jordan	12.05
64	Bosnia and Herzegovina	12.18
65	Namibia	12.34
66	Burkina Faso	12.41
67	Brunei Darussalam	12.48
68	Iceland	12.69
69	Uruguay	12.71
70	Kenya	12.83
71	Ecuador[2]	12.98
72	Lithuania	13.03
73	Australia	13.20
74	Jamaica	13.22
75	Sweden	13.62
76	Denmark	13.71
77	Turkey	14.08
78	Russian Federation	14.60
79	Uganda	14.75
80	Honduras[2]	14.93
81	Japan	15.32
82	Switzerland	15.49
83	Madagascar	15.70
84	Senegal	16.46
85	Chad[1]	16.54
86	Slovenia	16.84
87	Montenegro	16.94
88	Italy	17.13
89	France	17.34
90	Norway	17.37
91	Romania	17.49
92	El Salvador	17.71
93	United Kingdom	17.77
94	Austria	17.89
95	Croatia	18.10
96	Mozambique[2]	18.53
97	Luxembourg	19.04
98	Germany	19.19
99	Bulgaria	19.54
100	Dominican Republic	19.89
101	Greece	19.99
102	Belgium	19.99
103	Cambodia	20.73
104	Netherlands	21.12
105	Trinidad and Tobago	22.03
106	Portugal	22.47
107	Mexico	22.96
108	Côte d'Ivoire	22.96
109	Cyprus[2]	23.36
110	Oman	23.41
111	Botswana	23.77
112	Spain	24.03
113	Macedonia, FYR	24.16
114	Morocco	24.58
115	Hungary	25.51
116	Poland	25.80
117	Philippines	25.86
118	Ireland	25.97
119	Barbados	26.27
120	Peru	26.33
121	South Africa	26.74
122	Canada	26.78
123	Brazil	27.02
124	Timor-Leste[2]	27.75
125	New Zealand	27.82
126	Czech Republic	28.13
127	Chile	30.85
128	Bolivia	51.49
n/a	Malawi	n/a
n/a	Suriname	n/a
n/a	Taiwan, China	n/a
n/a	Tajikistan	n/a
n/a	Zimbabwe	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved January 4, 2010); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

[1] 2006 [2] 2007

4.06 Fixed broadband tariffs (hard data)

Fixed broadband tariffs, residential monthly fee (PPP $) | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Serbia	14.74
2	United States	14.95
3	India	16.40
4	Canada	16.50
5	Denmark	17.36
6	Taiwan, China	17.63
7	Italy	19.51
8	Trinidad and Tobago	19.58
9	Switzerland	20.57
10	Australia	20.98
11	Russian Federation	21.08
12	Sweden	22.04
13	Malta	22.14
14	Lithuania	22.20
15	Belgium	22.34
16	United Kingdom	22.51
17	Greece	23.22
18	Egypt	24.39
19	Bosnia and Herzegovina	24.74
20	Croatia	24.78
21	Ireland	25.20
22	Finland	25.21
23	Spain	25.43
24	Cyprus	25.50
25	Tunisia	25.72
26	New Zealand	25.87
27	Korea, Rep.	26.62
28	France	27.42
29	Slovenia	27.77
30	Romania	27.87
31	Japan	28.04
32	Netherlands	28.21
33	Germany	28.25
34	Portugal	28.42
35	Panama	28.81
36	Singapore	28.97
37	Hungary	29.54
38	Macedonia, FYR	30.21
39	Bulgaria	30.55
40	Algeria	30.76
41	Poland	31.00
42	Morocco	31.12
43	Luxembourg	31.39
44	Costa Rica	31.56
45	United Arab Emirates	32.40
46	Montenegro	33.02
47	Czech Republic	33.27
48	Norway	33.54
49	Uruguay	33.72
50	Latvia	33.99
51	El Salvador	34.50
52	Slovak Republic	34.96
53	Hong Kong SAR	35.99
54	Thailand	36.12
55	China	36.76
56	Malaysia	37.74
57	Iceland	38.74
58	Bahrain	40.20
59	Indonesia	42.51
60	Philippines	45.01
61	Ukraine	45.21
62	Venezuela	45.83
63	Austria	45.95
64	Estonia	46.31
65	South Africa	47.15
66	Senegal	48.37
67	Dominican Republic	50.80
68	Oman	51.64
69	Jamaica	52.40
70	Albania	53.10
71	Vietnam	53.23
72	Sri Lanka	53.41
73	Mexico	53.61
74	Jordan	54.70
75	Pakistan	56.46
76	Brazil	56.50
77	Saudi Arabia	57.73
78	Kuwait	58.05
79	Colombia	59.88
80	Nepal	60.55
81	Guatemala	61.10
82	Botswana	65.26
83	Armenia	65.51
84	Paraguay	65.69
85	Chile	67.24
86	Peru	67.33
87	Côte d'Ivoire	68.75
88	Argentina	76.66
89	Namibia	78.82
90	Nicaragua	79.64
91	Barbados	80.05
92	Georgia	84.47
93	Mauritius	88.24
94	Ecuador	89.11
95	Bolivia	95.25
96	Lesotho	101.51
97	Mali	101.59
98	Guyana	105.15
99	Syria	114.28
100	Ghana	114.72
101	Zambia	116.10
102	Mauritania	127.11
103	Suriname	153.04
104	Bangladesh	155.05
105	Azerbaijan	167.29
106	Tanzania	194.05
107	Mozambique	203.79
108	Benin	204.91
109	Madagascar	262.44
110	Cambodia	271.77
111	Cameroon	314.36
112	Kenya	318.64
113	Uganda	412.86
114	Gambia, The	1,051.76
115	Nigeria	1,122.93
116	Ethiopia	2,198.03
117	Malawi	2,674.25
118	Burkina Faso	4,098.47
n/a	Brunei Darussalam	n/a
n/a	Burundi	n/a
n/a	Chad	n/a
n/a	Honduras	n/a
n/a	Israel	n/a
n/a	Kazakhstan	n/a
n/a	Kyrgyz Republic	n/a
n/a	Libya	n/a
n/a	Mongolia	n/a
n/a	Puerto Rico	n/a
n/a	Qatar	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a
n/a	Turkey	n/a
n/a	Zimbabwe	n/a

SOURCE: International Telecommunication Union, *Measuring the Information Society 2009*

4.07 Mobile cellular tariffs (hard data)

Average per-minute cost of different types of mobile cellular calls (PPP $) | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Hong Kong SAR	0.03
2	Thailand	0.03
3	India	0.07
4	Denmark	0.07
5	Sweden	0.08
6	Bangladesh	0.08
7	Norway	0.10
8	Pakistan	0.11
9	Costa Rica	0.11
10	United Arab Emirates	0.12
11	Sri Lanka	0.13
12	Guatemala	0.14
13	Singapore	0.15
14	Nepal	0.16
15	Finland	0.16
16	Jordan	0.17
17	China	0.17
18	Germany	0.18
19	Serbia	0.18
20	Cyprus	0.18
21	Netherlands	0.19
22	Iceland	0.19
23	Latvia	0.20
24	Mauritius	0.20
25	Kuwait	0.20
26	Italy	0.21
27	Bahrain	0.22
28	Egypt	0.23
29	Panama	0.23
30	Oman	0.24
31	Malaysia	0.24
32	Montenegro	0.24
33	Luxembourg	0.25
34	United States	0.25
35	Indonesia	0.26
36	Malta	0.26
37	Ghana	0.26
38	Ireland	0.27
39	Philippines	0.27
40	Saudi Arabia	0.27
41	Algeria	0.28
42	Slovenia	0.28
43	Lithuania	0.29
44	United Kingdom	0.30
45	Ethiopia	0.30
46	Armenia	0.31
47	Poland	0.31
48	Jamaica	0.32
49	Peru	0.32
50	Syria	0.32
51	Belgium	0.32
52	Trinidad and Tobago	0.33
53	Paraguay	0.33
54	Russian Federation	0.33
55	Romania	0.33
56	Canada	0.33
57	Suriname	0.33
58	Bosnia and Herzegovina	0.34
59	Estonia	0.34
60	Colombia	0.35
61	Georgia	0.35
62	Senegal	0.35
63	Austria	0.36
64	Cambodia	0.37
65	Tunisia	0.37
66	Vietnam	0.37
67	Ukraine	0.38
68	Chile	0.38
69	Guyana	0.39
70	Czech Republic	0.41
71	Dominican Republic	0.42
72	Gambia, The	0.42
73	Ecuador	0.44
74	Barbados	0.44
75	Mali	0.45
76	Australia	0.46
77	Uruguay	0.46
78	Côte d'Ivoire	0.47
79	Mexico	0.48
80	Zambia	0.48
81	Korea, Rep.	0.50
82	Greece	0.50
83	El Salvador	0.50
84	Switzerland	0.51
85	Nigeria	0.53
86	Hungary	0.54
87	Lesotho	0.54
88	Croatia	0.54
89	Uganda	0.55
90	Taiwan, China	0.56
91	Slovak Republic	0.57
92	New Zealand	0.58
93	Argentina	0.58
94	Mauritania	0.58
95	Bolivia	0.58
96	Mozambique	0.60
97	France	0.61
98	Botswana	0.61
99	South Africa	0.61
100	Kenya	0.65
101	Namibia	0.66
102	Portugal	0.67
103	Cameroon	0.67
104	Spain	0.71
105	Madagascar	0.73
106	Japan	0.75
107	Macedonia, FYR	0.76
108	Benin	0.77
109	Azerbaijan	0.79
110	Albania	0.80
111	Bulgaria	0.81
112	Morocco	0.81
113	Nicaragua	0.84
114	Tanzania	0.88
115	Venezuela	0.90
116	Burkina Faso	0.91
117	Malawi	0.93
118	Brazil	0.99
n/a	Brunei Darussalam	n/a
n/a	Burundi	n/a
n/a	Chad	n/a
n/a	Honduras	n/a
n/a	Israel	n/a
n/a	Kazakhstan	n/a
n/a	Kyrgyz Republic	n/a
n/a	Libya	n/a
n/a	Mongolia	n/a
n/a	Puerto Rico	n/a
n/a	Qatar	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a
n/a	Turkey	n/a
n/a	Zimbabwe	n/a

SOURCE: Authors' calculations based on International Telecommunication Union, *Measuring the Information Society 2009*

4.08 Fixed telephone tariffs (hard data)

Fixed telephone tariffs for a 3-minute local call during peak hours (PPP $) | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Barbados	0.00
1	Brazil	0.00
1	Canada	0.00
1	Hong Kong SAR	0.00
1	Kuwait	0.00
1	New Zealand	0.00
1	Philippines	0.00
8	Guyana	0.01
9	Ecuador	0.02
10	Bangladesh	0.02
11	Montenegro	0.03
12	Syria	0.03
13	Serbia	0.04
14	Singapore	0.04
15	Costa Rica	0.04
16	Argentina	0.05
17	Tunisia	0.05
18	Korea, Rep.	0.05
19	India	0.05
20	Russian Federation	0.05
21	Iceland	0.06
22	China	0.06
23	Saudi Arabia	0.06
24	Nepal	0.06
25	Ukraine	0.06
26	United Arab Emirates	0.06
27	Egypt	0.07
28	Malta	0.07
29	Benin	0.07
30	Malaysia	0.07
31	Vietnam	0.07
32	Japan	0.07
33	Ethiopia	0.07
34	Jamaica	0.07
35	Venezuela	0.07
36	Sweden	0.08
37	Indonesia	0.08
38	Bahrain	0.08
39	Armenia	0.08
40	Suriname	0.08
41	Albania	0.08
42	Denmark	0.09
43	Taiwan, China	0.09
44	Cambodia	0.09
45	Pakistan	0.09
46	Spain	0.10
47	Luxembourg	0.10
48	Netherlands	0.10
49	Romania	0.11
50	Peru	0.11
51	Jordan	0.11
52	Ireland	0.11
53	Cyprus	0.12
54	Nicaragua	0.12
55	Greece	0.13
56	Mauritius	0.13
57	Slovenia	0.13
58	Portugal	0.13
59	Germany	0.14
60	El Salvador	0.14
61	Italy	0.14
62	Switzerland	0.15
63	Finland	0.15
64	Bosnia and Herzegovina	0.15
65	Norway	0.15
66	Guatemala	0.16
67	Algeria	0.17
68	Austria	0.17
69	Paraguay	0.17
70	Estonia	0.18
71	Dominican Republic	0.18
72	France	0.18
73	Panama	0.18
74	United Kingdom	0.18
75	Macedonia, FYR	0.18
76	Thailand	0.18
77	Trinidad and Tobago	0.19
78	Chile	0.19
79	Sri Lanka	0.20
80	Bulgaria	0.20
81	Bolivia	0.21
82	Australia	0.21
83	Croatia	0.21
84	Mali	0.22
85	Colombia	0.22
86	Uruguay	0.23
87	Latvia	0.24
88	Gambia, The	0.24
89	Azerbaijan	0.24
90	United States	0.24
91	Kenya	0.25
92	Belgium	0.25
93	Nigeria	0.25
94	Ghana	0.26
95	Lithuania	0.31
96	Poland	0.31
97	Malawi	0.31
98	Czech Republic	0.33
99	Hungary	0.33
100	Mexico	0.36
101	Senegal	0.38
102	Burkina Faso	0.38
103	Namibia	0.42
104	Morocco	0.42
105	Botswana	0.42
106	South Africa	0.43
107	Lesotho	0.46
108	Mauritania	0.51
109	Georgia	0.54
110	Cameroon	0.60
111	Côte d'Ivoire	0.62
112	Uganda	0.70
113	Tanzania	0.73
114	Mozambique	0.76
115	Slovak Republic	0.79
116	Madagascar	0.80
117	Zambia	1.07
118	Oman	1.08
n/a	Brunei Darussalam	n/a
n/a	Burundi	n/a
n/a	Chad	n/a
n/a	Honduras	n/a
n/a	Israel	n/a
n/a	Kazakhstan	n/a
n/a	Kyrgyz Republic	n/a
n/a	Libya	n/a
n/a	Mongolia	n/a
n/a	Puerto Rico	n/a
n/a	Qatar	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a
n/a	Turkey	n/a
n/a	Zimbabwe	n/a

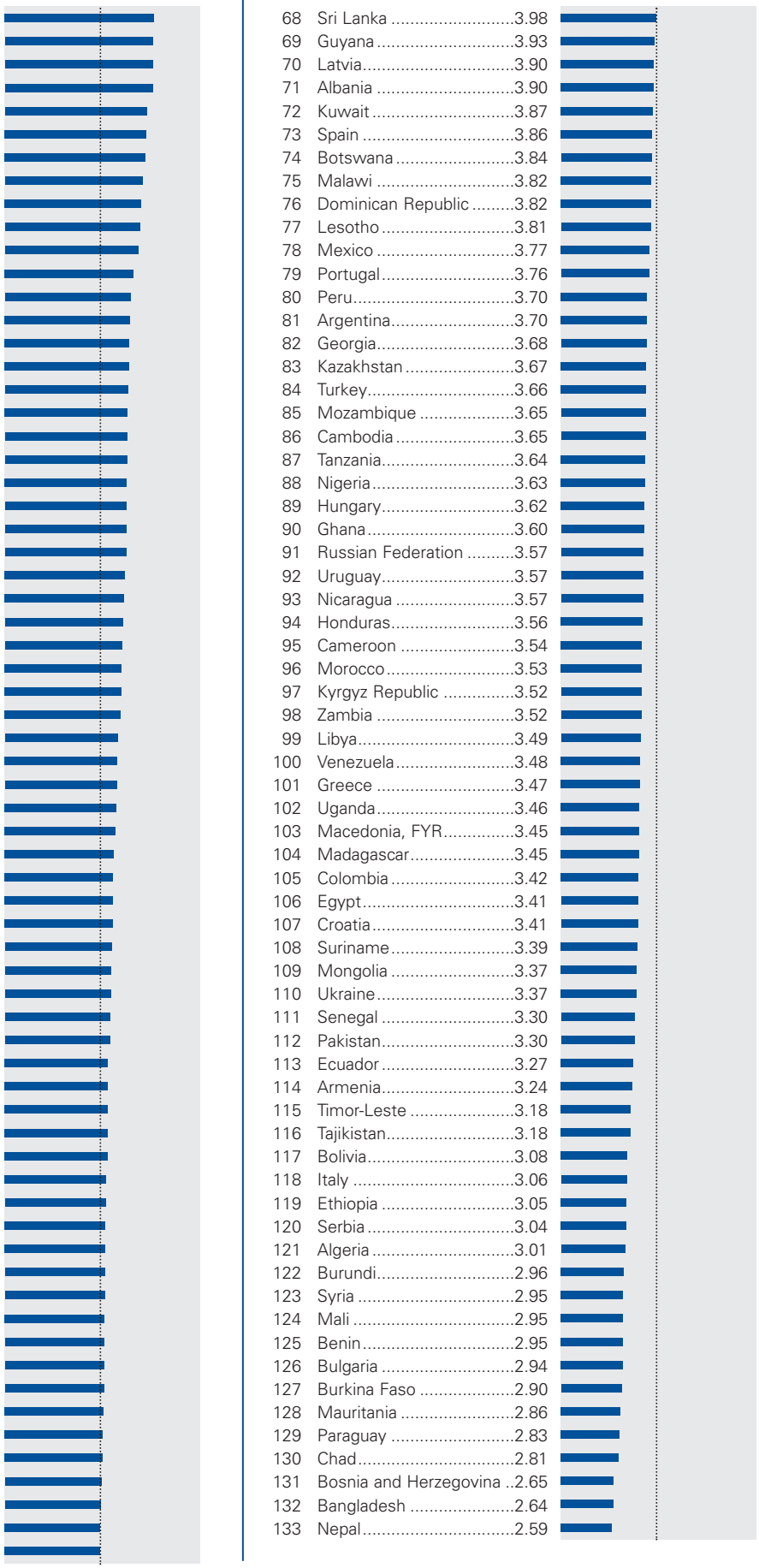
SOURCE: International Telecommunication Union, *Measuring the Information Society 2009*

5th pillar
Business readiness

5.01 Extent of staff training

To what extent do companies in your country invest in training and employee development? (1 = hardly at all; 7 = to a great extent) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Sweden	5.68
2	Singapore	5.63
3	Switzerland	5.63
4	Denmark	5.63
5	Japan	5.45
6	Luxembourg	5.43
7	Norway	5.41
8	United States	5.31
9	Finland	5.27
10	Netherlands	5.23
11	Germany	5.18
12	Canada	5.03
13	Belgium	4.94
14	Iceland	4.92
15	Ireland	4.89
16	Malaysia	4.89
17	France	4.86
18	Australia	4.84
19	Taiwan, China	4.83
20	New Zealand	4.83
21	South Africa	4.81
22	Puerto Rico	4.80
23	Qatar	4.80
24	Austria	4.80
25	Hong Kong SAR	4.77
26	United Kingdom	4.73
27	Costa Rica	4.70
28	Czech Republic	4.67
29	Korea, Rep.	4.66
30	United Arab Emirates	4.65
31	Tunisia	4.62
32	Azerbaijan	4.53
33	Indonesia	4.52
34	India	4.51
35	Israel	4.49
36	Bahrain	4.47
37	Barbados	4.42
38	Philippines	4.38
39	Chile	4.38
40	Estonia	4.38
41	Gambia, The	4.35
42	Slovenia	4.32
43	Cyprus	4.32
44	Mauritius	4.29
45	Saudi Arabia	4.29
46	Vietnam	4.23
47	Côte d'Ivoire	4.22
48	Kenya	4.22
49	Malta	4.22
50	China	4.22
51	Slovak Republic	4.17
52	Brazil	4.16
53	Oman	4.15
54	Brunei Darussalam	4.14
55	Trinidad and Tobago	4.13
56	El Salvador	4.13
57	Romania	4.12
58	Namibia	4.11
59	Panama	4.10
60	Lithuania	4.10
61	Jamaica	4.09
62	Thailand	4.06
63	Poland	4.06
64	Guatemala	4.02
65	Montenegro	4.00
66	Zimbabwe	3.99
67	Jordan	3.99
68	Sri Lanka	3.98
69	Guyana	3.93
70	Latvia	3.90
71	Albania	3.90
72	Kuwait	3.87
73	Spain	3.86
74	Botswana	3.84
75	Malawi	3.82
76	Dominican Republic	3.82
77	Lesotho	3.81
78	Mexico	3.77
79	Portugal	3.76
80	Peru	3.70
81	Argentina	3.70
82	Georgia	3.68
83	Kazakhstan	3.67
84	Turkey	3.66
85	Mozambique	3.65
86	Cambodia	3.65
87	Tanzania	3.64
88	Nigeria	3.63
89	Hungary	3.62
90	Ghana	3.60
91	Russian Federation	3.57
92	Uruguay	3.57
93	Nicaragua	3.57
94	Honduras	3.56
95	Cameroon	3.54
96	Morocco	3.53
97	Kyrgyz Republic	3.52
98	Zambia	3.52
99	Libya	3.49
100	Venezuela	3.48
101	Greece	3.47
102	Uganda	3.46
103	Macedonia, FYR	3.45
104	Madagascar	3.45
105	Colombia	3.42
106	Egypt	3.41
107	Croatia	3.41
108	Suriname	3.39
109	Mongolia	3.37
110	Ukraine	3.37
111	Senegal	3.30
112	Pakistan	3.30
113	Ecuador	3.27
114	Armenia	3.24
115	Timor-Leste	3.18
116	Tajikistan	3.18
117	Bolivia	3.08
118	Italy	3.06
119	Ethiopia	3.05
120	Serbia	3.04
121	Algeria	3.01
122	Burundi	2.96
123	Syria	2.95
124	Mali	2.95
125	Benin	2.95
126	Bulgaria	2.94
127	Burkina Faso	2.90
128	Mauritania	2.86
129	Paraguay	2.83
130	Chad	2.81
131	Bosnia and Herzegovina	2.65
132	Bangladesh	2.64
133	Nepal	2.59

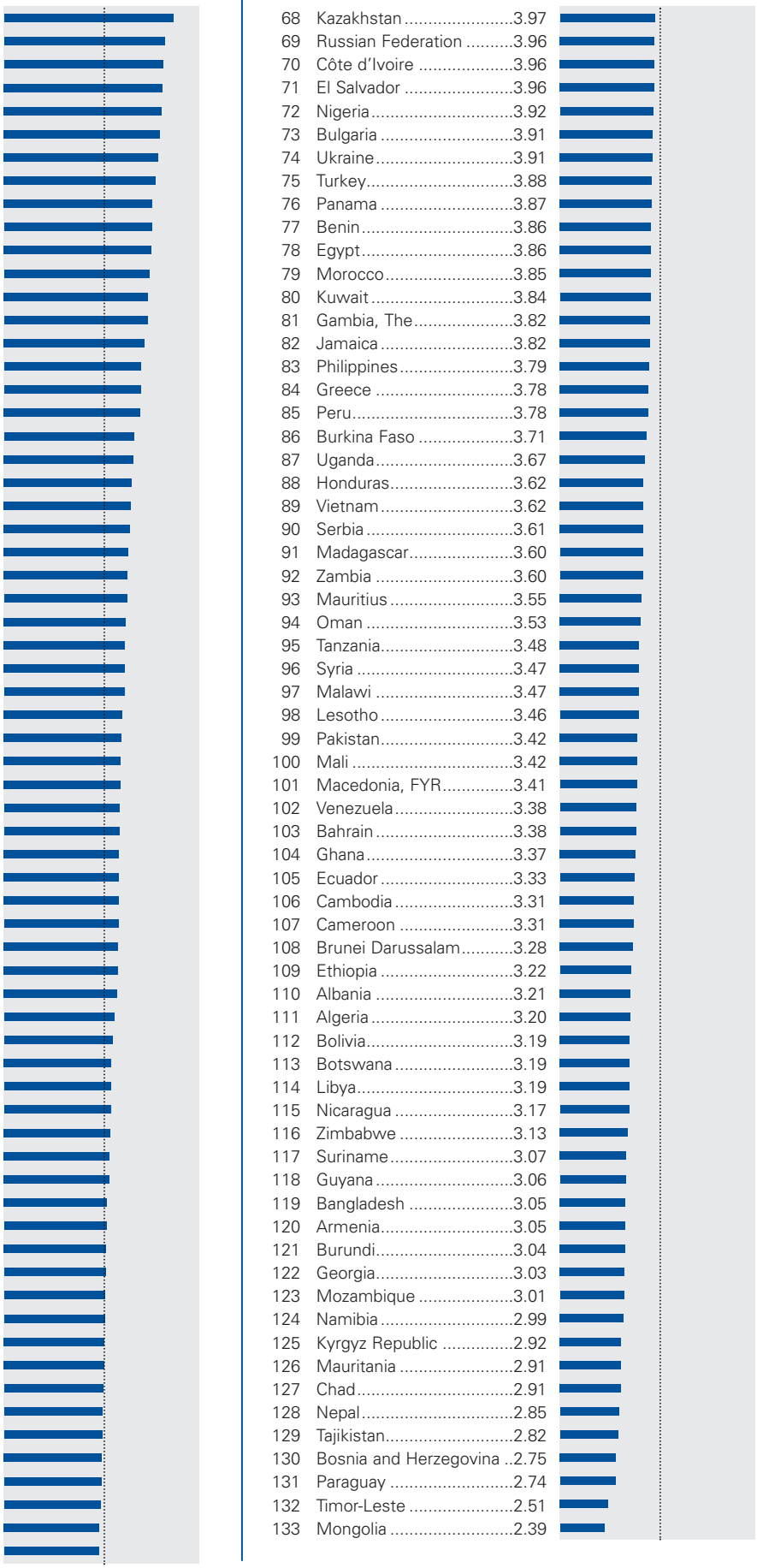


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.02 Local availability of specialized research and training services

