Executive Summary

SOUMITRA DUTTA, INSEAD
IRENE MIA, World Economic Forum

Information and communication technologies (ICT) has proven to be a key enabler of socioeconomic progress and development, enhancing productivity and therefore economic growth, reducing poverty and improving living standards in many ways. ICT is increasingly revolutionizing production processes, access to markets, and information sources together with social interactions. ICT also has an impact on government efficiency, fostering transparency and better communication and services with and to citizens.

Among these new technologies, mobile telephony takes a special place in view of its exceptional diffusion in the last decade or so and its strong social and economic impact. In particular, mobile telephony has proven instrumental in raising prosperity and reducing poverty in developing countries, where it has boomed in recent years—thanks also to a number of facilitating factors, including an infrastructure fairly easy to deploy, a market generally open to new entrants, and the decreasing costs of mobile handsets and communication per minute, among others.

The Global Information Technology Report series, launched in 2001 and published annually since, has gone hand in hand with the ICT revolution and evolution for eight years now, contributing to raising public and private awareness of the many benefits associated with fully leveraging ICT in everyday life, in business practices, and in a government's activities and interactions with its citizens. The *Report* has stressed the importance of ICT in national competitiveness and development strategies and has provided a very useful tool for decision makers and civil society alike to monitor national progress as well as examples of best practices and policies to increase networked readiness.

The Global Information Technology Report 2008–2009 appears at a difficult time for the global economic system, which seems to be plunging deeper and deeper into the serious recession that began with the subprime housing crisis in the United States and then spread to most countries in the world. Against such a daunting economic outlook, it is important to reaffirm the crucial role of ICT for general competitiveness and progress and the importance of continuing to invest in ICT infrastructure and related services, as well as, more broadly, in innovation. We hope that the *Report* and the Networked Readiness Index (NRI) 2008–2009 will further strengthen the case for ICT by highlighting the strong correlation between ICT readiness and economic growth and showcasing success stories of countries that have used ICT to leapfrog stages of development or, more generally, to enhance their competitiveness.

The *Report* is the eighth of a series and is the result of a well-established partnership between the World Economic Forum (the Forum) and INSEAD, aimed at advancing knowledge of networked readiness and of its principal drivers.

The *Report* is composed of four thematic parts. Part 1 features the findings of the Networked Readiness Index for 2008–09, as well as a number of remarkable essays examining different topics related to mobility and ICT. Among these topics are mobile telephony and its impact on economic growth and networked readiness, Internet ubiquity, mobile reality mining, and mobility of talents and research and development (R&D) flows.

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 Egypt, Korea, Rep. (Korea), and Brazil, for, respectively, best practices as an outsourcing destination, general ICT strategy to promote national competitiveness, and the use of e-government services and ICT to alleviate economic and social problems.

Part 3 includes detailed profiles for each of the 134 economies covered in this year's *Report,* offering a comprehensive snapshot of each economy's current networked readiness landscape and allowing for international and historical comparison on specific variables or components of the NRI. Part 4 features detailed data tables for each of the 68 variables composing the NRI this year, with rankings for the 134 economies covered, and technical notes and sources.

Part 1: The Networked Readiness Landscape in 2008–09 and Mobility

This part presents the latest findings of the NRI, sketching a comprehensive picture of the networked readiness landscape of the world in 2008–09. A number of deep-dive analyses focusing on different aspects related to mobility, ICT, and innovation are also included, as follows: (1) mobile telephony and its impact on networked readiness; (2) the shift from mobility to ubiquity, thanks to universal Internet connectivity; (3) how to maximize the economic impact of mobile communications;

(4) best practices in regulation that can amplify mobile service benefits in emerging markets; (5) reality mining of mobile communications; (6) global mobility of talent; and (7) mobility of international flows in ICT R&D.

The Networked Readiness Index

Chapter 1.1, "Gauging the Networked Readiness of Nations: Findings from the Networked Readiness Index 2008–2009," presents the latest NRI findings. The NRI was developed by INSEAD in 2002 as a part of an ongoing joint research project with the Forum, and is the main methodological tool featured in the *Report* to assess countries' preparedness to leverage ICT advances for increased competitiveness and development. It 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 2008–2009 covers a record number of 134 economies (up from 127 in last year's edition) from both the developed and developing world, accounting for over 98 percent of world GDP. The Networked Readiness Framework, underpinning the NRI and stable since 2002, measures:

- the presence of an ICT-conducive environment, by taking into consideration a number of features of the broad business environment, some regulatory aspects, and the soft and hard infrastructure for ICT;
- the degree of preparation needed to use ICT for the three main national stakeholders—individuals, the business sector, and the government; and
- the actual use of ICT by the above three stakeholders.

