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Nagy K. Hanna
Peter T. Knight *Editors*

National Strategies to Harness Information Technology

Seeking Transformation in Singapore, Finland, the Philippines, and South Africa

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Preface

This book aims to capture the experiences of countries in their journey toward e-transformation, and the strategic issues and choices they faced along their journey. From our own practice and observation of the aspirations and challenges of developing countries, we believe there are a lot of lessons to learn from sharing these experiences. They transcend the formal descriptions of national information and communications technologies (ICT) strategies. We attempt to capture the dynamics of formulating and implementing a strategy over a long time horizon, and to examine how some countries have learned to harness the ICT revolution, while others have been slow to adapt to a fast changing global economy.

As a new field of development, with poorly understood strategic implications for countries and institutions, ICT-enabled development raises many issues for policy makers and researchers alike. Best practices are yet to be established or codified, failures not fully recognized or examined, and expectations far exceed results on the ground. Some speak of "next practices," even before we have learned what are the best practices today, or what worked and what did not, and why, so we can confidently and reliably embark on developing next practices. We consistently asked ourselves and our coauthors: Why did some countries succeed in transforming their economies and enhancing their global competitiveness, with the help of ICT, while for others, ICT made no difference, even though almost all countries have expressed similar aspirations about ICT and formally adopted national ICT plans? What factors made the ultimate difference in results?

Given the high risks of failures of ICT investments for transforming business, and even more in transforming government, should countries adopt a venture capital approach where the high payoffs of few ICT investments would outweigh the failures of many? Are there strategies and approaches that can reduce these risks while maximizing the transformational impacts of ICT?

In a similar vein, can we learn from failures, at least as much as from successes? Even within the same country, there are examples of successes and failures in effecting transformation in different regions and sectors. For example, both South Africa and the Philippines have had a mixed record, in contrast with their aspirations about the information revolution and bridging the digital and income divides. Were the failures to meet expectations due to design or implementation factors? Were these aspirations unrealistic in view of broader political and policy constraints? Conversely,

how did Singapore and Finland make such dramatic progress in transforming their economies, despite difficult initial country conditions and very different political systems? We are obviously not short on questions in this field. Countries are in search of ways to harness this technological revolution in all sectors and at all levels.

When it came to applying ICT, most aid agencies have focused on pilots and micro-interventions, or components of investment in other sectors. Apart from UNDP-funded technical assistance to draft a first wave of national ICT strategies and a few studies done by the World Bank, very little has been done to help countries manage this transformation at the national or cross-sectoral levels, or to put micro-interventions in the context of national e-transformation strategies. Operating at the pilot or enclave project level may have its merits in terms of selecting the "low hanging fruits," lowering risks by focusing on "privileged particles of development," and/or avoiding complex policy and coordination issues and sustainability challenges. But in doing so, international development agencies may have avoided entry at the strategic and transformational levels, missed on learning about the most challenging tasks facing their clients, and failed them in building local capacity for ICT integration and coordination at the national or ecosystem level.

In this book, our focus is at the national level of e-transformation. Country cases attempt to cover all components of e-transformation: polices, institutions, human resources, communications infrastructure, ICT industry, the vast array of possible ICT applications in public and private sectors, and the synergies and interdependencies among these components. These case studies also reflect the hard choices and tradeoffs that must be made in designing and implementing e-development within real-life human, financial, and institutional constraints. They attempt to capture the gap between blueprint design and implementation, and the instruments used to meet implementation challenges.

We drew on the in-depth observation of the authors who have been actors or participant-observers of the country they are reporting on. That gives these authors a position or perspective that can capture the *process* of formulating and implementing e-strategies and appreciate the roles of various stakeholders and the underlying forces and dynamics that shape both design and implementation. All cases follow a common conceptual framework, to facilitate cross-country comparisons of e-strategy design and implementation. Yet, the story is told in ways that emphasize the unique features of each county's conditions and journey.

Initially, we thought of having many country case studies, briefly told. But as the drafts emerged, it became clear that the limits on the length of each case would deprive the readers of some interesting innovations and concrete examples of the initiatives taken, or the long-term perspective taken by some countries over a series of strategies, or the interdependencies among various elements of e-transformation. Hence, we decided to have two companion books, each focusing on four countries and a comparative analysis, done in more depth than would have been possible in one volume. This is the second of the two books. It covers Singapore, Finland, South Africa, and the Philippines, and compares their characteristics along key design and implementation parameters. A companion book covered Brazil, China, Canada, and Sri Lanka (Hanna and Knight 2011). We hope more cases will be

developed and more comparative studies will be done and published as the list of such country cases becomes longer, and country experiences get better documented and analyzed.

We owe many colleagues special thanks for helping us on our own journey in coauthoring and coediting this book. Jeannie Chua contributed the Singapore country case. Jorma Routti coauthored the Finland case with Peter Knight. Lucienne Abrahams and Arthur Goldstuck collaborated on the South Africa case, while Sherwin Ona and Estafenie Ulit coauthored the Philippines case with Nagy Hanna. We also acknowledge the valuable comments we received from: Sandor Boyson, Research Professor, Robert H. Smith Business School, University of Maryland; Irfan Haque, Special Advisor on Financing for Development, South Centre, Geneva; J.P. Auffret, Managing Director, Center for Advanced Technology Strategy. We also benefitted from generous comments of our colleagues at the World Bank: Shahid Yusuf, Randeep Sudan, and Samia Melhem. Finally, we must acknowledge the many policy makers and innovators, in part cited in the publications in the four selected country cases, as they led their countries' e-transformation.

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Reference

Nagy K. Hanna and Peter T. Knight (eds.) 2011. *Seeking Transformation through Information Technology: Strategies for Brazil, China, Canada and Sri Lanka*. New York: Springer.

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Nagy K. Hanna is an author, academic, keynote speaker, and advisor with extensive experience in helping policy makers and business leaders in designing policies and programs in support of e-transformation, innovation, competitiveness, governance, and private sector development. He was the World Bank's first senior advisor on e-strategies. He has more than 35 years of experience at the highest levels of development policy, strategy, finance, and operations, and covering all geographic regions. He advises the World Bank, UN, and other international organizations, global ICT companies and consulting firms on designing strategies and institutions for ICT-enabled innovation and transformation. He founded and first chaired the World Bank's global community of practice on e-development. He pioneered the first World Bank lending operation in support of comprehensive ICT-enabled development, now being replicated in several countries.

Dr. Hanna holds a Ph.D. from the University of Pennsylvania, Wharton; and executive development, Harvard Business School. He is also currently senior fellow at the Center for Policy on Emerging Technologies, advisor to national CIOs and boards of national ICT agencies, and member of the Board of Springer International Journal of the Knowledge Economy and Springer book series on Innovation, Technology and Knowledge Management. He is a Commissioner of World IT Forum (WITFOR); and co-chair of its e-Government committee. He has published over 100 books, reports and articles on e-transformation, innovation, ICT industry, knowledge economy, national innovation systems, and state modernization.

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Peter T. Knight is an economist and consultant specializing in e-transformation and working with international organizations, governments, and private sector enterprises. From 2005-2009 he coordinated the *e-Brasil* Project. Before joining the private sector, he led the World Bank's pioneering Pilot Electronic Media Center

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Mr. Goldstuck has represented South Africa as a judge of the digital category in the Cannes International Advertising Awards. For his work in uncovering technology trends, Arthur was a finalist in the Men's Health Man of the Year awards in 2009 and in the Computer Society of South Africa's IT Personality of the Year awards for 2010. Arthur is author of 18 books, including South Africa's best-selling IT book yet, *The Hitchhiker's Guide to the Internet*. Through Penguin Books, he has also published six books on urban legends, with the latest edition, *The Burglar in the Bin-Bag*, released in October 2010.

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Mr. Ona has been an assistant professor and lecturer for the Information Technology department of CCS-DLSU and in academia since 1995. He also served as consultant for the Human Capital Development Group-Commission on Information and Communications Technology (CICT), Republic of the Philippines from 2006–2008. During his stint at CICT, Mr. Ona was part of the APEC-TEL project on the creation of the GCIO Training Model. In 2009 and 2010, Mr. Ona was part of the iGov summer institute administered by the Center for Technology in Government, University at Albany (SUNY), USA. At present, he is a PhD candidate with the Development Studies program of DLSU-Manila.

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Chapter 1
Why National e-Transformation Strategies?

Nagy K. Hanna

We are at a turning point in history, shaped by globalization, and the information and communication technology (ICT) revolution.[1] This technological revolution has sparked and enabled a late twentieth and early twenty-first century wave of globalization—a deeper global integration that goes beyond the trade liberalization that enabled the first wave of globalization. ICT is enabling the creation and management of global networks, as ICT is used to coordinate production and services, expedite and monitor delivery, share ideas and information, and collaborate on design and research. As a general purpose technology (GPT), ICT has been transforming logistics, enabling global demand-driven supply chain management, transforming services and manufacturing, enabling the offshoring of production and outsourcing to suppliers in emerging markets, and diffusing innovations across all kinds of economic and social activities (Hanna 2009a, b). In turn, globalization is enabling the diffusion of ICT and associated innovations, at a faster pace than any GPT in history.

The ICT revolution is the preeminent technological revolution of our time. It is perhaps more profound than any other in history in terms of its speed and pervasiveness (Hanna 1991, 2009a, b). The impact of the ongoing revolution extends beyond the developed countries to countries at all levels of development. It extends from industry to services and from business to public agencies, communities, and civil society organizations.

[1] ICT is broadly defined to include electronics, semiconductors, and microprocessors, as well as broadcasting, computers and communication technologies.

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The ICT revolution continues unabated—driven by Moore's law,[2] network effects (Metcalfe law),[3] and the continuing dramatic advances in communications (Internet, broadband, mobile, wireless, social networking) technologies, and in sensing technologies (GPS,[4] RFID,[5] Internet of Things). This revolution is by no means a spent force, as diffusion advances and deepens, and for the majority of developing countries, it is just beginning.

The ICT revolution lent impetus to development miracles in East Asia (Yusuf 2003; Hanna et al. 1996). These countries were early adopters of ICT, and by harnessing this GPT, they were able to transform industries, modernize their logistics, insert themselves into global supply chains, enlarge the gains from trade, and maximize the returns from globalization. Singapore is a model of this ICT-enabled development paradigm. Other emerging markets are following their models, with many variations. Some, like India and Ireland, are specializing in software, Business Process Outsourcing (BPO), and IT Enabled Services (ITES). Others, like Finland, have leveraged the ICT revolution for diversifying the economy beyond forestry, and for building an innovation-driven economy.

Looking to the future, this transformation will be also increasingly shaped by the limits to energy-intensive growth. Environmental pressures, rising energy prices, and resource scarcity are posing limits to energy- and material-intensive growth. Climate change calls for reinventing the transportation system, revamping the energy system, reindustrializing the planet, and dramatically shifting toward greener products and lifestyles. The race is on to build a new clean energy economy that can sustain human civilization.

An emerging role of ICT is in globalizing research and development activities, and enabling the rapid and wide creation and dissemination of ideas and innovations. Countries are learning to harness ICT to transform their education systems, deepen their learning capabilities, and improve interactions among participants in their national innovation systems. Globalization forces, enabled by ICT, are opening up national systems of learning and innovation, and mobilizing talents and ideas

[2] According to Moore's Law, the number of transistors on a chip roughly doubles every 2 years. The cumulative impact of these spiraling increases in capability power the economy and the Internet, running everything from digital phones and PCs to stock markets and spacecraft, and enable today's information-rich, converged digital world.

[3] A network effect (also called network externality or demand-side economies of scale) is the effect that one user of a product has on the value of that product to other people. When network effect is present, the value of a product or service increases as more people use it. According to Metcalfe, the value of the network is proportional to the square of the number of users.

[4] The Global Positioning System (GPS) is a space-based global navigation satellite system that provides reliable location and time information anywhere on earth and is freely accessible by anyone with a GPS receiver (Wikipedia).

[5] Radio-frequency identification (RFID) technology uses communication via radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking.

across the world. Electronically mediated interactions are giving birth to virtual communities, transcending geography, institutions, and disciplines.

Ubiquitous connectivity and new platforms for collaboration and information sharing are enabling new models of open innovation and mass collaboration—mobilizing and leveraging the collective knowledge and creativity of citizens and businesses around the world (Tapscott and Williams 2010). Open innovation and mass collaboration can tap into the global diffusion of information, knowledge, and innovative capabilities. And an increasingly complex set of global challenges, such as environmentally sustainable growth and poverty reduction, calls for open and collaborative models of innovation.

The Internet is destroying old models of media and enabling new forms of communications, and these new forms are leading to global and instantaneous diffusion of information. Information diffusion is leading to power diffusion and challenges to old forms of organization and governance. NGOs and individuals, empowered with information and communication, have become key local and global actors—powerfully influencing governments and markets, and building new models of collective action and bottom-up development.

As the ICT revolution opens up new sources of growth, it also poses new risks and challenges. It threatens the competitive advantages of countries as it transforms industries and services in dramatic ways. It poses major uncertainties. For some industries and countries, it raises the bar for competing in the global marketplace, and for others, it lowers entry barriers and multiplies the number of players. It accelerates product and process change, demands experimentation and innovation, and calls for openness, flexibility, adaptation, and fast learning. It challenges countries to invest in their knowledge and communication infrastructures.

The ICT revolution offers avenues to leapfrog traditional stages of industrialization, and these routes have been taken by inspiring examples like Korea, Finland, and Singapore, and even larger countries like India and China. The ICT revolution is not the arena of the few or some privileged sectors. It is not limited to ICT as a sector, or to high-tech and knowledge-based sectors—it extends to all types of industries and services. Considerable gains in Total Factor Productivity (TFP) now come from institutional and business process innovations, enabled by ICT. The ongoing revolution also opens new opportunities to solve long-standing development problems through effective delivery of health and education services, new learning and training systems, and effective agricultural extension systems.

Chapter Organization

We first discuss why ICT is a game changer for global growth, welfare, development, and sustainability. The literature covering both the current and potential pervasive impact of ICT locally and globally is voluminous and increasing (see for example, Friedman 2005; Tapscott and Williams 2010; Hanna 2009a, b, 2010).

First, we focus on how globalization and ICT have been mutually reinforcing and have opened up opportunities for developing countries to accelerate their development.

Second, we illustrate how ICT can help meet three global challenges: (1) achieving energy and environmental sustainability; (2) building platforms for open and collaborative innovation; and (3) promoting participatory development and governance.

Third, we articulate the concept of a techno-economic paradigm shift and the substantial investments in policy and institutional adjustments, learning, and human capabilities that are required to make such a shift.

Fourth, we describe the responses of the majority of countries and aid agencies to the challenge of the ongoing ICT revolution and the imperatives of its techno-economic paradigm. Their basic responses and their limitations are defined: (1) as the ICT revolution is primarily driven by business, leave this transformation process to market forces; (2) as ICT is a new and pervasive technology and options abound, we should focus on pilots, micro-interventions, and quick wins with no need for overarching national strategy; (3) given complexity, focus on one element of e-transformation at a time; and (4) given the speed and uncertainties of technological change, focus on short-term adaptation and serendipity. We argue that these responses are inadequate and explain why a national e-transformation strategy is needed.[6]

Fifth, we define e-transformation as such a paradigm shift, induced by or required to harness the ICT revolution. We argue for moving from the "why" to the "how" of e-transformation and indicate that this book is concerned with the latter—meeting the specific challenges governments face in designing and implementing economic and social transformation through ICT. Case studies are to be used to show the "how" and what can be learned from successes and failures.

Sixth, we propose an integrated framework for understanding the holistic nature of e-transformation and for designing strategies to take account of key interdependencies among its elements. The aims of this framework are outlined. Country experiences can be analyzed and assessed, and gaps and weaknesses can also be identified using the e-transformation framework. Thus, all country case studies of this book examine national ICT strategies through the lens of this framework.

Finally, this chapter concludes with an overview and organization of the book.