In your country, to what extent are high-quality, specialized training services available? (1 = not available; 7 = widely available) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Switzerland	6.30
2	Germany	6.03
3	United States	5.98
4	Netherlands	5.97
5	Finland	5.94
6	Denmark	5.89
7	Sweden	5.84
8	France	5.75
9	United Kingdom	5.64
10	Belgium	5.63
11	Canada	5.62
12	Austria	5.55
13	Japan	5.51
14	Singapore	5.50
15	Norway	5.40
16	Czech Republic	5.29
17	Australia	5.28
18	Iceland	5.27
19	New Zealand	5.07
20	Hong Kong SAR	5.05
21	United Arab Emirates	5.01
22	Taiwan, China	4.97
23	Puerto Rico	4.95
24	Estonia	4.89
25	Ireland	4.87
26	Malaysia	4.85
27	Spain	4.82
28	Israel	4.79
29	Brazil	4.79
30	Poland	4.78
31	Slovenia	4.71
32	India	4.68
33	Tunisia	4.65
34	Portugal	4.65
35	Korea, Rep.	4.61
36	Senegal	4.61
37	Costa Rica	4.60
38	Luxembourg	4.60
39	Cyprus	4.60
40	South Africa	4.59
41	Chile	4.58
42	Saudi Arabia	4.58
43	Italy	4.54
44	Jordan	4.45
45	Kenya	4.40
46	Sri Lanka	4.36
47	China	4.35
48	Indonesia	4.35
49	Hungary	4.33
50	Slovak Republic	4.31
51	Lithuania	4.30
52	Qatar	4.22
53	Mexico	4.21
54	Croatia	4.20
55	Guatemala	4.19
56	Uruguay	4.16
57	Argentina	4.16
58	Malta	4.14
59	Colombia	4.14
60	Azerbaijan	4.11
61	Thailand	4.08
62	Barbados	4.08
63	Dominican Republic	4.06
64	Montenegro	4.05
65	Trinidad and Tobago	4.03
66	Latvia	3.99
67	Romania	3.97
68	Kazakhstan	3.97
69	Russian Federation	3.96
70	Côte d'Ivoire	3.96
71	El Salvador	3.96
72	Nigeria	3.92
73	Bulgaria	3.91
74	Ukraine	3.91
75	Turkey	3.88
76	Panama	3.87
77	Benin	3.86
78	Egypt	3.86
79	Morocco	3.85
80	Kuwait	3.84
81	Gambia, The	3.82
82	Jamaica	3.82
83	Philippines	3.79
84	Greece	3.78
85	Peru	3.78
86	Burkina Faso	3.71
87	Uganda	3.67
88	Honduras	3.62
89	Vietnam	3.62
90	Serbia	3.61
91	Madagascar	3.60
92	Zambia	3.60
93	Mauritius	3.55
94	Oman	3.53
95	Tanzania	3.48
96	Syria	3.47
97	Malawi	3.47
98	Lesotho	3.46
99	Pakistan	3.42
100	Mali	3.42
101	Macedonia, FYR	3.41
102	Venezuela	3.38
103	Bahrain	3.38
104	Ghana	3.37
105	Ecuador	3.33
106	Cambodia	3.31
107	Cameroon	3.31
108	Brunei Darussalam	3.28
109	Ethiopia	3.22
110	Albania	3.21
111	Algeria	3.20
112	Bolivia	3.19
113	Botswana	3.19
114	Libya	3.19
115	Nicaragua	3.17
116	Zimbabwe	3.13
117	Suriname	3.07
118	Guyana	3.06
119	Bangladesh	3.05
120	Armenia	3.05
121	Burundi	3.04
122	Georgia	3.03
123	Mozambique	3.01
124	Namibia	2.99
125	Kyrgyz Republic	2.92
126	Mauritania	2.91
127	Chad	2.91
128	Nepal	2.85
129	Tajikistan	2.82
130	Bosnia and Herzegovina	2.75
131	Paraguay	2.74
132	Timor-Leste	2.51
133	Mongolia	2.39

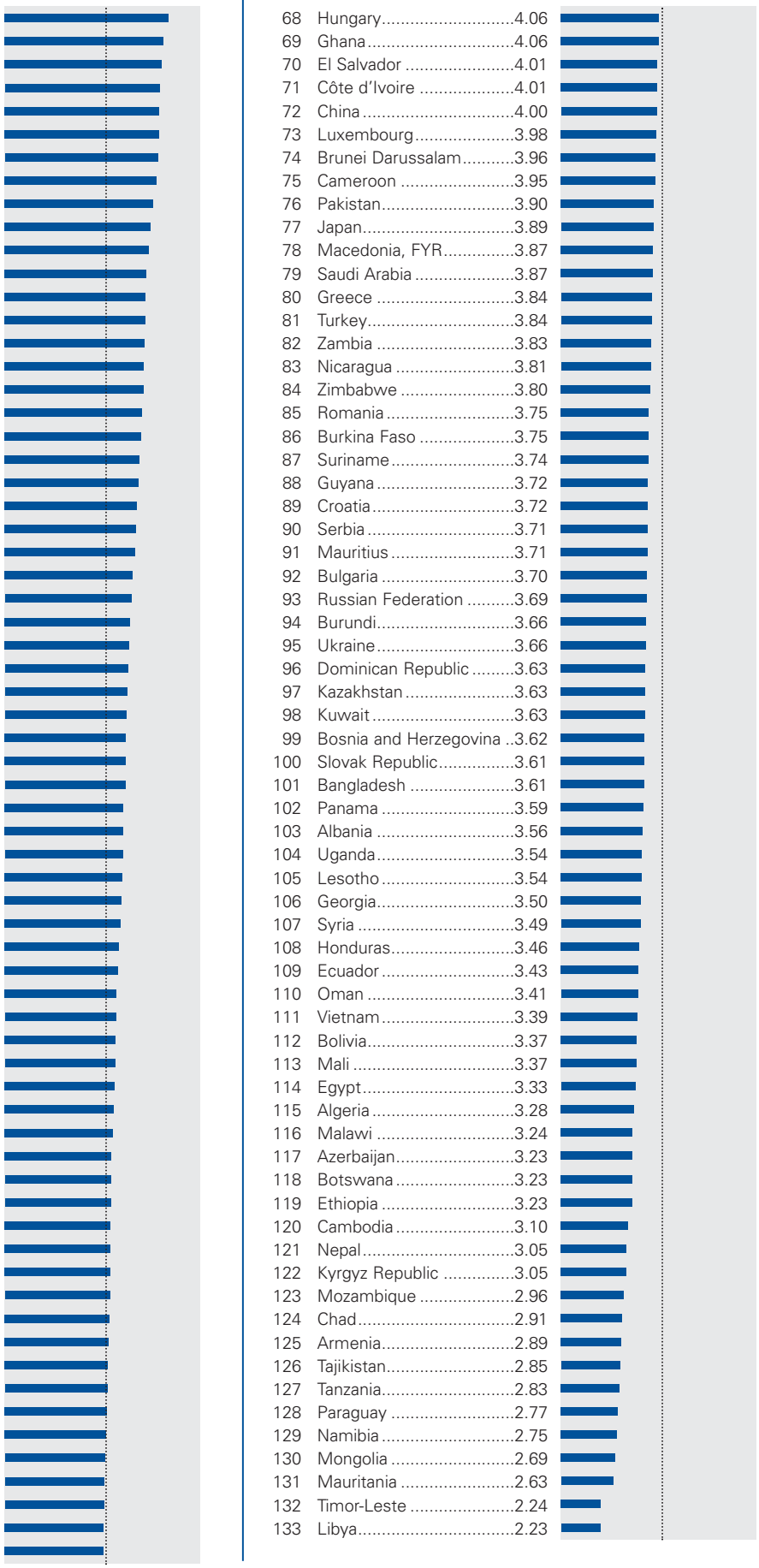


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.03 Quality of management schools

How would you assess the quality of management or business schools in your country? (1 = poor; 7 = excellent—among the best in the world) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Switzerland	6.13
2	Canada	5.97
3	France	5.92
4	United States	5.85
5	Singapore	5.84
6	Spain	5.83
7	Belgium	5.79
8	Qatar	5.76
9	Denmark	5.64
10	Iceland	5.56
11	Netherlands	5.51
12	Finland	5.44
13	Costa Rica	5.41
14	Sweden	5.40
15	India	5.38
16	United Kingdom	5.36
17	Chile	5.35
18	Australia	5.30
19	Ireland	5.27
20	New Zealand	5.22
21	Norway	5.19
22	United Arab Emirates	5.13
23	Argentina	5.11
24	Austria	5.09
25	Tunisia	5.00
26	Germany	4.96
27	Barbados	4.93
28	Hong Kong SAR	4.90
29	Senegal	4.86
30	South Africa	4.83
31	Taiwan, China	4.80
32	Cyprus	4.79
33	Trinidad and Tobago	4.79
34	Malaysia	4.78
35	Estonia	4.71
36	Czech Republic	4.71
37	Slovenia	4.70
38	Portugal	4.68
39	Philippines	4.66
40	Sri Lanka	4.63
41	Bahrain	4.57
42	Malta	4.54
43	Uruguay	4.50
44	Korea, Rep.	4.48
45	Poland	4.47
46	Italy	4.45
47	Kenya	4.44
48	Guatemala	4.42
49	Mexico	4.39
50	Latvia	4.34
51	Indonesia	4.32
52	Morocco	4.32
53	Jordan	4.31
54	Peru	4.30
55	Puerto Rico	4.30
56	Benin	4.29
57	Venezuela	4.28
58	Gambia, The	4.25
59	Thailand	4.22
60	Lithuania	4.21
61	Colombia	4.20
62	Madagascar	4.18
63	Nigeria	4.13
64	Montenegro	4.11
65	Israel	4.10
66	Brazil	4.09
67	Jamaica	4.09
68	Hungary	4.06
69	Ghana	4.06
70	El Salvador	4.01
71	Côte d'Ivoire	4.01
72	China	4.00
73	Luxembourg	3.98
74	Brunei Darussalam	3.96
75	Cameroon	3.95
76	Pakistan	3.90
77	Japan	3.89
78	Macedonia, FYR	3.87
79	Saudi Arabia	3.87
80	Greece	3.84
81	Turkey	3.84
82	Zambia	3.83
83	Nicaragua	3.81
84	Zimbabwe	3.80
85	Romania	3.75
86	Burkina Faso	3.75
87	Suriname	3.74
88	Guyana	3.72
89	Croatia	3.72
90	Serbia	3.71
91	Mauritius	3.71
92	Bulgaria	3.70
93	Russian Federation	3.69
94	Burundi	3.66
95	Ukraine	3.66
96	Dominican Republic	3.63
97	Kazakhstan	3.63
98	Kuwait	3.63
99	Bosnia and Herzegovina	3.62
100	Slovak Republic	3.61
101	Bangladesh	3.61
102	Panama	3.59
103	Albania	3.56
104	Uganda	3.54
105	Lesotho	3.54
106	Georgia	3.50
107	Syria	3.49
108	Honduras	3.46
109	Ecuador	3.43
110	Oman	3.41
111	Vietnam	3.39
112	Bolivia	3.37
113	Mali	3.37
114	Egypt	3.33
115	Algeria	3.28
116	Malawi	3.24
117	Azerbaijan	3.23
118	Botswana	3.23
119	Ethiopia	3.23
120	Cambodia	3.10
121	Nepal	3.05
122	Kyrgyz Republic	3.05
123	Mozambique	2.96
124	Chad	2.91
125	Armenia	2.89
126	Tajikistan	2.85
127	Tanzania	2.83
128	Paraguay	2.77
129	Namibia	2.75
130	Mongolia	2.69
131	Mauritania	2.63
132	Timor-Leste	2.24
133	Libya	2.23

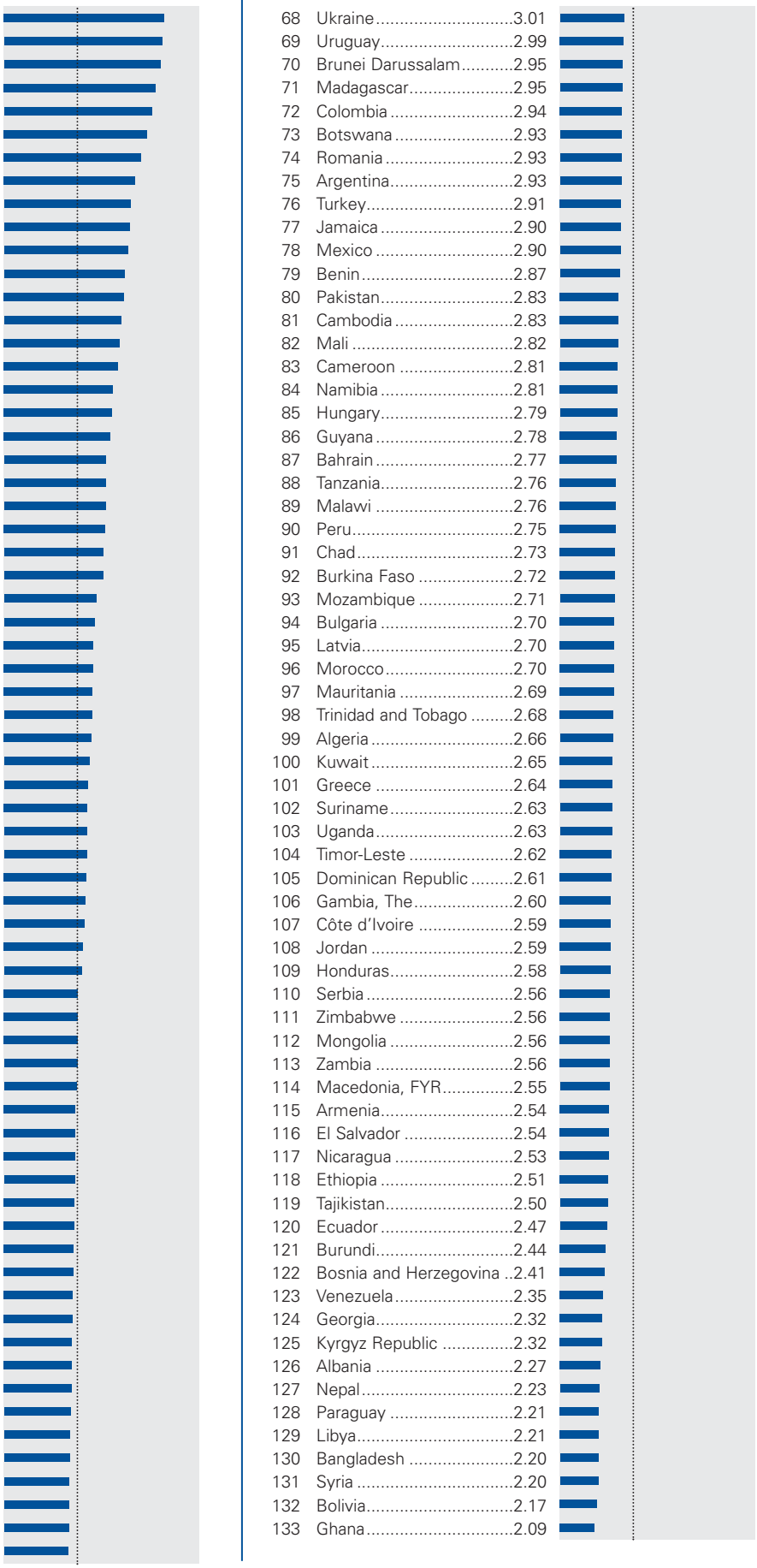


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.04 Company spending on R&D

To what extent do companies in your country spend on research and development (R&D)? (1 = do not spend on R&D; 7 = spend heavily on R&D) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Switzerland	6.02
2	Japan	5.95
3	Sweden	5.90
4	Germany	5.76
5	United States	5.63
6	Denmark	5.48
7	Finland	5.30
8	Singapore	5.11
9	Taiwan, China	4.96
10	Korea, Rep.	4.94
11	Israel	4.88
12	Netherlands	4.78
13	France	4.76
14	United Kingdom	4.67
15	Belgium	4.63
16	Luxembourg	4.58
17	Austria	4.42
18	Norway	4.39
19	Malaysia	4.34
20	Australia	4.18
21	Ireland	4.18
22	Canada	4.18
23	China	4.17
24	Iceland	4.10
25	Czech Republic	4.10
26	Slovenia	3.89
27	Vietnam	3.84
28	Indonesia	3.79
29	Brazil	3.79
30	United Arab Emirates	3.77
31	New Zealand	3.76
32	Costa Rica	3.75
33	Hong Kong SAR	3.68
34	Saudi Arabia	3.62
35	South Africa	3.61
36	India	3.60
37	Kenya	3.59
38	Cyprus	3.58
39	Spain	3.55
40	Nigeria	3.52
41	Sri Lanka	3.47
42	Italy	3.44
43	Tunisia	3.31
44	Estonia	3.31
45	Portugal	3.31
46	Russian Federation	3.30
47	Thailand	3.27
48	Lesotho	3.24
49	Croatia	3.23
50	Puerto Rico	3.23
51	Panama	3.22
52	Lithuania	3.21
53	Malta	3.20
54	Egypt	3.18
55	Slovak Republic	3.18
56	Chile	3.16
57	Poland	3.16
58	Senegal	3.13
59	Montenegro	3.13
60	Kazakhstan	3.12
61	Philippines	3.08
62	Oman	3.06
63	Guatemala	3.06
64	Qatar	3.03
65	Azerbaijan	3.03
66	Mauritius	3.03
67	Barbados	3.01
68	Ukraine	3.01
69	Uruguay	2.99
70	Brunei Darussalam	2.95
71	Madagascar	2.95
72	Colombia	2.94
73	Botswana	2.93
74	Romania	2.93
75	Argentina	2.93
76	Turkey	2.91
77	Jamaica	2.90
78	Mexico	2.90
79	Benin	2.87
80	Pakistan	2.83
81	Cambodia	2.83
82	Mali	2.82
83	Cameroon	2.81
84	Namibia	2.81
85	Hungary	2.79
86	Guyana	2.78
87	Bahrain	2.77
88	Tanzania	2.76
89	Malawi	2.76
90	Peru	2.75
91	Chad	2.73
92	Burkina Faso	2.72
93	Mozambique	2.71
94	Bulgaria	2.70
95	Latvia	2.70
96	Morocco	2.70
97	Mauritania	2.69
98	Trinidad and Tobago	2.68
99	Algeria	2.66
100	Kuwait	2.65
101	Greece	2.64
102	Suriname	2.63
103	Uganda	2.63
104	Timor-Leste	2.62
105	Dominican Republic	2.61
106	Gambia, The	2.60
107	Côte d'Ivoire	2.59
108	Jordan	2.59
109	Honduras	2.58
110	Serbia	2.56
111	Zimbabwe	2.56
112	Mongolia	2.56
113	Zambia	2.56
114	Macedonia, FYR	2.55
115	Armenia	2.54
116	El Salvador	2.54
117	Nicaragua	2.53
118	Ethiopia	2.51
119	Tajikistan	2.50
120	Ecuador	2.47
121	Burundi	2.44
122	Bosnia and Herzegovina	2.41
123	Venezuela	2.35
124	Georgia	2.32
125	Kyrgyz Republic	2.32
126	Albania	2.27
127	Nepal	2.23
128	Paraguay	2.21
129	Libya	2.21
130	Bangladesh	2.20
131	Syria	2.20
132	Bolivia	2.17
133	Ghana	2.09

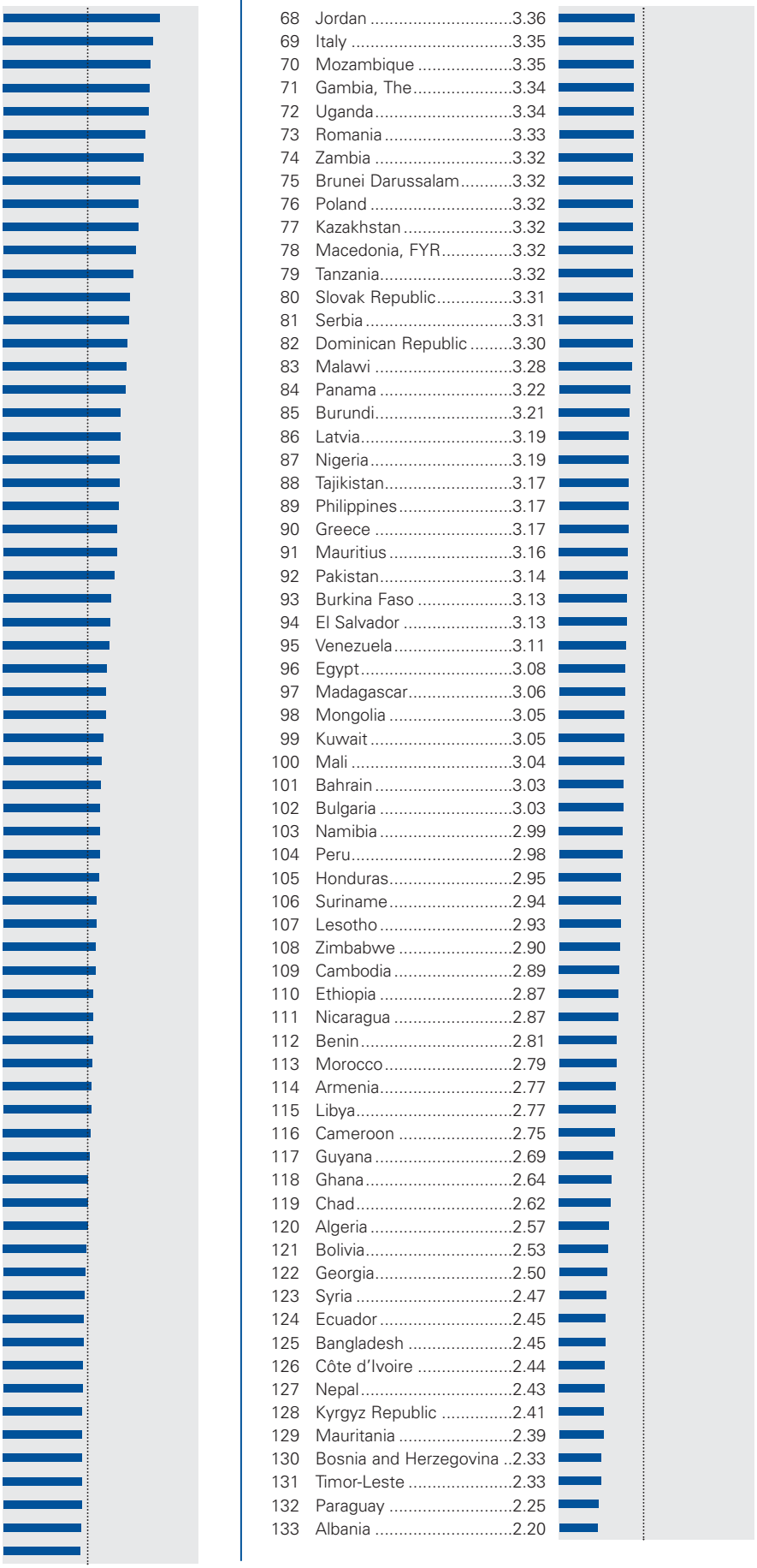


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.05 University-industry collaboration in R&D

To what extent do business and universities collaborate on research and development (R&D) in your country? (1 = do not collaborate at all; 7 = collaborate extensively) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	United States	5.90
2	Switzerland	5.70
3	Finland	5.62
4	Singapore	5.59
5	Sweden	5.55
6	Denmark	5.45
7	United Kingdom	5.41
8	Belgium	5.30
9	Canada	5.25
10	Germany	5.25
11	Netherlands	5.15
12	Taiwan, China	5.08
13	Ireland	4.96
14	Australia	4.94
15	Norway	4.90
16	Austria	4.87
17	Iceland	4.84
18	New Zealand	4.68
19	Luxembourg	4.68
20	Japan	4.65
21	Israel	4.65
22	Malaysia	4.63
23	China	4.57
24	Korea, Rep.	4.56
25	South Africa	4.48
26	Czech Republic	4.37
27	Hong Kong SAR	4.36
28	Puerto Rico	4.33
29	Costa Rica	4.25
30	Slovenia	4.22
31	Hungary	4.21
32	Estonia	4.13
33	Portugal	4.08
34	Brazil	4.06
35	Barbados	4.03
36	Colombia	4.02
37	Saudi Arabia	4.02
38	Qatar	4.00
39	United Arab Emirates	3.93
40	Kenya	3.92
41	Chile	3.91
42	France	3.91
43	Indonesia	3.83
44	Thailand	3.82
45	Lithuania	3.82
46	India	3.80
47	Cyprus	3.77
48	Russian Federation	3.76
49	Spain	3.74
50	Guatemala	3.71
51	Sri Lanka	3.67
52	Tunisia	3.66
53	Oman	3.65
54	Montenegro	3.61
55	Azerbaijan	3.57
56	Senegal	3.56
57	Malta	3.53
58	Botswana	3.53
59	Vietnam	3.50
60	Jamaica	3.49
61	Croatia	3.48
62	Mexico	3.48
63	Argentina	3.48
64	Ukraine	3.48
65	Trinidad and Tobago	3.46
66	Uruguay	3.43
67	Turkey	3.41
68	Jordan	3.36
69	Italy	3.35
70	Mozambique	3.35
71	Gambia, The	3.34
72	Uganda	3.34
73	Romania	3.33
74	Zambia	3.32
75	Brunei Darussalam	3.32
76	Poland	3.32
77	Kazakhstan	3.32
78	Macedonia, FYR	3.32
79	Tanzania	3.32
80	Slovak Republic	3.31
81	Serbia	3.31
82	Dominican Republic	3.30
83	Malawi	3.28
84	Panama	3.22
85	Burundi	3.21
86	Latvia	3.19
87	Nigeria	3.19
88	Tajikistan	3.17
89	Philippines	3.17
90	Greece	3.17
91	Mauritius	3.16
92	Pakistan	3.14
93	Burkina Faso	3.13
94	El Salvador	3.13
95	Venezuela	3.11
96	Egypt	3.08
97	Madagascar	3.06
98	Mongolia	3.05
99	Kuwait	3.05
100	Mali	3.04
101	Bahrain	3.03
102	Bulgaria	3.03
103	Namibia	2.99
104	Peru	2.98
105	Honduras	2.95
106	Suriname	2.94
107	Lesotho	2.93
108	Zimbabwe	2.90
109	Cambodia	2.89
110	Ethiopia	2.87
111	Nicaragua	2.87
112	Benin	2.81
113	Morocco	2.79
114	Armenia	2.77
115	Libya	2.77
116	Cameroon	2.75
117	Guyana	2.69
118	Ghana	2.64
119	Chad	2.62
120	Algeria	2.57
121	Bolivia	2.53
122	Georgia	2.50
123	Syria	2.47
124	Ecuador	2.45
125	Bangladesh	2.45
126	Côte d'Ivoire	2.44
127	Nepal	2.43
128	Kyrgyz Republic	2.41
129	Mauritania	2.39
130	Bosnia and Herzegovina	2.33
131	Timor-Leste	2.33
132	Paraguay	2.25
133	Albania	2.20



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.06 Business telephone connection charge (hard data)