The NRI rankings for 2008–09 feature Denmark as the most networked economy in the world for the third consecutive year, the culmination of an upward trend observed since 2003. The other Nordic countries also continue to teach the world best practices on how to leverage ICT for increased competitiveness, with Sweden, Finland, Iceland, and Norway at 2nd, 6th, 7th, and 8th position, respectively. Among the top 20, the United States continues to deliver a convincing performance in networked readiness, climbing one position to an outstanding 3rd place, followed by Singapore (4th) and Switzerland (5th). Five other economies from the Asia and Pacific region place in the top 20 this year: Korea (11th), Hong Kong (12th), Taiwan (13th), Australia (14th), and Japan (17th).

With regard to the largest Asian emerging markets, China leapfrogs 11 positions to 46th, overtaking India (which is down four positions at 54th) and the rest of the BRIC countries for the first time.

The assessment of Latin America and the Caribbean is more mixed in nature, with only six economies in the top half of the rankings, namely Barbados (36th), Chile (39th), Puerto Rico (42nd), Jamaica (53rd), Costa Rica (56th), and Brazil (59th). Chile loses five positions and the leadership in the region for the first time since the inception of this Index. Mexico and Argentina are both losing ground, positioning themselves at 67th and 87th, respectively.

Despite some positive trends, sub-Saharan Africa continues to lag behind the rest of the world by a significant margin, with only two economies (Mauritius and South Africa, at 51st and 52nd place, respectively) in the top half of the NRI, while 18 rank below 100th place.

In Northern Africa, Tunisia (38th) leads the way again, with a large and widening gap. Egypt, Morocco, and Algeria are down at 76th, 86th, and 109th, respectively.

By contrast, the Middle East further improves its networked readiness, with all countries but one appearing in the top half of the NRI rankings, namely Israel (25th), the United Arab Emirates (27th), Qatar (29th), Bahrain (37th), Saudi Arabia (40th), Jordan (44th), Oman (50th), and Kuwait (57th).

Similar to last year, a trend analysis of the eight-year time-series of the NRI is included in the chapter, with the aim of identifying the countries and regions that have proven particularly dynamic in leveraging ICT and have advanced the most in the NRI rankings over the years.

Mobile telephony and networked readiness

Mobile telephony has emerged as one of the most important and widespread forms of ICT in recent decades, with a significant impact on economic growth and poverty reduction.

In particular, mobile communications penetration has boomed in the developing world, compensating for an often underdeveloped and flawed fixed telephony infrastructure and offering a promising tool to lift more and more people out of poverty and improve market efficiency. This is good news in view of reducing the digital and economic divide existing between high- and low-income countries.

In their paper "Mobile Telephony: A Critical Enabler of Networked Readiness?" Thierry Geiger and Irene Mia (both at the World Economic Forum) explore the connections among mobile telephony, economic growth and development, and countries' networked readiness, as captured by the NRI. The authors' original assumption is that mobile readiness should have a strong impact on overall networked readiness and therefore on sustained economic growth and development. The analysis performed in the chapter shows that this supposition is certainly true, but only to a certain extent.

While the latest data as well as historical data demonstrate that only a handful of countries with low mobile telephony penetration rates achieve above average networked readiness levels, Geiger and Mia noticed that high mobile telephony penetration is not inevitably synonymous with high networked readiness. They also observe that the relation between mobile telephony usage and GDP per capita is clearly positive, but is about three times stronger in low- and lower-middle-income countries. This finding bodes well for poor countries' capacity to reduce poverty levels and improve competitiveness and prosperity, considering the booming mobile phone penetration rates they have registered in recent years.

From mobility to ubiquitous connectivity

High-speed networks have become part of the basic infrastructure of any country and one of the foundations of the knowledge economy. For many countries they also offer a unique, cost-effective opportunity to enhance their competitiveness and rise above physical or geographical constraints. Beyond mobility of telecommunications, ubiquitous Internet access offers connectivity that follows users seamlessly as they move from place to place and device to device.