Globalization and ICT

The globalization of the last 2 or 3 decades gathered momentum from trade and financial liberalization, and the diffusion of innovations sparked by the powerful new GPT, ICT. A steady decline in the costs of surface transportation reinforced

[6] In the final chapter, we conclude with a critique of the current roles and practices of aid agencies, in light of the lessons learned about successes and failures of the country case studies covered in this book and its companion (Hanna and Knight 2011).

the effects of lower tariff barriers; this reduction in costs arose from technological advances such as containerization, port modernization, and advanced logistics and trade facilitation—all aided by ICT applications. The growth of trade was boosted by the offshoring of manufacturing from the US, Japan, and the European countries to industrializing economies, and an international production system began to take shape initially led by multinational corporations (MNCs)—again enabled by ICT. The initial round of production offshoring and outsourcing to suppliers in emerging economies was followed by a far-reaching elaboration, specialization, and geographical dispersion of production made possible by growing networks and expertise in managing complex manufacturing and product integration processes. ICT played a key role in enabling the dispersal of manufacturing through the standardization and modularization of products and intermediates, and the codification of production techniques (Yusuf and Nabeshima 2011).

ICT lent impetus to the industrial miracles in East Asia. It is by harnessing the potential of ICT that countries were able to maximize the returns from other elements of globalization. Countries that proved adept at exploiting the Internet and digital technologies, and became efficient producers of manufactures, enlarged the gains from trade, attracted more capital, and entered into advantageous virtuous spirals (Yusuf and Nabeshima 2011).

Combined with liberalization, ICT played a similar role in enabling the globalization of financial services, and increasingly, other services. ICT made possible the outsourcing and offshoring of impersonal services thereby enabling countries such as India and the Philippines to build entirely new and thriving services sectors specializing in BPO, ITES, and software within a decade or two. The Internet has become a major force driving change by mobilizing and networking talents across the world.

Another facet of globalization is the role of ideas, their production, and rapid as well as widespread dissemination via the many channels created by ICT-enabled networking. The revolution caused by advances in ICT is widely associated with new products and in the ways products are manufactured. Product innovation was powerfully reinforced by the numerous collaborative innovations in other areas: services, institutions, organizations, management systems, etc. ICT has proven to be an extraordinarily potent transformative force in all these aspects of innovation and in creating cross-disciplinary and global learning communities.

Globalization and ICT have become drivers or enablers for disseminating ideas and technologies, with countries that built modern learning and innovation systems capitalizing on the new opportunities much faster than the laggards. Leveraging globalization and ICT, successful countries linked their national systems and mobilized talent from throughout the world. The continuous deepening of knowledge in every field is demanding even greater specialization and the pooling of expertise drawn from several subdisciplines. National systems of learning and innovation nurture these specializations but it is ICT and globalization that have spurred networking and collaboration by encouraging electronic interaction among specialists, by giving birth to virtual cross-disciplinary communities of researchers, by making innovation a global enterprise, and by creating channels permitting the exchange and circulation of ideas or research results.

Globalization was an enabling element for the success of countries like Singapore and Finland. Other countries were equally well positioned to move forward, but did not. We contend that these successful countries, among others, moved quickly to harness the powerful forces unleashed by ICT to take maximum advantage of globalization.

These various facets of globalization reflect the diverse and expanding roles of ICT: first to automate information and data processes, initially within firms and then extending to global supply chains; second, to migrate information acquisition, search, and transaction activities to the Internet, as stores of information were connected to the network; and third, to access valuable human resources and innovation capabilities and mobilize them in supply chains that interconnect the global economy (Spence 2011a).

Before the diffusion of the Internet, a large fraction of human resources were devoted to storing and processing information. A first wave of automation involved productivity-enhancing, labor-saving forms of technological progress. This process continues in both advanced and developing economies, with the introduction of ICT-enabled flexible manufacturing and advanced manufacturing processes.

With the Internet, ICT impact was extended to the information layer that coordinates and controls the underlying economic processes across all sectors of the economy. This role of ICT brought about dramatic reduction in transaction, coordination, and control costs—creating new forms of agile global firms, new enterprises with global reach, and new blends of organizations and markets. With increasing instrumentation and intelligence embedded into the Internet and various processes, new breeds of smart transportation, smart energy, and smart urban systems are likely to emerge.

This impact was extended to information- and knowledge-intensive services. The Internet became a platform for the delivery of a long and expanding list of services: e-finance, e-business, e-government, e-learning, e-publishing, and so on. What drives all of this? It is the dramatic reduction in the cost of finding, communicating, and transacting—in transaction costs. Before the Internet, the costs of delivering many of these services were either prohibitive, or, in developing countries, such services never reached the majority of the population. The practical effect of the Internet is to increase knowledge, access to information, the power of informed consumers and citizens, and the transparency and effectiveness of decision-making. As Spence admits, "it is hard to know how to quantify these effects…but that does not diminish their importance" (Spence 2011a, p. 232).

The most recent and significant long-run effect of ICT's spread is to access and mobilize human talent locally and globally. The defining features of the Internet are speed, multimedia connectivity, irrelevance of location, interactivity, and asynchronous communication. These features are enabling both insourcing and outsourcing a growing array of services: software development, business processes, customer services and support, medical diagnosis, learning activities, and so on. The volume of such activities has been growing between 30 and 40% annually. This trend opens up major opportunities for finding and utilizing highly skilled human resources all

over the world. This is not only beneficial for large recruiting countries like the USA, but also small countries like Singapore, and of course, many developing countries with large pools of human resources.

But what about the distribution of benefits of ICT revolution and ICT-enabled globalization? Will this revolution herald the onset of global economic inclusion or increasing tensions and divides? This is an area of great concern to many developing countries and even among developed countries. Globalization and its enabling ICT revolution have been sold initially as benefitting everyone, and then modified to "potentially benefitting everyone." Some leading economists (e.g., Spence 2011a, b) have now argued that the primary beneficiaries will be the developing economies as these forces are speeding up economic growth in large developing economies and causing "the next convergence." The best defense of globalization and ICT diffusion is that hundreds of millions of people in developing countries are better off. Encouraging trends for developing countries include, among others, the outsourcing of services to developing countries like India and the Philippines, the increasing participation of advanced developing countries in the global supply chains and production networks, the dramatic diffusion of mobile phones in developing countries, the potential of dramatic decrease in the transaction costs for remittances to developing countries (using mobile phone-based electronic banking), and the aggregate effect of reducing the transaction costs of many other essential services.

On the other hand, we know much less about the distributional effects of globalization and the digital revolution and how to deal with these effects within and across countries, at least over the short to medium term. The great recession that started in 2008 has increased the concern that the distributional impacts will be greater and more adverse in advanced countries. Dealing with distributional effects has proven to be hard within advanced economies (Spence 2011b). For the majority to benefit, it is assumed that losers would be compensated through redistribution of income, and that seems to be increasingly harder to do (politically) in advanced countries under slow growth conditions, except for a few small countries like Singapore and Finland. But dealing with these distributional effects is likely to be even harder in developing countries, where inequalities are much higher, and have been increasing even among the fastest growing economies. While it is a promising development in support of inclusion, the diffusion of mobile phones does not eliminate the digital divide, nor other more fundamental divides like basic education.[7] The case studies of the Philippines and South Africa show promising initiatives for inclusion, but also show how difficult it is to address this challenge.

[7] Recent and projected advances in smartphones are very promising, as these devices are becoming available at increasingly low price points and consequently to a wider consumer audience, particularly in emerging markets. Smartphones will increasingly become mass-market devices for Internet connectivity and diverse applications, driven by fierce competition, technological advance, and phenomenal increase in applications using open source tools (Pyramid Research, June 2011).

Meeting Three Challenges

In this section, we illustrate how ICT can help address three global challenges: (1) energy and environmental sustainability; (2) collaborative and accelerated innovation; and (3) participatory development and governance. The aim is to give more concrete examples of the opportunities that ICT has been opening to solve global and local development challenges.

ICT for Energy and Environmental Sustainability

Climate change is emerging as the biggest issue with which human civilization has ever had to cope. With the increasing concern about global warming and polluting industries, the pressures are on to integrate information technology solutions to manufacturing processes, optimize the use of raw materials, monitor processes and reduce their energy consumption, and optimize logistics and distribution. Fortunately, ICT promises a new growth paradigm that is less material-based and energy-intensive—a smart, green growth strategy. ICT is enabling profound transformations in the way we work and live, toward more sustainable lifestyles for an energy-challenged planet.

ICT is expected to continue to drive energy-efficiency improvements. Several studies indicate that the potential for improvements are substantial. For example, A McKinsey report estimates that cost-effective investments in existing energy productivity technologies (ranging from more efficient lightening, to more efficient home appliances, to advanced power plant technologies) could improve energy production and use in the US by 25% over the next 20 years (Bressand et al. 2007). ICT would clearly contribute significantly to all these improvements. Another study of the US estimated that ICT can reduce the growth of carbon emissions by one-third over a decade, as a result of continued ICT diffusion in e-commerce, supply chain management, telecommuting, reduced paper and materials consumption, shift in growth to less energy-intensive sectors, and ICT-driven efficiency improvements in a wide range of equipment (Laitner and Ehrhard-Martinez 2008).

A study by McKinsey's Global Institute concluded that the world could cut projected global energy demand growth between 2008 and 2020 by at least half by capturing opportunities to increase energy productivity. A similar study in Japan projected that widespread use of ICT could reduce carbon emissions by over 40% by 2050. The reductions would come from intelligent transportation systems, widespread teleworking, and ubiquitous home energy management systems (Laitner and Ehrhard-Martinez 2008).

ICT is also enabling the digitization of media and business processes, and the "dematerialization" of the economy. Digital movies and music, Web-based news, and electronic banking, all digitally distributed or transacted over the Internet, are among the many examples of relying less on paper, hardware, and other energy-intensive vehicles. Similarly, ICT can drive energy-efficient practices in business. With lean manufacturing and digitized processes, energy can be saved at every step

of the production and supply chain. ICT is also allowing more effective utilization of transport systems—using ICT to better schedule flights and raise seat utilization in air transport, for example. Some ICT applications could facilitate carpooling and ridesharing, and ease congestion and select optimal routes. New e-commerce-enabled business practices like Amazon.com's centralized warehousing are less energy consuming than brick-and-mortar retail operations.

Applied to energy management, ICT is used to achieve more efficient and reliable control of electric grids—transmission and distribution of electric energy. Sensors in transformers and substations allow rapid detection of outages and other malfunctions and prompt dispatch for repairs. Smart meters installed in the premises of final users permit two-way communication that can be used to implement smart marginal-cost pricing policies. This includes the ability to turn off or reduce consumption of appliances in consumer premises—using plug-in hybrid vehicles and intelligent home appliances. Smart grids also help monitor and control energy theft, very significant in many developing countries.

Two-way communication in the grid can also favor cogeneration from renewable sources owned by consumers (solar, wind, small hydro). Accordingly, the pro-sumer gets credit for contributions to the grid. Another use is for plug-in-electric vehicles, whose batteries can also be used as a source to store energy generated or acquired at nonpeak periods and resell it to the grid at peak periods if plugged in. Under appropriate regulation, this allows sale of broadband Internet connections as well as power to consumers.

Energy and environmental management also depends on strategic planning, monitoring, knowledge networks and adaptation strategies, real-time energy demand management, and monitoring and acting on the environment. e-Enabled green policy networks as well as e-enabled carbon markets are emerging to help formulate energy and environmental policies and adaptation strategies. Adaptation strategies are further supported by ICT-enabled knowledge building and connecting to those on the frontline.

In sum, ICT has catalyzed important innovations in energy efficiency. It is also revolutionizing electricity production, distribution, and consumption. Moreover, new energy production technologies, including solar and wind power, rely heavily on ICT for their design and management. The trend toward ICT-driven improvements in energy efficiency is expected to continue as the most promising ICT-enabled innovations are still in early stages of implementation even among advanced countries.

But market forces alone cannot provide the pace and scope of innovations required to meet the urgent national and global need for green energy supply and use, and to overcome the huge built-in incentives for legacy energy technologies and energy-intensive consumption practices (Weiss and Bonvillian 2009). The impact of ICT on energy and the environment can be significant, but will depend on how quickly and fully society will adopt not only available ICT capabilities, but also policies to spur adoption of ICT-enabled energy-conserving practices. ICT-enabled transformation toward a green growth paradigm will require massive investment in policies, institutions, and smart infrastructure, involving extensive collaboration between government, business, civil society, and universities.

Collaborative and Accelerated Innovation

An ICT-enabled new model of innovation, involving open source and mass collaboration, is sweeping across all sectors in the advanced economies. It allows people with drive and expertise to take advantage of new Web-based tools to reshape established institutions and the world (Tapscott and Williams 2010). A new era of collaboration in business is emerging, and many promising examples show how business, government, civil society, and individuals can leverage collaborative technologies to work in new ways to solve the greatest problems of our time. Collaborative innovation promises to revolutionize work, as well as how we live, learn, create, and govern.

A new environment fostered by the Internet and the rise of networked intelligence together suggest that organizations can succeed by embracing collaboration, openness, sharing, and interdependence. There is a growing realization that the collective knowledge, capability, and resources embodied within broad horizontal networks of participants can accomplish more than one organization or individual acting alone. Twitter, Facebook, and Wikipedia have captured the popular imagination about collaborative innovation and content creation, but there are many other examples of companies and communities that apply collaborative innovation, with great impact (Tapscott and Williams 2010). A few examples of platforms that radically cut collaboration costs and make accessing the global marketplace for ideas, innovations, and talents are Linux, InnoCentive, NineSigma, iPhone, Open source, Proctor and Gamble's open innovation called "Connect and Develop," and General Electric's "virtual collaboratory"—all developing Internet-based global platforms for collaboration and innovation.

Open and collaborative innovation tools are promoting collaborative education. Collaborative tools can transform pedagogy through collaborative learning, interactive computer-based courseware, just-in-time teaching, course content exchange (like MIT's OpenCourseWare), course content co-innovation, and even customized student-centered collective *Syllabi of the World* (Tapscott and Williams 2010). Foundations are organizing large-scale innovation contests as a way to generate ideas and turn them into radical breakthroughs that will benefit humanity. The World Bank has recently organized a global contest on "Apps for Development."

Internet-based platforms for innovation and mass collaboration can be applied to the challenges of saving the planet. The Internet and interactive ICT tools open up new ways to marshal and exploit the collective ingenuity of citizens and businesses, provide transparency around climate change, build pressures for policy and political solutions, and stimulate widespread consumer and business action. Opening up university and government databases and supporting transparency brokers can make climate change information accessible to the public and key institutions, and this information can change perceptions, improve understanding of causes and consequences, and compel participants to search for solutions or accept the need for new regulations. A site called Carbonrally pits teams from around the world against one another in contest to see who can reduce their carbon footprint the most (Tapscott and Williams 2010). EarthLab.com translates science into digestible pieces of

information that can actually influence people's behavior and gives consumers reliable estimates of their personal carbon footprint.

Many companies are working in isolation to invent, scale, and disseminate new sustainable technologies, and in the process are developing portfolios of sustainable technologies, many of which are not core to their business model. Nike's Sustainable Business and Innovation Lab is one example—developing recyclable materials for producing their products. Technologies like these will only get better and cheaper for Nike the more other companies use them and achieve economies of scale. A collaborative approach to R&D, by like-minded companies, could create common pools of industry knowledge and processes upon which new sustainable industries are built. GreenXchange, a database and a new model of patent licensing, makes it easy for companies to share sustainable technologies, and for all to know what intellectual property is available and who is using it, while recognizing the intellectual leadership behind the technologies being shared (Tapscott and Williams 2010).

Emerging applications of collaborative innovation in the public sector are no less inspiring: the "Apps for Democracy" contest by the US federal government, open sourcing government (Web-enabled collaboration with citizens, civil society, and the private sector for public services), participatory budgeting, Data.gov (an open hub for government data) to help cocreate information-based services, and the use of social networks to reinvent government from the bottom-up. The US Government is investing in the building blocks and practices of open innovation, by connecting databases and opening them up to the public for innovative uses by businesses and individual citizens. It has also established an innovation fund for government agencies to give out small "challenge grants" to groups or individuals to solve some of the biggest problems facing these agencies. Thus governments are becoming platforms for creating public value through information sharing and co-innovation with private sector and civil society.

While celebrating the power of collaborative technologies—mainly applied in advanced countries—vested interests maintaining closed systems and authoritarian governments present formidable barriers to widespread use of these technologies.[8] We should not underestimate the barriers of adopting, spreading, and scaling up collaborative innovation in the context of the digital divide and institutional rigidities that prevail in developing countries. National e-transformation policy and strategy must address these barriers and the role of new leaders, public policies, and national strategies in making open and collaborative innovation a mass movement that can reboot development and address global poverty.