One-time business telephone connection charge (PPP $) | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Hong Kong SAR	0.00
2	Turkey	7.46
3	India[2]	19.09
4	Iceland	23.07
5	Jamaica[1]	23.53
6	Guyana[2]	25.33
7	Malaysia[2]	27.96
8	Switzerland	28.10
9	Oman	29.64
10	Côte d'Ivoire	32.43
11	Tunisia	33.36
12	Montenegro	33.89
13	New Zealand	34.12
14	United Arab Emirates	34.64
15	Pakistan[2]	35.05
16	Senegal[2]	38.16
17	Mozambique[2]	40.21
18	Greece[2]	40.94
19	Czech Republic	41.40
20	Mauritania[2]	42.04
21	Tanzania	43.78
22	Australia[2]	44.13
23	Trinidad and Tobago[2]	47.44
24	Brunei Darussalam	48.01
25	Singapore[2]	49.07
26	Venezuela	49.76
27	Zambia[2]	51.89
28	Namibia[2]	55.49
29	France[2]	60.45
30	Qatar[2]	61.43
31	Colombia[2]	63.07
32	Romania	63.46
33	Luxembourg[1]	63.73
34	Costa Rica[2]	65.96
35	Israel[1]	68.40
36	Timor-Leste[2]	69.34
37	Slovak Republic[2]	69.58
38	Germany	69.87
39	Syria[1]	70.50
40	Bahrain[2]	71.94
41	United States[1]	72.26
42	Uruguay[2]	73.13
43	Barbados[2]	73.46
44	Algeria	73.74
45	Armenia	73.77
46	Belgium[2]	74.13
47	Macedonia, FYR	75.09
48	Madagascar	77.18
49	Brazil[2]	77.43
50	Nepal[2]	77.85
51	Panama[2]	78.11
52	Korea, Rep.	79.58
53	Spain[2]	80.34
54	Lesotho[2]	80.75
55	Dominican Republic[2]	82.01
56	Vietnam[1]	83.09
57	Kenya	87.14
58	Ghana[2]	89.19
59	South Africa[2]	89.63
60	Gambia, The[2]	90.88
61	Estonia[2]	93.93
62	Argentina[2]	96.55
63	Finland	99.15
64	El Salvador	99.88
65	Saudi Arabia	100.86
66	Sweden	101.33
67	Botswana	106.97
68	Bosnia and Herzegovina[2]	108.28
69	Norway[2]	109.41
70	Italy[2]	112.77
71	Honduras[2]	114.44
72	Bulgaria	118.95
73	Mongolia[1]	122.62
74	Burkina Faso	124.06
75	Ethiopia[1]	124.88
76	Ireland[2]	125.61
77	Nigeria[2]	126.27
78	Cyprus[2]	127.33
79	Portugal	127.47
80	Ecuador[2]	129.99
81	Slovenia	134.89
82	Lithuania	141.64
83	Mauritius	143.21
84	Croatia	150.86
85	Paraguay[2]	154.39
86	Mali[2]	157.34
87	Philippines[2]	157.38
88	Jordan	157.54
89	Poland[1]	160.15
90	United Kingdom	160.86
91	Mexico	165.74
92	Burundi[1]	172.82
93	Latvia[1]	183.28
94	Bolivia[2]	185.43
95	Guatemala[1]	186.83
96	Austria	186.94
97	Cambodia[2]	186.95
98	Malta[2]	192.01
99	Uganda[2]	192.89
100	Georgia[2]	217.15
101	Libya[1]	222.27
102	Azerbaijan	240.07
103	Bangladesh[2]	244.68
104	Morocco	245.81
105	Chad[1]	248.03
106	Kyrgyz Republic[2]	253.95
107	Hungary[2]	267.09
108	Albania	282.13
109	Peru	288.31
110	Kuwait[1]	309.10
111	Kazakhstan[2]	314.15
112	Serbia[2]	322.55
113	Japan	331.60
114	Ukraine[1]	356.64
115	Cameroon[2]	397.64
116	Nicaragua[2]	409.00
117	Egypt[2]	457.64
118	Sri Lanka[2]	468.54
119	Benin	746.78
n/a	Canada	n/a
n/a	Chile	n/a
n/a	China	n/a
n/a	Denmark	n/a
n/a	Indonesia	n/a
n/a	Malawi	n/a
n/a	Netherlands	n/a
n/a	Puerto Rico	n/a
n/a	Russian Federation	n/a
n/a	Suriname	n/a
n/a	Taiwan, China	n/a
n/a	Tajikistan	n/a
n/a	Thailand	n/a
n/a	Zimbabwe	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved January 14, 2010); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

[1] 2006 [2] 2007

5.07 Business monthly telephone subscription (hard data)

Business monthly telephone subscription (PPP $) | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Burundi[1]	1.21
2	Syria[1]	1.88
3	Serbia[2]	2.42
4	Bangladesh[2]	3.34
5	Algeria	3.69
6	Tunisia	4.45
7	Gambia, The[2]	4.57
8	China[2]	5.52
9	Ghana[2]	5.57
10	Vietnam[1]	5.61
11	Korea, Rep.	6.90
12	Ethiopia[1]	6.96
13	Georgia[2]	7.24
14	India[2]	7.64
15	Costa Rica[2]	7.67
16	Bahrain[1]	8.12
17	Pakistan[2]	8.13
18	Finland	8.37
19	Nepal[2]	8.65
20	Portugal	8.73
21	Colombia[2]	8.87
22	Egypt[2]	8.88
23	Kyrgyz Republic[2]	9.32
24	United Arab Emirates	9.62
25	Nigeria[2]	9.82
26	Saudi Arabia	10.09
27	Mauritania[2]	10.93
28	Guatemala[1]	10.93
29	Tanzania	10.94
30	Mongolia[1]	11.24
31	Benin	11.48
32	Israel[1]	11.58
33	Cameroon[2]	11.93
34	Singapore[2]	12.27
35	Senegal[1]	12.31
36	Kazakhstan[2]	12.44
37	Brunei Darussalam	12.48
38	Guyana[2]	12.66
39	Burkina Faso[2]	12.76
40	Kenya	12.83
41	Paraguay[2]	13.59
42	Estonia[2]	13.68
43	Ukraine[1]	13.71
44	Namibia[2]	13.76
45	Zambia[2]	13.84
46	Azerbaijan	14.00
47	Lesotho[2]	14.39
48	Iceland	14.68
49	Madagascar	15.70
50	Lithuania	15.86
51	Venezuela	15.88
52	Uganda[2]	16.07
53	Mauritius	16.11
54	Switzerland	16.50
55	Chad[1]	16.54
56	Argentina[2]	16.63
57	Slovenia	16.84
58	Montenegro	16.94
59	Netherlands[2]	17.30
60	Greece[2]	17.30
61	Italy[2]	17.33
62	Sweden	17.43
63	Norway[2]	17.57
64	Libya[1]	18.52
65	Germany[1]	18.58
66	Mozambique[2]	18.62
67	Spain[2]	18.77
68	Luxembourg	19.04
69	Hong Kong SAR	19.37
70	Cyprus[2]	19.52
71	France[2]	19.72
72	Belgium[2]	20.22
73	Cambodia[2]	20.25
74	Bolivia[1]	20.27
75	Croatia	21.12
76	Austria	21.16
77	Poland[1]	21.33
78	Dominican Republic[2]	21.60
79	Mali[2]	21.62
80	Latvia[1]	21.63
81	Bosnia and Herzegovina[2]	22.14
82	Japan	22.53
83	Sri Lanka[2]	22.54
84	Oman	23.41
85	Uruguay	23.97
86	Kuwait[1]	24.03
87	Côte d'Ivoire[2]	24.30
88	Slovak Republic[2]	24.31
89	Albania	24.45
90	Armenia	24.59
91	Puerto Rico[2]	24.60
92	Ireland[2]	24.91
93	Peru	25.02
94	Malaysia[2]	25.16
95	Romania	25.38
96	Ecuador[2]	26.00
97	Australia[2]	26.14
98	El Salvador	26.70
99	Malta[2]	27.22
100	Jordan	27.25
101	Nicaragua[2]	27.27
102	Honduras[2]	28.00
103	Mexico	29.04
104	Panama[2]	29.19
105	Morocco	29.50
106	Bulgaria	30.59
107	New Zealand	32.23
108	Hungary[2]	32.50
109	Timor-Leste[2]	33.01
110	Barbados[2]	34.48
111	South Africa[2]	34.76
112	Qatar[2]	35.93
113	Botswana	39.68
114	Turkey	39.80
115	Czech Republic	41.07
116	Macedonia, FYR	42.39
117	United States[1]	45.27
118	Brazil[2]	47.21
119	Philippines	53.84
120	Trinidad and Tobago[2]	59.30
121	United Kingdom	61.79
n/a	Canada	n/a
n/a	Chile	n/a
n/a	Denmark	n/a
n/a	Indonesia	n/a
n/a	Jamaica	n/a
n/a	Malawi	n/a
n/a	Russian Federation	n/a
n/a	Suriname	n/a
n/a	Taiwan, China	n/a
n/a	Tajikistan	n/a
n/a	Thailand	n/a
n/a	Zimbabwe	n/a

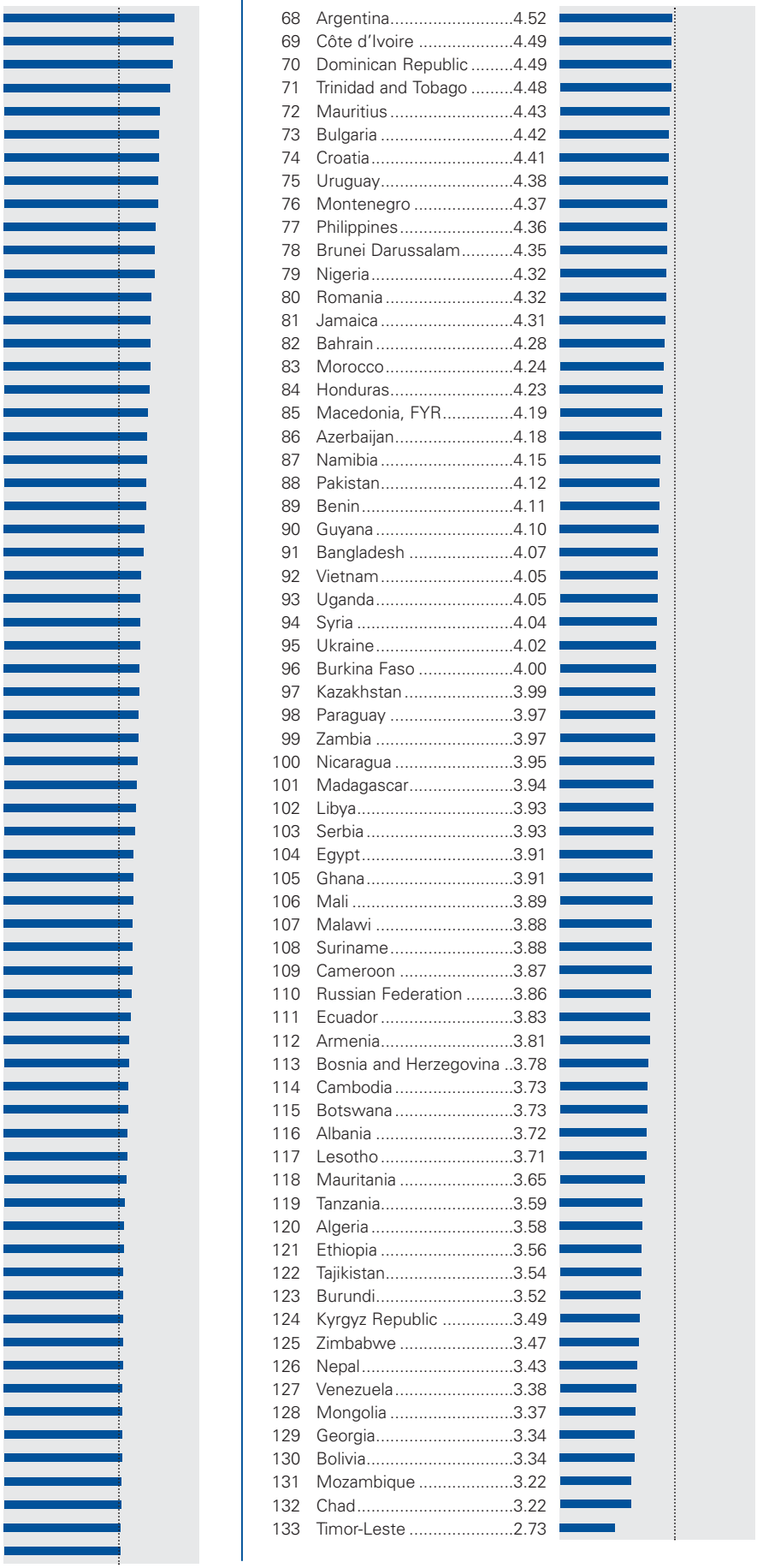
SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved January 4, 2010); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

[1] 2006 [2] 2007

5.08 Local supplier quality

How would you assess the quality of local suppliers in your country? (1 = very poor; 7 = very good) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Austria	6.35
2	Switzerland	6.32
3	Germany	6.29
4	Japan	6.21
5	Belgium	5.88
6	Sweden	5.85
7	Netherlands	5.85
8	Canada	5.82
9	United States	5.82
10	Denmark	5.76
11	France	5.72
12	Norway	5.71
13	Finland	5.61
14	New Zealand	5.60
15	Czech Republic	5.59
16	Australia	5.59
17	Taiwan, China	5.55
18	Puerto Rico	5.51
19	Iceland	5.48
20	Hong Kong SAR	5.48
21	Ireland	5.45
22	South Africa	5.44
23	Qatar	5.40
24	United Arab Emirates	5.38
25	Estonia	5.28
26	Chile	5.27
27	United Kingdom	5.27
28	Singapore	5.26
29	Cyprus	5.25
30	Israel	5.24
31	Slovenia	5.22
32	Spain	5.22
33	Costa Rica	5.18
34	Italy	5.15
35	Brazil	5.14
36	Guatemala	5.10
37	Luxembourg	5.06
38	Korea, Rep.	5.06
39	Poland	5.05
40	Thailand	5.03
41	India	5.03
42	Malaysia	5.03
43	Saudi Arabia	5.00
44	Lithuania	4.98
45	Senegal	4.92
46	Kuwait	4.91
47	Mexico	4.89
48	Colombia	4.89
49	Slovak Republic	4.87
50	Sri Lanka	4.85
51	Panama	4.83
52	Turkey	4.78
53	China	4.76
54	Barbados	4.76
55	Jordan	4.74
56	El Salvador	4.74
57	Portugal	4.74
58	Indonesia	4.73
59	Tunisia	4.73
60	Peru	4.71
61	Greece	4.70
62	Oman	4.70
63	Malta	4.69
64	Hungary	4.67
65	Gambia, The	4.67
66	Latvia	4.66
67	Kenya	4.64
68	Argentina	4.52
69	Côte d'Ivoire	4.49
70	Dominican Republic	4.49
71	Trinidad and Tobago	4.48
72	Mauritius	4.43
73	Bulgaria	4.42
74	Croatia	4.41
75	Uruguay	4.38
76	Montenegro	4.37
77	Philippines	4.36
78	Brunei Darussalam	4.35
79	Nigeria	4.32
80	Romania	4.32
81	Jamaica	4.31
82	Bahrain	4.28
83	Morocco	4.24
84	Honduras	4.23
85	Macedonia, FYR	4.19
86	Azerbaijan	4.18
87	Namibia	4.15
88	Pakistan	4.12
89	Benin	4.11
90	Guyana	4.10
91	Bangladesh	4.07
92	Vietnam	4.05
93	Uganda	4.05
94	Syria	4.04
95	Ukraine	4.02
96	Burkina Faso	4.00
97	Kazakhstan	3.99
98	Paraguay	3.97
99	Zambia	3.97
100	Nicaragua	3.95
101	Madagascar	3.94
102	Libya	3.93
103	Serbia	3.93
104	Egypt	3.91
105	Ghana	3.91
106	Mali	3.89
107	Malawi	3.88
108	Suriname	3.88
109	Cameroon	3.87
110	Russian Federation	3.86
111	Ecuador	3.83
112	Armenia	3.81
113	Bosnia and Herzegovina	3.78
114	Cambodia	3.73
115	Botswana	3.73
116	Albania	3.72
117	Lesotho	3.71
118	Mauritania	3.65
119	Tanzania	3.59
120	Algeria	3.58
121	Ethiopia	3.56
122	Tajikistan	3.54
123	Burundi	3.52
124	Kyrgyz Republic	3.49
125	Zimbabwe	3.47
126	Nepal	3.43
127	Venezuela	3.38
128	Mongolia	3.37
129	Georgia	3.34
130	Bolivia	3.34
131	Mozambique	3.22
132	Chad	3.22
133	Timor-Leste	2.73



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

5.09 Computer, communications, and other services imports (hard data)

Computer, communications, and other services as percentage of total commercial services imports | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Ireland	72.74
2	Azerbaijan	71.54
3	Tajikistan[3]	70.12
4	Suriname[3]	68.21
5	Saudi Arabia[3]	67.84
6	Kazakhstan	63.21
7	Hungary	55.75
8	Finland[3]	54.79
9	Sweden	52.45
10	Nigeria[3]	50.81
11	Croatia	48.87
12	Netherlands	48.60
13	Spain	48.43
14	Malta	47.96
15	Italy	47.69
16	Japan	45.68
17	Brazil	45.54
18	Israel	45.21
19	Slovenia	45.04
20	Russian Federation	45.02
21	Romania	43.45
22	Belgium	43.03
23	Singapore[3]	42.39
24	Czech Republic	42.12
25	India[2]	42.07
26	Macedonia, FYR[3]	40.64
27	Germany	40.58
28	Switzerland	39.44
29	Pakistan[3]	39.21
30	Guyana[3]	39.14
31	Korea, Rep.	38.99
32	Poland	38.72
33	Portugal	38.61
34	Zambia[3]	38.58
35	Malaysia[3]	38.35
36	Slovak Republic[3]	38.10
37	Serbia	37.33
38	Oman	37.26
39	Mauritius	36.95
40	China	36.84
41	Austria	36.83
42	France	36.83
43	United Kingdom[3]	36.55
44	Taiwan, China	36.40
45	Estonia	36.01
46	Mozambique	35.41
47	Gambia, The[3]	35.06
48	Madagascar[1]	34.66
49	Thailand[3]	33.89
50	Canada	33.78
51	Latvia	33.20
52	Jamaica[3]	31.93
53	New Zealand	31.39
54	United States	30.68
55	Argentina	29.31
56	Morocco[3]	29.20
57	Australia	28.81
58	Norway	28.31
59	Bulgaria	28.27
60	Luxembourg	26.77
61	Indonesia	26.60
62	Botswana[3]	25.83
63	Colombia	25.32
64	Ethiopia[3]	25.08
65	Egypt[3]	24.89
66	Côte d'Ivoire[3]	24.87
67	South Africa	23.68
68	Hong Kong SAR[3]	23.47
69	Brunei Darussalam[2]	23.31
70	Ukraine	23.19
71	Iceland[3]	23.11
72	Costa Rica[3]	22.98
73	Kenya[3]	22.10
74	Peru[3]	21.79
75	Cameroon[3]	21.04
76	Senegal[3]	20.59
77	Tunisia[3]	20.49
78	Greece	20.44
79	Ecuador[3]	20.36
80	Philippines	20.33
81	Cambodia	20.15
82	Bolivia[3]	19.85
83	Namibia[3]	19.79
84	Venezuela	19.75
85	Cyprus	19.54
86	Uruguay	19.49
87	Mali[3]	19.20
88	Barbados[1]	19.16
89	Chile	18.80
90	Kyrgyz Republic	17.73
91	Nepal[3]	17.38
92	Turkey	17.29
93	Ghana[3]	17.26
94	Trinidad and Tobago[3]	16.96
95	Benin[2]	16.73
96	Bosnia and Herzegovina	16.68
97	Tanzania[3]	15.25
98	Lithuania[3]	14.29
99	El Salvador[3]	13.19
100	Sri Lanka	13.18
101	Albania	12.97
102	Georgia	12.16
103	Nicaragua	11.16
104	Syria[2]	11.16
105	Jordan[3]	11.14
106	Mongolia[2]	10.11
107	Bahrain[3]	10.10
108	Panama	9.33
109	Armenia	8.14
110	Uganda	8.11
111	Honduras[3]	7.81
112	Guatemala[3]	7.45
113	Dominican Republic[3]	7.26
114	Bangladesh[3]	7.17
115	Burundi[3]	4.32
116	Libya[3]	3.95
117	Lesotho[3]	3.09
118	Paraguay	2.63
119	Kuwait[3]	1.28
120	Mexico	1.28
n/a	Algeria	n/a
n/a	Burkina Faso	n/a
n/a	Chad	n/a
n/a	Denmark	n/a
n/a	Malawi	n/a
n/a	Mauritania	n/a
n/a	Montenegro	n/a
n/a	Puerto Rico	n/a
n/a	Qatar	n/a
n/a	Timor-Leste	n/a
n/a	United Arab Emirates	n/a
n/a	Vietnam	n/a
n/a	Zimbabwe	n/a

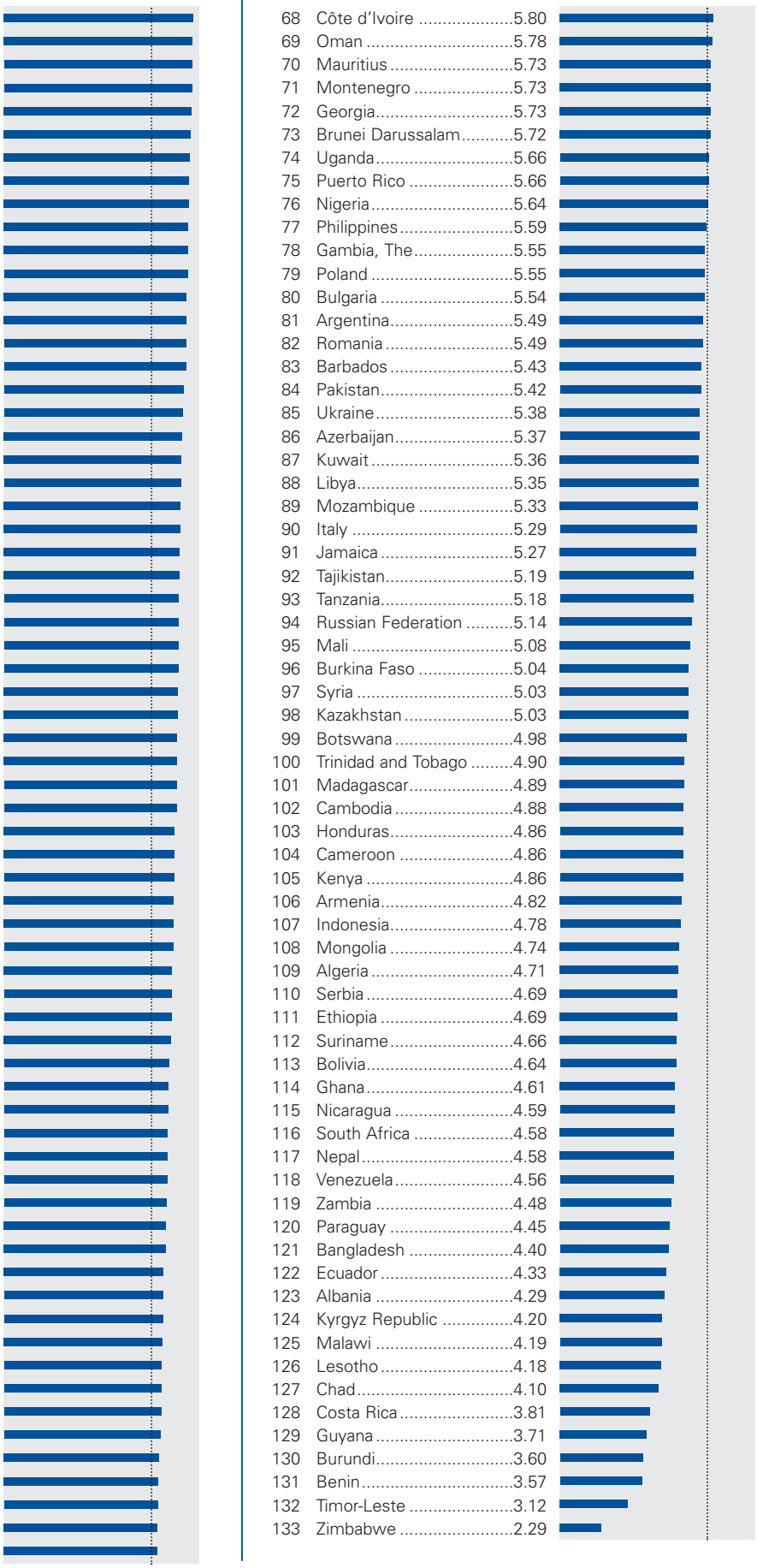
SOURCE: The World Bank, *World Development Indicators Online* (retrieved October 2009); national sources

[1] 2005 [2] 2006 [3] 2007

5.10 Availability of new telephone lines

How difficult is to obtain new telephone lines for business in your country (1 = very difficult; 7 = very easy) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Iceland	6.93
2	Finland	6.90
3	Norway	6.89
4	Austria	6.89
5	Switzerland	6.88
6	Hong Kong SAR	6.86
7	Sweden	6.83
8	Singapore	6.80
9	Japan	6.80
10	Denmark	6.78
11	Israel	6.78
12	Canada	6.76
13	France	6.72
14	Chile	6.72
15	Netherlands	6.71
16	United States	6.70
17	Taiwan, China	6.62
18	El Salvador	6.60
19	Germany	6.58
20	Jordan	6.56
21	Egypt	6.55
22	United Arab Emirates	6.53
23	Slovak Republic	6.53
24	Guatemala	6.51
25	Belgium	6.51
26	Estonia	6.47
27	Portugal	6.46
28	Brazil	6.46
29	Cyprus	6.46
30	Uruguay	6.45
31	United Kingdom	6.45
32	Malta	6.43
33	Hungary	6.42
34	Czech Republic	6.41
35	Dominican Republic	6.41
36	India	6.34
37	Qatar	6.34
38	New Zealand	6.33
39	Lithuania	6.32
40	Tunisia	6.32
41	Slovenia	6.30
42	Bahrain	6.27
43	Luxembourg	6.25
44	Senegal	6.25
45	Thailand	6.24
46	Croatia	6.17
47	Mauritania	6.14
48	Korea, Rep.	6.14
49	Sri Lanka	6.12
50	Greece	6.11
51	Saudi Arabia	6.11
52	Peru	6.09
53	Ireland	6.07
54	Panama	6.07
55	Macedonia, FYR	5.99
56	Colombia	5.98
57	Turkey	5.98
58	Morocco	5.97
59	Malaysia	5.93
60	Mexico	5.93
61	Spain	5.93
62	Latvia	5.90
63	Australia	5.86
64	Namibia	5.83
65	China	5.82
66	Bosnia and Herzegovina	5.81
67	Vietnam	5.80
68	Côte d'Ivoire	5.80
69	Oman	5.78
70	Mauritius	5.73
71	Montenegro	5.73
72	Georgia	5.73
73	Brunei Darussalam	5.72
74	Uganda	5.66
75	Puerto Rico	5.66
76	Nigeria	5.64
77	Philippines	5.59
78	Gambia, The	5.55
79	Poland	5.55
80	Bulgaria	5.54
81	Argentina	5.49
82	Romania	5.49
83	Barbados	5.43
84	Pakistan	5.42
85	Ukraine	5.38
86	Azerbaijan	5.37
87	Kuwait	5.36
88	Libya	5.35
89	Mozambique	5.33
90	Italy	5.29
91	Jamaica	5.27
92	Tajikistan	5.19
93	Tanzania	5.18
94	Russian Federation	5.14
95	Mali	5.08
96	Burkina Faso	5.04
97	Syria	5.03
98	Kazakhstan	5.03
99	Botswana	4.98
100	Trinidad and Tobago	4.90
101	Madagascar	4.89
102	Cambodia	4.88
103	Honduras	4.86
104	Cameroon	4.86
105	Kenya	4.86
106	Armenia	4.82
107	Indonesia	4.78
108	Mongolia	4.74
109	Algeria	4.71
110	Serbia	4.69
111	Ethiopia	4.69
112	Suriname	4.66
113	Bolivia	4.64
114	Ghana	4.61
115	Nicaragua	4.59
116	South Africa	4.58
117	Nepal	4.58
118	Venezuela	4.56
119	Zambia	4.48
120	Paraguay	4.45
121	Bangladesh	4.40
122	Ecuador	4.33
123	Albania	4.29
124	Kyrgyz Republic	4.20
125	Malawi	4.19
126	Lesotho	4.18
127	Chad	4.10
128	Costa Rica	3.81
129	Guyana	3.71
130	Burundi	3.60
131	Benin	3.57
132	Timor-Leste	3.12
133	Zimbabwe	2.29