In their chapter "From Mobility to Ubiquity: Ensuring the Power and Promise of Internet Connectivity… for Anyone, Anywhere, Anytime," authors Robert Pepper, Enrique J. Rueda-Sabater, Brian C. Boeggeman, and John Garrity (all at Cisco Systems, Inc.) propose: (1) a typology of Internet stages and an ICT Map to place countries' ICT development in perspective and provide a basis for charting a course forward, (2) a framework for assessing and improving connectivity and the use of networks, and (3) a review of the key drivers toward the goal of Internet ubiquity. The stages and ICT Map highlight the importance of balancing infrastructure investments with improvements in the ecosystem (notably ICT policies and market regulation). This is confirmed, the authors say, by evidence that connectivity is not determined solely by income levels—making it possible for lower-income countries to leapfrog in ICT development.

A framework built around six keystones is suggested by the authors to benefit from the opportunity that network connectivity offers. These comprise: a competitive market structure that balances investment incentives and efficient service, policies and regulations that support technology adoption (including convergence around IP), entrepreneurship around applications and content, the use of government ICT budgets to "prime the pump" and
pioneer ICT adoption, skill development, and extensive investment (public and private) in infrastructure. This framework, they argue, can be used to build the foundations from which to progress toward the goal of Internet ubiquity—with all its implications for collaboration and Web 2.0 productivity and inclusiveness. This requires ensuring, in particular, the wide availability of a core network, spectrum availability and other means to allow a diverse system of "capillaries" extending to "the last mile" to emerge, and the proliferation of Internet-enabled devices that meet the needs of users.

Maximizing the economic impact of mobile communications

Although there is no magic bullet solution for economic development, mobile telecommunications has indeed had a positive disruptive impact on life in many developing economies, especially in rural areas. In their chapter "How to Maximize the Economic Impact of Mobile Communications: The Four Waves," Leonard Waverman (Haskayne School of Business, London Business School, and LECG) and Kalyan Dasgupta (LECG) identify four stages of development of an information society, which they define as the "four waves" of communications technology, namely (1) simple access, (2) universal service, (3) usage, and (4) provision of complementary skills and assets. According to them, only when a country has evolved through all four waves is it able to make the fullest use of technology. The authors observe that the literature and the policy debate have so far essentially concentrated on the first two waves; also there is a lack of data availability for the other two. They believe the development of additional research on the last two waves is of paramount importance for understanding the role of usage and complementary capital in governing gains from ICT in a developing country context. This could provide policymakers with a robust assessment of the policies that will maximize the returns from ICT investment. Indeed, the developing world has seen only a glimpse of the potential economic and social value of investment in mobile telecommunications networks so far. In particular, Waverman and Dasgupta believe that setting the right taxation and the licensing process play crucial roles in ensuring adequate investment and enhancing consumer benefits in the mobile sector, as does defining the appropriate role of government intervention and regulation in the current challenging economic environment. They also remark that 3G or wireless mobile telephony could have a particularly important impact in the developing world since these technologies may represent the most cost-effective way to bring broadband or even Internet access to the masses. Developing countries are likely to enjoy, argue the authors, the benefit of adopting 3G+ technology at a time when devices and applications enhancing the mobile broadband experience are entering a mature developmental phase; therefore one can expect relatively rapid diffusion of 3G technology in the developing world.

Regulation and its impact on mobile service benefits in emerging markets

Mobile communications play a key role in developing economies, crucially facilitating economic growth and development. At the same time, emerging markets are home to 75 percent of the world's subscribers today and hold an important position in the mobile industry's agenda because of their strong potential going forward. However, succeeding in these markets often requires different and innovative approaches tailored to the specificities of those markets. After discussing the benefits of mobile services in emerging markets, "Unshackled: How Regulation Can Amplify Mobile Service Benefits in Emerging Markets," by Scott Beardsley, Luis Enriquez, Mehmet Güvendi, Miguel Lucas, Oleg Timchenko, Sergio Sandoval, and Ashish Sharma (all at McKinsey & Company, Inc.), highlights a broader set of policy considerations that policymakers and industry players should consider and address together in view of enhancing ubiquity and the benefits of mobile service when regulating the latter in developing economies. Among these considerations are:

1. ensuring sufficient but not excessive competition —in a capital-intensive industry, where large upfront investments are necessary, competition among a few players may have better results than hyper-competition among many;

2. avoiding direct price controls—low prices typically retard industry returns and overall growth in the medium to long term, hampering investment levels and translating into poor customer service;

3. attaching strict rollout and coverage requirements to mobile licenses, in order to prevent new players from investing in rich niche areas and neglecting more low-income and remote areas; and

4. effectively managing spectrum allocation and pricing, given that spectrum management has risen significantly in importance in emerging markets, and spectrum policies will play a major role in delivering telecommunication services to users.