Participatory Development and Governance

Much of failed development is the outcome of top-down strategies and *dirigiste* plans, and the lack of collaboration among government, business, and civil society

[8]Recent pro-democracy movements in the Arab World among others, are empowered by social networks and mobile communications.

in shaping these strategies. These strategies have been framed in an environment of information scarcity and based on a common conception of passive recipients of development programs. The alternative route has been to leave development directions to market forces—leading to growing inequalities and unaddressed market failures. Recognizing the limits of the state and the market, new development thinking is turning to building partnerships among stakeholders, and catalyzing and leveraging community knowledge, creativity, and capital to promote grassroots development.

Development is increasingly viewed as a local process of change and learning (Rodrik 2004; Rodrik 2007; Stiglitz 1999a, b, 1998). Sustainable development is as much about social and institutional transformation, as it is about economic transformation. It depends on local participation, empowerment of community organizations and change agents, and mobilization of local knowledge and resources. It requires societal ownership, partnerships among stakeholders, and enhanced experimentation, accountability, and evaluation of results (Hanna and Picciotto 2002). Institutional innovation, entrepreneurship, technological change, and capability development are at the heart of this process (Rodrik 2004, 2007; Dosi et al. 1988; Freeman and Soete 1997).

Top-down strategies have tended to rely on "push" programs, based on forecasting needs and then designing the most efficient investment programs to ensure that the right people and resources are available at the right time and place using scripted processes and standardized applications. Such push programs have their place in driving e-development, and they have dominated development planning and policymaking. They remain amenable to elite control and central institutions. But fundamental shifts are changing our world and making it possible to use pull strategies (Hagel et al. 2010). The digital infrastructure is advancing and spreading rapidly and in turn intensifying competition; enabling outsourcing; lowering barriers to entry; and enabling the flow of capital, talent, and knowledge within and across organizations, and across countries. In turn, these fundamental changes allow for new institutional innovations and new "pull" techniques and practices: open innovation, pull or collaborative platforms, cross-sector and cross-institutional partnerships, and leveraging change agents.

The ICT revolution is making it possible to build a more widely distributed information environment and knowledge-enabled collaborative world. Informed citizens are better equipped to take advantage of opportunities, access services, exercise their rights, negotiate effectively, and hold state and non-state actors accountable. In this environment, inclusive and pro-poor growth strategies can harness the collective knowledge of society and the resourcefulness of communities.

The new ICT tools have the potential to mobilize and strengthen the demand for good governance—liberating government information, building awareness and demystifying information on policies and rights, encouraging consultations, promoting collective action, monitoring performance, institutionalizing avenues for citizen feedback and grievance redress, etc. The mobile phone, Internet, Web 2.0 (participatory Internet, with user-generated content), social media, and the growing array of information and communication tools empower citizens to access unfiltered

information, register their demands, and shape public services to meet these demands. These tools create contexts or platforms that allow people to self-organize and to create things that are valuable for themselves, and maybe for the world. Widely diffused mobile communication devices and ubiquitous networks empower citizens to hold the state accountable through participatory budgeting and monitoring, monitoring public expenditures on schools, monitoring local implementation of various development programs, disseminating information on laws and regulations and who is responsible for what in government, etc. They also make the co-innovation of development programs and public services much more possible (Hanna 2011).

The applications to which mobiles are being put by the users, frequently the poor, show extraordinary creativity (Hanna 2010). Examples abound. Safaricom, a Kenyan-based mobile operator, has developed nationwide a mobile banking (m-banking) service called M-PESA (mobile phone-based money transfer), that allows Kenyans to transfer money via SMS. The service does not require users to have bank accounts, an important aspect in a country like Kenya, where many people do not have bank accounts. M-PESA is being also used to receive remittances, so the user can buy digital funds at any M-PESA agent and send that electronic cash to any other mobile phone user in Kenya, who can then redeem it for conventional cash at any agent. It has contributed to a significant growth of remittances within Kenya. An M-PESA-enabled mobile phone can also be used to pay for many services—from school fees to utility bills, to many other basic services. It has spread widely in Kenya, with subscribers far exceeding those with Bank accounts. Safaricom has partnered with over 100 organizations that accept payments using M-PESA, ranging from banks, government agencies, and media houses, to microfinance institutions and insurance companies. M-PESA is being rolled out throughout Africa, the Middle East, and beyond.

Ushahidi, also a Kenyan-born organization, developed a crowd-sourcing information and Internet-based mapping site that allows users to submit eyewitness accounts of election fraud and riots via e-mail, text, or Twitter, then was later used during Haiti earthquake and other crises to allow users to submit their accounts and other relevant information in a disaster situation—and then visualize the frequency and distribution of these events on a map. It helped a global effort to crowd-source assistance for Haiti. It is one of many examples of tools that empower millions of ordinary individuals to play a larger role in development, from democratic decision-making to crisis management, to protecting public health (Tapscott and Williams 2010).

New communications technologies, combined with old, particularly mobile and social media, combined with satellite broadcasting, can help empower citizens and expand freedom, political and economic. Social media—text messaging, e-mail, photo sharing, social networking, etc.—have become coordinating tools for nearly all of the world's political movements. As the communications landscape gets denser and more participatory, the networked population is gaining greater access to information, more opportunities to engage in public conversation and speech, and a vastly enhanced ability to organize and undertake public action. Examples during the first decade of twenty-first century are many—the Philippines, Moldova, Iran, Chile, South Korea, etc.—with no preordained outcomes (Shirky 2011).

Demonstrations starting in early 2011 in Tunisia and Egypt, and spreading elsewhere in the Middle East, show the increasing role of new media and social networks in raising shared awareness, and enabling grassroots coordination in support of political freedom and economic justice.

The new ICT tools and platforms are enabling or facilitating a power shift in the way citizens engage with the state. The growing number and networking power of community service organizations (CSOs), demographic changes (youth and urban population growth), ongoing decentralization reforms, and open government initiatives and laws are all contributing factors to this power shift. ICT complements and reinforces those contributors to the power shift. These factors are strengthening the demand for good governance and the capability of citizens to hold the state accountable. The spread of ICT, including mobile, social media, and satellite broadcasting, is a powerful enabler of the process of strengthening demand for transparency, accountability, and good governance.

The high costs of ignoring real-time dialogue with citizens are becoming increasingly evident to governments. Several countries are taking the initiative to open their public sector data in electronic form for others to use, manipulate, and mesh with other sources for all kinds of applications and users. The trend in several leading countries is toward bringing higher value for citizens and businesses through partnerships in the delivery of e-services, toward treating citizens not as objects but coproducers of such services, and toward involving citizens in shaping and monitoring public policies. Cocreation is a key part of Singapore's "Gov-with-You" strategy, which leverages Web 2.0 technologies to facilitate two-way communications between a government and its citizens with regard to service delivery and citizen engagement.

The information and communication revolution presents an opportunity for a "second generation" development strategy that emphasizes an informed, inclusive and participatory development. ICT opens new options for development. ICT-enabled development draws on widely distributed information and communication to support grassroots innovation and collaboration. New tools like mobile phones and collaborative technologies enable more targeted and strategic communications, widely shared awareness of possibilities, peer and collaborative production, and broad participation in development programs. They facilitate local partnerships, enhanced experimentation, and local monitoring of development programs. They support community learning and knowledge sharing, network-based innovation, and the building of community-based institutions. They help promote access to health information and learning resources, and new ways to deliver extension and support services to small farmers and businesses.

A second generation e-development strategy would be based on a new phase in applying ICT for development, an "ICT4D 2.0" (Heeks 2008). This new phase shifts attention from preoccupation with technical novelty to contextual understanding of how existing technologies can be used effectively to solve problems of poor communities. It shifts the locus of innovation from supply-driven solutions to collaborative innovation that emerges from working with poor communities, and even more radically, to grassroots innovation that mobilizes and empowers communities to innovate by, and for, themselves. It shifts ICT initiatives from an exclusive focus on

investing in physical access to ICT, to taking a holistic approach that invests in local competency development to create and use content. It shifts emphasis from designing top-down blueprint plans to developing local processes and grassroots institutions that enable flexibility, beneficiary participation, local leadership, and local innovation and learning.

Yet, the transition to a bottom-up participatory development—leveraging shared national vision and policy directions with local initiatives and grassroots innovation—is never easy or without resistance. Existing power structures in public and private spheres are likely to hoard information and undermine decentralization. Changes in mindset about development, the locus of development efforts, and skills of development practitioners are key ingredients. Open leadership and open government demand new attitudes and skills for information sharing and collaboration—not just investments in ICT tools and networks. Policies to support information sharing and accountability, and investments in community organization, local institutions and collaboration platforms, and information and digital literacy are necessary complements to make the transition.

Participatory development also calls for supporting home-grown entrepreneurship, and rewarding initiative and risk taking. The ICT industry has been a major source of entrepreneurship, from ITES to mobile applications and information services. It has been the hotbed of social entrepreneurship, techno-entrepreneurship, and fastest growing enterprises. Networked cities are the hubs for learning, innovation, and creative industries (Castells 2000). ICT tools and access to information can empower small entrepreneurs, connect them to local suppliers and markets, and help them internationalize. ICT tools and networks enable wider participation by members of the diaspora to invest, mentor, and partner with local entrepreneurs. Promoting entrepreneurship and small ICT enterprises can thus create a virtuous cycle of participatory and dynamic development.

The Challenge of a Techno-Economic Paradigm Shift

The previously discussed examples of ICT-enabled transformation share common enablers or foundations: policies in support of information sharing, advanced communications infrastructures, digital and information literacy, experimentation and learning to harness the new technologies, public–private partnerships, user-driven content, collaborative innovation, mechanisms to manage change in processes and organizations, new attitudes and practices, and new institutions. Together, these enablers are facilitating a techno-economic paradigm shift.

These examples of ICT-enabled transformation also point to a broad and fundamental lesson of development: technology is much more than an ingredient in development strategies; it is an enabling tool and conditioning element of their viability. As technology changes, it opens new frontiers and sets conditions that generate development opportunities. Such development requires learning to benefit from opportunities arising from technological breakthroughs. A new technological

revolution creates major discontinuities and shifts in the direction of change, opening new paths to development and opportunities for learning and catching up. Taking a long-term perspective, each technological revolution is associated with socio-institutional transformation or techno-economic paradigm, and leads to a surge in productivity development (Perez 2002).

New growth theorists and economic historians have characterized GPTs as having: (1) wide scope for improvement and elaboration; (2) applicability across a broad range of uses; (3) potential for use in a wide variety of products and processes; and, (4) strong complementarities with existing or potential new technologies (Bresnahan and Trajtenberg 1995; Helpman 1998). GPTs are engines of growth. They play the role of "enabling technologies," opening up new opportunities rather than offering complete solutions. They act as catalysts, inducing complementary innovations in other sectors. While the steam engine is widely accepted as the GPT of the first industrial revolution, electricity is viewed as the GPT for the second industrial revolution.

Long adjustment periods are needed for an economy to fully reflect the productivity impact of a revolutionary new technology like ICT (David 2000). It is instructive to understand the dynamics of the productivity surge of the 1920s arising from electrification. In the case of the electric dynamo, the great productivity gains came not from the fact that electrical engines were faster and stronger than steam engines, but that they facilitated more efficient organization of work. It took decades for factories to be reorganized and for the full gains to be realized, but there were overall surges in productivity growth once a certain critical mass was reached. There are parallels between the interconnection of electric motors through grids—and the associated transformation in manufacturing practices—and the interconnection of computers via communication networks. The Internet, diffusing much faster in the USA than electricity did during 1880s–1920s, is a major step in this interconnection throughout local and global economies.

The ongoing ICT technological revolution is so profound and pervasive that it challenges many traditional economic concepts rooted in incremental thinking. However, the evidence in terms of economy-wide productivity has become most clear in the case of the USA (Jorgenson 2006; Jorgensen and Stiroh 2000; Oliner and Sichel 2000; Gordon 2000; David 2000; Brynjolfsson and Hitt 2000; Brynjolfsson 2009). The evidence of impact on productivity is even more compelling and persuasive across countries at the microeconomic, firm and industry sector levels. Although economists have had great difficulties measuring the productivity and transformative impact of ICT for some time, some leading economists now acknowledge the profound and continuing impact of ICT on productivity, economic convergence, the integration of the global economy (Spence 2011a, b).

The relatively recent adoption and low usage of ICT in many developing countries suggest that this revolution has not yet had a significant impact on economy-wide productivity, except among a few emerging economies. In order to have significant impact on growth, a country needs to have a significant stock of ICT or users in place, and perhaps be more advanced in using that stock for economic transformation. Most recent evidence on ICT contribution to growth comes from Korea, India, and China, best reflected in terms of their substantial exports in ICT industries.

Raising productivity through ICT use is essentially a developmental task that requires cumulative socio-technical learning and orchestrated investments in a combination of technological and social capabilities. Empowering the poor with ICT to increase access to information, learning, and employment opportunities also requires substantial experimentation, grassroots participation, social learning and strategies for scaling up, and sustainability.

As in earlier GPTs, the short-term impact (reflected in economy-wide productivity surge) may be uncertain or difficult to measure, but the long-term impact will be profound and typically has been underestimated in earlier revolutions. The lead time for ICT to have its full impact may be relatively shorter and the impact more transformative than for earlier GPTs. But advances in the technology are running far ahead of potential applications and the capacity of institutions and society to absorb and adjust to take full advantage of these technological capabilities. Moreover, the institutional changes and complementary innovations necessary for ICT diffusion and effective use in the public and educational sectors are likely to come at a slower pace than in business.

Each technological revolution provides a new set of general purpose, pervasive technologies and a corresponding set of new organizational practices for a significant increase in productivity in existing sectors, and this combined best practice is referred to as a techno-economic paradigm (Perez 2002). A techno-economic paradigm provides the means for modernizing all existing industries, activities, and infrastructures. This was the case with the deployment of the mass production paradigm in the twentieth century, and currently, the early phases of the ICT paradigm. A techno-economic paradigm articulates the technical and organizational model for taking the best advantage of the technological revolution and results in the rejuvenation of the whole productive structure. A techno-economic paradigm gradually defines the new best practice frontier and becomes the shared organizational common sense of the period.[9]

Each technological revolution encounters powerful resistance from established institutions and vested interests. The transition to the new practices is never easy and takes decades. It is best described by Schumpeter (1942) as a process of "creative destruction" where the established leaders are unlearning much of the old and inventing or adapting to the new. Matching and realigning the social and institutional environment to assimilate fully a technological revolution and its techno-economic paradigm involve painful changes, and at times creative disruption and destructions. Similarly, realizing the potential of the information and communication revolution requires revamping the productive structure, the building of new networks of institutions, the transformation of regulatory frameworks and governance, and even deep changes in ideas and culture.

Newcomers who understand the dynamics of the techno-economic paradigm shift can direct their efforts toward learning the new practices and may even find

[9]For example, in the era of car and mass production, the paradigm principles were mass production/mass markets, economies of scale, standardization, centralization, and hierarchies.

a route to leaping forward and catching up (Perez 2002). The "Asian tigers" took the leap forward with the microelectronics revolution, rejuvenated mature industries, and entered new and fast-growing industries. This involved intense learning and substantial investments in human capital and active absorption of technology. Similarly, development under the current techno-economic paradigm requires proactive and sustained efforts. According to this new paradigm, capacity to handle information, knowledge, and innovation will be more central than ever. This paradigm also calls for radical transformation in education and training systems, science and technology policies, and even more broadly, in conceiving development strategies.[10]

How Are Countries and Aid Agencies Responding?

A strong case can to be made for facilitating an ICT-based techno-economic paradigm shift by adopting a national e-transformation policy and strategy, based on theory and practice. However, there are many distractions and barriers to the effective adoption of national ICT policies, and to the sustained pursuit of long-term ICT strategies and programs. Neoclassical economists and sufferers of technophobia argue that no industrial or technology policy is needed or can work, either because market forces are adequate or because government failures are serious and inevitable. The ICT utopians and technology determinists are so driven by their excitement and aspirations about the dramatic advances in ICT that they are willing to invest in all sorts of pilots and component applications without strategy or preconditions—to "let a thousand flowers bloom." Here are some of the prevailing attitudes and responses.

Technological change and the ICT industry are driven by entrepreneurship, so leave it to the market or private sector, as skeptics of national ICT policy, innovation policy, and industrial policy would say. The neoclassical economists and technophobes suggest that policies for ICT (production and diffusion), like policies for industrialization and innovation, are best left to the private sector. They argue that ICT is driven by the private sector; governments cannot lead or add much value to this process, except perhaps by using ICT tools in government agencies to manage and deliver public services. Can governments and aid agencies really play a role in setting priorities and investing in emerging technologies in the context of an encompassing technological revolution? Can societies develop a national consensus on strategic priorities to advance e-transformation? Why pick ICT as a priority industry or a focus for technology innovation, as this would be akin to industrial policy?