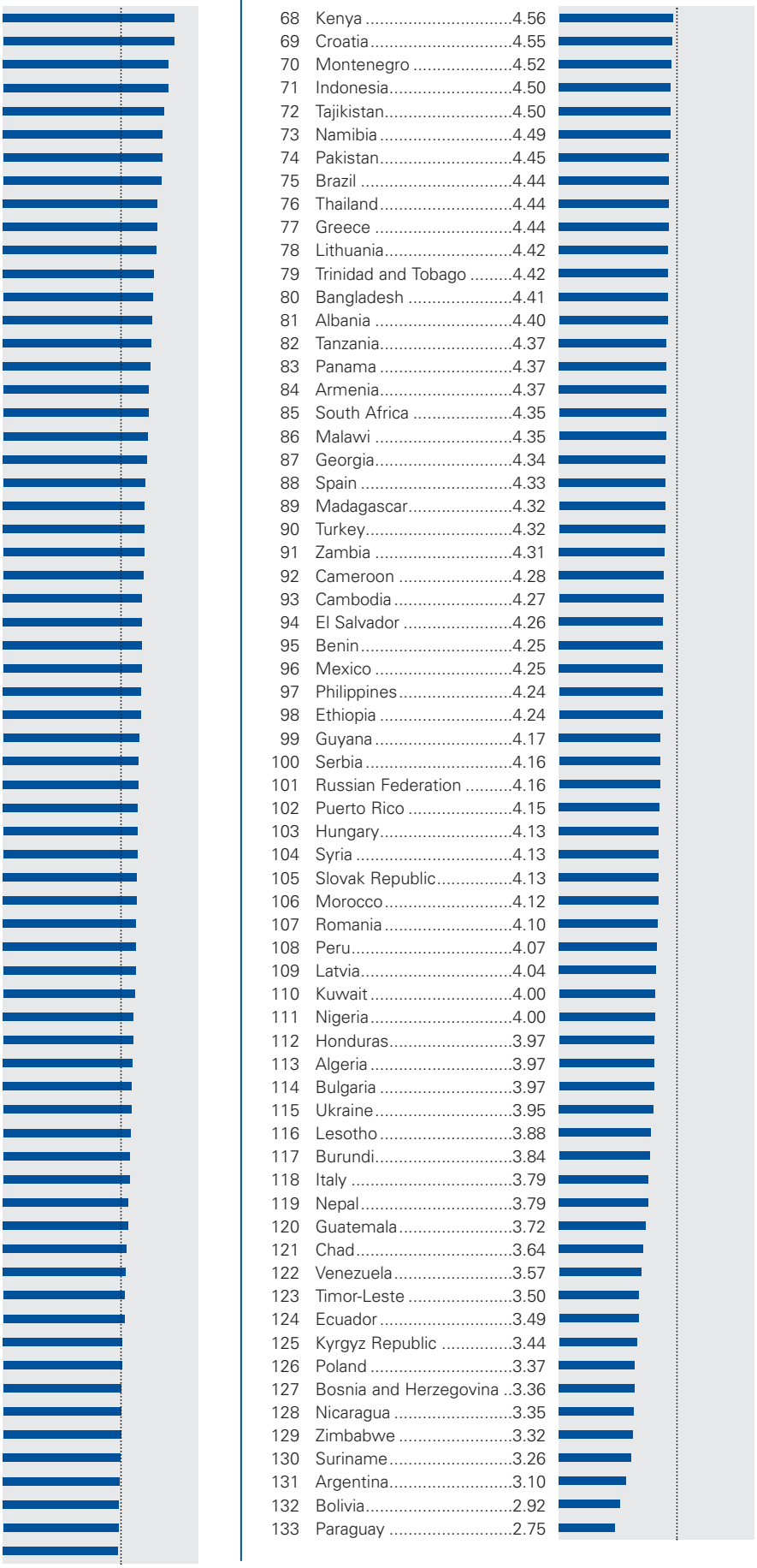
SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

6th pillar
Government readiness

6.01 Government prioritization of ICT

How much priority does the government in your country place on information and communication technologies? (1 = weak priority; 7 = high priority) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.37
2	Malta	6.36
3	Qatar	6.19
4	United Arab Emirates	6.17
5	Finland	6.05
6	Denmark	6.00
7	Tunisia	5.98
8	Portugal	5.95
9	Estonia	5.84
10	Taiwan, China	5.83
11	Sweden	5.80
12	Luxembourg	5.72
13	Bahrain	5.69
14	Malaysia	5.67
15	Iceland	5.65
16	United States	5.62
17	China	5.55
18	Gambia, The	5.55
19	India	5.53
20	Switzerland	5.52
21	Jordan	5.45
22	Korea, Rep.	5.44
23	Barbados	5.43
24	New Zealand	5.42
25	Oman	5.39
26	Mauritius	5.36
27	Norway	5.36
28	Australia	5.35
29	Brunei Darussalam	5.34
30	Saudi Arabia	5.32
31	Hong Kong SAR	5.32
32	Dominican Republic	5.26
33	Canada	5.25
34	Vietnam	5.25
35	Austria	5.22
36	Sri Lanka	5.20
37	Germany	5.20
38	Azerbaijan	5.19
39	Uruguay	5.19
40	Mali	5.16
41	Egypt	5.16
42	Senegal	5.15
43	Macedonia, FYR	5.12
44	Japan	5.08
45	United Kingdom	5.07
46	Israel	5.06
47	Cyprus	5.03
48	Slovenia	5.02
49	France	4.99
50	Netherlands	4.96
51	Chile	4.96
52	Costa Rica	4.93
53	Mauritania	4.92
54	Mongolia	4.87
55	Ghana	4.84
56	Czech Republic	4.80
57	Burkina Faso	4.80
58	Libya	4.74
59	Uganda	4.72
60	Belgium	4.70
61	Botswana	4.69
62	Jamaica	4.69
63	Ireland	4.68
64	Kazakhstan	4.65
65	Mozambique	4.62
66	Côte d'Ivoire	4.61
67	Colombia	4.60
68	Kenya	4.56
69	Croatia	4.55
70	Montenegro	4.52
71	Indonesia	4.50
72	Tajikistan	4.50
73	Namibia	4.49
74	Pakistan	4.45
75	Brazil	4.44
76	Thailand	4.44
77	Greece	4.44
78	Lithuania	4.42
79	Trinidad and Tobago	4.42
80	Bangladesh	4.41
81	Albania	4.40
82	Tanzania	4.37
83	Panama	4.37
84	Armenia	4.37
85	South Africa	4.35
86	Malawi	4.35
87	Georgia	4.34
88	Spain	4.33
89	Madagascar	4.32
90	Turkey	4.32
91	Zambia	4.31
92	Cameroon	4.28
93	Cambodia	4.27
94	El Salvador	4.26
95	Benin	4.25
96	Mexico	4.25
97	Philippines	4.24
98	Ethiopia	4.24
99	Guyana	4.17
100	Serbia	4.16
101	Russian Federation	4.16
102	Puerto Rico	4.15
103	Hungary	4.13
104	Syria	4.13
105	Slovak Republic	4.13
106	Morocco	4.12
107	Romania	4.10
108	Peru	4.07
109	Latvia	4.04
110	Kuwait	4.00
111	Nigeria	4.00
112	Honduras	3.97
113	Algeria	3.97
114	Bulgaria	3.97
115	Ukraine	3.95
116	Lesotho	3.88
117	Burundi	3.84
118	Italy	3.79
119	Nepal	3.79
120	Guatemala	3.72
121	Chad	3.64
122	Venezuela	3.57
123	Timor-Leste	3.50
124	Ecuador	3.49
125	Kyrgyz Republic	3.44
126	Poland	3.37
127	Bosnia and Herzegovina	3.36
128	Nicaragua	3.35
129	Zimbabwe	3.32
130	Suriname	3.26
131	Argentina	3.10
132	Bolivia	2.92
133	Paraguay	2.75

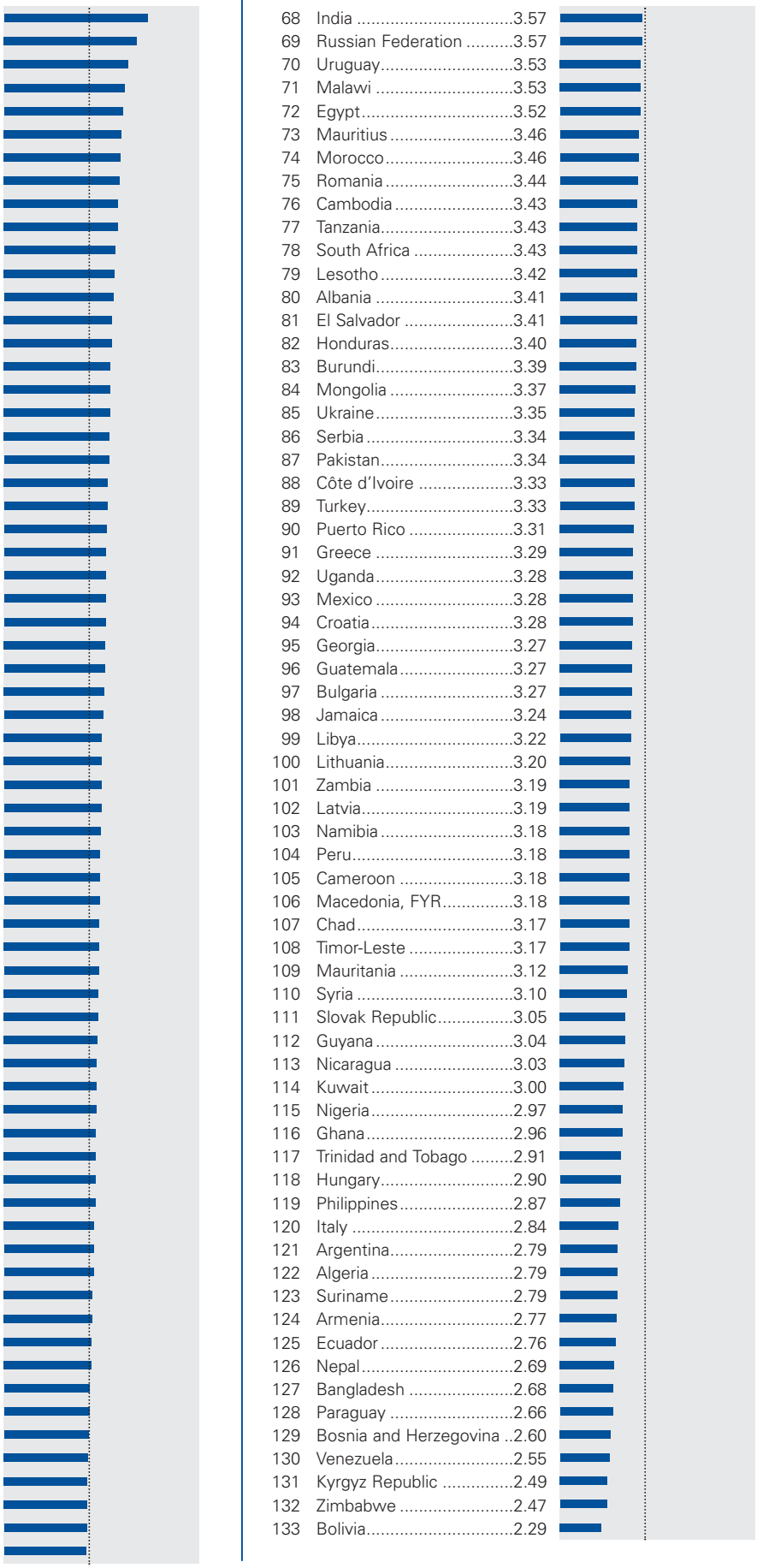


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

6.02 Government procurement of advanced technology products

Do government procurement decisions foster technology innovation in your country? (1 = no, not at all; 7 = yes, extremely effectively) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	5.50
2	United Arab Emirates	5.17
3	Luxembourg	4.90
4	United States	4.77
5	Qatar	4.72
6	Finland	4.68
7	Taiwan, China	4.66
8	Denmark	4.63
9	Malaysia	4.58
10	Tunisia	4.57
11	Vietnam	4.48
12	Oman	4.47
13	China	4.43
14	Sweden	4.39
15	Korea, Rep.	4.38
16	Azerbaijan	4.34
17	Portugal	4.34
18	Bahrain	4.33
19	Cyprus	4.30
20	Iceland	4.29
21	Malta	4.25
22	Saudi Arabia	4.24
23	Czech Republic	4.21
24	Switzerland	4.19
25	Canada	4.19
26	Israel	4.18
27	Gambia, The	4.18
28	Hong Kong SAR	4.17
29	Poland	4.16
30	Norway	4.15
31	Netherlands	4.10
32	Brunei Darussalam	4.07
33	Montenegro	4.07
34	Indonesia	4.05
35	Belgium	4.05
36	Estonia	4.02
37	France	4.00
38	Costa Rica	4.00
39	Senegal	4.00
40	Botswana	3.99
41	Mali	3.99
42	Australia	3.97
43	United Kingdom	3.96
44	Colombia	3.95
45	Germany	3.93
46	Barbados	3.91
47	Benin	3.90
48	Jordan	3.90
49	Japan	3.88
50	Panama	3.88
51	Madagascar	3.88
52	Sri Lanka	3.88
53	Burkina Faso	3.83
54	Chile	3.81
55	Austria	3.81
56	Mozambique	3.77
57	New Zealand	3.77
58	Thailand	3.75
59	Ireland	3.74
60	Brazil	3.68
61	Slovenia	3.67
62	Kazakhstan	3.65
63	Dominican Republic	3.63
64	Kenya	3.61
65	Ethiopia	3.61
66	Spain	3.60
67	Tajikistan	3.57
68	India	3.57
69	Russian Federation	3.57
70	Uruguay	3.53
71	Malawi	3.53
72	Egypt	3.52
73	Mauritius	3.46
74	Morocco	3.46
75	Romania	3.44
76	Cambodia	3.43
77	Tanzania	3.43
78	South Africa	3.43
79	Lesotho	3.42
80	Albania	3.41
81	El Salvador	3.41
82	Honduras	3.40
83	Burundi	3.39
84	Mongolia	3.37
85	Ukraine	3.35
86	Serbia	3.34
87	Pakistan	3.34
88	Côte d'Ivoire	3.33
89	Turkey	3.33
90	Puerto Rico	3.31
91	Greece	3.29
92	Uganda	3.28
93	Mexico	3.28
94	Croatia	3.28
95	Georgia	3.27
96	Guatemala	3.27
97	Bulgaria	3.27
98	Jamaica	3.24
99	Libya	3.22
100	Lithuania	3.20
101	Zambia	3.19
102	Latvia	3.19
103	Namibia	3.18
104	Peru	3.18
105	Cameroon	3.18
106	Macedonia, FYR	3.18
107	Chad	3.17
108	Timor-Leste	3.17
109	Mauritania	3.12
110	Syria	3.10
111	Slovak Republic	3.05
112	Guyana	3.04
113	Nicaragua	3.03
114	Kuwait	3.00
115	Nigeria	2.97
116	Ghana	2.96
117	Trinidad and Tobago	2.91
118	Hungary	2.90
119	Philippines	2.87
120	Italy	2.84
121	Argentina	2.79
122	Algeria	2.79
123	Suriname	2.79
124	Armenia	2.77
125	Ecuador	2.76
126	Nepal	2.69
127	Bangladesh	2.68
128	Paraguay	2.66
129	Bosnia and Herzegovina	2.60
130	Venezuela	2.55
131	Kyrgyz Republic	2.49
132	Zimbabwe	2.47
133	Bolivia	2.29

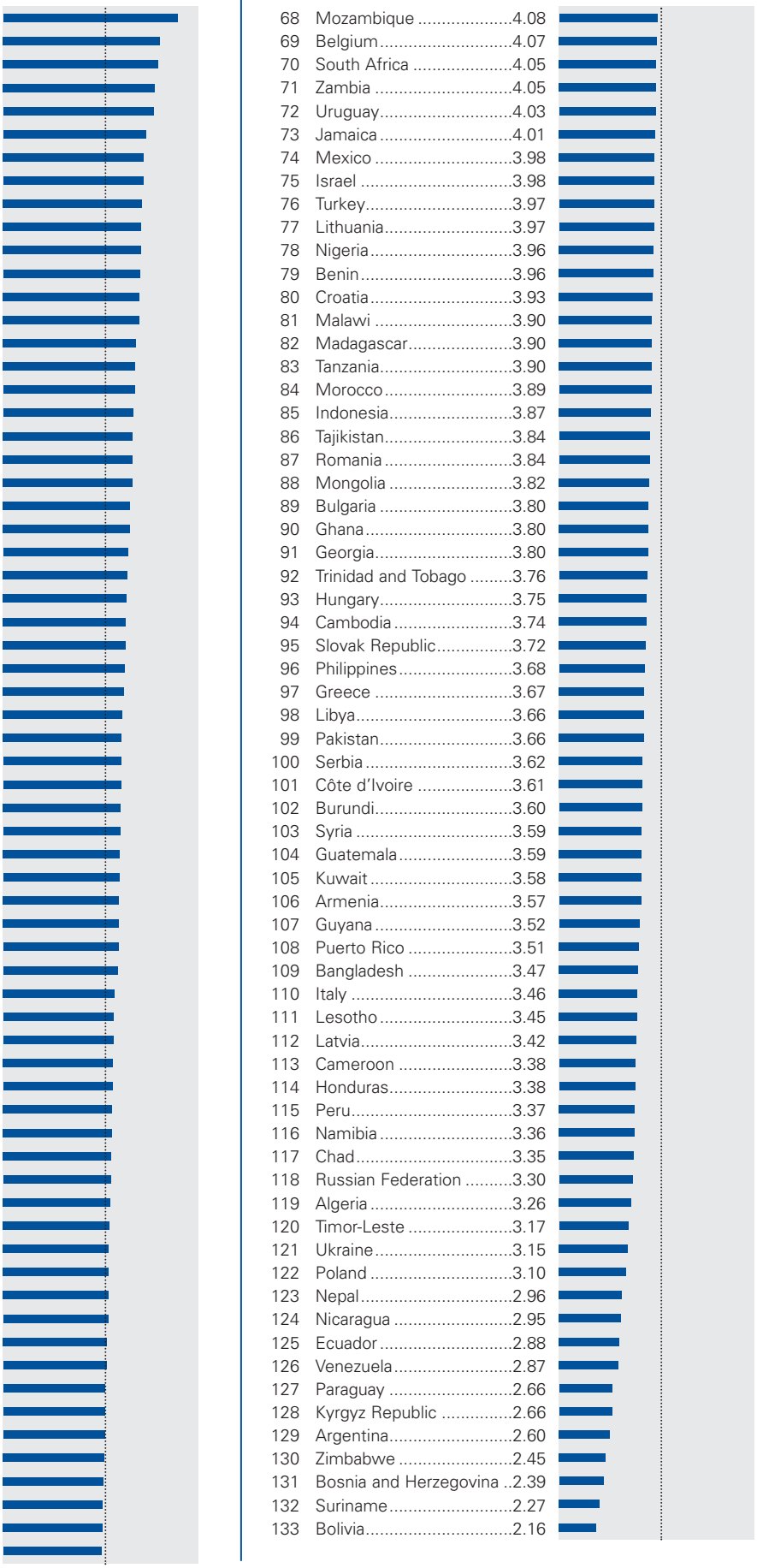


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

6.03 Importance of ICT to government vision of the future

To what extent does the government have a clear implementation plan for utilizing information and communication technologies to improve your country's overall competitiveness? (1 = no plan; 7 = clear plan) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.47
2	United Arab Emirates	5.92
3	Malta	5.86
4	Portugal	5.75
5	Qatar	5.71
6	Denmark	5.47
7	Tunisia	5.40
8	Korea, Rep.	5.39
9	Taiwan, China	5.35
10	Sweden	5.33
11	Malaysia	5.32
12	Estonia	5.29
13	China	5.27
14	Hong Kong SAR	5.27
15	Norway	5.16
16	Gambia, The	5.13
17	Iceland	5.12
18	Luxembourg	5.07
19	Finland	5.06
20	Bahrain	5.06
21	Oman	5.05
22	Australia	4.98
23	Jordan	4.98
24	United States	4.91
25	Switzerland	4.90
26	Canada	4.87
27	Brunei Darussalam	4.85
28	Saudi Arabia	4.84
29	Vietnam	4.82
30	Austria	4.79
31	New Zealand	4.73
32	France	4.71
33	Japan	4.69
34	Slovenia	4.69
35	Cyprus	4.68
36	Chile	4.67
37	Dominican Republic	4.65
38	India	4.64
39	Sri Lanka	4.63
40	Azerbaijan	4.62
41	United Kingdom	4.61
42	Mauritania	4.59
43	Barbados	4.49
44	Mali	4.45
45	Montenegro	4.45
46	Costa Rica	4.44
47	Germany	4.43
48	Senegal	4.42
49	Netherlands	4.41
50	Macedonia, FYR	4.39
51	Colombia	4.37
52	Kazakhstan	4.36
53	Mauritius	4.34
54	Botswana	4.31
55	Uganda	4.30
56	Ireland	4.30
57	Egypt	4.29
58	Czech Republic	4.25
59	Thailand	4.24
60	Kenya	4.19
61	Panama	4.19
62	Burkina Faso	4.19
63	El Salvador	4.17
64	Brazil	4.15
65	Ethiopia	4.12
66	Spain	4.12
67	Albania	4.08
68	Mozambique	4.08
69	Belgium	4.07
70	South Africa	4.05
71	Zambia	4.05
72	Uruguay	4.03
73	Jamaica	4.01
74	Mexico	3.98
75	Israel	3.98
76	Turkey	3.97
77	Lithuania	3.97
78	Nigeria	3.96
79	Benin	3.96
80	Croatia	3.93
81	Malawi	3.90
82	Madagascar	3.90
83	Tanzania	3.90
84	Morocco	3.89
85	Indonesia	3.87
86	Tajikistan	3.84
87	Romania	3.84
88	Mongolia	3.82
89	Bulgaria	3.80
90	Ghana	3.80
91	Georgia	3.80
92	Trinidad and Tobago	3.76
93	Hungary	3.75
94	Cambodia	3.74
95	Slovak Republic	3.72
96	Philippines	3.68
97	Greece	3.67
98	Libya	3.66
99	Pakistan	3.66
100	Serbia	3.62
101	Côte d'Ivoire	3.61
102	Burundi	3.60
103	Syria	3.59
104	Guatemala	3.59
105	Kuwait	3.58
106	Armenia	3.57
107	Guyana	3.52
108	Puerto Rico	3.51
109	Bangladesh	3.47
110	Italy	3.46
111	Lesotho	3.45
112	Latvia	3.42
113	Cameroon	3.38
114	Honduras	3.38
115	Peru	3.37
116	Namibia	3.36
117	Chad	3.35
118	Russian Federation	3.30
119	Algeria	3.26
120	Timor-Leste	3.17
121	Ukraine	3.15
122	Poland	3.10
123	Nepal	2.96
124	Nicaragua	2.95
125	Ecuador	2.88
126	Venezuela	2.87
127	Paraguay	2.66
128	Kyrgyz Republic	2.66
129	Argentina	2.60
130	Zimbabwe	2.45
131	Bosnia and Herzegovina	2.39
132	Suriname	2.27
133	Bolivia	2.16



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

7th pillar

Individual usage

7.01 Mobile telephone subscriptions (hard data)

Mobile telephone subscriptions per 100 population | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	United Arab Emirates	208.65
2	Estonia	188.20
3	Bahrain	185.77
4	Hong Kong SAR	165.85
5	Barbados	159.09
6	Italy	151.57
7	Lithuania	151.24
8	Luxembourg	147.11
9	Saudi Arabia	142.85
10	Russian Federation	141.11
11	Portugal	139.64
12	Bulgaria	138.30
13	Singapore	138.15
14	Czech Republic	133.54
15	Croatia	132.95
16	Qatar	131.39
17	Austria	129.73
18	Finland	128.76
19	Germany	128.27
20	Israel	127.38
21	United Kingdom	126.34
22	Denmark	125.72
23	Netherlands	124.80
24	Greece	123.90
25	Macedonia, FYR	122.56
26	Hungary	122.09
27	Ukraine	121.09
28	Ireland	120.74
29	Sweden	118.33
30	Montenegro	118.10
31	Switzerland	117.97
32	Cyprus	117.89
33	Argentina	116.61
34	Oman	115.58
35	Poland	115.28
36	Panama	115.19
37	Romania	114.54
38	El Salvador	113.32
39	Trinidad and Tobago	112.87
40	Spain	111.67
41	Belgium	111.63
42	Puerto Rico	111.00
43	Taiwan, China	110.31
44	Norway	110.16
45	Guatemala	109.22
46	New Zealand	109.22
47	Iceland	108.64
48	Australia	104.96
49	Uruguay	104.73
50	Malaysia	102.59
51	Slovak Republic	102.23
52	Slovenia	101.97
53	Jamaica	100.58
54	Armenia	99.99
55	Albania	99.93
56	Kuwait	99.59
57	Latvia	98.90
58	Serbia	97.76
59	Venezuela	96.31
60	Kazakhstan	96.06
61	Brunei Darussalam	95.85
62	Paraguay	95.46
63	Korea, Rep.	94.71
64	Malta	94.64
65	France	93.45
66	Algeria	92.72
67	Thailand	92.01
68	Colombia	91.90
69	South Africa	90.60
70	Turkey	89.05
71	Chile	88.05
72	United States	86.79
73	Japan	86.73
74	Jordan	86.60
75	Ecuador	85.61
76	Honduras	84.86
77	Tunisia	84.59
78	Bosnia and Herzegovina	84.26
79	Suriname	80.76
80	Mauritius	80.74
81	Vietnam	80.37
82	Brazil	78.47
83	Botswana	77.34
84	Libya	76.71
85	Philippines	75.39
86	Azerbaijan	75.00
87	Peru	72.66
88	Dominican Republic	72.45
89	Morocco	72.19
90	Gambia, The	70.24
91	Mexico	69.37
92	Mongolia	66.76
93	Canada	66.42
94	Mauritania	65.07
95	Georgia	63.97
96	Kyrgyz Republic	62.69
97	Indonesia	61.83
98	Sri Lanka	55.24
99	Nicaragua	54.84
100	Tajikistan	53.74
101	Côte d'Ivoire	50.74
102	Egypt	50.62
103	Bolivia	49.82
104	Pakistan	49.74
105	Ghana	49.55
106	Namibia	49.39
107	China	47.95
108	Senegal	44.13
109	Kenya	42.06
110	Costa Rica	41.75
111	Nigeria	41.66
112	Benin	39.66
113	Syria	33.24
114	Cameroon	32.28
115	Tanzania	30.62
116	India	29.36
117	Cambodia	29.10
118	Lesotho	28.35
119	Zambia	28.04
120	Bangladesh	27.90
121	Mali	27.07
122	Uganda	27.02
123	Madagascar	25.30
124	Mozambique	19.68
125	Burkina Faso	16.76
126	Chad	16.58
127	Nepal	14.58
128	Zimbabwe	13.28
129	Malawi	12.00
130	Timor-Leste	9.20
131	Burundi	5.95
132	Ethiopia	2.42
n/a	Guyana	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); national sources