The authors believe these policy issues, if well tackled, can create a fertile environment in which the mobile industry can thrive, generating a high public value for the developing world and its people.

Reality mining of mobile communications

Humanity has the beginnings of a new nervous system —a digital one derived from mobile telephone networks and already nearly 4 billion people strong. In his chapter "Reality Mining of Mobile Communications: Toward a New Deal on Data," MIT professor Alex Pentland focuses on the consequences in terms of data gathering of the fact we live nowadays in digital networks and leave digital breadcrumbs of our daily activities all the time. He explains that computational models based on these digital "people data," using a process called *reality mining,* allow us to create a startlingly comprehensive picture of our lives and to predict human social behavior with a power that was barely conceivable just a few years ago. Pentland believes that this new "God's eye" view of humanity will present unprecedented opportunities for profitable commerce and effective government but also may endanger our personal freedom. To harness the good and avoid the evil, he calls for a "New Deal" about how personal data can be gathered and used. This deal should be based on ownership as a minimal requirement, complemented by a commitment to adopt policies encouraging the combination of massive amounts of anonymous data to promote the Common Good.

Global mobility of talent

In today's world, some 200 million people live and work outside their country of origin. OECD countries alone host some 75 million migrants. Broader access to transportation and ICT-enabled new forms of production combined with disparities in income and labor markets are some of the factors behind the growing global market for migrant workers, both short term and less so. In "Global Mobility of Talents: What Will Make People Move, Stay, or Leave in 2015 and Beyond?" Vijayakumar Ivaturi (Wipro), Bruno Lanvin (INSEAD, eLab), and Hrishi Mohan (Wipro) attempt to make some sense of the emerging mobile talent geography, casting light on how the different mobility drivers are likely to combine, compound, or offset each other in the future; what the main directions of labor flows will be; and how the "war for talents" is going to be waged, among other issues.

Taking into account longer-term trends and recent changes in the way companies and individuals operate, the authors explore some avenues that may help define new dimensions of talent mobility, as well as some of the most urgent issues to be addressed by decision makers with respect to the skills required to sustain national competitiveness. In particular, a simple model (the Global Talent Pyramid Model, or GTPM) is presented, according to which the ability of a country to attract talents internationally is determined by three main factors: the attractiveness of the national ecosystem vis-à-vis local and foreign talent, the existence of a critical mass in the "national talent pool" (stock and flow), and the overall efficiency/quality of the economy and society.

The authors believe that mobility, whether virtual or physical, will be a central factor in our collective efforts to establish an equitable, multicultural, open, innovative, and sustainable globalization. They point to

the need to become fully aware of the potential benefits of collective action to encourage and allow such mobility on a global scale, and to the opportunity offered by the current crisis to take such action.

International flows in R&D in ICT

"R&D and Innovation in the ICT Sector: Toward Globalization and Collaboration," by Graham Vickery and Sacha Wunsch-Vincent (both at the OECD), deals with recent developments in increasingly globalized ICT R&D and innovation. The authors relate how global structures of R&D, science performance, and innovation are undergoing an important change whose main dimensions are the absolute growth of R&D and innovation-related activities; the rise of the BRIC economies in scientific and technological fields; the significant globalization of R&D; the greater performance of R&D in the services sector; and a growing focus on non-technological innovation, enhanced internationalization, and mobility of highly skilled people; and increased internationalized patenting. According to Vickery and Wunsch-Vincent, a number of factors underpin these trends, namely the increasingly knowledge-driven nature of innovation; the quickly changing organization of research that is driven by information technologies, collaboration, and the sharing of knowledge; and changes in markets, the competition environment, and technology.

Part 2: ICT as a Bridge to Increased Growth and Competitiveness: Selected Case Studies

This part showcases some best practices and policies in networked readiness and competitiveness, relating the experiences of three countries—Egypt, Korea, and Brazil—in becoming a successful outsourcing destination; in adopting a general ICT strategy fostering national competitiveness; and in using world-class e-government practices and ICT (and soccer) to bridge social and economic inequalities.

Egypt's success story in outsourcing

In the current globalization wave, some developing countries, have emerged as major outsourcing destinations, greatly benefiting from the related opportunities. In their chapter "How Outsourcing Can Help Mobilize Talents Globally: Egypt's Success Story," Nagwa El Shenawy (Ministry of Communications and Information Technology, Egypt) and Bruno Lanvin (INSEAD, eLab) focus on Egypt's successful experience as an emerging outsourcing gateway in the Middle East and relate the carefully built business environment strategy and the sustainable and ongoing technological development and skills upgrading programs that enabled Egypt's transformation in this area. Indeed, an aggressive national plan was set, including specialized ICT-training programs and the creation of business hubs such as the Smart Village and Maadi Investment Park, while investor-tailored incentive packages were introduced.