[10]There is a significant risk that development practice will fail to appreciate the profound implications of the new techno-economic paradigm, and the need to respond in real time to the consequent challenges. An incremental and narrow perspective of development misses viewing development as a process of transformation, as a non-incremental paradigm shift, and as a discovery of new sources of growth and innovation.

The skeptics point to frequent government failures in pursuing industrial policies and "picking winners." They object to a government role, regardless of the labels used: ICT policy, innovation policy, or industrial policy—policies that stimulate specific economic activities or specific GPT that promote structural transformation.

However, a strong case be made for ICT policy as well as industrial policy, based on economic theory: there is no doubt that market failures exist and are often pervasive in developing markets (Rodrik 2008). The arguments for pursuing e-transformation policy are similar to pursuing policies for transforming education or any other complex national system—not just the "controversial" industrial sector policy. Asymmetric information results in financial market imperfections and reluctance to finance new and innovation-driven ICT activities that are risky and lack a track record. Investments in new industries and nontraditional areas need complementary services and inputs which are unlikely to exist before a substantial cluster emerges. Externalities, learning, and knowledge spillovers abound. Learning-by-doing and new-good-creation spillovers are at the heart of explaining growth in developing countries (new growth theory). These were essential to the wide adoption of high-yield variety in India's agriculture and elsewhere. Many investments in ICT infrastructures tend to be lumpy, requiring coordination; such investments play a similar role as investments in irrigation systems in supporting the diffusion of high-yield varieties. Development is fundamentally about structural change, producing new goods with new technologies, and this process is a fertile ground for many market failures. In sum, the opportunities for structural change and industrial upgrading brought about by ICT demand rethinking development and the role of government in facilitating ICT-enabled transformation (Lin 2011).

The arguments for sector policy are much stronger for ICT or the creation of the digital economy than for industrial policy in general—to capture supply-side and demand-side economies of scale, network effects, substantial externalities, and positive feedbacks or synergies that are prevalent in the ICT sector in particular (Hanna 2009a). Digital content providers cannot prosper without widespread connectivity and telecom infrastructure suppliers. e-Government cannot be inclusive and sustainable without a critical mass of users, and in turn, unless e-literacy, relevant content, and affordable connectivity and delivery channels are developed at the same time. Synergies create virtuous cycles in which initial government and private investments attract significant investments by other interested parties. The ICT services industry can thrive only when several appropriate ingredients for a healthy ecosystem are combined such as enabling environment, human resources, and communication infrastructure.

Economies of scale on the supply side offer opportunities to share information infrastructure (including broadband), share access to ICT, consolidate data centers, share information systems development, develop a critical mass of skilled human resources, and expand local capacity to produce and adapt ICT products and services. The new information economy is also increasingly driven by demand-side economies of scale or network economics (Shapiro and Varian 1999). The value of connecting to a network depends on the number of people already connected to it. This fundamental value proposition goes under many names: network effects, network externalities, positive feedback, and demand-side economies of scale. As the installed

base of users grows, the benefit for the users increases, and more and more users find adoption worthwhile. Once a critical mass of customer base is achieved, the market builds on itself with positive feedback and demonstration effects (Hanna 2009a).

Industrial policy skeptics may accept the need for policy intervention, but then insist that such polices have to be "horizontal" rather than preferential or sectorally targeted. Thus they would remain skeptical about industrial or innovation policies targeting ICT production or adoption—despite the potential pervasiveness of ICT as an enabler or GPT. Accordingly, market imperfections would be best remedied by uniform measures that target financial markets, education, and R&D. But horizontal incentives such as R&D subsidies and accelerated depreciation discriminate against small firms and labor-intensive activities. Policy makers therefore need to ensure that the activities favored are those that disproportionately suffer from the market imperfections in question (Rodrik 2008).

Despite these theoretical groundings for a government role in shaping ICT production and diffusion through policies based on addressing market failures, skeptics argue that government failures also abound, constraining any industrial or ICT policy in practice—there are informational, bureaucratic, and political constraints. The skeptics have thus often blocked any support to industrial and technological upgrading programs and ICT promotion strategies, at the World Bank and many other aid agencies, on the grounds of that they risk government failures. Yet most fast-growing countries, intentionally or not, pursue industrial policy in one form or another. This is true not only of Singapore, Finland, China, and Brazil, where industrial policies are openly pursued, but also Chile, Germany, UK, and the US, where industrial policies are common but less explicit (Justin Lin 2011).[11] A 2006 survey by UNCTAD shows that 44% of countries have adopted ICT plans, and 20% have actually designed such plans as part of their development plans and poverty reduction strategies.

Governments increasingly view ICT policies (and industrial policies) as imperatives to promote national competitiveness in an increasingly connected digital world, and are leaning to generate and implement policies needed to alleviate the consequences of market failures. Most societies do not view government failures in pursuing such policies to be inevitable and consider such policies as part of good governance. Government failures are taken seriously and their implications are thought through for the design of industrial, innovation, and ICT policy institutions. Countries such as South Korea, Singapore, and Taiwan did not have perfect institutions at their start of industrialization (or informatization), but pursued policies that overcame the market obstacles their investors faced in modern industries. These countries learned to improve their capabilities to design and implement these policies over time (Rodrik 2008; Hanna et al. 1996).

Focus on pilots and components, remain simple and small, and learn as you go. This is an attractive proposition since new advances like mobile phones (Apps)

[11] As economies in advanced countries struggle to maintain or restore growth in 2011 and beyond, industrial policies (and ICT and innovation policies) are likely to be brought under a brighter spotlight than ever before.

allow for small, cheap, quick development, incremental and modular improvement, and easy-to-use applications or pilots.[12] These developments, enabled by new mobile handsets with growing capabilities, are generating great excitement within the development community. They present affordable tools that can be available globally and quickly. ICT for development literature has thus been dominated by research and reporting on pilots, applications, and micro-level intervention.[13] So has been the focus of development assistance by NGOs, foundations, bilateral aid, and multilateral development banks.[14] The business and development literatures have also portrayed ICT as an endless stream of technological innovations—for consumers, businesses, or governments. It is tempting to focus on the latest tools and the "next best thing," to search for the silver bullet, to celebrate quick success stories, and to take credit for them.[15]

Yet there is growing awareness that scalability and sustainability are raising novel and inevitable issues. Perhaps less than 10% of such pilots become sustainable or scalable, particularly when they are donor-driven. Funding sources tend to be short term. Stakeholders critical to long-term sustainability are not engaged. Human resource capabilities become a constraint to scalability. Information sharing across applications, and integration across the value or supply chains are hindered by lack of interoperability. Enabling policies like privacy and reliability of information are missed. Ecosystems and capabilities critical to local innovation and sustainability are poorly understood and rarely established.

Earlier waves of ICT have generated similar excitements, and continue to shape and add to the tools for e-transformation. Telecenters are a prominent example. They were first promoted by ITU, and then by various UN organizations involved in rural development (FAO), small and medium enterprises (ILO, UNCTAD), health (WHO), information society (UNESCO) and many bilateral aid agencies (IDRC, CIDA, USAID), and to a lesser extent the World Bank and other multilateral development banks. Many of these telecenters have been piloted and financed by external donors, foundations, and NGOs, local entrepreneurs, or local communities, since they could also be started small, at low cost, and without much central or local government support. But as these telecenters strived to bridge the digital divide, add development applications, and reach out to the poor, they encountered problems of sustainability and scalability. As with the mobile wave, the short-termism and single-mindedness of aid agencies do not help in securing the scale, sustainability, and impact of telecenters.

The experience of the World Bank and other aid financing agencies is similar when it comes to adding ICT components to sectoral investment projects. The share of ICT

[12] Apps for development on mobile are multiplying with much promise for rural development, health, etc.

[13] This literature is best represented by the well-respected International Journal: *Information Technology and International Development.*

[14] InfoDev, a multi-donor financed program, with secretariat at the World Bank, has focused for many years on ICT pilots to demonstrate the value of various ICTs and business models. But the InfoDev program seldom worked to secure scalability and sustainability of such pilots and innovations.

[15] Many pilots, in India and elsewhere, were declared prematurely as success stories, but further independent evaluations proved otherwise.

components in World Bank lending has been growing faster than other sectoral investments, since the early 1990s. An early study by one of the authors suggested that these components were present in 60–90% of World Bank-financed projects, and add up to 5–10% of total lending (Hanna and Boyson 1993). That study highlighted that these components have become catalytic or critical to investment projects in almost all sectors and countries at different levels of development—improving macroeconomic management, as well as management information and communication systems, and the efficiency, responsiveness, and adaptability, and accountability of all investment programs. Even then, it was clear that the Bank, like other aid agencies, was reacting to a technological revolution with no clear sense of direction.

More recent quality assurance and audit studies have repeatedly shown that such ICT applications remain significantly lower in quality of design and implementation than the rest of the Bank portfolio. They lack any systematic integration into their sectors and institutions, and thus end up automating existing processes and isolated functions, rather than reinventing them or initiating and sustaining transformation of whole sectors and institutions. Their poor integration reflects the persistent disciplinary gaps between sector staff (in education, health, rural development, etc.) and ICT specialists (Hanna 2009a).

Focus on one element of e-transformation at a time, since each element is under one or more agency, and coordination of all elements of e-transformation is too complex and way beyond the capacity of most developing countries. At the national level, the focus has been on one single element at a time of e-transformation: telecommunications, ICT industry, ICT human resources, e-government, information policies, etc. Much of current development policy and practice treats elements of e-transformation in isolation. Yet, telecommunications, Internet, media, search engines, data mining and mashing, and business intelligence tools, and an exploding number of information technology applications continue to converge or become increasingly interdependent. Most of the documented failures of ICT applications in e-government, e-business, e-education, or rural development are traced to fragmented approaches that missed key enablers, operated within separate bureaucratic domains, and ignored synergies for sustained transformation and ecosystems for sustained innovation.

Consider the synergies between e-government and e-business, and other enabling conditions for e-transformation. Making e-government and e-business services broadly available to citizens and enterprises requires accelerating Internet penetration and affordable connectivity. And the take-up of online services depends critically on the development of digital literacy and an information culture. Education and the policy environment are keys to making technology work. Moreover, when governments tap domestic firms to act as partners in providing e-government solutions, they support private sector development in ways that can broaden e-development and create competitive domestic markets and learning opportunities for developing the local ICT industry.

The tendency to treat various elements of e-transformation in isolation is prevalent, but it must be overcome. Development assistance agencies tend to reinforce fragmented and ad hoc responses to the ongoing ICT revolution and its transformation imperatives. Responsibility for e-transformation within developing country governments is typically nobody's responsibility, or so widely distributed and fragmented as to lead

to the same thing. Ministries or agencies concerned with ICT, telecommunications, science and technology, innovation, small business, education, and all sectors concerned with applications are potential stakeholders, but are likely to protect their information and turfs, rather than adopt a whole-of-government approach to e-transformation. Thus, coordination failures and unexploited synergies are pervasive.

In practice, national ICT strategies have not been closely linked with overall development strategies, particularly in low-income countries (World Bank 2006, pp. 87–124). When linked to national development strategy, they tend to focus on ICT as an industry, but often neglect ICT as a cross-sector enabler and transformer. Even when such links are mentioned in planning documents, they are not rendered operational—seldom have the legal mandate and support, budgetary backing, institutional capacity for implementation, and monitoring and evaluation systems been implemented. They are left as good intentions then forgotten in practice. The reasons are many: scarcity of e-leaders, poor understanding of the links, low awareness and ownership of ICT among most public administrators, fragmented ICT applications by turf-bound sectoral ministries, weak involvement of core ministries such as finance and economic planning, and the pursuit of technology-driven agendas by ICT ministries or their equivalent.

But that is where national strategy and coherent policy for shared infrastructures, integrated investment programs, and systematic learning can have the highest payoffs. As a GPT, ICT is applicable to all sectors. Moreover, ICT payoffs are contingent on many other factors and coinvestments—in skills, infrastructures, policies, processes, institutions, and leadership. Integrative frameworks are needed to systematically define the key interdependencies and identify the stakeholders or custodians of various elements of e-transformation, and thus begin to manage or influence them. How comprehensive the action on various elements of e-transformation is would depend on informed analysis of where the binding constraints are, and where selective action would have the highest payoffs.

Other skeptics of national strategies argue that ICT continues to advance at breathtaking speed, posing insurmountable uncertainties and unpredictable trajectories that defy any strategizing at the national level. Just note the recent emergence and advance of wireless and broadband communications, mobile devices, search engines, Google maps, collaborative technologies and social networks, analytics and business intelligence tools, and cloud computing. Success is as much the outcome of serendipity and chance, as it would be of policy and planning, they say.[16] Can any national ICT policy or strategy be relevant, dynamic, or robust in the face of such technological upheavals? Can past experience, with old or current ICTs, be a reliable guide for future adoption of new ICTs?[17] Vendors and technology

[16] Note how the demand for programming to address the Y2K problem, and the overinvestment in telecommunications during the dot com boom helped the early growth of India's export of software services.

[17] The Independent Evaluation Group (IEG) of the World Bank has been reviewing the Bank Group's experience in implementing its ICT sector Strategy, which was adopted in 2002, as an input into The Bank's preparation of its next corporate ICT sector assistance strategy for the next decade, to be available in 2012.

consultants tend to push fads, the latest gadgets, and the "next best thing," while local users and procurement officers suffer from asymmetric information. Can this asymmetry be overcome? Some development practitioners go as far as suggesting that development agencies have "missed the boat" on the ICT revolution, and are unlikely to be able to catch up or match the fast-evolving needs and learning requirements of such a technological upheaval![18] In the same vein, some development economists argue that this is a "new world," where evidence-based policy and historical data do not apply, and where "Internet bubbles" and "irrational exuberance" are likely to recur—so, ICT strategy is at best uncertain, and due prudence suggests that aid agencies should keep it out of development thinking!

A good ICT strategy must have a long-time horizon, based on the best foresight available about technological trends. Yet, it must be flexible enough to continue to harness advances in ICT during implementation. Governments are engaged in setting open standards and enterprise-wide architectures for their public agencies so as to make it possible to readily integrate new technologies while securing interoperability and information sharing across the government and the economy. Some countries have learned to master successive waves of technological changes in ICT, via successive strategies and continuous learning. A dynamic e-transformation strategy should also develop foresight, innovation ecosystems, and learning capabilities to assess possibilities for leapfrogging to new technologies and to discover through experimentation what and how technologies can make sense in diverse local contexts.

What is e-Transformation?[19]

e-Transformation is conceived as a process of fundamental structural change, a shift to a new techno-economic paradigm, driven by a powerful GPT, ICT. ICT is enabling the transformation of all kinds of economic activities: financial services, manufacturing, transportation and logistics, education and health care, media and entertainment, public services, science and innovation, and more. At the national level, e-transformation policies and strategies are our means to facilitate and compress the shift to this new techno-economic paradigm. The guiding principles of e-transformation are decentralized integration, network structures, adaptability, agility, customization, knowledge capital, innovation ecosystems, transformational leadership, and synergistic and change management. At the level of an organization, e-transformation goes beyond automation of existing processes to encompass fundamental redesign and innovation of business processes and practices, the internal relationships within the organization, and the relationships between the organization and its stakeholders and operating environments.

[18] When it came to the ICT sector, "missing the boat" was an often-made remark by World Bank colleagues, since the advent of the Internet and the diffusion of personal computers.