7.02 Personal computers (hard data)

Personal computers per 100 population | 2008 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Switzerland	97.60
2	Canada[2]	94.40
3	Netherlands[2]	90.91
4	Sweden[2]	87.79
5	Taiwan, China	83.47
6	United Kingdom[2]	80.23
7	United States[2]	78.67
8	Singapore[3]	76.04
9	Bahrain	74.58
10	Hong Kong SAR	69.25
11	Saudi Arabia	68.25
12	Luxembourg[2]	67.73
13	Germany[2]	65.54
14	France[2]	65.17
15	Norway[2]	62.68
16	Austria[1]	60.69
17	Slovak Republic	58.15
18	Korea, Rep.[3]	58.14
19	Ireland[2]	58.07
20	Japan[3]	57.40
21	Denmark[3]	55.09
22	Iceland[2]	53.09
23	New Zealand[2]	52.97
24	Finland[1]	50.05
25	Slovenia[3]	42.68
26	Spain[3]	40.04
27	Cyprus[2]	38.34
28	Belgium[1]	37.96
29	Macedonia, FYR[3]	36.76
30	Italy[1]	36.64
31	Croatia[3]	33.80
32	United Arab Emirates[2]	33.08
33	Latvia[2]	32.81
34	Czech Republic[1]	27.47
35	Georgia	27.17
36	Hungary[3]	25.63
37	Estonia	25.50
38	Mongolia	24.61
39	Lithuania	24.46
40	Namibia[3]	23.94
41	Malaysia[2]	23.15
42	Costa Rica[1]	23.10
43	Kuwait[1]	22.22
44	Romania[3]	19.32
45	Serbia	19.31
46	Portugal	18.16
47	Mauritius[2]	17.43
48	Poland[2]	16.92
49	Oman[3]	16.88
50	Brazil[1]	16.12
51	Barbados[1]	15.79
52	Qatar[2]	15.69
53	Chile[1]	14.11
54	Mexico[2]	14.10
55	Uruguay[1]	13.53
56	Russian Federation[2]	13.33
57	Trinidad and Tobago[3]	13.21
58	Ecuador[2]	12.95
59	Colombia	11.25
60	Bulgaria	11.01
61	Peru[1]	10.06
62	Tunisia	9.81
63	Armenia[1]	9.69
64	Vietnam[2]	9.54
65	Greece[2]	9.43
66	Venezuela[1]	9.26
67	Argentina[1]	9.04
68	Brunei Darussalam[1]	8.92
69	Syria[3]	8.78
70	South Africa[1]	8.25
71	Azerbaijan	8.00
72	Paraguay[1]	7.79
73	Zimbabwe	7.62
74	Philippines[2]	7.23
75	Jordan	7.20
76	Jamaica[1]	6.71
77	Thailand[1]	6.68
78	Bosnia and Herzegovina[2]	6.40
79	Botswana	6.25
80	Turkey[2]	6.10
81	El Salvador[1]	5.78
82	Morocco	5.70
83	China[2]	5.61
84	Albania	4.61
85	Ukraine[2]	4.55
86	Mauritania[2]	4.54
87	Nicaragua[1]	4.03
88	Suriname[1]	4.00
89	Egypt	3.92
90	Guyana[1]	3.80
91	Sri Lanka[1]	3.76
92	Gambia, The[3]	3.53
93	India[3]	3.18
94	Panama	2.85
95	Honduras	2.49
96	Bolivia[1]	2.40
97	Bangladesh[2]	2.25
98	Senegal[1]	2.22
99	Libya[1]	2.19
100	Guatemala[1]	2.06
101	Indonesia[2]	2.03
102	Kyrgyz Republic[1]	1.92
103	Uganda[2]	1.69
104	Côte d'Ivoire[1]	1.68
105	Kenya[1]	1.37
106	Mozambique[1]	1.36
107	Tajikistan[1]	1.29
108	Cameroon[1]	1.12
109	Zambia[1]	1.12
110	Ghana	1.07
111	Algeria[1]	1.07
112	Tanzania[1]	0.91
113	Burundi[2]	0.85
114	Nigeria[1]	0.85
115	Puerto Rico[1]	0.84
116	Mali[3]	0.81
117	Benin[3]	0.71
118	Ethiopia[3]	0.68
119	Burkina Faso[2]	0.63
120	Madagascar[1]	0.58
121	Pakistan[3]	0.55
122	Nepal[1]	0.48
123	Cambodia[3]	0.36
124	Lesotho[1]	0.25
125	Malawi[1]	0.18
126	Chad[1]	0.16
n/a	Australia	n/a
n/a	Dominican Republic	n/a
n/a	Israel	n/a
n/a	Kazakhstan	n/a
n/a	Malta	n/a
n/a	Montenegro	n/a
n/a	Timor-Leste	n/a

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); national sources

1 2005 2 2006 3 2007

7.03 Broadband Internet subscribers (hard data)

Total broadband Internet subscribers per 100 population | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Barbados	64.81
2	Sweden	41.19
3	Denmark	37.12
4	Netherlands	35.14
5	Switzerland	34.15
6	Norway	33.27
7	Iceland	32.87
8	Korea, Rep.	32.14
9	Finland	30.50
10	Luxembourg	29.80
11	Canada	29.59
12	France	28.52
13	United Kingdom	28.21
14	Hong Kong SAR	28.11
15	Belgium	27.97
16	Germany	27.47
17	Malta	24.77
18	Australia	24.39
19	Israel	23.88
20	Estonia	23.70
21	Japan	23.65
22	United States	23.46
23	Taiwan, China	21.81
24	Singapore	21.74
25	New Zealand	21.63
26	Slovenia	21.17
27	Austria	20.74
28	Spain	20.22
29	Ireland	20.09
30	Italy	18.93
31	Lithuania	17.77
32	Hungary	17.48
33	Czech Republic	17.05
34	Cyprus	16.37
35	Portugal	15.31
36	Bahrain	14.18
37	Greece	13.53
38	Poland	12.58
39	United Arab Emirates	12.43
40	Croatia	11.86
41	Romania	11.73
42	Slovak Republic	11.20
43	Bulgaria	11.11
44	Montenegro	9.99
45	Macedonia, FYR	8.87
46	Latvia	8.85
47	Chile	8.49
48	Qatar	8.07
49	Argentina	7.99
50	Turkey	7.78
51	Uruguay	7.30
52	Mauritius	7.17
53	Mexico	7.00
54	Russian Federation	6.56
55	China	6.23
56	Panama	5.76
57	Puerto Rico	5.40
58	Brazil	5.26
59	Bosnia and Herzegovina	4.99
60	Malaysia	4.93
61	Venezuela	4.73
62	Serbia	4.59
63	Trinidad and Tobago	4.58
64	Kazakhstan	4.26
65	Colombia	4.23
66	Saudi Arabia	4.16
67	Jamaica	3.59
68	Brunei Darussalam	3.56
69	Ukraine	3.48
70	Peru	2.52
71	Costa Rica	2.38
72	Vietnam	2.35
73	Dominican Republic	2.27
74	Jordan	2.24
75	Tunisia	2.24
76	Georgia	2.23
77	Albania	2.04
78	El Salvador	2.01
79	Morocco	1.53
80	Paraguay	1.43
81	Algeria	1.41
82	Thailand	1.41
83	Mongolia	1.37
84	Kuwait	1.37
85	Philippines	1.16
86	Oman	1.15
87	Suriname	1.12
88	Egypt	0.94
89	South Africa	0.86
90	Azerbaijan	0.69
91	Bolivia	0.68
92	Nicaragua	0.64
93	Guatemala	0.58
94	Sri Lanka	0.51
95	Botswana	0.46
96	India	0.45
97	Senegal	0.39
98	Guyana	0.26
99	Ecuador	0.26
100	Mauritania	0.18
101	Indonesia	0.18
102	Armenia	0.16
103	Libya	0.16
104	Zimbabwe	0.14
105	Cambodia	0.11
106	Ghana	0.10
107	Pakistan	0.09
108	Kyrgyz Republic	0.09
109	Tajikistan	0.05
110	Syria	0.05
111	Côte d'Ivoire	0.05
112	Mozambique	0.05
113	Zambia	0.04
114	Nigeria	0.04
115	Mali	0.04
116	Nepal	0.03
117	Bangladesh	0.03
118	Benin	0.03
119	Burkina Faso	0.03
120	Malawi	0.02
121	Madagascar	0.02
122	Gambia, The	0.02
123	Tanzania	0.02
124	Uganda	0.02
125	Namibia	0.02
126	Kenya	0.01
127	Lesotho	0.01
128	Timor-Leste[1]	0.00
129	Cameroon	0.00
130	Burundi	0.00
131	Ethiopia	0.00
132	Chad	0.00
132	Honduras	0.00

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

[1] 2007

7.04 Internet users (hard data)

Internet users per 100 population | 2008

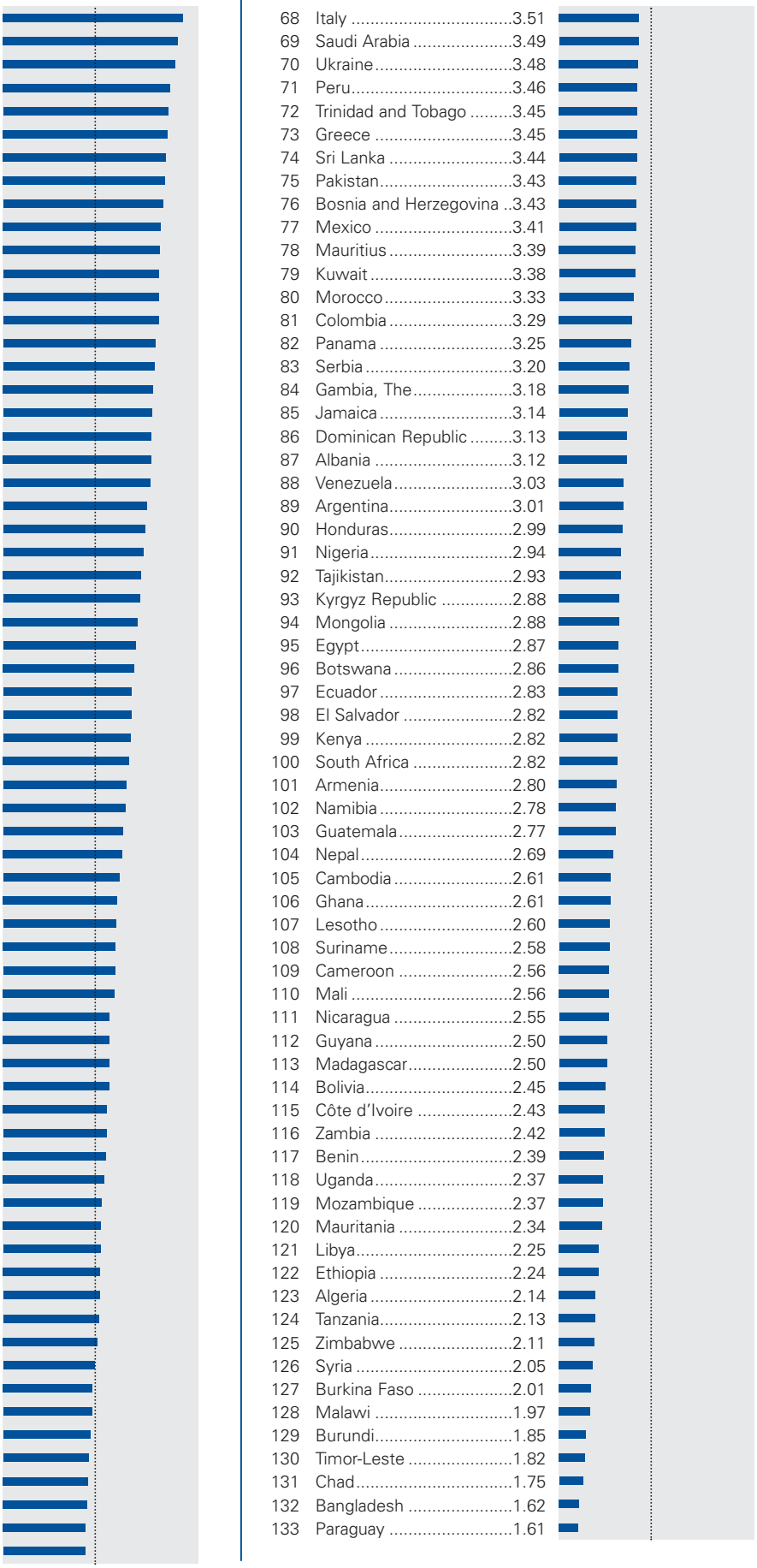
RANK	COUNTRY/ECONOMY	HARD DATA
1	Iceland	90.56
2	Sweden	87.84
3	Netherlands	86.55
4	Denmark	83.89
5	Finland	82.62
6	Norway	82.55
7	Luxembourg	80.53
8	Switzerland	77.00
9	Korea, Rep.	76.50
10	United Kingdom	76.24
11	Canada	75.43
12	Japan	75.40
13	Germany	75.33
14	United States	74.00
15	Barbados	73.67
16	Singapore	73.02
17	New Zealand	72.03
18	Australia	71.98
19	Austria	71.21
20	Belgium	68.86
21	France	68.21
22	Hong Kong SAR	67.00
23	Estonia	66.21
24	Slovak Republic	66.05
25	Taiwan, China	65.73
26	United Arab Emirates	65.15
27	Ireland	62.54
28	Latvia	60.63
29	Hungary	58.66
30	Czech Republic	58.41
31	Jamaica	56.88
32	Spain	56.74
33	Slovenia	55.86
34	Malaysia	55.80
35	Brunei Darussalam	55.32
36	Lithuania	55.00
37	Bahrain	51.95
38	Croatia	50.60
39	Israel	49.64
40	Poland	49.02
41	Malta	48.79
42	Montenegro	47.24
43	Greece	43.50
44	Italy	41.93
45	Portugal	41.92
46	Macedonia, FYR	41.54
47	Uruguay	40.01
48	Cyprus	38.78
49	Colombia	38.50
50	Brazil	37.52
51	Bulgaria	34.86
52	Bosnia and Herzegovina	34.66
53	Turkey	34.37
54	Kuwait	34.26
55	Qatar	34.04
56	Serbia	33.54
57	Morocco	33.04
58	Chile	32.47
59	Costa Rica	32.31
60	Russian Federation	32.00
61	Saudi Arabia	30.80
62	Romania	29.00
63	Ecuador	28.80
64	Argentina	28.11
65	Azerbaijan	28.00
66	Tunisia	27.53
67	Panama	27.49
68	Guyana	26.85
69	Jordan	26.00
70	Venezuela	25.49
71	Puerto Rico	25.22
72	Peru	24.72
73	Vietnam	23.92
74	Thailand	23.89
75	Albania	23.86
76	Georgia	23.78
77	China	22.28
78	Mauritius	22.03
79	Mexico	21.71
80	Dominican Republic	21.58
81	Oman	20.00
82	Trinidad and Tobago	17.02
83	Syria	16.79
84	Egypt	16.65
85	Nigeria	15.86
86	Kyrgyz Republic	15.70
87	Paraguay	14.34
88	Guatemala	14.32
89	Honduras	13.09
90	Mongolia	12.49
91	Algeria	11.93
92	Zimbabwe	11.40
93	Kazakhstan	11.00
94	Bolivia	10.83
95	Ukraine	10.60
96	El Salvador	10.60
97	Pakistan	10.45
98	Suriname	9.71
99	Tajikistan	8.78
100	Kenya	8.67
101	South Africa	8.43
102	Senegal	8.35
103	Indonesia	7.92
104	Uganda	7.90
105	Gambia, The	6.88
106	Botswana	6.25
107	Philippines	6.22
108	Armenia	6.21
109	Sri Lanka	5.80
110	Zambia	5.55
111	Namibia	5.33
112	Libya	5.13
113	India	4.38
114	Ghana	4.27
115	Cameroon	3.80
116	Lesotho	3.58
117	Nicaragua	3.26
118	Côte d'Ivoire	3.21
119	Malawi	2.13
120	Mauritania	1.87
121	Benin	1.85
122	Nepal	1.73
123	Madagascar	1.65
124	Mali	1.57
125	Mozambique	1.56
126	Tanzania	1.22
127	Chad	1.19
128	Burkina Faso	0.92
129	Burundi	0.81
130	Cambodia	0.51
131	Ethiopia	0.45
132	Bangladesh	0.35
133	Timor-Leste	0.16

SOURCE: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

7.05 Internet access in schools

How would you rate the level of access to the Internet in schools in your country? (1 = very limited; 7 = extensive) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Iceland	6.64
2	Estonia	6.48
3	Sweden	6.40
4	Korea, Rep.	6.23
5	Singapore	6.17
6	Denmark	6.15
7	Finland	6.10
8	Switzerland	6.07
9	Netherlands	6.01
10	United States	5.94
11	Austria	5.92
12	Canada	5.88
13	Taiwan, China	5.88
14	Hong Kong SAR	5.87
15	Qatar	5.77
16	Slovenia	5.74
17	United Kingdom	5.70
18	New Zealand	5.66
19	Czech Republic	5.65
20	Luxembourg	5.64
21	Norway	5.61
22	Malta	5.50
23	China	5.45
24	Belgium	5.39
25	Australia	5.33
26	United Arab Emirates	5.28
27	Portugal	5.22
28	Bahrain	5.15
29	Hungary	5.11
30	Latvia	5.02
31	Israel	5.02
32	Lithuania	4.99
33	Japan	4.95
34	Cyprus	4.86
35	France	4.85
36	Slovak Republic	4.75
37	Brunei Darussalam	4.74
38	Chile	4.64
39	Germany	4.58
40	Malaysia	4.53
41	Thailand	4.52
42	Barbados	4.51
43	Uruguay	4.50
44	Spain	4.34
45	Jordan	4.33
46	Tunisia	4.33
47	Ireland	4.32
48	Oman	4.26
49	Poland	4.24
50	Senegal	4.23
51	Croatia	4.18
52	Bulgaria	4.08
53	Puerto Rico	4.07
54	Turkey	4.05
55	Kazakhstan	4.04
56	Azerbaijan	4.03
57	Romania	4.00
58	Vietnam	3.96
59	Indonesia	3.86
60	Montenegro	3.79
61	Macedonia, FYR	3.78
62	Costa Rica	3.73
63	Russian Federation	3.68
64	Brazil	3.66
65	Georgia	3.63
66	Philippines	3.58
67	India	3.57
68	Italy	3.51
69	Saudi Arabia	3.49
70	Ukraine	3.48
71	Peru	3.46
72	Trinidad and Tobago	3.45
73	Greece	3.45
74	Sri Lanka	3.44
75	Pakistan	3.43
76	Bosnia and Herzegovina	3.43
77	Mexico	3.41
78	Mauritius	3.39
79	Kuwait	3.38
80	Morocco	3.33
81	Colombia	3.29
82	Panama	3.25
83	Serbia	3.20
84	Gambia, The	3.18
85	Jamaica	3.14
86	Dominican Republic	3.13
87	Albania	3.12
88	Venezuela	3.03
89	Argentina	3.01
90	Honduras	2.99
91	Nigeria	2.94
92	Tajikistan	2.93
93	Kyrgyz Republic	2.88
94	Mongolia	2.88
95	Egypt	2.87
96	Botswana	2.86
97	Ecuador	2.83
98	El Salvador	2.82
99	Kenya	2.82
100	South Africa	2.82
101	Armenia	2.80
102	Namibia	2.78
103	Guatemala	2.77
104	Nepal	2.69
105	Cambodia	2.61
106	Ghana	2.61
107	Lesotho	2.60
108	Suriname	2.58
109	Cameroon	2.56
110	Mali	2.56
111	Nicaragua	2.55
112	Guyana	2.50
113	Madagascar	2.50
114	Bolivia	2.45
115	Côte d'Ivoire	2.43
116	Zambia	2.42
117	Benin	2.39
118	Uganda	2.37
119	Mozambique	2.37
120	Mauritania	2.34
121	Libya	2.25
122	Ethiopia	2.24
123	Algeria	2.14
124	Tanzania	2.13
125	Zimbabwe	2.11
126	Syria	2.05
127	Burkina Faso	2.01
128	Malawi	1.97
129	Burundi	1.85
130	Timor-Leste	1.82
131	Chad	1.75
132	Bangladesh	1.62
133	Paraguay	1.61



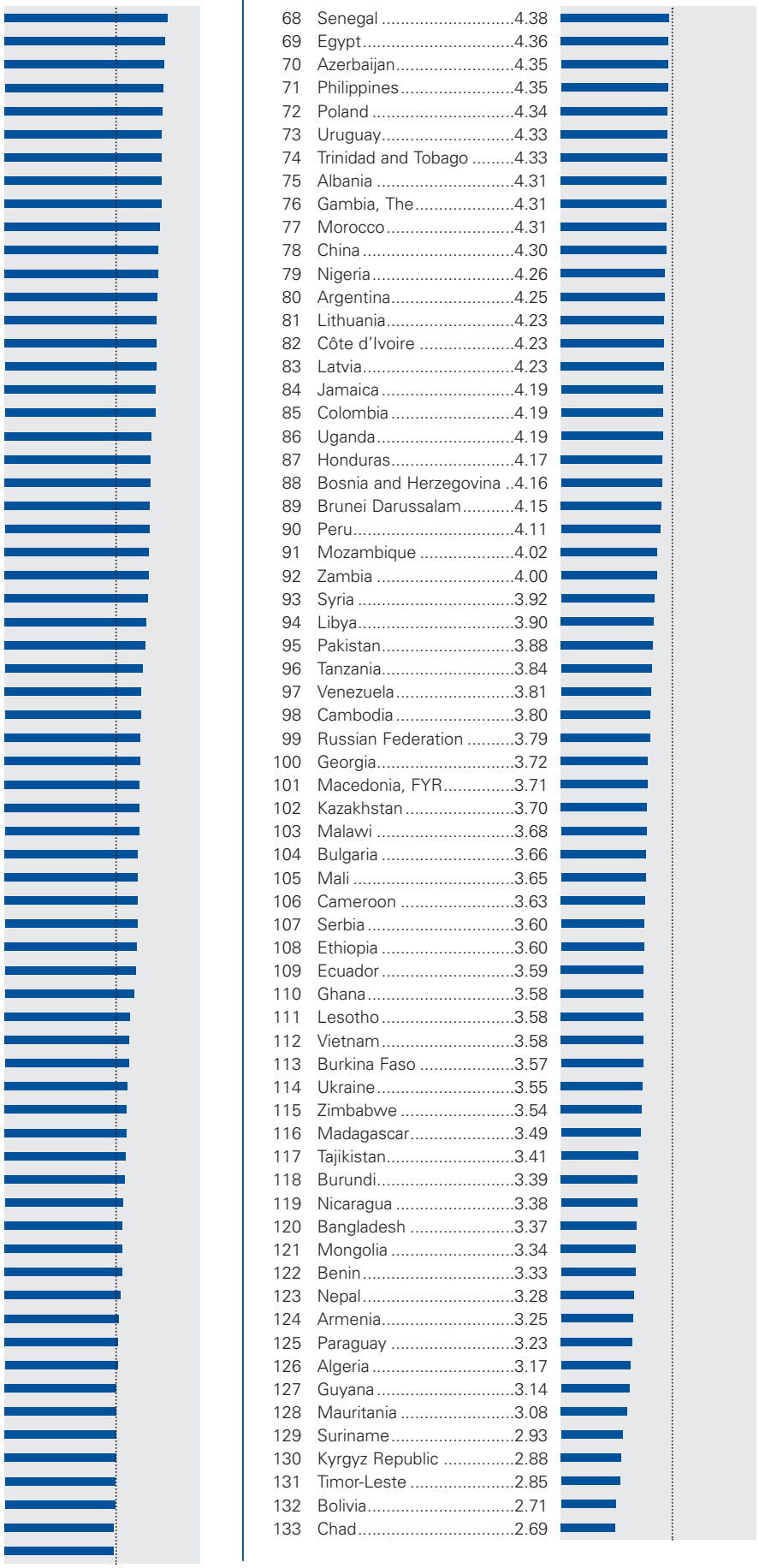
SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

8th pillar
Business usage

8.01 Prevalence of foreign technology licensing

How common is licensing of foreign technology in your country? (1 = extremely uncommon; 7 = extremely common) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Canada	6.10
2	Iceland	6.02
3	Qatar	6.00
4	United Arab Emirates	5.96
5	Singapore	5.94
6	Switzerland	5.91
7	Netherlands	5.91
8	Denmark	5.91
9	Japan	5.91
10	Norway	5.86
11	Australia	5.80
12	Sweden	5.80
13	Luxembourg	5.78
14	Taiwan, China	5.76
15	New Zealand	5.76
16	Hong Kong SAR	5.74
17	United Kingdom	5.73
18	Finland	5.71
19	Austria	5.60
20	Portugal	5.57
21	United States	5.56
22	South Africa	5.54
23	Belgium	5.53
24	France	5.52
25	Germany	5.51
26	Bahrain	5.48
27	Ireland	5.44
28	Jordan	5.40
29	Saudi Arabia	5.31
30	Malaysia	5.27
31	India	5.26
32	Czech Republic	5.24
33	Chile	5.24
34	Korea, Rep.	5.22
35	Brazil	5.21
36	Puerto Rico	5.20
37	Spain	5.17
38	Tunisia	5.17
39	Cyprus	5.16
40	Israel	5.15
41	Oman	5.14
42	Malta	5.10
43	Slovak Republic	5.04
44	Slovenia	4.92
45	Thailand	4.90
46	Turkey	4.88
47	Greece	4.84
48	Panama	4.82
49	Indonesia	4.81
50	Sri Lanka	4.79
51	Dominican Republic	4.77
52	Italy	4.69
53	Estonia	4.68
54	Costa Rica	4.68
55	Barbados	4.68
56	Mexico	4.63
57	Croatia	4.57
58	Hungary	4.55
59	Botswana	4.53
60	Kenya	4.50
61	Namibia	4.50
62	Mauritius	4.49
63	Kuwait	4.49
64	Guatemala	4.45
65	El Salvador	4.45
66	Romania	4.42
67	Montenegro	4.41
68	Senegal	4.38
69	Egypt	4.36
70	Azerbaijan	4.35
71	Philippines	4.35
72	Poland	4.34
73	Uruguay	4.33
74	Trinidad and Tobago	4.33
75	Albania	4.31
76	Gambia, The	4.31
77	Morocco	4.31
78	China	4.30
79	Nigeria	4.26
80	Argentina	4.25
81	Lithuania	4.23
82	Côte d'Ivoire	4.23
83	Latvia	4.23
84	Jamaica	4.19
85	Colombia	4.19
86	Uganda	4.19
87	Honduras	4.17
88	Bosnia and Herzegovina	4.16
89	Brunei Darussalam	4.15
90	Peru	4.11
91	Mozambique	4.02
92	Zambia	4.00
93	Syria	3.92
94	Libya	3.90
95	Pakistan	3.88
96	Tanzania	3.84
97	Venezuela	3.81
98	Cambodia	3.80
99	Russian Federation	3.79
100	Georgia	3.72
101	Macedonia, FYR	3.71
102	Kazakhstan	3.70
103	Malawi	3.68
104	Bulgaria	3.66
105	Mali	3.65
106	Cameroon	3.63
107	Serbia	3.60
108	Ethiopia	3.60
109	Ecuador	3.59
110	Ghana	3.58
111	Lesotho	3.58
112	Vietnam	3.58
113	Burkina Faso	3.57
114	Ukraine	3.55
115	Zimbabwe	3.54
116	Madagascar	3.49
117	Tajikistan	3.41
118	Burundi	3.39
119	Nicaragua	3.38
120	Bangladesh	3.37
121	Mongolia	3.34
122	Benin	3.33
123	Nepal	3.28
124	Armenia	3.25
125	Paraguay	3.23
126	Algeria	3.17
127	Guyana	3.14
128	Mauritania	3.08
129	Suriname	2.93
130	Kyrgyz Republic	2.88
131	Timor-Leste	2.85
132	Bolivia	2.71
133	Chad	2.69