The authors argue that Egypt has the potential to be one of the top five business process outsourcing destinations within the next 10 years, thanks to competitive advantages such as its low costs, competitive labor pool, stable macroeconomic environment, strategic geographical location, strong government focus, good telecommunications infrastructure, and improving business environment. They highlight, as a main takeaway from Egypt's experience, the importance of investing in relevant human resources, ensuring an overall infrastructure supply with world-class connectivity levels and creating a well-funded investment agency with an adequate regulatory authority working on a public-private partnership basis.

However, Egypt also faces a number of challenges going forward, among which are its intellectual property rights and security risks, the challenge of marketing the country as a late entrant, and labor pool bottlenecks at the middle management and middle level, not to mention global inflationary trends.

The past, present, and future of IT Korea

Korea has become one of the leading IT nations of the 21st century; it has achieved rapid economic growth owing to the successful development of the IT industry and its applications. The reasons for Korea's amazing economic growth have been analyzed in terms of its proactive acceptance of technology, value-adding development with enhanced performance, and quick transition through industrial structuring. "IT Korea: Past, Present, and Future," by Jae Kyu Lee (Korea Advanced Institute of Science and Technology) and Choonmo Ahn and Kihoon Sung (both at the Electronics and Telecommunications Research Institute, Korea), identifies and reviews four phases in Korean IT industry evolution, explaining how the IT industry is related to the electronics industry and how important it is for technology leadership to attain global IT business leadership. The authors regard as especially crucial the government's proactive role in propagating new standard platforms of telecommunications. Korea has overcome various challenges over time, including financial crises and oil shocks. The Korean IT industry has critically contributed in tackling the above by discovering new answers to demanding pressures. The authors point to the fact that Korea is currently faced with the effect of the financial crisis sweeping the world as well as with a slowdown in the growth of the IT industry. They argue that the role of proactive IT development becomes necessary again as the new growth engine, and describe the New IT Strategy as aiming to overcome today's challenges.

Brazil: E-government, ICT, and the World Cup to bridge the social divide

ICT-wise, Brazil is a country of many contrasts where one of the most elaborate electronic voting systems in the world and a remarkable online tax return operation coexist with poor broadband penetration and computer illiteracy in many parts of the country, especially among the poor. This reflects entrenched inequalities in the distribution of income, wealth, and access to education and health services, among many other issues. These inequalities not only threaten social cohesion and undermine public safety, they also cut economic competitiveness.

In their chapter "Will the 2014 Soccer World Cup Help Bridge the Social Gap through the Promotion of ICT and E-government in Brazil?" authors Darcilene Magalhães (Minas Gerais State Agency for IT Development, Brazil), Peter Knight (Telemática e Desenvolvimento Ltda., Brazil), and Eduardo Moreira da Costa (The Brazilian Innovation Agency) provide a thoughtful account of the progress made in e-government and ICT diffusion in the last couple of decades in Brazil, as well as the pending challenges that must still be tackled. In particular, two major projects hold the potential to help the government bridge the digital and socioeconomic gap in the country, fostering growth and prosperity for all Brazilians: the *e-Brasil* Project and the 2014-Bis Program. The former, begun in 2004, promotes a broad agenda of public policies aimed at building a more equitable and competitive country through intensive use of ICT and seeks to raise general awareness about the advantages of a coherent e-development strategy. By 2008, the *e-Brasil* Project had created a Web portal promoting the *e-Brasil* vision and published three books, notably featuring a list of policy recommendations and the "10 commandments" program—a concise summary of these recommendations—for *e-Brasil* candidates. An initial assessment of the Project's results is mostly positive, with visible progress at the political level, especially in important states such as São Paulo, Rio de Janeiro, Ceará, and Minas Gerais.

The 2014-Bis Program, which is expected to gain speed this year, intends to create a stronger country brand, showcasing unique Brazilian developments in terms of technology, scope, approach, and social impact, in parallel to the preparation of the World Cup 2014, which will be hosted by Brazil.

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

Parts 3 and 4 present detailed profiles for each of the 134 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 details and information on the definitions and sources of the specific hard data variables included in the *Report*.