[19] For those interested in full treatment of the concept of e-transformation and the broad implications of ICT for development and techno-economic paradigm shift, see Hanna (2009a).

e-Transformation stands for e-development, ICT-enabled development, information society, and knowledge economy, collectively. e-Transformation is about promoting a new development strategy paradigm, one adapted to the opportunities and challenges arising from ICT. It fosters deep changes in the economy and society brought about by the effective deployment and diffusion of ICT. These changes typically lead to increased production and use of information and communication; reduced cost and increased pace of transactions and interaction throughout the economy; empowerment of individuals, communities, and enterprises with connectivity and knowledge; and increasing the share of information-based production and services in the economy.

e-Transformation is a broader concept than *high technology* or the *new economy*. It is more linked to a knowledge-based, innovation-driven, competitive economy, and to an inclusive, learning, information society. But unlike the knowledge economy, which deals with the intangible resource of knowledge, it focuses on ICT as a focal point and takes a holistic approach to harness this technological revolution to transform the economy and society. This means acting on all elements of the e-transformation process—including policies, institutions, and capabilities to leverage the new technologies—and not just promoting the ICT industry or ICT investments.

e-Transformation is really more about the effective diffusion and use of ICT as well as the deep structural and capability changes in the economy and society that accompany ICT use and diffusion.[20] The ends of e-transformation should be guided by the overall development vision, goals, and strategy of the country itself: environmentally sustainable growth, elimination of poverty, effective and transparent governance, competitive and innovative economy, learning society, etc.

e-Transformation: From Why to How

Countries are learning to adapt and in some cases to smartly harness the ICT revolution to enhance their competitive position in various industries, improve governance and public services, and build an inclusive information society. Obviously there is much to be learned, in view of the fast pace of technological change, the emergence of the digital economy, the uncertain payoff of ICT investments, the malleable nature of ICT as a GPT, and the need for complementary policies and investments to realize the potential benefits. e-Transformation demands new policies, institutions, learning, and new types of leaders and change managers.

As during the early stages of all major technological revolutions, before large-scale diffusion or deep transformation occurs, experimentation and innovation are essential. There are no recipes or standard strategies that can be taken by early

[20]Progress with e-transformation should not be confused with e-readiness indicators. E-readiness indicators attempt to measure progress in the ICT sector and to some extent, its use in government and business. But e-readiness indicators do not tell the whole story, as they provide a static picture of inputs and outputs, and are not ends in themselves. E-readiness indicators provide measures of context and of initial conditions for ICT-enabled change.

adopters or fast followers. Countries and enterprises alike have to discover for themselves what this technological revolution means for their constituencies, markets, institutions, practices, and futures.

This book is concerned with how governments can meet the specific challenges of designing and implementing economic transformation through ICT. Some of the common challenges facing all countries are as follows: How to diffuse the adoption of ICT as fast, and tap its benefits as broadly as possible? How to ensure an appropriate mix of investments (in hardware, software, skills, institutional change) at the local and national level? What is the optimal path or sequencing among such investments? How to ensure appropriation and adaptation of the technology to diverse local contexts? What degrees of decentralization are necessary for different elements of e-transformation? What kinds of policies and institutions will be needed to facilitate coordination among these elements? What synergies can be tapped and how to identify them? What balance may be struck among various stakeholders (public agencies, private sector, civil society) and among various development objectives (growth, poverty reduction, sustainability) in designing e-transformation strategies? Case studies are used to illustrate how countries have attempted to address such issues.

This book sheds light on the above issues and contributes to the debate. The country case studies show the merits of pursuing e-transformation strategies at many levels. They show specifically how governments are partnering with the private sector and other stakeholders to pursue such strategies. These cases can shed light on new-style strategies that are adaptive and dynamic, in some cases pursued and adapted over decades, and in continuous consultations with various stakeholders.

In practice, national ICT policies and strategies do not come close to an idealized integrated e-transformation process. Most cases in this book (and its companion book: *Seeking Transformation Through Information Technology*) suggest that countries have a lot to learn to capture the economy-wide benefits of ICT. But these cases suggest that many countries are striving to design and implement such strategies, and are learning this new development game—drawing on their own experience, and those of early leaders and late bloomers. While there is no one common recipe, the book sheds light on key characteristics of effective strategy formulation and implementation of e-transformation, the instruments and policies being used, the role of various stakeholders, and the lessons learned. In such a fast but long race, even the most advanced among these countries cannot be content to rest on their own laurels.

Successful industrial policy practice as well as past failures point to some common principles for the practice of ICT policy and strategy. The specifics of industrial policy have varied and depended heavily on the circumstances and institutional capabilities of a country. Yet, there are some general principles that can be articulated about how institutions carrying out industrial policy should be designed to address market failures while minimizing government failures. Rodrik (2008) suggests that these principles should follow from three considerations: (1) the requisite knowledge about market and coordination failures, synergies, spillovers, and barriers to structural change is diffused—requiring mechanisms for eliciting information and for close collaboration among stakeholders, particularly government and private sector; (2) businesses have strong incentives to game the government—calling for market

discipline and strong safeguards against bureaucratic capture; and (3) the intended beneficiary of industrial policy is the society at large, not just government or business—demanding accountability. These considerations and principles are taken into account in interpreting the e-transformation case studies and drawing lessons in the last chapter of this book, as we shift from the why to the how of e-transformation.

Case Studies of e-Transformation

Despite the proliferation of national ICT strategies, these strategies and programs are typically communicated in planning documents in terms of their final design—in blueprint terms, not process terms.[21] That gives the impression of a highly controlled, deductive, linear planning exercise, starting from a comprehensive analysis and appraisal upfront and ending with a comprehensive investment program or project blueprint.[22] The reality is quite different. Like all development strategies, those related to e-transformation seldom emerge full blown or remain intact.

Examining e-transformation strategy formulation and implementation as a process through a case study can make important contributions to our understanding and practice. First, it offers a model for practitioners to reflect on their own practices, become participant-observers, and help contribute to multidisciplinary research on national ICT strategy. Second, it captures the political and institutional dynamics that shapes e-development strategies. Early political backing and coalition formation, timely mobilization of resources, dynamic negotiation of priorities, and sequencing of implementation are often neglected in the reductionist recasting of ICT application in development. Yet, these are critical aspects of strategy design, implementation, and sustainability. Finally, a case study of the strategy development process allows for contextual understanding of the linkages and interdependencies among the various elements of e-development.

Unlike common descriptions of national ICT strategies, these case studies go beyond static assessment of the knowledge economy and e-readiness to capture the dynamics of developing and implementing a strategy and of building partnerships within the country for e-transformation. They go beyond the typically long laundry list of recommendations for transforming a country into a knowledge economy. They reflect the hard choices and tradeoffs that must be made in designing and implementing e-development within real-life human, financial, and institutional constraints. They take account of initial conditions, stakeholder interests, institutional learning, and political dynamics.

The literature on country experience in developing and implementing e-transformation is scarce. With few exceptions, that literature is theoretical or

[21] National ICT strategies have been developed and adopted by many countries, particularly in preparation for and as a follow up to the World Summit on Information Society (WSIS) in 2005.

[22] For relevant discussion of the project cycle and its limits for nonengineering investment projects, see Hanna and Picciotto (2002).

descriptive. Descriptive literature typically depends on official statements of national ICT polices and strategies, with scant attention to implementation experience, evaluation, and lessons learned.[23] Even scarcer is the literature on cross-country or comparative experience in pursuing e-development or e-transformation. One such notable exception is a World Bank's review of national e-strategies (*Trends in "National E-Strategies: A Review of 40 Countries,"* Chapter 5 in World Bank 2006). However, this review was based on desk exercises of examining written e-strategy plans. Thus, it missed capturing the gap between blueprint design and implementation, the rich lessons to be learned from meeting implementation challenges, and the instruments used or created to meet these challenges. A relatively recent ITU review of national e-strategies also fails to make an evaluative assessment of the formal strategies and their actual implementation (ITU 2010).

One key contribution of this book (and the companion book *Seeking Transformation Through Information Technology* with the same coeditors) is that it draws on the in-depth observation of the authors who have been actors or participant-observers of the country they are reporting on. That gives these authors a position or perspective that can capture the *process* of formulating and implementing e-strategies and appreciate the underlying forces and dynamics that shape both design and implementation. Moreover, all cases follow a common conceptual framework, to facilitate cross-country comparisons of e-strategy design and implementation, without reducing country experiences into some aggregate measures of readiness or indicators of outcomes. This has not been an easy task, since most practitioners do not have much time to reflect on and evaluate such experiences. This is perhaps one contributing factor to the scarcity of such literature.

In-depth country experiences are indispensible in learning new practices, capturing tacit knowledge, and helping to build frameworks and theories. Case studies of country experiences convey a more realistic picture of the messy, creative, and emergent processes involved—providing researchers with a rich source for theory building and hypothesis testing, and providing practitioners with examples that capture best or promising practices. For thoughtful practitioners, case studies enrich their menu of the "how" and give them realistic assessment of the efficacy and limits of various instruments and innovations. For researchers and scholars, and when placed within an explicit framework, case studies show the role of conceptual models in guiding strategy design and implementation and point to the need for further elaboration or improvements on such models.

Case studies are also accessible to a broad audience of development practitioners, policy makers, and national and international development consultants and researchers—not just ICT and technology policy specialists. This broad audience is a primary target of this book. The chapters concerning specific country cases can be more concrete and contextual and thus more appealing than the first and last chapters, which are concerned with frameworks and comparative analysis.

[23] Individual country case studies have been covered in successive issues of the annual Global Information Technology Report, published by INSEAD and the World Economic Forum.

A Framework for e-Transformation

The unrealized potential of ICT as a transformational enabler calls for strategic, holistic, and innovation- and learning-based approaches. We advance the framework of e-transformation as an approach to pursue coherent policies and mutually reinforcing ICT-enabled development initiatives at the national and regional levels. The e-transformation framework helps identify and influence key stakeholders to help create an "ecosystem" for the knowledge economy. It is a holistic approach that generates shared visions and mobilizes stakeholders. It both maps the connections and shapes the relationships among diverse players. It facilitates the creation of national consensus on e-transformation, and systematic thinking about ICT as enabler of development.

e-Transformation can be conceived as composed of key, interdependent elements: an enabling policy and institutional environment, shaped by shared vision, long-term strategy, and institutional leadership; an affordable and competitive information infrastructure; a dynamic ICT industry and innovation system that can adapt the technology to local needs and capture export opportunities; a broad ICT literacy and technical education, and techno-entrepreneurship to harness and master ICT potential; a coherent investment program to apply ICT to modernizing the public sector; and incentives to promote the effective use of ICT for developing the private sector and empowering civil society (Fig. 1.1).[24]

Institutions leading long-term e-transformation strategies are at the heart of orchestrating and implementing all elements of the transformation process. Countries need to learn to develop the necessary governance and institutions to engage stakeholders and forge national consensus around an e-transformation strategy and its implementation mechanisms. What should be the mandate, authorizing environment, and core capabilities of such institutions? How can countries minimize government failures and yet address market failures? What capabilities and incentives would be needed to strategize, implement policies, partner with the private sector, build alliances, and engage key stakeholders, without being captured by rent-seeking elements of the business communities? How can these institutions prioritize, sequence, and coordinate investments, to respond to development crises and imminent opportunities, yet be guided by long-term goals and visions?

The concerns of these leading institutions are not limited to the internal coordination and implementation of ICT sector policies and investments. They must extend to articulating visions of e-transformation that support and align with the long-term development strategy and goals of the nation. Such alignment is often absent or weak. How did leading countries fashion such integrating institutions? Did these institutions and strategies arise in response to compelling visions or national crises?

[24]The figure is a highly simplified representation of the key enablers and application areas of ICT and the many possible interdependencies among them. The first four elements are the enablers to the effective use and wide diffusion of ICT in government, business, and society. For more detailed analysis of each element and their interdependencies, see Hanna (2009a).

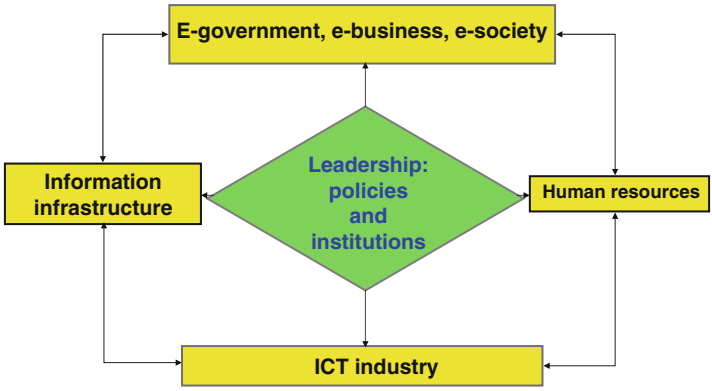

Fig. 1.1 Simplified links among key elements of e-transformation (for a concrete example of designing such an e-leadership institution, see Hanna (2008). For examples of the variety of e-leadership institutional models that have been crafted by developed and developing countries, see Hanna (2007b). On institutional innovation, see Rodrik (2007))

Did they aim to support an open, networked, learning and innovative economy? Did they develop information sharing policies, open digital platforms, and ICT diffusion programs to promote inclusive growth and participatory development? Did they harness ICT for energy management and environmentally sustainable growth?

A second core element of the e-transformation process is the human resources and learning systems. e-Transformation hinges on ICT education to research and adapt the new technologies, ICT skills to operate and maintain information systems and infrastructure, managerial understanding of the information and communication requirements to build responsive and learning organizations, leaders to manage change in processes and institutions as they adopt ICT-enabled business practices, and e-literacy for society at large to harness digital intelligence and participate effectively in an information and learning society. Did some countries choose to leverage ICT to reform and transform the education system at large? Are there specific managerial practices that can facilitate e-transformation in government and the private sector and wring the maximum productivity from ICT investments? How did the leading countries like Singapore and Finland promote learning and innovation in ICT? How did they acquire the new skills and encourage deep assimilation through partnerships among local businesses, universities, MNCs, and the diaspora?

The third core element, the ICT industry and innovation ecosystem, is the engine for technological change, for diversifying the economy, and for exporting high-value ICT products and services.[25] All countries in this book—as well as many other industrial and developing countries—developed specific incentive policies and innovation ecosystems for the ICT sector and related industries and services.

[25]For more detailed treatment of the role of the ICT industry in e-transformation, see Hanna (2009a, 2010).

Did they target ICT multinationals or local and small ICT enterprises? How did they encourage spillovers, technology transfer, and partnerships among MNCs and local ICT companies? How did the governing and promoting institutions gain the requisite knowledge about spillovers, market failures, and constraints that block ICT innovation and diffusion in the economy? How did these countries nurture and respond to the special needs of ICT as an infant industry? How did they nurture specialized ICT innovation ecosystems? Did some countries leverage ICT to open up their national innovation system and improve interactions among all its players? Why did some countries succeed and others lag behind in ensuring that the benefits from nurturing ICT industry capabilities accrue to the society at large?

The fourth element is building a dynamic and competitive information infrastructure. This is a leading element on which information access and sharing, and much of ICT systems and application benefits depend. In many lagging countries, absence of a dynamic and competitive information infrastructure has been the binding constraint. Underdeveloped information infrastructures have also limited the benefits from network effects, e-business, and e-government applications, and in countries with large rural populations, reinforced the economic and rural–urban divides. How did countries like Singapore and Finland compress the development of their advanced information infrastructures to become the most connected societies? Why did South Africa and the Philippines lag behind in securing investment in a competitive communications infrastructure? What promising approaches are they exploring to bridge their digital divides?

Finally, the most pervasive element of e-transformation is the application of ICT in all sectors of the economy, in public, private, and civil society institutions. Most countries, developed and developing, are seeking to use ICT to improve governance and the delivery of public services. But performance varied widely in reaping benefits from such investments. Countries like Singapore pioneered the use of ICT in government, first to modernize and enhance the efficiency of the civil service, and increasingly to syndicate all kinds of public and private services, practice open and smart government, and change the interactions with business and the public and personalize all services. Why did countries differ in using and diffusing ICT to transform government and business? What lessons can be learned about programs to diffuse ICT among small and medium enterprises?

Collectively, these elements—or foundations—of e-transformation cover the package of policies, investments, and institutions that enable an economy to master and diffuse ICT for social and economic development. At the heart of e-development are e-leaders and e-leadership institutions—individuals, networks, and institutions that develop a vision of an information society, set policies and priorities, seek to forge national consensus on reforms, and create and coordinate synergies among the elements of e-development. To succeed, leaders should act in sync on many fronts: build the communication infrastructure, human resources, ICT innovation system, policy and institutional regime, and ICT use and diffusion throughout the economy.

The proposed e-transformation framework is inevitably a simplified view and stylized depiction of a complex process involving tacit knowledge and rich experience. We use the proposed framework to glean the strands of causal order and key

synergies underlying what may seem a chaotic process and to structure the unwieldy mass of historical events into a meaningful sequence of change and transformation. This framework is mainly a heuristic device or conceptual model, not a straightjacket to be forced upon the infinite richness of real life and the real journey of each country toward an ICT-enabled and transformed economy.[26]

Country experiences can be analyzed and assessed, and gaps and weaknesses can also be identified using the e-transformation framework.[27] Thus, all country case studies of this book examine national ICT strategies through the lens of this framework. They demonstrate how the e-development framework has guided—or might be enlisted to guide—the design and implementation of national ICT-enabled development strategies.