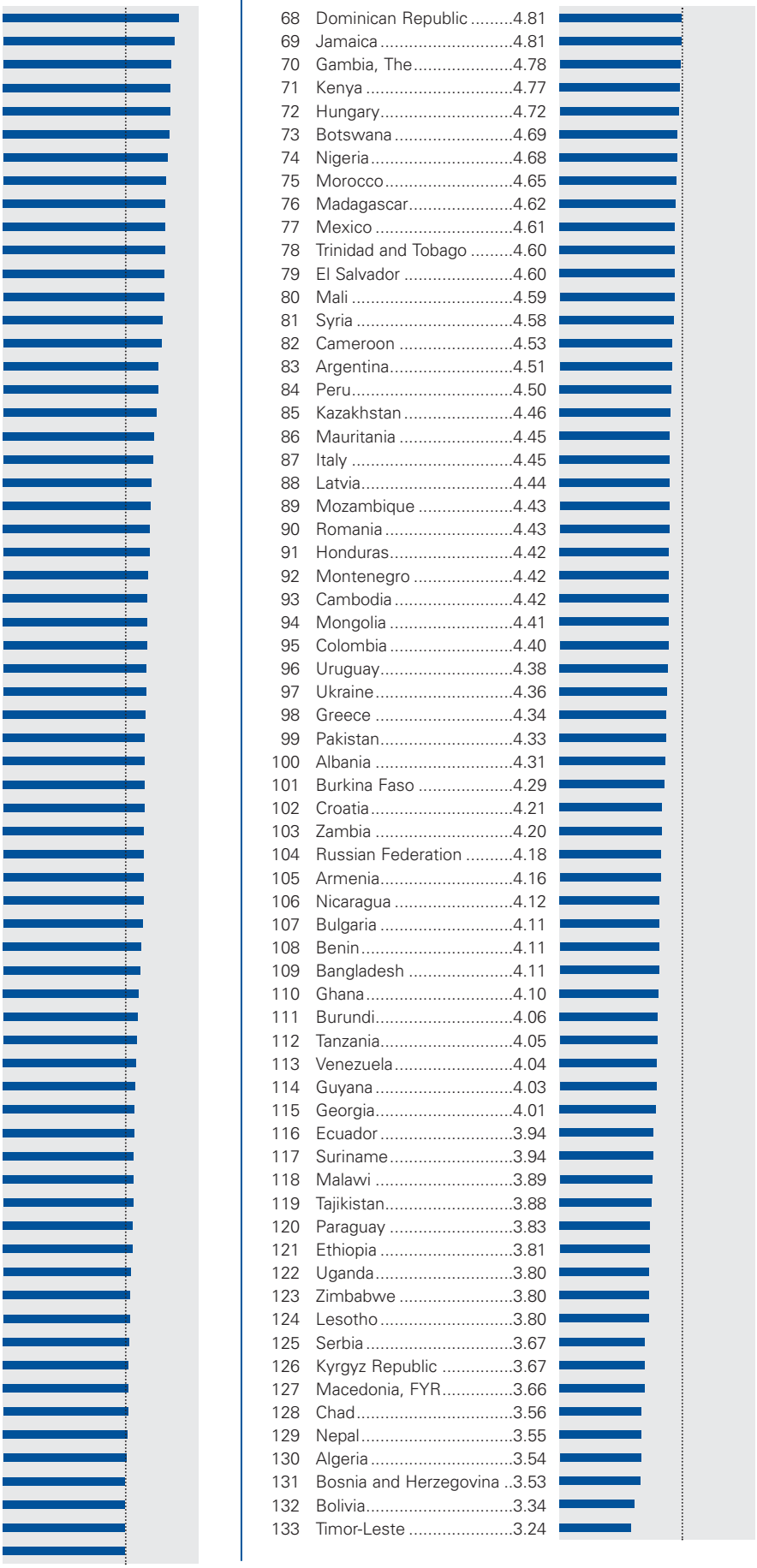


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

8.02 Firm-level technology absorption

To what extent do businesses in your country absorb new technology? (1 = not at all; 7 = aggressively absorb) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Iceland	6.50
2	Japan	6.36
3	Switzerland	6.25
4	United Arab Emirates	6.24
5	United States	6.23
6	Sweden	6.21
7	Denmark	6.14
8	Norway	6.09
9	Finland	6.08
10	Austria	6.07
11	Israel	6.07
12	Taiwan, China	6.05
13	Singapore	6.03
14	Germany	6.00
15	Korea, Rep.	5.96
16	Australia	5.85
17	Hong Kong SAR	5.85
18	New Zealand	5.79
19	Qatar	5.72
20	Luxembourg	5.69
21	Canada	5.65
22	United Kingdom	5.62
23	Puerto Rico	5.60
24	Jordan	5.58
25	Netherlands	5.52
26	France	5.51
27	Belgium	5.51
28	Senegal	5.50
29	Estonia	5.47
30	India	5.47
31	Chile	5.46
32	Ireland	5.43
33	South Africa	5.43
34	Portugal	5.43
35	Czech Republic	5.42
36	Brazil	5.41
37	Malaysia	5.39
38	Tunisia	5.39
39	Cyprus	5.39
40	Saudi Arabia	5.36
41	Barbados	5.33
42	Kuwait	5.28
43	Malta	5.24
44	Guatemala	5.20
45	Slovak Republic	5.18
46	Sri Lanka	5.17
47	China	5.14
48	Egypt	5.11
49	Spain	5.11
50	Côte d'Ivoire	5.08
51	Vietnam	5.08
52	Turkey	5.07
53	Costa Rica	5.06
54	Philippines	5.06
55	Azerbaijan	4.99
56	Slovenia	4.97
57	Brunei Darussalam	4.96
58	Panama	4.95
59	Bahrain	4.93
60	Oman	4.92
61	Thailand	4.91
62	Mauritius	4.90
63	Namibia	4.86
64	Lithuania	4.82
65	Indonesia	4.81
66	Libya	4.81
67	Poland	4.81
68	Dominican Republic	4.81
69	Jamaica	4.81
70	Gambia, The	4.78
71	Kenya	4.77
72	Hungary	4.72
73	Botswana	4.69
74	Nigeria	4.68
75	Morocco	4.65
76	Madagascar	4.62
77	Mexico	4.61
78	Trinidad and Tobago	4.60
79	El Salvador	4.60
80	Mali	4.59
81	Syria	4.58
82	Cameroon	4.53
83	Argentina	4.51
84	Peru	4.50
85	Kazakhstan	4.46
86	Mauritania	4.45
87	Italy	4.45
88	Latvia	4.44
89	Mozambique	4.43
90	Romania	4.43
91	Honduras	4.42
92	Montenegro	4.42
93	Cambodia	4.42
94	Mongolia	4.41
95	Colombia	4.40
96	Uruguay	4.38
97	Ukraine	4.36
98	Greece	4.34
99	Pakistan	4.33
100	Albania	4.31
101	Burkina Faso	4.29
102	Croatia	4.21
103	Zambia	4.20
104	Russian Federation	4.18
105	Armenia	4.16
106	Nicaragua	4.12
107	Bulgaria	4.11
108	Benin	4.11
109	Bangladesh	4.11
110	Ghana	4.10
111	Burundi	4.06
112	Tanzania	4.05
113	Venezuela	4.04
114	Guyana	4.03
115	Georgia	4.01
116	Ecuador	3.94
117	Suriname	3.94
118	Malawi	3.89
119	Tajikistan	3.88
120	Paraguay	3.83
121	Ethiopia	3.81
122	Uganda	3.80
123	Zimbabwe	3.80
124	Lesotho	3.80
125	Serbia	3.67
126	Kyrgyz Republic	3.67
127	Macedonia, FYR	3.66
128	Chad	3.56
129	Nepal	3.55
130	Algeria	3.54
131	Bosnia and Herzegovina	3.53
132	Bolivia	3.34
133	Timor-Leste	3.24

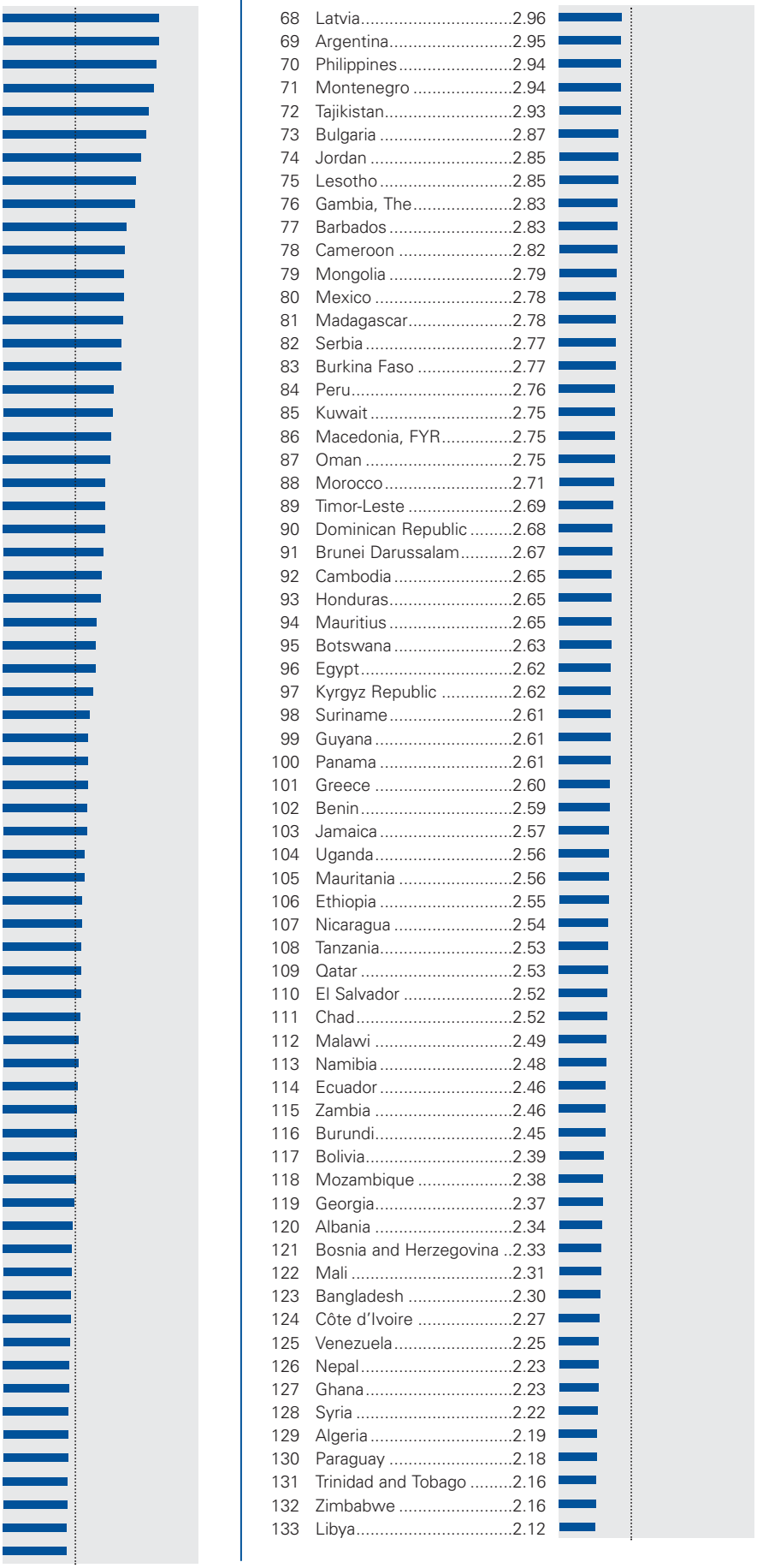


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

8.03 Capacity for innovation

In your country, how do companies obtain technology? (1 = exclusively from licensing or imitating foreign companies; 7 = by conducting formal research and pioneering their own new products and processes) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Japan	5.89
2	Germany	5.87
3	Switzerland	5.80
4	Sweden	5.71
5	Finland	5.56
6	United States	5.49
7	Denmark	5.33
8	Israel	5.16
9	France	5.14
10	Netherlands	4.87
11	Austria	4.81
12	Belgium	4.79
13	Taiwan, China	4.78
14	Norway	4.76
15	Korea, Rep.	4.71
16	United Kingdom	4.70
17	Slovenia	4.46
18	Singapore	4.43
19	Luxembourg	4.38
20	Canada	4.36
21	Czech Republic	4.20
22	China	4.20
23	Iceland	4.20
24	New Zealand	4.13
25	Malaysia	4.08
26	Australia	4.05
27	Italy	3.92
28	Brazil	3.90
29	Azerbaijan	3.90
30	Ireland	3.83
31	Saudi Arabia	3.72
32	Ukraine	3.67
33	Vietnam	3.66
34	Spain	3.66
35	India	3.64
36	South Africa	3.62
37	Estonia	3.56
38	Portugal	3.56
39	United Arab Emirates	3.48
40	Cyprus	3.48
41	Costa Rica	3.45
42	Russian Federation	3.45
43	Hong Kong SAR	3.45
44	Indonesia	3.42
45	Kenya	3.35
46	Turkey	3.35
47	Nigeria	3.34
48	Hungary	3.31
49	Sri Lanka	3.31
50	Kazakhstan	3.31
51	Tunisia	3.27
52	Croatia	3.23
53	Lithuania	3.18
54	Puerto Rico	3.16
55	Slovak Republic	3.14
56	Pakistan	3.13
57	Poland	3.13
58	Bahrain	3.09
59	Thailand	3.07
60	Chile	3.06
61	Malta	3.05
62	Colombia	3.03
63	Guatemala	3.03
64	Romania	3.02
65	Uruguay	3.01
66	Armenia	2.99
67	Senegal	2.99
68	Latvia	2.96
69	Argentina	2.95
70	Philippines	2.94
71	Montenegro	2.94
72	Tajikistan	2.93
73	Bulgaria	2.87
74	Jordan	2.85
75	Lesotho	2.85
76	Gambia, The	2.83
77	Barbados	2.83
78	Cameroon	2.82
79	Mongolia	2.79
80	Mexico	2.78
81	Madagascar	2.78
82	Serbia	2.77
83	Burkina Faso	2.77
84	Peru	2.76
85	Kuwait	2.75
86	Macedonia, FYR	2.75
87	Oman	2.75
88	Morocco	2.71
89	Timor-Leste	2.69
90	Dominican Republic	2.68
91	Brunei Darussalam	2.67
92	Cambodia	2.65
93	Honduras	2.65
94	Mauritius	2.65
95	Botswana	2.63
96	Egypt	2.62
97	Kyrgyz Republic	2.62
98	Suriname	2.61
99	Guyana	2.61
100	Panama	2.61
101	Greece	2.60
102	Benin	2.59
103	Jamaica	2.57
104	Uganda	2.56
105	Mauritania	2.56
106	Ethiopia	2.55
107	Nicaragua	2.54
108	Tanzania	2.53
109	Qatar	2.53
110	El Salvador	2.52
111	Chad	2.52
112	Malawi	2.49
113	Namibia	2.48
114	Ecuador	2.46
115	Zambia	2.46
116	Burundi	2.45
117	Bolivia	2.39
118	Mozambique	2.38
119	Georgia	2.37
120	Albania	2.34
121	Bosnia and Herzegovina	2.33
122	Mali	2.31
123	Bangladesh	2.30
124	Côte d'Ivoire	2.27
125	Venezuela	2.25
126	Nepal	2.23
127	Ghana	2.23
128	Syria	2.22
129	Algeria	2.19
130	Paraguay	2.18
131	Trinidad and Tobago	2.16
132	Zimbabwe	2.16
133	Libya	2.12

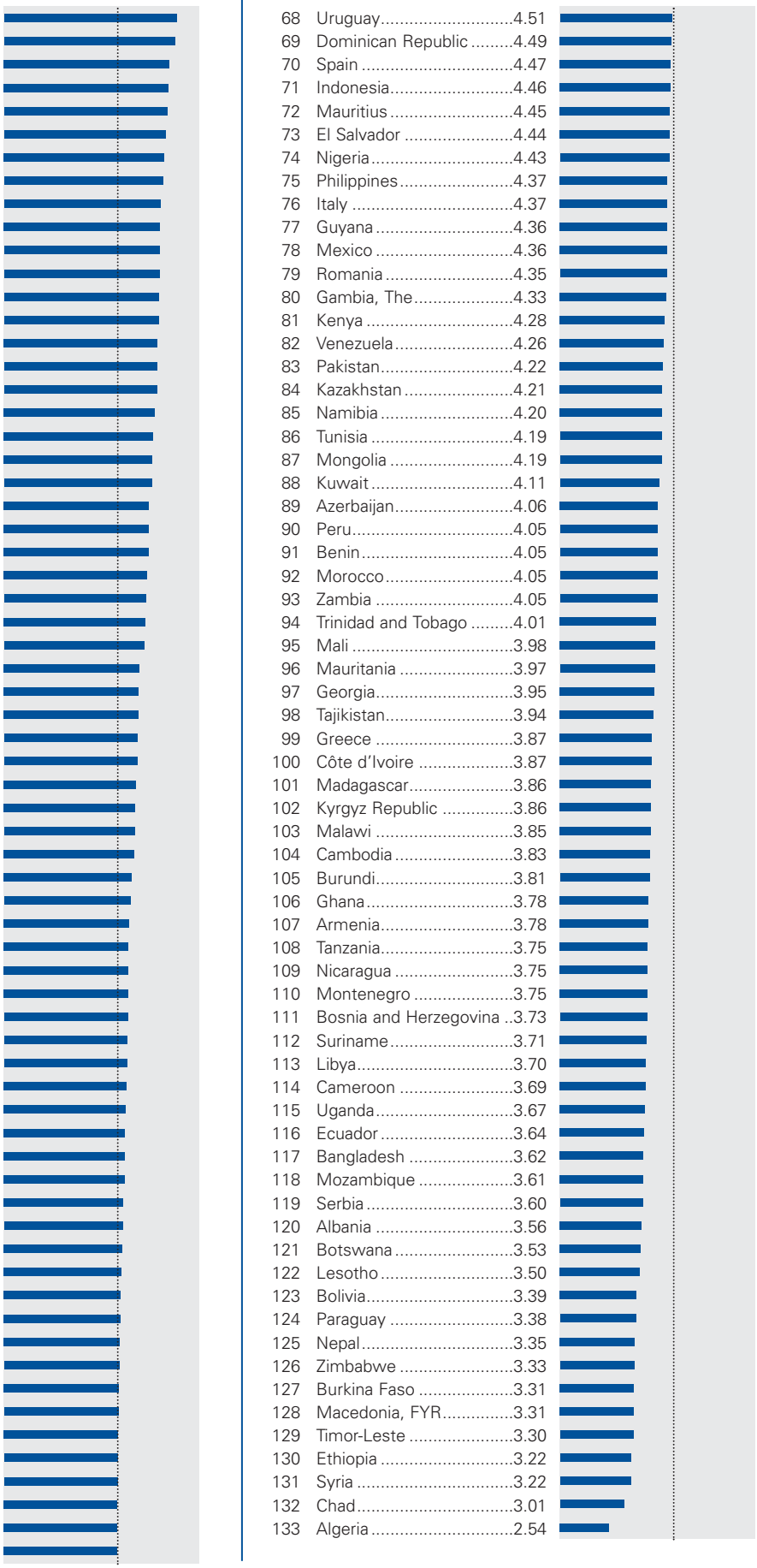


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

8.04 Extent of business Internet use

To what extent do companies within your country use the Internet for their business activities (e.g., buying and selling goods, for interacting with customers and suppliers)? (1 = not at all; 7 = extensively) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Sweden	6.41
2	United States	6.36
3	Korea, Rep.	6.19
4	Estonia	6.15
5	Canada	6.11
6	Israel	6.06
7	Denmark	6.02
8	United Kingdom	5.98
9	Switzerland	5.90
10	Japan	5.89
11	Netherlands	5.88
12	Norway	5.87
13	Iceland	5.85
14	Taiwan, China	5.85
15	Finland	5.81
16	Singapore	5.79
17	Germany	5.79
18	Hong Kong SAR	5.72
19	Czech Republic	5.68
20	France	5.64
21	Austria	5.63
22	Lithuania	5.54
23	Australia	5.54
24	New Zealand	5.54
25	Puerto Rico	5.48
26	Brazil	5.44
27	Luxembourg	5.43
28	United Arab Emirates	5.39
29	Chile	5.25
30	Belgium	5.22
31	Ireland	5.22
32	Bahrain	5.18
33	Portugal	5.18
34	Guatemala	5.14
35	Slovenia	5.11
36	Malta	5.10
37	Senegal	5.08
38	Cyprus	5.01
39	Malaysia	4.96
40	Sri Lanka	4.92
41	Poland	4.90
42	Barbados	4.89
43	India	4.89
44	South Africa	4.88
45	Egypt	4.86
46	Bulgaria	4.85
47	Slovak Republic	4.84
48	Turkey	4.82
49	Saudi Arabia	4.79
50	Latvia	4.79
51	Brunei Darussalam	4.79
52	China	4.74
53	Colombia	4.72
54	Croatia	4.71
55	Jordan	4.68
56	Hungary	4.66
57	Honduras	4.66
58	Ukraine	4.62
59	Argentina	4.61
60	Costa Rica	4.60
61	Russian Federation	4.59
62	Oman	4.57
63	Jamaica	4.56
64	Qatar	4.56
65	Vietnam	4.54
66	Panama	4.54
67	Thailand	4.54
68	Uruguay	4.51
69	Dominican Republic	4.49
70	Spain	4.47
71	Indonesia	4.46
72	Mauritius	4.45
73	El Salvador	4.44
74	Nigeria	4.43
75	Philippines	4.37
76	Italy	4.37
77	Guyana	4.36
78	Mexico	4.36
79	Romania	4.35
80	Gambia, The	4.33
81	Kenya	4.28
82	Venezuela	4.26
83	Pakistan	4.22
84	Kazakhstan	4.21
85	Namibia	4.20
86	Tunisia	4.19
87	Mongolia	4.19
88	Kuwait	4.11
89	Azerbaijan	4.06
90	Peru	4.05
91	Benin	4.05
92	Morocco	4.05
93	Zambia	4.05
94	Trinidad and Tobago	4.01
95	Mali	3.98
96	Mauritania	3.97
97	Georgia	3.95
98	Tajikistan	3.94
99	Greece	3.87
100	Côte d'Ivoire	3.87
101	Madagascar	3.86
102	Kyrgyz Republic	3.86
103	Malawi	3.85
104	Cambodia	3.83
105	Burundi	3.81
106	Ghana	3.78
107	Armenia	3.78
108	Tanzania	3.75
109	Nicaragua	3.75
110	Montenegro	3.75
111	Bosnia and Herzegovina	3.73
112	Suriname	3.71
113	Libya	3.70
114	Cameroon	3.69
115	Uganda	3.67
116	Ecuador	3.64
117	Bangladesh	3.62
118	Mozambique	3.61
119	Serbia	3.60
120	Albania	3.56
121	Botswana	3.53
122	Lesotho	3.50
123	Bolivia	3.39
124	Paraguay	3.38
125	Nepal	3.35
126	Zimbabwe	3.33
127	Burkina Faso	3.31
128	Macedonia, FYR	3.31
129	Timor-Leste	3.30
130	Ethiopia	3.22
131	Syria	3.22
132	Chad	3.01
133	Algeria	2.54



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

8.05 Creative industries exports (hard data)

Exports of creative industries products as a share of world total in such exports | 2006 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	China	18.19
2	Italy	11.76
3	United States	11.16
4	Hong Kong SAR	8.61
5	Germany	8.22
6	United Kingdom	8.22
7	France	7.83
8	Canada	4.03
9	Switzerland	3.42
10	India[3]	3.26
11	Spain[3]	3.12
12	Belgium	2.97
13	Netherlands[3]	1.99
14	Austria	1.74
15	Thailand[3]	1.31
16	Japan	1.27
17	Mexico	1.22
18	Sweden	1.21
19	Singapore[3]	1.17
20	Korea, Rep.	1.13
21	Malaysia	0.97
22	Poland[3]	0.85
23	Brazil	0.81
24	Czech Republic[3]	0.77
25	Indonesia	0.73
26	Denmark	0.72
27	Pakistan	0.70
28	Ireland	0.67
29	Russian Federation	0.63
30	Taiwan, China[3]	0.57
31	Turkey	0.56
32	Finland	0.46
33	Portugal[3]	0.39
34	Greece	0.37
35	Cambodia[2]	0.31
36	Israel[3]	0.29
37	Philippines[3]	0.28
38	Australia[3]	0.27
39	Romania	0.25
40	Colombia	0.24
41	Slovenia	0.19
42	Slovak Republic[3]	0.19
43	South Africa	0.17
44	Hungary[3]	0.15
45	Croatia	0.13
46	Jordan	0.13
47	Saudi Arabia[3]	0.13
48	Argentina[3]	0.13
49	Peru	0.12
50	Norway	0.11
51	Ukraine	0.11
52	Namibia[3]	0.10
53	New Zealand[3]	0.10
54	Morocco	0.09
55	Chile[3]	0.08
56	Estonia	0.08
57	Luxembourg[3]	0.08
58	Guatemala[3]	0.08
59	Lithuania	0.08
60	Tunisia[3]	0.08
61	Malta	0.06
62	Bulgaria[3]	0.06
63	Sri Lanka[3]	0.06
64	Bangladesh[2]	0.05
65	Nepal[1]	0.05
66	Ghana	0.05
67	Zimbabwe[2]	0.05
68	Bolivia	0.04
69	Mauritius	0.04
70	Latvia	0.04
71	Côte d'Ivoire	0.04
72	Costa Rica	0.04
73	Madagascar	0.03
74	Uruguay[3]	0.02
75	Honduras	0.02
76	Kenya[2]	0.02
77	Armenia	0.02
78	Ecuador	0.02
79	Senegal	0.02
80	El Salvador[2]	0.01
81	Venezuela	0.01
82	Oman	0.01
83	Barbados	0.01
84	Bahrain	0.01
85	Bosnia and Herzegovina	0.01
86	Macedonia, FYR	0.01
87	Panama	0.01
88	Cyprus	0.01
89	Kazakhstan	0.01
90	Trinidad and Tobago[3]	0.01
91	Qatar[3]	0.01
92	Albania	0.01
93	Tanzania	0.01
94	Zambia	0.00
95	Cameroon	0.00
96	Uganda	0.00
97	Botswana[1]	0.00
98	Paraguay	0.00
99	Kyrgyz Republic	0.00
100	Nicaragua[3]	0.00
101	Malawi	0.00
102	Ethiopia[1]	0.00
103	Nigeria[1]	0.00
104	Georgia[3]	0.00
105	Iceland	0.00
106	Algeria[2]	0.00
107	Mongolia	0.00
108	Jamaica[3]	0.00
109	Azerbaijan	0.00
110	Burkina Faso[2]	0.00
111	Guyana	0.00
112	Mali[2]	0.00
113	Benin[3]	0.00
114	Mozambique	0.00
115	Gambia, The[3]	0.00
116	Burundi[2]	0.00
117	Brunei Darussalam	0.00
117	Dominican Republic	0.00
117	Kuwait	0.00
117	Mauritania	0.00
117	Suriname	0.00
n/a	Chad	n/a
n/a	Egypt	n/a
n/a	Lesotho	n/a
n/a	Libya	n/a
n/a	Montenegro	n/a
n/a	Puerto Rico	n/a
n/a	Serbia	n/a
n/a	Syria	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a
n/a	United Arab Emirates	n/a
n/a	Vietnam	n/a

SOURCE: UNCTAD, Creative Economy and Industries Programme

[1] 2003 [2] 2004 [3] 2005

8.06 Utility patents (hard data)

Number of utility patents (i.e., patents for invention) granted between January 1 and December 31, 2008, per million population | 2008