Integrating e-Transformation into Broader Strategies

The e-transformation framework aims to integrate ICT into development strategies by placing ICT interventions within a broader development context and making them meaningful to policy makers.[28] It facilitates the process of creating a shared and energizing vision of how a society will harness the ongoing ICT revolution to access knowledge, address development priorities, and meet competitiveness challenges.

By tightly linking national ICT strategies to broader development visions and strategies, the holistic e-transformation strategy engages policy makers in driving the ICT agenda in response to national development priorities—rather than the other way around. It helps focus the attention of policy makers and program managers on ICT-enabled development results. ICT becomes an enabling force for pursuing

[26] This framework can help both explain and guide e-transformation as a process enabled by ICT, in a similar way as Porter's system of competitive advantage (Porter 1990; Heeks 2006) is used to both explain and guide the design of programs to enhance national competitive advantage. Porter's competitive advantage theory takes a holistic and systemic view of four elements or determinants: factor conditions; demand conditions; related and supporting industries; and firm strategy, structure, and rivalry. It views these elements together as a mutually reinforcing system. These elements and their interrelationships are continually evolving. The proposed e-development framework functions in the same fashion to explain the dynamics of ICT-enabled development and to guide the design and strategic management of ICT4D programs.

[27] The value added of this framework has been validated, among others, by a case study of e-Sri Lanka–a comprehensive e-development program already underway for several years, with World Bank assistance (see Chapter 5 in Hanna and Knight 2011). The experience of using an integrated e-development framework to guide the design and implementation of e-Sri Lanka and capture lessons of implementation is documented elsewhere (Hanna 2007a, b). The World Bank has since applied this framework to its assistance in a number of other countries such as ongoing Bank-financed projects for e-Ghana, and e-Rwanda.

[28] Little theory or research has linked concepts of development studies to ICT-for-development research (see Heeks 2006).

policy reforms. Enlightened leaders become engaged in shaping this vision and in using it to build consensus on institutional and economic transformation.

The e-transformation framework reframes what were typically seen as specialized technology debates, isolated ICT interventions, and separate infrastructure investments—it sets them within a broader whole as an integral dimension of the country's development strategy.[29] Considered holistically, these interventions can be linked to a broad development vision that keeps the focus of debate on development outcomes and the focus of program design on linking means to ends. Rather than assuming causality between individual elements of e-development—such as connectivity, content, e-literacy, and e-government—and development outcomes, these elements are strategically combined to coproduce such outcomes.

The case studies illustrate the links the countries involved tried to establish between ICT strategy and their overall national development and competitiveness strategy. The institutional mechanisms for doing so are rarely in place and vary in quality. e-Leadership institutions, integration mechanisms, and consultation forums are critical to making e-transformation central to sectoral and cross-sectoral strategies. How did these countries pursue such integration?

Taking Account of Interdependencies; Exploiting Synergies

The interdependencies among e-transformation components are significant in advanced knowledge economies and even greater in developing and emerging economies. Studies in OECD countries indicate a strong link between ICT investment, productivity, and competitiveness (OECD 2004). Moreover, they show the significance of "interaction effects"—for example, interactions between ICT investment, infrastructure, skill levels, and the policy environment (Economist Intelligence Unit 2004). A critical mass or minimum threshold of ICT development can have a significant positive impact on a country's economy. Integration offers many opportunities for tapping synergies among the elements of e-development and reaping returns to scale when investing in information infrastructures.

For a developing country in particular, with circular and multiple causation for information poverty (Hanna 1991; Myrdal 1957), the impact of one element of e-transformation is heavily dependent on progress in others. Investments in ICT must be accompanied by investments in human resources, process innovations, institutional changes, and policy reforms to fully realize the potential benefits. This is consistent with a key lesson of development experience in general, that is, the need for a comprehensive approach to development (Hanna and Picciotto 2002). The case studies explore the attempts of various countries to capture and manage these interdependencies over time, and show why some succeeded and others failed to exploit the potential synergies.

[29] On the issue of reframing, see Wilson (2005).

Engaging All Relevant Stakeholders

National ICT strategies typically describe plans and initiatives in lifeless and bureaucratic terms, devoid of actors and stakeholders. They make little use of coalitions, partnerships, stakeholder participation, social interactions, governance mechanisms, conflicting interests and perspectives, power relations, pull platforms, and authorizing environments. Yet these factors drive the success or failure of efforts to diffuse ICT (Hanna 2009a, b; Wilson 2005).

Adopting an e-transformation framework, policy makers and strategists are expected to think holistically about all key stakeholders of an information society. This framework, combined with stakeholder analysis tools, can be used to map the connections, shape the relationships, and coordinate the work among diverse players.[30] They can help clarify the roles of the government, the private sector, civil society, academia, and aid agencies, with the aim of building partnerships among them. Over the medium term, this framework helps transformational leaders tap the interdependencies among the actions and resources of different stakeholders and champions to realize a shared and compelling vision.

Balancing Top-Down Direction with Bottom-Up Initiative

The e-transformation approach promotes systems thinking or "ecosystem thinking," that is, the development of an environment that enhances innovation, scaling up, and sustainability. Centrally driven programs need to be complemented by bottom-up initiatives, creative partnerships, and grassroots empowerment. National policies and institutions matter for creating healthy ecosystems and for enhancing developmental payoffs of local initiatives. And local initiatives accelerate learning, facilitate adaptation and coordination, and promote innovation and diverse experience on the ground.

The balance between centrally driven programs and locally driven initiatives will vary depending on a country's size, the diversity of its regions, and its tradition of political and administrative centralization. But since ICT is a new dimension of development and a malleable GPT, the balance should favor mechanisms to empower grassroots organizations, promote local ownership and innovation, ensure local fit and flexibility, and meet the special needs of communities.

Balancing Short- and Long-Term Objectives

Current documentation and reporting of national ICT strategies do not capture the dynamics of implementation, and the multiple learning and feedback channels that

[30] For detailed description of such stakeholder tools and their role in strategies for engaging stakeholders in design and implementation, see Hanna (2009a). For a country case study of how this is done in practice, see Hanna (2007a, 2008).

shape implementation. Also, they do not capture the difficult tradeoffs between responding to short-term imperatives and staying the course on strategic and foundational investments. The country case studies in this book attempt to capture the dynamics of formulating and implementing these strategies. Policy makers and e-leadership institutions face tremendous pressures to attend to quick wins and visible interventions, to diffuse resources across many initiatives, and to limit attention to short-term political horizons.[31] In particular, newly established ICT agencies are likely to face a diversity of legacy systems, backlogs of demands from powerful ministries, and resistance to establishing government-wide standards for ICT investments, and architecture.

A holistic e-development strategy needs to strategically balance and orchestrate the ICT investment portfolio, to give a sense of quick payoffs, while progressing toward sustainable transformation. It gives due attention to the less tangible investments that take a long time to yield results—such as the development of e-literacy, e-leadership, e-policies, e-institutions, core competencies, and ICT human resources—but that are fundamental to sustainable e-development. Short-term quick wins, deemed necessary for political sustainability, need to be balanced with long-gestating investments necessary for economic sustainability. How can a country maintain an appropriate balance between responding to political pressures for quick fixes and visible short-term milestones, and achieving sustainable change and long-term objectives of e-transformation?

Building Flexibility and Learning into Strategy

National ICT strategies are often conceived of as detailed, long-term investment plans, to be centrally financed, monitored, and controlled. Their outcomes are monitored largely through ICT indicators, which focus mainly on intermediate outputs such as teledensity, and information traffic flows. But there are big gaps between access to ICT and its use.[32] Moreover, establishing causality between interventions and changes in development impact indicators is difficult, as many other factors come into play, most of which can be understood only in the local context.

ICT is a new and fast-changing technology, and diffusing it across diverse social and economic settings requires contextual adaptation, and continuous experimentation and learning. e-Development programs have to be flexible. Innovation, learning,

[31] At times quick wins are driven by an economic rationale and the need to learn, build user capacity, and sustain confidence in a program. Politicians may also prefer smaller, citizen-oriented initiatives that have lower risks and fewer implementation problems. Here, however, the discussion focuses on tensions and tradeoffs between high-impact but long-gestating investments and low-impact but short-term initiatives.

[32] There are several methodologies for measuring e-readiness, developing aggregate indices of readiness, and ICT indicators. The trend is to move beyond measures of ICT inputs to measures of ICT use and outputs. Several international institutions have devised such measures: World Bank (World Bank Institute), ITU, UNCTAD, and World Economic Forum, among others.

monitoring, and evaluation should be central functions and critical success factors. The need for flexibility and adaptability in e-development demands an emphasis on social learning, user-driven innovation, and participatory monitoring and evaluation. The case studies attempt to illustrate some of the approaches and mechanisms involved in facilitating adaptation and learning among the effective adopters of e-transformation, and the absence of such mechanisms among the slow adopters.

Overview and Organization of This Book

The book focuses first on two small, advanced countries that have been pursuing e-transformation for some time: Singapore and Finland. These countries are selected to capture the dynamics and impacts of e-transformation that become clearer only over a long time horizon. Their design and implementation of e-transformation come closest to the idealized framework outlined above. They demonstrated capacity for technological learning and innovation, to catch up and move to the frontiers. They provide evidence of development outcomes and competitive impacts of pursuing a long-term and holistic e-transformation strategy. Finland's GDP per capita grew from $11,250 in 1985 to $51,320 in 2008, while Singapore's grew from $6,490 to 37,600, for the same period (World Bank 2008). This growth performance is derived from early promotion and adoption of ICT throughout the economy, combined with continuous upgrading of human resources.

Singapore has been transformed by successive ICT-driven strategies, pursued over 3 decades. Finland is an example of a small country that transformed itself within 2 decades from a resource-intensive economy facing a crippling economic crisis to a knowledge economy driven by the information and communications sector and having one of the highest levels of innovation and competitiveness in the world. Both countries have small populations of around five millions. Both countries developed broad national commitment to harness the ICT revolution for a networked, learning economy. Both anticipated and seized opportunities opened up by the ongoing technological revolution. Yet, Finland is vastly different from Singapore in terms of its liberal democracy, political institutions, and leadership practices. And while Singapore used MNCs to build its innovation, learning, and ICT-based transformation capabilities, Finland relied on indigenous technological and institutional innovation.

The other pair of countries represent middle-income countries, but with challenging digital and economic divides: South Africa and the Philippines. South Africa is an interesting case of an economically divided country: partly highly developed, partly underdeveloped. Poor telecommunications policies have reinforced this divide, notwithstanding early visions and high aspirations of an inclusive information society. Highly developed ICT industries and technological capabilities were not matched with policies and programs to leverage and diffuse ICT, enable

local users to appropriate and adapt the new technologies, and promote an inclusive information society. The case promises rich lessons in the political economy shaping the information society.

The Philippines is an economically divided and geographically disbursed country, but with many ICT-enabled opportunities for outsourcing and for communication-based economic integration. The case study presents a country at a crossroad, where ICT offers a new paradigm for genuine development and new ways to address old and persistent problems. It offers a glimpse of an ICT-enabled Philippine society—enabled by mobile communications and applications that promote innovation, participation, decentralization, transparency, and governance. Like the South Africa case, the Philippine case shows the crucial role of leadership and institutions in bridging the huge gap between the transformative potential of ICT and current deployment of the new technologies and accompanying practices.

This book does not cover a representative sample of countries, but, together with a companion volume (Hanna and Knight 2011), shares a stratified one, as we strived to include countries at different levels of development, different sizes of population, and different political systems, from different continents. The book does not include only frontrunners, such as Finland and Singapore, but also recent followers facing continuing challenges of a digital divide, such as the Philippines and South Africa, so we can capture lessons from countries at different stages of e-transformation. Despite different levels of implementation and performance, a key common thing among them is their aspiration and systematic search for e-transformation. Thus, they have interesting experiences and lessons to tell.

The final chapter conducts comparative analyses along key e-strategy design and implementation issues for the four countries covered in the book. The key issues include the degree of centrality, linkage, or integration of e-transformation into the country's development strategy; search for comprehensiveness, synergy, and coherence of the strategy; and attention to e-leadership, stakeholder engagement, and institutional mechanisms for implementation. They also cover the balance taken between top-down direction and bottom-up initiative, between pursuing long-term and short-term objectives, and between ICT as a cross-sector enabler and as an industry or sector on its own. The final set of issues or criteria for comparing e-strategies includes degree of reliance on innovation and adaptation during implementation, emphasis on monitoring and evaluation or measuring outcomes, and attention to the digital divide and social inclusion. Lessons are organized along these key design and implementation issues.

Most countries are still at early stages of their e-transformation journey, and have much to learn from within, from each other, and particularly from the pioneers. No framework or overarching theory can substitute for this process of experimentation and self-discovery, which is also an intrinsic part of e-transformation. We hope this book can help countries share the policy lessons and discoveries arising from their exciting journeys.

References

Atkinson, Robert, and Castro, Daniel. 2008. *Digital Quality of Life: Understanding the Personal and Social Benefits of the Information Technology Revolution*. Washington, D.C.: the Information Technology and Innovation Foundation.

Blackburn, J. Chambers, R., and Gaventa, J. 2002 "Mainstreaming Participation in Development", in Nagy Hanna and Robert Picciotto. *Making Development Work,* pp 61–82.

Bresnahan, Timothy F. and Manuel Trajtenberg. 1995. "General Purpose Technologies: 'Engines of Growth'?" *Journal of Econometrics* 65(1):83–103.

Bressand, Florian, et al. 2007. *Curbing Global Energy Demand Growth: The Energy Productivity Opportunity.* California: McKinsey Global Institute.

Brynjolfsson, E. and Hitt, L.M. 2000. "Beyond Computation: Informational Technology, Organizational Transformation and Business Performance". *Journal of Economic Perspectives,* 14 (4), pp. 23–48.

Brynjolfsson, E. 2009. Presentation. *IT and Organizational Productivity*. World Bank Conference on Enabling Development, held January 26-29, 2009. Washington D.C.

Brynjolfsson, E., Saunders, A. 2010. Wired for Innovation: How Information Technology is Reshaping the Economy. Boston, MA: The MIT Press.

Castells, Manuel. 2000. *The Rise of Network Society*. Oxford, UK: Blackwell Publishers.

Carr, Nicholas. 2008. *Big Switch: Rewiring the World, From Edison to Google.* Boston: Harvard Business School Press.

David, P.A. 2000. "Understanding Digital Technology's Evolution and the Path of Measured Productivity Growth: Present and Future in the Mirror of the Past", in *Understanding the Digital Economy*. Brynolfsson, E. and Kahin, B. (eds). Cambridge, Mass. : MIT Press, pp 49–95

David P.A. (1990). "The Dynamo and the Computer: A Historical Perspective on the Modern Productivity Paradox". *American Economic Review*, 80 (2), pp. 355–361

Dosi G et al. Eds. (1988). *Technical Change and Economic Theory.* London, Pinter and NY, Columbia University Press

Economist Intelligence Unit. 2004. "Reaping the Benefits of ICT: Europe's Productivity Challenge." http://graphics.eiu.com/files/ad_pdfs/MICROSOFT_FINAL.pdf.

Fillip, Barbara, and Dennis Foote, 2007. *Making Connection: Scaling Telecenters for Development,* Washington, D.C.: Academy for Education Development.

Freeman, Christopher and Soete, Luc. 1997. *The Economics of Industrial Innovation.* London: Pinter

Friedman, Thomas. 2005 *The World is Flat: A Brief History of the Twenty-First Century.* New York: Farrar, Straus, and Giroux.

Gordon, R.J. (2000) "Interpreting the one big wave in US long term productivity growth", in *Productivity, Technology, and Economic Growth*. Van Ark, B., Kuipers, S. and Kuper, G. (eds)

Hagel, John, John Seely Brown, and Lang Davison. 2010. *The Power of Pull*. New York: Basic Books.

Hanna, Nagy K. 1991. *The Information Technology Revolution and Economic Development.* World Bank Discussion Paper 120. Washington, DC: World Bank.

1994. *Exploiting Information Technology for Development: A Case Study of India.* Washington, DC: World Bank.

2000. *Annual Review of Development Effectiveness*. Operations Evaluation Department. Washington, D.C. World Bank.

2004. *Why National Strategies Are Needed for ICT-Enabled Development*. Information Solutions Group Paper. Washington, DC: World Bank.

2007a. *From Envisioning to Designing e-Development: The Experience of Sri Lanka.* Directions in Development Series. Washington, DC: World Bank.