RANK	COUNTRY/ECONOMY	HARD DATA
1	Taiwan, China	279.25
2	Japan	263.35
3	United States	250.93
4	Israel	166.57
5	Korea, Rep.	155.97
6	Finland	155.47
7	Switzerland	148.27
8	Sweden	115.22
9	Germany	108.06
10	Canada	102.20
11	Singapore	88.67
12	Iceland	85.81
13	Netherlands	80.55
14	Denmark	71.09
15	Australia	61.52
16	Norway	58.09
17	Austria	55.12
18	France	51.10
19	Luxembourg	50.85
20	United Kingdom	50.72
21	Belgium	48.57
22	Hong Kong SAR	42.60
23	Ireland	37.27
24	New Zealand	25.00
25	Italy	23.04
26	Slovenia	7.00
27	Spain	6.79
28	Hungary	6.60
29	Malaysia	5.63
30	Kuwait	5.17
31	Malta	4.90
32	Czech Republic	4.71
33	Puerto Rico	3.50
34	Lithuania	3.24
35	Croatia	3.04
36	Bulgaria	2.11
37	Greece	2.05
38	United Arab Emirates	2.00
39	South Africa	1.86
40	Oman	1.85
41	Estonia	1.54
42	Jamaica	1.48
43	Poland	1.42
44	Russian Federation	1.24
45	Saudi Arabia	1.19
46	Qatar	1.17
47	Cyprus	1.16
48	Portugal	1.03
49	Slovak Republic	0.93
50	China	0.92
51	Costa Rica	0.89
52	Panama	0.88
53	Argentina	0.80
54	Chile	0.77
55	Trinidad and Tobago	0.77
56	Uruguay	0.59
57	Romania	0.56
58	India	0.53
59	Brazil	0.52
60	Mexico	0.50
61	Macedonia, FYR	0.50
62	Venezuela	0.50
63	Namibia	0.48
64	Ukraine	0.46
65	Georgia	0.45
66	Latvia	0.43
67	Serbia	0.40
68	Thailand	0.34
69	Armenia	0.33
70	Colombia	0.26
71	Bosnia and Herzegovina	0.26
72	Azerbaijan	0.24
73	Guatemala	0.22
74	Turkey	0.21
75	Dominican Republic	0.20
76	Tunisia	0.19
77	Kyrgyz Republic	0.19
78	Philippines	0.18
79	Ecuador	0.15
80	Morocco	0.13
81	Kenya	0.10
82	Bolivia	0.10
82	Sri Lanka	0.10
84	Chad	0.09
85	Kazakhstan	0.06
86	Egypt	0.03
87	Indonesia	0.02
88	Pakistan	0.02
89	Nigeria	0.01
90	Albania	0.00
90	Algeria	0.00
90	Bahrain	0.00
90	Bangladesh	0.00
90	Barbados	0.00
90	Benin	0.00
90	Botswana	0.00
90	Brunei Darussalam	0.00
90	Burkina Faso	0.00
90	Burundi	0.00
90	Cambodia	0.00
90	Cameroon	0.00
90	Côte d'Ivoire	0.00
90	El Salvador	0.00
90	Ethiopia	0.00
90	Gambia, The	0.00
90	Ghana	0.00
90	Guyana	0.00
90	Honduras	0.00
90	Jordan	0.00
90	Lesotho	0.00
90	Libya	0.00
90	Madagascar	0.00
90	Malawi	0.00
90	Mali	0.00
90	Mauritania	0.00
90	Mauritius	0.00
90	Mongolia	0.00
90	Montenegro	0.00
90	Mozambique	0.00
90	Nepal	0.00
90	Nicaragua	0.00
90	Paraguay	0.00
90	Peru	0.00
90	Senegal	0.00
90	Suriname	0.00
90	Syria	0.00
90	Tajikistan	0.00
90	Tanzania	0.00
90	Timor-Leste	0.00
90	Uganda	0.00
90	Vietnam	0.00
90	Zambia	0.00
90	Zimbabwe	0.00

SOURCE: The United States Patent and Trademark Office (June 2009); UNFPA, *State of World Population 2008;* The Economist Intelligent Unit, *CountryData Database* (July 2009)

8.07 High-tech exports (hard data)

High-technology exports as a percentage of total goods exports | 2007 or most recent year available

RANK	COUNTRY/ECONOMY	HARD DATA
1	Hong Kong SAR	44.77
2	Malta	44.37
3	Taiwan, China	44.20
4	Malaysia	36.61
5	Singapore	34.82
6	Korea, Rep.	29.19
7	Philippines	27.86
8	China	27.62
9	Costa Rica[3]	25.88
10	Ireland	24.86
11	Hungary	20.62
12	Thailand	20.61
13	United States	19.84
14	Japan	17.91
15	Finland	17.26
16	Switzerland	16.79
17	Puerto Rico[4]	16.49
18	Netherlands	16.09
19	Iceland	15.22
20	France	14.74
21	United Kingdom	14.27
22	Czech Republic	12.55
23	Mexico	12.25
24	Sweden	11.94
25	Germany	11.55
26	Denmark	11.20
27	Austria	8.96
28	Belgium	7.77
29	Estonia	7.58
30	Lithuania	7.07
31	Canada	6.85
32	Cyprus	6.39
33	Luxembourg	6.39
34	Portugal	6.34
35	Israel	6.17
36	Croatia	6.09
37	Brazil	5.79
38	Morocco	5.66
39	Italy	5.54
40	Côte d'Ivoire	5.42
41	Barbados[2]	5.18
42	Mauritius	4.99
43	Slovenia	4.59
44	Indonesia	4.43
45	Slovak Republic	4.35
46	Latvia	4.29
47	Greece	4.19
48	Spain	3.76
49	Tunisia	3.73
50	India[3]	3.34
51	Bulgaria	3.33
52	Norway	3.20
53	Vietnam[3]	3.20
54	Kazakhstan	3.04
55	Romania	2.90
56	Poland	2.87
57	Namibia	2.83
58	Serbia[3]	2.74
59	Ukraine	2.64
60	Australia	2.49
61	South Africa	2.45
62	Burundi	2.31
63	New Zealand	2.30
64	Argentina	2.05
65	Kenya	1.97
66	Georgia	1.89
67	Bosnia and Herzegovina	1.80
68	Guatemala	1.70
69	Sri Lanka[2]	1.56
70	Zimbabwe	1.44
71	Senegal	1.32
72	Uganda	1.21
73	Russian Federation	1.17
74	Colombia	1.11
75	Burkina Faso[2]	1.05
76	El Salvador	1.04
77	Pakistan	1.04
78	Albania[3]	1.03
79	Uruguay	0.81
80	Armenia	0.77
81	Chile[3]	0.68
82	Jordan	0.67
83	Macedonia, FYR	0.63
84	Kyrgyz Republic	0.59
85	Ecuador	0.49
86	Trinidad and Tobago	0.45
87	Paraguay	0.45
88	Bolivia	0.34
89	Ethiopia	0.34
90	Madagascar[2]	0.32
91	Botswana	0.31
92	Suriname	0.30
93	Turkey	0.28
94	Syria[3]	0.28
95	Kuwait	0.26
96	Bangladesh[1]	0.26
97	Peru	0.25
98	Malawi	0.22
99	Nicaragua	0.22
100	Tanzania	0.22
101	Mali	0.22
102	Brunei Darussalam[3]	0.21
103	Zambia	0.19
104	Mongolia[3]	0.17
105	Cambodia[1]	0.16
106	Honduras	0.15
107	Venezuela[3]	0.12
108	Mozambique[3]	0.11
109	Jamaica	0.11
110	Ghana	0.11
111	Dominican Republic	0.11
112	Cameroon[3]	0.08
113	Azerbaijan	0.07
114	Lesotho[2]	0.06
115	Nigeria	0.05
116	Saudi Arabia	0.05
117	Guyana[3]	0.04
118	Oman	0.03
119	Gambia, The	0.03
120	Algeria	0.02
121	Egypt	0.02
122	United Arab Emirates[3]	0.02
123	Benin[2]	0.00
124	Bahrain	0.00
125	Panama	0.00
126	Qatar[3]	0.00
n/a	Chad	n/a
n/a	Libya	n/a
n/a	Mauritania	n/a
n/a	Montenegro	n/a
n/a	Nepal	n/a
n/a	Tajikistan	n/a
n/a	Timor-Leste	n/a

SOURCE: The World Bank, *World Development Indicators Online* (retrieved December 3, 2009); authors' estimates based on United Nations Statistics Division's COMTRADE database (retrieved October 1, 2009).

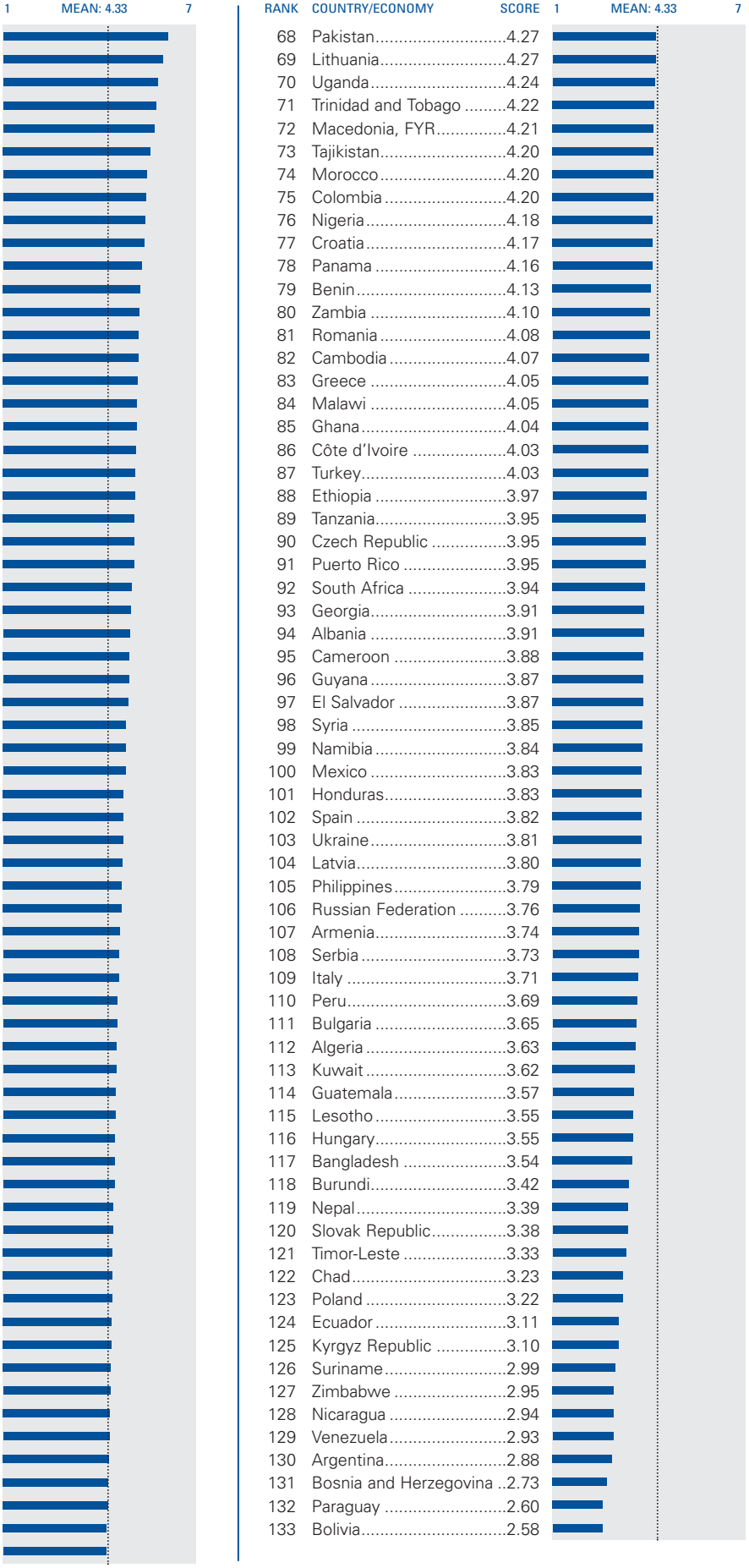
[1] 2004 [2] 2005 [3] 2006 [4] 2008

9th pillar
Government usage

9.01 Government success in ICT promotion

How successful is the government in promoting the use of information and communication technologies in your country? (1 = not successful at all; 7 = extremely successful) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.22
2	United Arab Emirates	6.06
3	Malta	5.90
4	Qatar	5.85
5	Taiwan, China	5.79
6	Tunisia	5.67
7	Sweden	5.55
8	Portugal	5.53
9	Denmark	5.50
10	Luxembourg	5.48
11	Estonia	5.39
12	Iceland	5.36
13	Gambia, The	5.33
14	Malaysia	5.30
15	Bahrain	5.30
16	China	5.27
17	Korea, Rep.	5.25
18	Norway	5.23
19	Oman	5.20
20	United States	5.19
21	Jordan	5.19
22	India	5.17
23	Finland	5.16
24	Hong Kong SAR	5.16
25	Saudi Arabia	5.08
26	Barbados	5.06
27	Egypt	5.02
28	Brunei Darussalam	5.00
29	Canada	4.99
30	Azerbaijan	4.97
31	Sri Lanka	4.89
32	Australia	4.89
33	Switzerland	4.88
34	Senegal	4.81
35	Dominican Republic	4.81
36	Cyprus	4.80
37	Uruguay	4.79
38	France	4.76
39	Germany	4.76
40	Slovenia	4.71
41	Netherlands	4.67
42	Austria	4.67
43	Mauritius	4.63
44	Mali	4.61
45	Israel	4.60
46	Thailand	4.59
47	Burkina Faso	4.56
48	Botswana	4.56
49	Mongolia	4.55
50	United Kingdom	4.55
51	Mozambique	4.53
52	Jamaica	4.48
53	Japan	4.48
54	Vietnam	4.47
55	Chile	4.46
56	Mauritania	4.45
57	Kenya	4.44
58	Belgium	4.44
59	New Zealand	4.41
60	Brazil	4.40
61	Libya	4.39
62	Costa Rica	4.37
63	Kazakhstan	4.36
64	Ireland	4.34
65	Indonesia	4.34
66	Madagascar	4.28
67	Montenegro	4.27
68	Pakistan	4.27
69	Lithuania	4.27
70	Uganda	4.24
71	Trinidad and Tobago	4.22
72	Macedonia, FYR	4.21
73	Tajikistan	4.20
74	Morocco	4.20
75	Colombia	4.20
76	Nigeria	4.18
77	Croatia	4.17
78	Panama	4.16
79	Benin	4.13
80	Zambia	4.10
81	Romania	4.08
82	Cambodia	4.07
83	Greece	4.05
84	Malawi	4.05
85	Ghana	4.04
86	Côte d'Ivoire	4.03
87	Turkey	4.03
88	Ethiopia	3.97
89	Tanzania	3.95
90	Czech Republic	3.95
91	Puerto Rico	3.95
92	South Africa	3.94
93	Georgia	3.91
94	Albania	3.91
95	Cameroon	3.88
96	Guyana	3.87
97	El Salvador	3.87
98	Syria	3.85
99	Namibia	3.84
100	Mexico	3.83
101	Honduras	3.83
102	Spain	3.82
103	Ukraine	3.81
104	Latvia	3.80
105	Philippines	3.79
106	Russian Federation	3.76
107	Armenia	3.74
108	Serbia	3.73
109	Italy	3.71
110	Peru	3.69
111	Bulgaria	3.65
112	Algeria	3.63
113	Kuwait	3.62
114	Guatemala	3.57
115	Lesotho	3.55
116	Hungary	3.55
117	Bangladesh	3.54
118	Burundi	3.42
119	Nepal	3.39
120	Slovak Republic	3.38
121	Timor-Leste	3.33
122	Chad	3.23
123	Poland	3.22
124	Ecuador	3.11
125	Kyrgyz Republic	3.10
126	Suriname	2.99
127	Zimbabwe	2.95
128	Nicaragua	2.94
129	Venezuela	2.93
130	Argentina	2.88
131	Bosnia and Herzegovina	2.73
132	Paraguay	2.60
133	Bolivia	2.58



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

9.02 Government Online Service Index (hard data)

The Government Online Service Index assesses the quality of government's delivery of online services | 2009

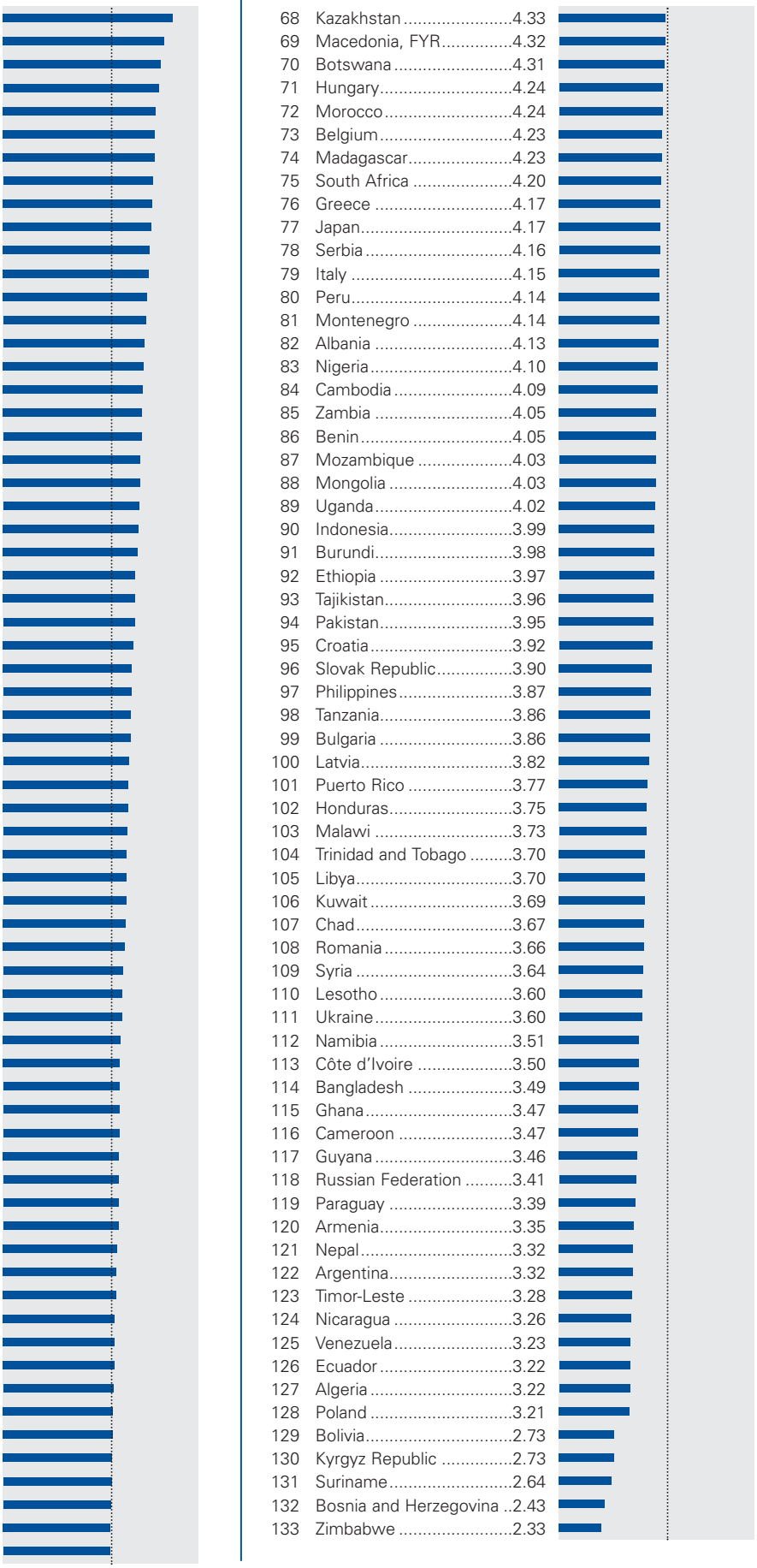
RANK	COUNTRY/ECONOMY	HARD DATA
1	Korea, Rep.	1.00
2	United States	0.94
3	Canada	0.88
4	United Kingdom	0.77
5	Australia	0.77
5	Spain	0.77
7	Norway	0.74
8	Bahrain	0.73
9	Colombia	0.71
10	Singapore	0.69
11	France	0.68
12	Netherlands	0.68
13	Denmark	0.67
13	Japan	0.67
15	New Zealand	0.64
16	Malaysia	0.63
17	Belgium	0.63
18	Chile	0.61
19	Israel	0.58
20	Mongolia	0.56
21	Germany	0.55
22	Jordan	0.53
23	Egypt	0.53
24	Kazakhstan	0.53
24	Sweden	0.53
26	Hungary	0.50
27	Estonia	0.50
28	Ireland	0.50
29	Lithuania	0.48
29	Tunisia	0.48
31	Finland	0.48
31	Uruguay	0.48
33	Austria	0.48
34	Malta	0.47
35	Kuwait	0.46
36	Czech Republic	0.45
37	Switzerland	0.44
38	Mexico	0.44
39	El Salvador	0.43
40	Croatia	0.42
41	Latvia	0.42
41	Romania	0.42
43	Argentina	0.41
44	Bulgaria	0.41
44	Peru	0.41
46	Slovenia	0.40
47	Iceland	0.40
48	Philippines	0.39
49	Poland	0.39
49	Portugal	0.39
51	Luxembourg	0.38
52	Cyprus	0.37
53	Brazil	0.37
53	China	0.37
53	India	0.37
53	Oman	0.37
57	Dominican Republic	0.37
58	Bangladesh	0.36
58	Greece	0.36
60	Slovak Republic	0.35
60	Turkey	0.35
60	Ukraine	0.35
63	Trinidad and Tobago	0.34
64	Thailand	0.33
65	Russian Federation	0.33
66	Azerbaijan	0.32
66	Côte d'Ivoire	0.32
68	Macedonia, FYR	0.32
69	Ecuador	0.32
69	Kyrgyz Republic	0.32
71	Montenegro	0.31
72	Albania	0.31
72	Saudi Arabia	0.31
74	Guatemala	0.31
74	South Africa	0.31
76	Bolivia	0.30
76	Costa Rica	0.30
76	Venezuela	0.30
76	Vietnam	0.30
80	Honduras	0.30
80	Mauritius	0.30
82	Italy	0.29
83	Brunei Darussalam	0.28
83	Panama	0.28
85	Qatar	0.28
86	Bosnia and Herzegovina	0.28
87	Lesotho	0.26
87	Paraguay	0.26
89	Sri Lanka	0.26
90	Nicaragua	0.25
91	United Arab Emirates	0.25
92	Georgia	0.25
92	Pakistan	0.25
94	Indonesia	0.24
95	Kenya	0.24
95	Morocco	0.24
97	Jamaica	0.23
98	Serbia	0.22
99	Barbados	0.20
99	Botswana	0.20
99	Ethiopia	0.20
102	Mali	0.18
103	Guyana	0.18
104	Senegal	0.18
105	Armenia	0.17
105	Tanzania	0.17
107	Mozambique	0.17
108	Nepal	0.17
109	Madagascar	0.17
110	Burkina Faso	0.16
111	Cameroon	0.15
112	Ghana	0.15
113	Cambodia	0.14
113	Libya	0.14
115	Timor-Leste	0.13
116	Zimbabwe	0.13
117	Benin	0.12
118	Zambia	0.10
119	Uganda	0.10
120	Algeria	0.10
121	Nigeria	0.10
122	Mauritania	0.09
122	Tajikistan	0.09
124	Gambia, The	0.08
125	Namibia	0.07
126	Burundi	0.04
126	Syria	0.04
128	Suriname	0.02
129	Chad	0.02
130	Malawi	0.02
n/a	Hong Kong SAR	n/a
n/a	Puerto Rico	n/a
n/a	Taiwan, China	n/a

SOURCE: United Nations, *UN e-Government Survey 2010: Leveraging e-Government at a Time of Financial and Economic Crisis*

9.03 ICT use and government efficiency

To what extent has the use of information and communication technologies by the government improved the efficiency of government services in your country? (1 = no effect; 7 = has generated considerable improvements) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.31
2	United Arab Emirates	6.05
3	Qatar	5.93
4	Estonia	5.87
5	Korea, Rep.	5.78
6	Portugal	5.76
7	Sweden	5.76
8	Denmark	5.69
9	Malta	5.67
10	Taiwan, China	5.64
11	Iceland	5.59
12	Hong Kong SAR	5.57
13	Chile	5.51
14	Malaysia	5.47
15	Bahrain	5.42
16	Austria	5.41
17	Canada	5.38
18	Norway	5.35
19	Slovenia	5.34
20	Switzerland	5.30
21	Finland	5.30
22	United States	5.26
23	Tunisia	5.24
24	France	5.21
25	Dominican Republic	5.13
26	Australia	5.13
27	China	5.12
28	Saudi Arabia	5.08
29	Luxembourg	5.03
30	Gambia, The	5.02
31	Jordan	5.01
32	Oman	5.01
33	Germany	4.94
34	New Zealand	4.92
35	Cyprus	4.92
36	Lithuania	4.88
37	Netherlands	4.87
38	India	4.87
39	Turkey	4.86
40	Ireland	4.84
41	Senegal	4.81
42	El Salvador	4.75
43	Brunei Darussalam	4.73
44	Vietnam	4.72
45	Thailand	4.68
46	Israel	4.66
47	Brazil	4.64
48	Colombia	4.64
49	Burkina Faso	4.64
50	Sri Lanka	4.63
51	Spain	4.61
52	United Kingdom	4.61
53	Egypt	4.61
54	Azerbaijan	4.58
55	Mali	4.55
56	Barbados	4.55
57	Costa Rica	4.49
58	Guatemala	4.49
59	Mauritania	4.49
60	Georgia	4.45
61	Czech Republic	4.44
62	Uruguay	4.44
63	Mauritius	4.42
64	Jamaica	4.40
65	Mexico	4.37
66	Kenya	4.36
67	Panama	4.35
68	Kazakhstan	4.33
69	Macedonia, FYR	4.32
70	Botswana	4.31
71	Hungary	4.24
72	Morocco	4.24
73	Belgium	4.23
74	Madagascar	4.23
75	South Africa	4.20
76	Greece	4.17
77	Japan	4.17
78	Serbia	4.16
79	Italy	4.15
80	Peru	4.14
81	Montenegro	4.14
82	Albania	4.13
83	Nigeria	4.10
84	Cambodia	4.09
85	Zambia	4.05
86	Benin	4.05
87	Mozambique	4.03
88	Mongolia	4.03
89	Uganda	4.02
90	Indonesia	3.99
91	Burundi	3.98
92	Ethiopia	3.97
93	Tajikistan	3.96
94	Pakistan	3.95
95	Croatia	3.92
96	Slovak Republic	3.90
97	Philippines	3.87
98	Tanzania	3.86
99	Bulgaria	3.86
100	Latvia	3.82
101	Puerto Rico	3.77
102	Honduras	3.75
103	Malawi	3.73
104	Trinidad and Tobago	3.70
105	Libya	3.70
106	Kuwait	3.69
107	Chad	3.67
108	Romania	3.66
109	Syria	3.64
110	Lesotho	3.60
111	Ukraine	3.60
112	Namibia	3.51
113	Côte d'Ivoire	3.50
114	Bangladesh	3.49
115	Ghana	3.47
116	Cameroon	3.47
117	Guyana	3.46
118	Russian Federation	3.41
119	Paraguay	3.39
120	Armenia	3.35
121	Nepal	3.32
122	Argentina	3.32
123	Timor-Leste	3.28
124	Nicaragua	3.26
125	Venezuela	3.23
126	Ecuador	3.22
127	Algeria	3.22
128	Poland	3.21
129	Bolivia	2.73
130	Kyrgyz Republic	2.73
131	Suriname	2.64
132	Bosnia and Herzegovina	2.43
133	Zimbabwe	2.33

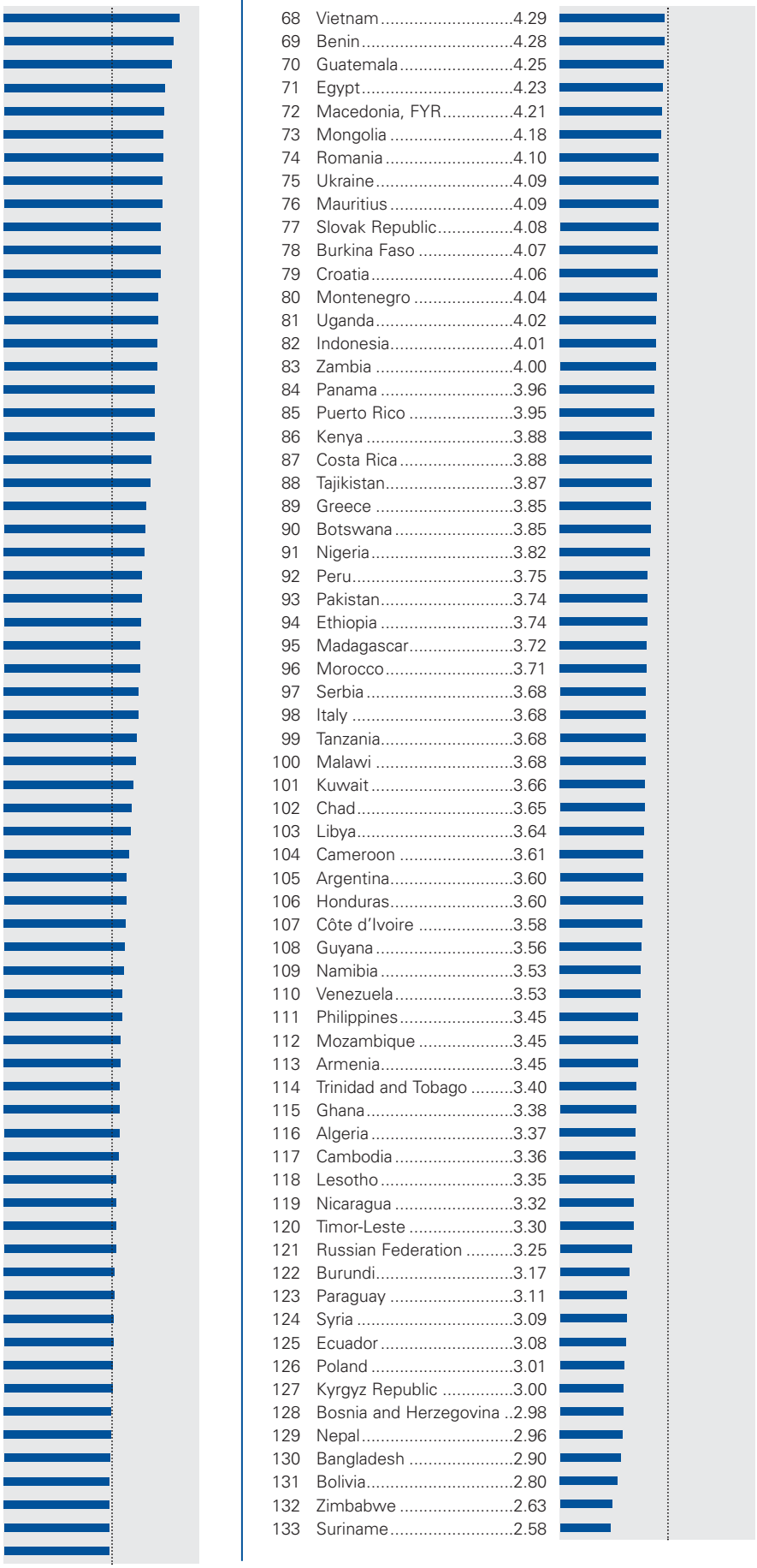


SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

9.04 Presence of ICT in government agencies

To what extent are information and communication technologies used by the government agencies in your country? (1 = not used at all; 7 = highly used) | 2008–2009 weighted average

RANK	COUNTRY/ECONOMY	SCORE
1	Singapore	6.50
2	Sweden	6.30
3	Estonia	6.27
4	Denmark	6.03
5	Switzerland	6.01
6	Austria	5.99
7	Korea, Rep.	5.98
8	United Arab Emirates	5.97
9	Qatar	5.95
10	Canada	5.92
11	Taiwan, China	5.91
12	Australia	5.91
13	Iceland	5.84
14	Norway	5.82
15	United States	5.81
16	New Zealand	5.79
17	Malta	5.72
18	Portugal	5.72
19	Hong Kong SAR	5.71
20	United Kingdom	5.62
21	Finland	5.59
22	Netherlands	5.46
23	China	5.42
24	Malaysia	5.40
25	Germany	5.33
26	Bahrain	5.32
27	Slovenia	5.28
28	Senegal	5.27
29	Chile	5.26
30	Ireland	5.22
31	Azerbaijan	5.22
32	France	5.17
33	Luxembourg	5.14
34	Brazil	5.06
35	Lithuania	5.01
36	Tunisia	4.98
37	Cyprus	4.91
38	Mauritania	4.84
39	Oman	4.83
40	Saudi Arabia	4.81
41	Israel	4.77
42	Dominican Republic	4.76
43	Gambia, The	4.70
44	Czech Republic	4.70
45	Belgium	4.66
46	Jordan	4.65
47	Thailand	4.63
48	Japan	4.62
49	Mali	4.61
50	Spain	4.60
51	Sri Lanka	4.52
52	South Africa	4.52
53	Barbados	4.52
54	Hungary	4.51
55	Colombia	4.46
56	Albania	4.45
57	Mexico	4.44
58	Brunei Darussalam	4.43
59	El Salvador	4.42
60	Turkey	4.40
61	Bulgaria	4.36
62	Georgia	4.36
63	Latvia	4.32
64	Kazakhstan	4.31
65	Jamaica	4.30
66	India	4.29
67	Uruguay	4.29
68	Vietnam	4.29
69	Benin	4.28
70	Guatemala	4.25
71	Egypt	4.23
72	Macedonia, FYR	4.21
73	Mongolia	4.18
74	Romania	4.10
75	Ukraine	4.09
76	Mauritius	4.09
77	Slovak Republic	4.08
78	Burkina Faso	4.07
79	Croatia	4.06
80	Montenegro	4.04
81	Uganda	4.02
82	Indonesia	4.01
83	Zambia	4.00
84	Panama	3.96
85	Puerto Rico	3.95
86	Kenya	3.88
87	Costa Rica	3.88
88	Tajikistan	3.87
89	Greece	3.85
90	Botswana	3.85
91	Nigeria	3.82
92	Peru	3.75
93	Pakistan	3.74
94	Ethiopia	3.74
95	Madagascar	3.72
96	Morocco	3.71
97	Serbia	3.68
98	Italy	3.68
99	Tanzania	3.68
100	Malawi	3.68
101	Kuwait	3.66
102	Chad	3.65
103	Libya	3.64
104	Cameroon	3.61
105	Argentina	3.60
106	Honduras	3.60
107	Côte d'Ivoire	3.58
108	Guyana	3.56
109	Namibia	3.53
110	Venezuela	3.53
111	Philippines	3.45
112	Mozambique	3.45
113	Armenia	3.45
114	Trinidad and Tobago	3.40
115	Ghana	3.38
116	Algeria	3.37
117	Cambodia	3.36
118	Lesotho	3.35
119	Nicaragua	3.32
120	Timor-Leste	3.30
121	Russian Federation	3.25
122	Burundi	3.17
123	Paraguay	3.11
124	Syria	3.09
125	Ecuador	3.08
126	Poland	3.01
127	Kyrgyz Republic	3.00
128	Bosnia and Herzegovina	2.98
129	Nepal	2.96
130	Bangladesh	2.90
131	Bolivia	2.80
132	Zimbabwe	2.63
133	Suriname	2.58



SOURCE: World Economic Forum, Executive Opinion Survey 2008, 2009

9.05 E-Participation Index (hard data)

The E-Participation Index assesses the quality, relevance, usefulness of government websites in providing online information, participatory tools, and services to citizens | 2009

RANK	COUNTRY/ECONOMY	HARD DATA
1	Korea, Rep.	1.00
2	Australia	0.91
3	Spain	0.83
4	New Zealand	0.77
4	United Kingdom	0.77
6	Japan	0.76
6	United States	0.76
8	Canada	0.73
9	Estonia	0.69
9	Singapore	0.69
11	Bahrain	0.67
12	Malaysia	0.66
13	Denmark	0.64
14	Germany	0.61
15	France	0.60
15	Netherlands	0.60
17	Belgium	0.59
18	Kazakhstan	0.56
19	Lithuania	0.53
20	Slovenia	0.51
21	Austria	0.50
21	Norway	0.50
23	Cyprus	0.49
23	Sweden	0.49
25	Croatia	0.46
26	Colombia	0.44
26	Ireland	0.44
28	Kyrgyz Republic	0.43
28	Mongolia	0.43
30	Finland	0.41
30	Israel	0.41
32	China	0.37
32	Mexico	0.37
34	Chile	0.34
34	Malta	0.34
36	Guatemala	0.31
36	Hungary	0.31
38	Bulgaria	0.30
38	Nicaragua	0.30
38	Tunisia	0.30
41	Brazil	0.29
41	Egypt	0.29
41	Jordan	0.29
44	Latvia	0.27
44	Portugal	0.27
46	Greece	0.26
46	Ukraine	0.26
46	Uruguay	0.26
49	Poland	0.24
50	Kenya	0.23
50	Kuwait	0.23
52	Italy	0.21
52	Macedonia, FYR	0.21
52	Turkey	0.21
55	Argentina	0.20
55	Bolivia	0.20
55	Costa Rica	0.20
55	India	0.20
55	Switzerland	0.20
60	Dominican Republic	0.19
60	Philippines	0.19
60	Romania	0.19
60	South Africa	0.19
64	Azerbaijan	0.17
64	Brunei Darussalam	0.17
64	Côte d'Ivoire	0.17
64	Libya	0.17
64	Luxembourg	0.17
64	Pakistan	0.17
64	Peru	0.17
71	Cameroon	0.16
71	Ecuador	0.16
71	Montenegro	0.16
71	Oman	0.16
75	Sri Lanka	0.14
75	Venezuela	0.14
77	Albania	0.13
77	Czech Republic	0.13
77	Honduras	0.13
77	Indonesia	0.13
77	Morocco	0.13
77	Qatar	0.13
77	Russian Federation	0.13
77	Trinidad and Tobago	0.13
77	United Arab Emirates	0.13
86	Cambodia	0.11
86	Mali	0.11
86	Mauritania	0.11
86	Mozambique	0.11
90	Bangladesh	0.10
90	Barbados	0.10
90	Botswana	0.10
90	Saudi Arabia	0.10
94	Ghana	0.09
94	Guyana	0.09
94	Jamaica	0.09
94	Lesotho	0.09
94	Thailand	0.09
94	Vietnam	0.09
100	Benin	0.07
100	El Salvador	0.07
100	Slovak Republic	0.07
100	Uganda	0.07
104	Burkina Faso	0.06
104	Chad	0.06
104	Georgia	0.06
104	Madagascar	0.06
104	Mauritius	0.06
104	Nepal	0.06
110	Armenia	0.04
110	Bosnia and Herzegovina	0.04
110	Ethiopia	0.04
110	Iceland	0.04
110	Serbia	0.04
110	Tanzania	0.04
116	Tajikistan	0.03
116	Zimbabwe	0.03
118	Algeria	0.01
118	Burundi	0.01
118	Gambia, The	0.01
118	Namibia	0.01
118	Nigeria	0.01
118	Paraguay	0.01
118	Senegal	0.01
118	Syria	0.01
118	Timor-Leste	0.01
n/a	Hong Kong SAR	n/a
n/a	Malawi	n/a
n/a	Panama	n/a
n/a	Puerto Rico	n/a
n/a	Suriname	n/a
n/a	Taiwan, China	n/a
n/a	Zambia	n/a

SOURCE: United Nations, *UN e-Government Survey 2010: Leveraging e-Government at a Time of Financial and Economic Crisis*

Technical Notes and Sources

The present section complements the Data Tables by providing additional information for the hard data indicators that enter the composition of the Networked Readiness Index 2009–2010. The data used in this *Report* represent the most recent available figures from various international agencies and national authorities at the time when the data collection process took place. It is possible that some data have been updated or revised since then.

Pillar 1: Market environment

1.07 Total tax rate (hard data)

Sum of profit tax, labor tax and social contributions, property taxes, turnover taxes, and other taxes, as a share of commercial profits | 2008

The total tax rate measures the amount of taxes and mandatory contributions payable by the business in the second year of operation, expressed as a share of commercial profits. The total amount of taxes is the sum of five different types of taxes and contributions payable after accounting for deductions and exemptions: profit or corporate income tax, social contributions and labor taxes paid by the employer, property taxes, turnover taxes, and other small taxes. For more details about the methodology employed and the assumptions made to compute this indicator, please consult the World Bank's Doing Business project's dedicated page at http://www.doingbusiness.org/methodologysurveys/.

Source: The World Bank Group, *Doing Business 2010*

1.08 Time required to start a business (hard data)

Number of days required to start a business | 2009

For details about the methodology employed and the assumptions made to compute this indicator, please consult the World Bank's Doing Business project's dedicated page at http://www.doingbusiness.org/methodologysurveys/.

Source: The World Bank Group, *Doing Business 2010*

1.09 Number of procedures required to start a business (hard data)

Number of procedures required to start a business | 2009

For details about the methodology employed and the assumptions made to compute this indicator, please consult the World Bank's Doing Business project's dedicated page at http://www.doingbusiness.org/methodologysurveys/.

Source: The World Bank Group, *Doing Business 2010*

Pillar 2: Political and regulatory environment

2.08 Number of procedures to enforce a contract (hard data)

Number of procedures from the moment the plaintiff files a lawsuit in court until the moment of payment | 2009

For details about the methodology employed and the assumptions made to compute this indicator, please consult the World Bank's Doing Business project's dedicated page at http://www.doingbusiness.org/methodologysurveys/.

Source: The World Bank Group, *Doing Business 2010*

2.09 Time to enforce a contract (hard data)

Number of days required to resolve a dispute | 2009

For details about the methodology employed and the assumptions made to compute this indicator, please consult the World Bank's Doing Business project's dedicated page at http://www.doingbusiness.org/methodologysurveys/.

Source: The World Bank Group, *Doing Business 2010*

2.10 Level of competition index (hard data)

Level of competition for Internet services, international long distance services, and mobile telephone services | 2007 or most recent year available

This variable measures the level of competition for retail Internet access services, for international long distance calls, and for digital cellular mobile services. For each economy, the level of competition in each of the three categories was assessed as follows: monopoly, partial competition, and full competition. The index is calculated as the sum of points obtained in each of the three categories above (0 = monopoly; 1 = partial competition; 2 = competition), with 6 as the best possible score.

Source: The World Bank Group, *Information and Communications for Development Online Database* (retrieved October 14, 2009)

Pillar 3: Infrastructure environment

3.01 Number of telephone lines (hard data)

Main telephone lines per 100 population | 2008

A *main telephone line* is a telephone line connecting the subscriber's terminal equipment to the public switched telephone network and that has a dedicated port in the telephone exchange equipment.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

3.02 Secure Internet servers (hard data)

Secure Internet servers per million population | 2008

Secure Internet servers are servers using encryption technology in Internet transactions.

Source: The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); national sources

3.03 Electricity production (hard data)

Electricity production (kWh) per capita | 2006 or most recent year available

Electricity production is measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, it covers generation by geothermal, solar, wind, and tide and wave energy as well as that from combustible renewables and waste. Production includes the output of electricity plants designed to produce electricity only, as well as that of combined heat and power plants. Electricity production (kWh) per capita is calculated by dividing the total electricity production (kWh) by each country's total population.

Source: The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); US Central Intelligence Agency, *The World Factbook* (retrieved October 16, 2009)

3.06 Tertiary education enrollment (hard data)

Gross tertiary education enrollment rate | 2007 or most recent year available

The reported value corresponds to the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the tertiary education level. Tertiary education, whether or not leading to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

Source: UNESCO Institute for Statistics (retrieved June 1, 2009); The World Bank, *World Development Indicators Online* (retrieved June 23, 2009); national sources

3.07 Education expenditure (hard data)

Adjusted savings: Public education expenditure as percentage of GNI | 2007 or most recent year available

Education expenditure refers to the current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment.

Source: The World Bank, *World Development Indicators Online* (retrieved September 7, 2009); national sources

3.09 Internet bandwidth (hard data)

International Internet bandwidth (Mb/s) per 10,000 population | 2008 or most recent year available

This measure shows the total capacity of international Internet bandwidth in megabits per second.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

Pillar 4: Individual readiness

4.04 Residential telephone connection charge (hard data)

One-time residential telephone connection charge (PPP $) | 2008 or most recent year available

This measure refers to the one-time charge involved in applying for basic telephone service for residential purposes. The amount is expressed in international dollars, adjusted for purchasing power parity (PPP).

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

4.05 Residential monthly telephone subscription (hard data)

Residential monthly telephone subscription (PPP $) | 2008 or most recent year available

Residential monthly telephone subscription refers to the recurring fixed charge for a residential subscriber to the public switched telephone network. The charge should cover the rental of the line but not the rental of the terminal (for example, the telephone set) where the terminal equipment market is liberalized. In some cases, the rental charge includes an allowance for free or reduced-rate call units. If there are different charges for different exchange areas, the largest urban area is used. The amount is expressed in international dollars, adjusted for PPP.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

4.06 Fixed broadband tariffs (hard data)

Fixed broadband tariffs, residential monthly fee (PPP $) | 2008

This measure gives a broad representation of typical fixed broadband offers available in a country. Broadband is considered to be any dedicated connection to the Internet at speeds equal to, or greater than, 256 kilobits per second in one or both directions. Tariffs are expressed in international dollars, adjusted for PPP. For details about the methodology employed and the assumptions made to compute this indicator, please consult the dedicated page of ITU's *Measuring the Information Society 2009 Report* at http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf.

Source: International Telecommunication Union, *Measuring the Information Society 2009*

4.07 Mobile cellular tariffs (hard data)

Average per-minute cost of different types of mobile cellular calls (PPP $) | 2008

This measure is constructed by first taking the average per-minute cost of a local call to another mobile cellular phone on the same network (*on-net*) and on another network (*off-net*). This amount is then averaged with the per-minute cost of a local call to a fixed telephone line. All the tariffs are for calls placed during peak hours and based on a basic, representative mobile cellular pre-paid subscription service. Tariffs are expressed in international dollars, adjusted for PPP. For more details about the methodology employed and the assumptions made to compute the composing variables of this indicator, please consult the dedicated page of ITU's *Measuring the Information Society 2009 Report* at http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf.

Source: Authors' calculations based on International Telecommunication Union, *Measuring the Information Society 2009*

4.08 Fixed telephone tariffs (hard data)

Fixed telephone tariffs for a 3-minute local call during peak hours (PPP $) | 2008

This variable refers to the cost of a 3-minute call within the same exchange (local call) using the subscriber's equipment (i.e., not from a public telephone). Tariffs are expressed in international dollars, adjusted for PPP. For more details about the methodology employed and the assumptions made to compute this indicator, please consult the dedicated page of ITU's *Measuring the Information Society 2009 Report* at http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf.

Source: International Telecommunication Union, *Measuring the Information Society 2009*

Pillar 5: Business readiness

5.06 Business telephone connection charge (hard data)

One-time business telephone connection charge (PPP $) | 2008 or most recent year available

This measure refers to the one-time charge involved in applying for basic telephone service for business purposes. The amount is expressed in international dollars, adjusted for PPP.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

5.07 Business monthly telephone subscription (hard data)

Business monthly telephone subscription (PPP $) | 2008 or most recent year available

This measures the recurring fixed charge for a business subscriber to the public switched telephone network. The amount is expressed in international dollars, adjusted for PPP.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); The World Bank, *World Development Indicators Online* (retrieved October 14, 2009); International Monetary Fund, *World Economic Outlook Database* (October 2009 edition); national sources

5.09 Computer, communications, and other services imports (hard data)

Computer, communications, and other services as percentage of total commercial services imports | 2008 or most recent year available

Computer, communications, and other services include such activities as international telecommunications; portal and courier services; computer data; news-related service transactions between residents and nonresidents; construction services; royalties and license fees; miscellaneous business, professional, and technical services; and personal, cultural, and recreational services. The total volume of computer, communications, and other services imports is divided by the total volume of commercial service imports, defined as the total service imports minus imports of government services not included elsewhere.

Source: The World Bank, *World Development Indicators Online* (retrieved October 2009); national sources

Pillar 7: Individual usage

7.01 Mobile telephone subscriptions (hard data)

Mobile telephone subscriptions per 100 population | 2008

According to the World Bank, *mobile cellular telephone subscriptions* are subscriptions to a public mobile telephone service using cellular technology, which provides access to switched telephone technology. Postpaid and prepaid subscriptions are included. This can also include analogue and digital cellular systems but should not include non-cellular systems. Subscribers to fixed wireless, public mobile data services, or radio paging services are not included.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); national sources

7.02 Personal computers (hard data)

Personal computers per 100 population | 2008 or most recent year available

Personal computers are self-contained computers designed to be used by a single individual.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010); national sources

7.03 Broadband Internet subscribers (hard data)

Total broadband Internet subscribers per 100 population | 2008

The International Telecommunication Union considers *broadband* to be any dedicated connection to the Internet of 256 kilobits per second or faster, in both directions. *Broadband subscribers* refers to the sum of DSL, cable modem, and other broadband (for example, fiber optic, fixed wireless, apartment LANs, satellite connections) subscribers.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

7.04 Internet users (hard data)

Internet users per 100 population | 2008

Internet users are people with access to the worldwide network.

Source: International Telecommunication Union, *World Telecommunication/ICT Indicators Database 2009* (retrieved January 4, 2010)

Pillar 8: Business usage

8.05 Creative industries exports (hard data)

Exports of creative industries products as a share of world total in such exports | 2006 or most recent year available

This variable measures the share of the world's total exports of the following creative industries products: art crafts such as carpets, celebration articles, paperware, wickerware, yarn, and other; films; architecture, fashion, glassware, jewellery; music; books, newspapers, and other; antiques, paintings, photography, sculpture, and other. Data were obtained from the Creative Industries Database using HS 96 industry classification.

Source: UNCTAD, Creative Economy and Industries Programme

8.06 Utility patents (hard data)

Number of utility patents (i.e., patents for invention) granted between January 1 and December 31, 2008, per million population | 2008

Utility patents are recorded such that the origin of the patent is determined by the first-named inventor at the time of the grant. Per million population figures are calculated by dividing the number of patents granted to a country in 2008 by that country's population in the same year.

Source: The United States Patent and Trademark Office (June 2009); UNFPA, *State of World Population 2008;* The Economist Intelligent Unit, *CountryData Database* (June 2009)

8.07 High-tech exports (hard data)

High-technology exports as a percentage of total goods exports | 2007 or most recent year available

The value of high-technology exports is expressed as a percentage of the value of manufactured goods exports. According to the World Bank, high-technology exports are products with high R&D intensity, as in aerospace, computers, pharmaceuticals, and scientific instruments.

Source: The World Bank, *World Development Indicators Online* (retrieved December 3, 2009); authors' estimates based on United Nations Statistics Division's COMTRADE database (retrieved December 4, 2009); national sources

Pillar 9: Government usage

9.02 Government Online Service Index (hard data)

The Government Online Service Index assesses the quality of government's delivery of online services | 2009

The Index captures a government's performance in delivering online services to the citizens. There are four stages of service delivery (Emerging, Enhanced, Transactional, and Connected). Online services are assigned to each stage according to their degree of sophistication, from the more basic to the more sophisticated. In each country, the performance of the government in each of the four stages is measured as the number of services provided as a percentage of the maximum services in the corresponding stage. Examples of services include online presence, deployment of multimedia content, governments' solicitation of citizen input, widespread data sharing, and use of social networking. For more details about the methodology employed and the assumptions made to compute this indicator, please consult the UN's *Global E-Government Survey 2010*'s dedicated page at http://www2.unpan.org/egovkb/global_reports/10report.htm.

Source: United Nations, *UN E-Government Survey 2010: Leveraging e-Government at a Time of Financial and Economic Crisis*

9.05 E-Participation Index (hard data)

The E-Participation Index assesses the quality, relevance, and usefulness of government websites in providing online information, participatory tools, and services to citizens | 2009

The E-Participation Index captures the extent to which governments create an environment in which citizens can be more active and supportive of their governments. It takes into account e-participation in all its aspects, ranging from e-information to e-consultation and e-decision making. For more details about the methodology employed and the assumptions made to compute this indicator, please consult the UN's *Global E-Government Survey 2010*'s dedicated page at http://www2.unpan.org/egovkb/global_reports/10report.htm.

Source: United Nations, *UN E-Government Survey 2010: Leveraging e-Government at a Time of Financial and Economic Crisis*

About the Authors

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Scott C. Beardsley is a Director at McKinsey & Company's Brussels Office. Since joining the firm in 1989, he has been particularly active in helping clients around the world on a range of strategy, regulation, stakeholder management, business in society, and performance transformation topics in the telecommunications, technology, and media sectors. He is a global leader of McKinsey's Telecommunications Practice, and heads McKinsey's Strategy Practice in Europe, the Middle East, and Africa. He has recently been leading a variety of internal research initiatives on such topics as managing the external environment through regulatory strategy and business in society, stakeholder and reputation management, strategic management, telecommunications transformation and performance improvement, next generation telecommunications regulation, and broadband. He is currently a leader of the McKinsey Technology Institute's special initiative to assess the leading technology trends that will impact business. He has published editorials in the *Wall Street Journal* and the *Financial Times* and articles in the *McKinsey Quarterly* and related publications on a variety of telecommunications, broadband, media, and strategy topics. He has also recently co-authored part of four books related to regulatory strategy, ICT, and networked readiness. Prior to joining McKinsey, Mr Beardsley was employed as Editor and Marketing Manager at the Massachusetts Institute of Technology (MIT) Sloan Management Review. Additionally, he worked in the strategic sales and product marketing functions for Advanced Micro Devices and Analog Devices of the semiconductor industry. Mr Beardsley is President of the Board of Directors of the American Chamber of Commerce in Belgium. He was a Henry S. Dupont III Scholar (highest honors) for outstanding academic performance at the MIT Sloan School of Management, where he graduated with an MBA in Corporate Strategy and Marketing. He holds a Bachelor of Science in Electrical Engineering magna cum laude from Tufts University.

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GBS Bindra is Global Director of Innovation at Logica plc, where he is responsible for innovation across the group and works closely with the executive committee to align these initiatives with Logica's strategic goals. Mr Bindra is a thought leader in the world today, with expertise spanning more than 20 years during which he has held several executive positions and has been India CEO of large multinational corporations. As an innovator, he has led design teams to create several new products and services that leverage technology to improve business outcomes. Prior to joining Logica in 2005, he led research and development at Ariba. Under Mr Bindra's leadership, Puncom received the honor of becoming the official IT services provider to create and manage an IT and communications system for the ICC World Cup of Cricket in 1996 held across India, Sri Lanka, and Pakistan, reaching out to a quarter of world's population. Mr Bindra is also a committed community leader and a strong and vocal advocate of children's and women's education in underprivileged societies. He serves on numerous governmental, industry, and charitable boards and panels.

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