2007b. *Leadership Institutions for the Knowledge Economy*. Washington, DC: World Bank.

2008. *Transforming Government and Empowering Communities: The Sri Lankan Experience with e-Development*. Directions in Development Series. Washington, DC: World Bank.

2009a. *e-Transformation: Enabling New Development Strategies*. New York: Springer
2009b. *Enabling Enterprise Transformation: Business and Grassroots Innovation for the Knowledge Economy.* New York: Springer
2010. *Transforming Government and Building the Information Society: Challenges and Opportunities for the Developing World*. New York: Springer
2011. *Information and Communication Technology for Governance.* Washington, DC: World Bank.
Hanna, Nagy K. and Sandor Boyson.1993. *Information Technology in World Bank Lending.* Washington DC
Hanna, Nagy K., Ken Guy and Erik Arnold. 1995. *Information Technology Diffusion: Experience of Industrial Countries and Lessons for Developing Countries.* Washington D.C. The World Bank
Hanna, Nagy K., Sandor Boyson, and Shakuntala Gunaratne. 1996. *The East Asia Miracle and Information Technology*. Washington, D.C.: World Bank
Hanna, Nagy K., and Robert Picciotto, eds. 2002. *Making Development Work: Developmental Learning in a World of Poverty and Wealth.* New Brunswick, NJ: Transaction Publishers.
Hanna, Nagy K. and Qiang, Christine. 2009. "Trends in National E-Government Institutions" in *Information and Communications for Development 2009: Extending Reach and Increasing Impact.* Washington, D.C.: World Bank.
Hanna, Nagy K. and Knight, Peter T. 2011. *Seeking Transformation through Information Technology: Strategies for Brazil, China, Canada and Sri Lanka*. New York: Springer.
Heeks, Richard. 2006. "Theorizing ICT4D Research." *Information Technologies and International Development* 3 (3): 1–4.
2008. "ITC4D 2.0: The Next Phase of Applying ICT for International Development", in June 2008 issue of IEEE Computer Society, pp.26–33
Helpman, Elhanan, ed. 1998. *General Purpose Technologies and Economic Growth*. Cambridge, MA: MIT Press.
International Telecommunications Union (ITU). 2010. Measuring the Information Society. Geneva, Switzerland: ITU
Jorgensen, D.W. and Stiroh, K. 2000. "Raising the Speed Limit: U.S. Economic Growth in the Information Age". Brookings Papers on Economic Activity, pp.125–235
Jorgenson, Dale W. 2006. "Information Technology and the World Economy." Presented at the CEIR Lecture Series, Barcelona.
Knight, Peter Titcòmb, Ciro Campos Christo Fernandes and Maria Alexandra Cunha. 2007. *e-Desenvolvimento no Brasil e no mundo: subsídios e Programa e-Brasil*. São Caetano do Sul, São Paulo: Yendis.
Lall, Sanjay. 2001. *Competitiveness, Technology and Skills, Cheltenham*. Edward Elgar
2003. "Foreign direct investment, technology development and competitiveness: issues and evidence" in *Technology Development in East Asia: Lessons for Other Developing Countries*, World Bank Institute.
Laitner, John A., and Ehrhardt-Martinez, Karen. *Information and Communication Technologies: The Power of Productivity.* Washington, D.C.: American Council for an Energy-Efficient Economy, February 2008.
Lin, Justin. 2011. "New Structural Economics: A Framework for Rethinking Development" in World Bank Research Observer. Volume 26, Issue 2: 193–221. Oxford University Press.
Myrdal, Gunnar. 1957. *Economic Theory and Underdeveloped Regions*. New York: Harper Torchbooks.
OECD. 2004. *The Economic Impact of ICT: Measurement, Evidence and Implications.* Paris: OECD. http://www1.oecd.org/publications/e-book/9204051E.PDF.
Oliner, S.D. and Sichel, D.E. 2000. "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" Journal of Economic Perspectives, 14 (4), pp 3–22
Perez, Carlota. 2002. *Technological Revolutions and Financial Capital.* Cheltenham, UK: Edward Elgar.
Porter, Michael. 1990. *The Competitive Advantage of Nations*. London: Macmillan.
Pyramid Research. June 2011. "Smartphone Operating Systems". Cambridge, MA: Pyramid Research.
Raiti, Gerard C. 2006. "The Lost Sheep of ICT4D Research." *Information Technologies and International Development* 3 (4): 1–7.

Rodrik, Dani. 2004. "Getting Institutions Right." *CESifo DICE Report.* University of Munich, Center for Economic Studies, and Ifo Institute for Economic Research.
2007. *One Economics, Many Recipes.* Princeton, NJ: Princeton University Press.
2008. *Normalizing Industrial Policy*. Washington, DC: Commission on Growth and Development, on behalf of the World Bank.
Schumpeter, Joseph A. 1942. *Capitalism, Socialism and Democracy*. New York: Harper & Row (original publication).
Shirky, Clay. 2011. "The Political Power of Social Media", in *Foreign Affairs*, Jan/Feb 2011, pp 28–41.
Spence, Michael. 2011a. *The Next Convergence: The Future of Economic Growth in a Multispeed World.* New York: Farrar, Straus, and Giroux.
2011b. "The Impact of Globalization on Income and Employment: the Downside of Integrating Markets", in *Foreign Affairs*, July/August 2011, Vol 90, Number 4, pp 28–41.
Tapscott, Don, and Williams, Anthony. *Macro Wikinomics: Rebooting Business and the World.* New York: Portfolio/Penguin.
Shapiro, Carl, and Varian, Hal R. 1999. *Information Rules: A strategic Guide to the Network Economy*. Boston, Mass.: Harvard Business School Press.
Stiglitz, Joseph. 1996. "Some lessons from the East Asian miracle", The World Bank Research Observer, 11(2), 151–177
Stiglitz, Joseph. 1998. "Towards a New Paradigm for Development: Strategies, Policies, and Processes" Ninth Raul Prebisch Lecture, United Nations Conference on Trade and Development, delivered at the Palais des Nations, Geneva. October 19.
Stiglitz, Joseph. 1999a. "Knowledge for Development: Economic Science Policy, and Economic Advice." In *Annual World Bank Conference on Development Economics*. 1998, ed. Boris Pleskovic and Joseph Stiglitz, 9–58. Washington, D.C. : World Bank.
Stiglitz, Joseph. 1999b. "Scan Globally, Reinvent Locally: Knowledge Infrastructure and the Localization of Knowledge". *Keynote Address, First Global Development Network Conference*, Bonn, Germany. December 1999.
Stiglitz, Joseph, Peter R. Orszag, and Jonathan M. Orszag. 2000. "The Role of Government in a Digital Age." Study commissioned by the Computer and Communications Industry Association. Washington, D.C. [http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN002055.pdf].
Weiss, Charles, and Bonvillian, William. 2009. *Structuring an Energy Technology Revolution.* Cambridge, Mass.: MIT Press.
Wilson, Ernest J., III. 2005. "Engaged Scholars and Thoughtful Practitioners: Enhancing Their Dialogue in the Knowledge Society." *Information Technologies and International Development* 2 (4): 89–92.
World Bank. 2006. *Information and Communications for Development 2006: Global Trends and Policies.* Washington, DC: World Bank.
World Bank. 2008. *World Development Indicators 2008*. Washington, DC: World Bank
Yusuf, Shahid. 2003. *Innovate East Asia: The Future of Growth.* Washington, DC: World Bank.
Yusuf, Shahid and Nabeshima, Kaoru. 2011. *Some Small Countries Do It Better: Are There Lessons For The Rest?*, Washington, DC: World Bank.

Chapter 2
The e-Transformation Journey of Singapore

Jeannie Chua

Introduction and Structure

Singapore is a success story of intelligently harnessing the ongoing technological revolution to accelerate development and transform a whole economy. Despite limited natural resources and unpromising initial economic conditions, Singapore compressed its development journey and moved from third world to first world economy, and positioned itself effectively for a global, knowledge-based, and innovation-driven economy. Its GDP per capita grew the fastest among the countries covered in this book, and among the world's fastest growing economies, from US $6,500 in 1985, to US $37,600 in 2008.

Among the most distinguishing features of Singapore e-transformation journey are: committed political and public service leadership, creating an environment for cumulative institutional learning, public–private collaboration, investment in a competitive information infrastructure, early attention to ICT literacy and user adoption capability, clear cyber policies, and dynamic governance based on results orientation and accountability. Singapore excelled in disciplined implementation and is currently striving to excel in innovation. Despite of leapfrogging to the frontiers of international best practices, Singapore continues to learn from its shortfalls and adapt its ongoing plans accordingly.

This chapter frames the e-transformation journey of Singapore in a way consistent with the e-development (e-transformation) framework set in Chap. 1. That is, it shows how ICT applications in the public sector or government have been planned and evolved, supported by the enabling components: information infrastructure, IT literacy and capability development (ICT human resources), ICT industry sector, and ICT governance and institutions (see Fig. 2.10). In reviewing the experience of

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Singapore, the chapter focuses on e-government applications, but not on the overall transformation of the economy in such areas as e-logistics, e-business, e-education, e-health or other sector applications. The aim here is to examine the experience of one sector in relative depth and the role of other e-development components as enablers of transforming that sector. Given the central role of government in Singapore's economic transformation and the ICT drive, it is the right focus. The lessons drawn from this experience are applicable to other sectors of the economy. As it shifts towards the future, the chapter concludes with a more holistic view of e-transformation, covering all enabling components of e-development, and extending its treatment of transformation to other sectors: media, education, health, small and medium enterprises (SMEs), transport, finance, tourism, trade and logistics.

The structure of this chapter is as follows. First is the introduction, country context, and the evolution of comprehensive ICT master plans in line with an evolving country development strategy. Second section is about establishing the institutions for governance, a key feature and success factor for this success story. e-Government is put in the context of public sector excellence and reform drive in Singapore. The following section briefly describes the strategic thrusts of successive e-government plans, their outcome-focused and stakeholder-centric applications, measures and practices. Next section describes the key enablers of the Singapore e-government programmes adopted within the Government and at national level: infrastructure, ICT literacy, capability development, stakeholder conversion and adoption, and governance. Next section gives a brief description of the progress made in ICT industry sector, since this sector is a partner in government transformation and enabler of overall economic transformation. The chapter then draws key lessons and conclusions from implementing these successive plans. The chapter concludes with a detailed description of the ongoing master plan (iN2015), a most ambitious and comprehensive transformation strategy towards an intelligent nation and global city.

Country Context

Singapore began its modest history as a place for maritime trade. After a period of British rule and transition to self-government, it separated itself from the Malaysian Federation in 1965 to become independent Singapore. Despite being an established trading post, Singapore faced daunting challenges in economic development at the start of its new life. In trade, it could no longer rely on its traditional hinterland after leaving the Federation. Unemployment was high and with the withdrawal of British troops, many job opportunities were lost. Urban slums proliferated, crime rates were high and only half the population was literate. Its multi-racial and multi-religious population also created natural fault lines which were an ever-present source of potential social instability.

Singapore's situation was compounded by its natural attributes. With a limited land area of about 600 km^2, Singapore faced immense challenges in land use

planning to house the needs of its nation state, develop sustainable and strategic industry clusters, and a robust infrastructure of transportation systems to support the growing economy.

Openness to the rest of the world was not a choice but a necessity dictated by its almost total lack of natural resources. Even after more than 45 years of growth and development, its leaders' consciousness of Singapore's precarious situation has not diminished and hence they abide by the belief that Singapore's continued survival depends on its ability to play a useful and valuable role in the world. Two strategic imperatives remain to undergird the nation state: economic development and domestic stability. This has formed the backdrop of Singapore's development and underpinned the foundations of governance—the openness, the emphasis on learning from, and establishing links with, the rest of the word, the push to stay relevant, its efforts to increase its international space and sphere of influence—based on connectivity.

Evolution of ICT Master Plans

The e-development progress can be summarised as follows. In the 1960s, the Government decided to use the competitive advantage of its then low-wage labour and its strategically located deep water port to develop its economy around the import of manufactured parts that would be assembled locally and re-exported as finished products—primarily computer components and consumer electronics. To accomplish Singapore's industrialisation strategy based on foreign investment and export orientation, it invested savings from the nation's retirement programme to build crucial infrastructure—port facilities, roads, airport, telecommunications, and industrial parks—that attracted additional private investment from transnational corporations that, in turn, built assembly facilities.

In the late 1970s, the Government realised that the island nation could no longer afford to compete with the much larger regional countries in labour-intensive industries. The only viable alternative for Singapore would be to move up the value chain and focus on capital-intensive and technology-intensive activities. Information technology (IT) was identified as one key technology that would help improve Singapore's economic performance by doing more with less—increasing labour productivity, making processes leaner and more efficient, and delivering better services to customers. In response to this, the Government leveraged their initial economic gains to deepen their capital, primarily through attracting investments in new technology, and to improve the quality of their educational system, increasing students' understanding of science and mathematics, so as to support a more productive, technology-based economy. The Government also began at this point to focus on technological innovation i.e., the application of technology to solve problems, increase efficiencies, develop new products and services, and create new knowledge.

Thus began Singapore's infocomm journey which has closely mirrored economic development and social needs. National infocomm masterplans and capabilities

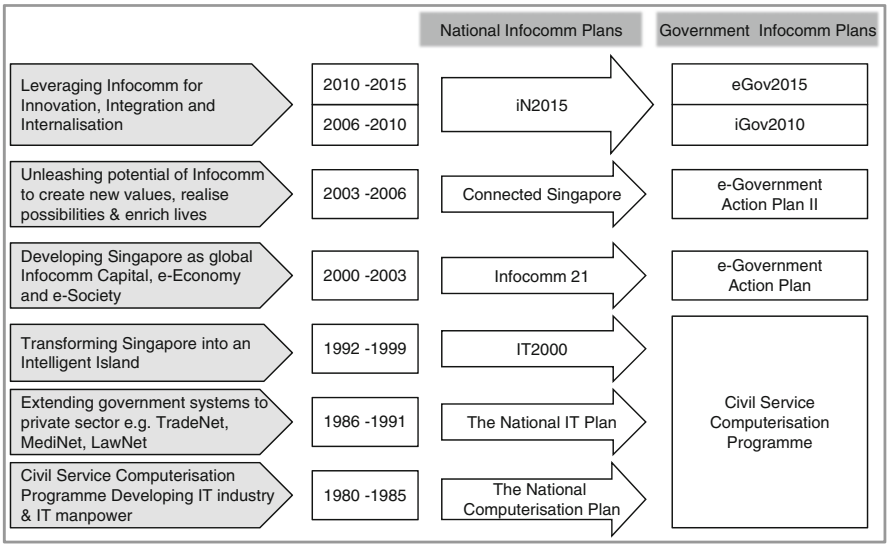


Fig. 2.1 Singapore ICT master plans, *Source*: IDA Singapore

over 30 years (1980–2011) not only focused on leveraging ICT as an enabler of economic competition and social development but also on building a globally competitive infocomm industry and a knowledge-based economy. Coordinated efforts arising from these masterplans have also emphasised infocomm manpower development, infocomm awareness and literacy of the populace and businesses, domestic and international infocomm infrastructure and connectivity, efficiencies in government agencies, as well as business transformation (Fig. 2.1).

Reflective of the changing technological, business and social climate, Singapore has progressed through five distinct national infocomm plans over those 30 years and in 2011 was midway through a sixth. It is useful to note that despite the ostensible differences seen in the couching of each successive national strategy, the Singapore government's efforts to promote infocomm development have been characterised by progressive evolution as opposed to disruptive revolution. To a large extent national strategies preserved continuity in infocomm development while serving as a catalyst for further renewal. A large number of established programmes continued from one national strategy to the next, as to established institutional structures. Institutional organisation and the lapsing of established programmes were not generally timed to match unveiling of new national strategy. Each multi-year national strategy was not designed to be static nor did it exist as an exclusive self-contained policy guide. On a periodic basis, complementary strategies and policies were introduced during the lifespan of a national strategy to reinforce, refresh and occasionally refocus its basic tenets.

Establishing Institutions for Governance

The exigencies of nation building shaped the early development of public sector governance. Singapore's small size, lack of resources and tenuous security situation made it inevitable that the government would take the lead in developing the economy and the country. The 1965–1985 period saw the expansion and transformation of the civil service structure, as well as the establishment of values and approach to governance. The focus of Singapore's policy options and directions was "execution was paramount" and about getting things done in the most efficient way. Based on a highly rational and pragmatic approach style of governance, workability of solutions was the primary criterion for assessing policy alternatives. If the solutions were thought to work and fitted into the strategic long-term framework, they were implemented, even though they may not be politically correct or fashionable at the time. In the absence of other viable institutions, the public sector drove practically all aspects of the development of the Singapore economy and society. The public sector worked hand-in-hand with the political leadership to mould and shape the values and ethos of the Singapore society.

Institutions such as the statutory boards, reporting to parent ministries but have greater flexibility than government departments in day-to-day operations, became the main vehicles for the implementation of economic and social policies. These include the Economic Development Board (EDB), Housing Development Board (HDB), Monetary Authority of Singapore (MAS), and others.

Historically, the responsibility for developing ICT sectoral policies had been undertaken by separate government agencies. The IT, telecommunications and broadcasting sectors were governed by three sector-specific agencies under the purview of three different ministries:

- IT, including e-commerce, by the then National Computer Board (NCB) under the Ministry of Trade and Industry (MTI).
- Telecommunications, by the then Telecommunication Authority of Singapore (TAS) under the previous Ministry of Communications.
- Broadcasting, by the then Singapore Broadcasting Authority (SBA) under the former Ministry of Information and the Arts. SBA also regulated Internet content issues as Internet is considered a form of broadcasting.

In an effort to open up the government ICT market to the private sector and allow the civil service to utilise a wider pool of ICT resources from the ICT industry, the government restructured these entities, separating the regulatory and commercial activities. This led to the formation of SingTel (the corporatised arm of TAS), and Singapore Broadcasting Corporation (SBC) (the corporatised operator of the SBA).

The NCB was a statutory board formed in 1981 to computerise the Singapore public service and to develop the IT industry as an engine of growth. As the principal IT solutions provider to the government, the NCB has helped ministries and agencies implement over 2,000 large-scale, mission-critical and multi-platform projects using its 1,400 strong professional staff. The creation of National Computer

Systems Pte Ltd (NCS) signified a major push by the government to spearhead development of the ICT industry and to use of ICT in the public sector, at a time when there was a lack of funds and ICT expertise. As the ICT industry began to develop and to ensure maximum return on investments, the NCB decided to incorporate the NCS in 1996. It was subsequently sold within a year of its corporatisation by way of a closed tender, to avoid any conflict of interest in the award of Civil Service IT projects. In 1997, NCS became a fully privatised, wholly owned subsidiary of SingTel and on 1 November 2003, NCS was renamed NCS Pte Ltd and subsequently known as NCS Group.

At the same time that the government moved to open its markets, a number of different government agencies—including Telecommunications Authority of Singapore (TAS), NCB, EDB and the then Singapore Broadcasting Authority (SBA)—were seen to have developed overlapping responsibilities with regards to ICT promotion, regulation and development. As a result, legislation was tabled to create a single, focused agency that would combine all government promotional and regulatory efforts involving the converging communications industries. The Info-Communications Development Authority of Singapore Act of 1999 officially disbanded TAS and the NCB, creating one new statutory board, the Info-Communications Development Authority (IDA). IDA was legally constituted on 1 December 1999. The rationale for setting up IDA was due in part to the government's strategic response to the converging IT and telecommunications markets and industries—a single agency was required to provide the integrated focus on strategy and policy for infocomm development in Singapore. The strategic goal of the IDA was to cultivate a vibrant and competitive infocomm industry in Singapore through its roles as the infocomm industry champion or catalyst, the national infocomm master-planner or architect, and the Government CIO.

In 2001, IDA was moved under the purview of an expanded Ministry of Information, Communications and the Arts (MICA) bringing it under the same supervising ministry as SBA. This move further provides the ability for many issues related to ICTs, broadcasting and the media to be resolved under the guidance of a single ministry and set the stage for a more integrated policy approach towards managing the converging ICT, broadcasting and media sectors.

Supporting the promotional and developmental role of the lead ICT agencies are the agencies under MTI: EDB; International Enterprise (IE) Singapore; Agency for Science, Technology and Research (A*STAR); and Standards, Productivity and Innovation Board (SPRING Singapore). MTI's main task is to set broad directions for growth while the agencies under MTI each have promotion roles and, in accordance with their own organisational goals and missions, supplement the efforts of the lead sectoral agencies to align and integrate the promotion of the ICT and broadcasting sectors with other national economic promotional programmes and plans.

The IDA works closely with these supporting agencies in the following ways:

- EDB: plan and execute strategies to make Singapore an ICT hub for businesses and investments.
- IE Singapore: help local ICT companies reach the overseas markets and become international players.

- A*STAR: cultivate local R&D in the ICT sector.
- SPRING Singapore: transformation of SMEs through the use of ICT; growth of local ICT industry.

Supporting the development of the ICT legal infrastructure are the Ministry of Law and the AGC. These agencies provide the legal perspective to support the establishment of the legal infrastructure for ICT sectors. They are instrumental in working with the lead agencies to put together the legislation that governs the ICT and broadcasting sectors today. In addition, the Intellectual Property Office of Singapore (IPOS) is responsible for providing the infrastructure, platform and environment for the greater creation, protection and exploitation of intellectual property.

"Reinventing Singapore" took place in the face of the recessions around 1986–2006, where the economic strategy for the nation shifted to include services as a pillar of growth to maintain competitiveness in the midst of rapidly changing international conditions, the coming of age of the post-independence generation of Singaporeans with new expectations as well as unparalleled level of mobility and access to information.

The push to IT and communications systems was critical to Singapore's effort to establish the services sector as a leading growth sector. Concerted efforts went to the repositioning Singapore as a "Total Business Centre" to encourage growth of services and service-related activities. Manufacturing MNCs such as Caltex and Matsushita were encouraged to set up their Operational HQs (OHQs) in Singapore and the Singapore OHQ would undertake the whole spectrum of an MNC's manufacturing operations support, which include purchasing, logistics, supply chain management, finance, R&D, etc. not only for Singapore but also for the region. Steps were taken to help develop local SMEs in their own right through the National Productivity Board and Small Business Bureau. At the same time, to complement measures to boost the SMEs, the government-linked companies (GLC) and statutory boards were identified for divestment to give private sector firms scope to take over. The Singapore Telecom, the national telecommunication authority, was the first statutory board to be converted to a private company, while other statutory boards like the Public Utilities Board, the Port of Singapore Authority, and the National Computer Board were subsequently privatised or corporatised.

Regionalisation efforts in the Association of Southeast Asian Nations (ASEAN) region were also initiated such as building industrial parks in the Indonesian islands of Batam and Bintan, encouraging firms to take their labour-intensive operations to Malaysia and Indonesia while retaining the higher-wage, higher value-added functions in servicing, distribution, financing and logistics in Singapore. This marked the start of the strategy to overcome the constraints of Singapore's size and expand its economic space.

Search for new sources of growth, tapping on Singapore comparative advantage in services, has led to the re-examination of past ideas, age-old assumptions and values, one of which is the case for the development of the integrated resort/casino industry in the form of the Marina Bay Sands and Resort World at Sentosa (operations

begun in early 2010) to broaden the leisure and entertainment options to enhance Singapore's reputation as a premium "must-visit" destination for leisure and business visitors. Intelligent building, innovative infocomm and gaming technologies, multimedia/3D contents delivered via IPTV, mobile channels, etc. have been deployed to richly enhance customer experience. To support the industry while responsibly addressing the ill-effects that legalised gambling bring to society, the Casino Regulatory Authority (CRA) was set up under the Ministry of Home Affairs to ensure the proper management and operation of a casino, and remains free from criminal influence or exploitation, the gaming in a casino is conducted honestly, and to contain and control the potential of a casino to cause harm to minors, vulnerable persons and society at large.

e-Government and Public Sector Excellence

The public service has played a pivotal role in Singapore's modernisation process and continues to go through reforms in its relentless drive to anticipate change and to stay relevant. Not only does the Civil Service have to ensure that public services work effectively, efficiently and smoothly, it has to keep pace with citizen's rising expectations.

The public service in Singapore has always been perceived to be efficient and effective. The level of red-tape has been gradually reduced and the corruption level has also been substantially lowered. Singapore recognises that an efficient public service sector is important to the growth of the economy; to attract investments. Hence a series of reforms to curb corruption and to improve public service were undertaken in the 1960s. Having attained the status of a developed nation, Singapore still continues to improve its public service so as to keep pace with a rapidly changing and globalised world and to equip public officers with different mindsets, behaviours and skills to operate in a dynamic, fluid environment.

The Public Service in the twenty-first century (PS21) initiative was launched in 1995 in an important step to achieve a world-class public service sector. The basic rationale for the PS21 initiative was to build an adaptable public service that could assist Singapore in meeting the challenges of a rapidly changing global environment in the context of the Singapore economy, which is very much outward-oriented. The initiative is led by the Office of the Prime Minister and a government-wide task force whose members are permanent secretaries.

The establishment of an e-government, one that recognises the impact of infocomm technologies on governance in the Digital Economy and exploits these technologies in the workplace and in internal processes for the delivery of citizen-centric public services, was a key focus area within the PS21, Managing For Excellence (MFE) movement. The other focus areas to help public sector achieve sustainable excellence under the MFE Framework were Total Organisational Excellence, More Vision Less Bureaucracy; and innovative Public Organisations (Fig.2.2).

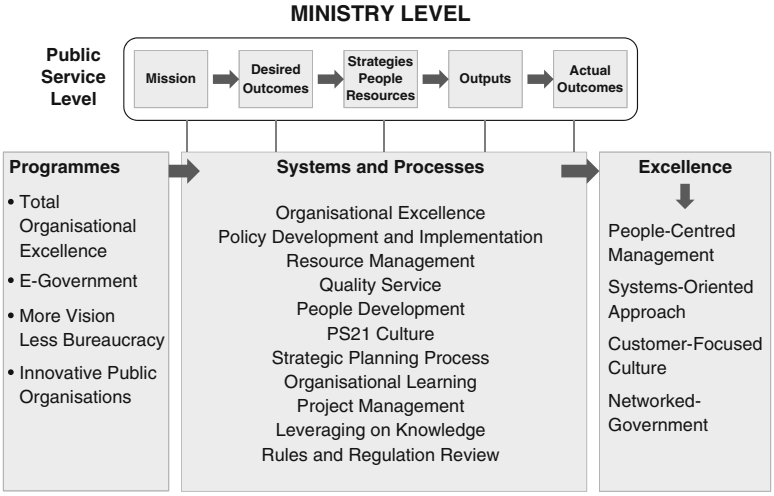


Fig. 2.2 Singapore's managing for excellence (MFE) framework

Evolution of e-Government Plans

Singapore's e-government has evolved in tandem with each National IT plan to bring about exciting changes to the way Singapore Government works, interacts and serves the public.

The focus of e-government in Singapore has evolved at each stage of planning and maturity:

1. *Civil Service Computerisation Programme (1980—1999)*
   - Improving public administration through the effective use of infocomm technology
   - Setting up data hubs—People Hub, Land Hub, Establishment Hub
   - Consolidation of computing resources, namely Singapore Government Email System (SGEMS), Singapore Network (SGNet), Government Finance System (NFS)
   - Provision of one-stop services such as TradeNet, LawNet, and MediNet
2. *e-Government Action Plan I (2000–2003)*
   - Moving services online
3. *e-Government Action Plan II (2003–2006)*
   - Delighted Customers, Connected Citizens, A Networked Government
   - Focus was to deliver accessible, integrated and value-adding public services to its customers; and help bring citizens closer together

4. *iGov2010 (2006–2010)*

- The iGov2010 vision was to be an Integrated Government (iGov) that delights customers and connects citizens through Infocomm

5. *eGov2015 (2011–2015)*

- The eGov2015 vision is to be a Collaborative Government to facilitate more co-creation and interaction between the Government, the people and the private sector to bring about greater value creation for Singapore and its people
- Three strategic thrusts are (1) *co-creating for greater value*, where customers are empowered to co-create new e-services with the government; (2) *connecting for active participation,* where citizens are informed and involved to engage government on national policies; and (3) *catalysing whole-of-government transformation,* where whole-of-government collaboration is enhanced through innovative and sustainable technologies

Framing the strategic thrusts is an *outcome-focused* and *stakeholder-centric* Singapore e-government Framework where the maturity of e-government is measured progressively. The stakeholders are broadly grouped into (1) Employees, (2) Business and Customers, and (3) Citizens based on the engagement of each group with the Government in terms of its consumption of e-Government Services (Fig. 2.3).

For Government-to-Employees (G2E), the guiding principles are about leveraging ICT for efficiency in government processes, equipping public officers with the relevant ICT tools and skills, and information sharing among government agencies. The G2E implementations have included ICT Trainings, Government Intranet/Email/Network, Common Applications such as Human Resource, Finance and Procurement, as well as Process Re-engineering. The key benefits reaped are operational efficiency and cost reduction for the government.

The G2E Maturity Framework (see Fig. 2.4) paints the stages that Singapore used in the evaluation of its G2E service delivery. The "whole of government" approach was the pacer as the public service undergoes its reforms, moving from computerisation to process automation and efficiency to an integration of services across agencies. The ultimate goal is to effectively extend a "no wrong door" policy to the end-users (citizens, residents, businesses, visitors) where the "multiple agencies, one government" tagline is put into action. Here, the customer needs are well mapped to the e-services rendered by the various government agencies that he does not physically get "referred" or "passed" from one government agency or department to another. In addition, key performance indicators (KPIs) to each G2E maturity level were identified and monitored as part of the overall progress for public service reforms (see Fig. 2.5).

For Government-to-Business and Customers (G2BC), the guiding principles are customer-centricity with the Government behaving like a service provider and about better service experience, not just moving from manual processes to e-processes. The G2BC implementations included the electronic information or services for the businesses and customers; and aggregation and/or integration across multiple agencies such as the Online Business Licensing System (OBLS), the Central Provident Fund Mandatory Retirement Account System, the one-stop OneMotoring.com.sg portal for motorists, e-Filing for Taxes, One Stop Change Of Address Reporting

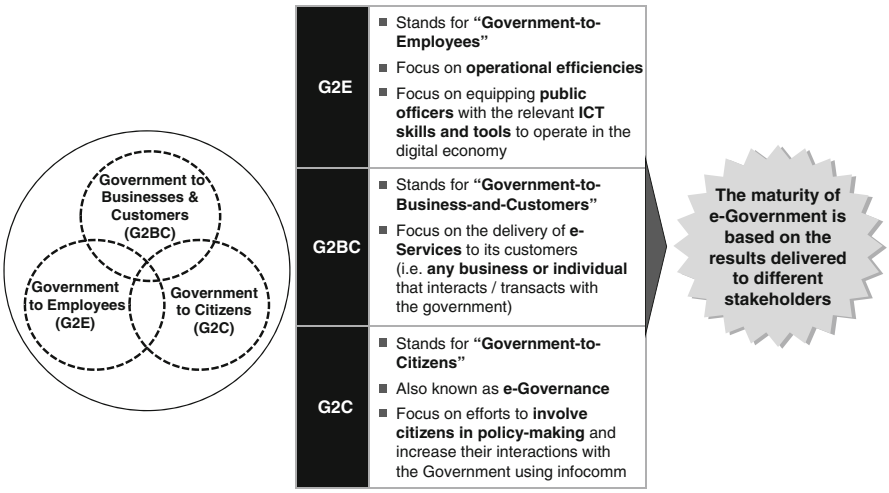


Fig. 2.3 Singapore e-government framework

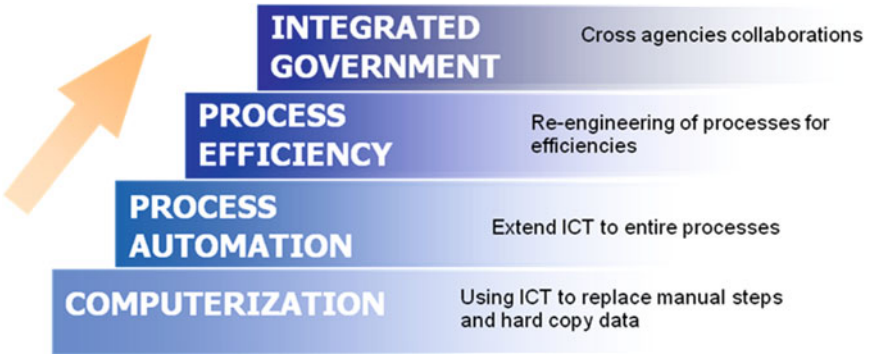


Fig. 2.4 Singapore's G2E maturity framework

Levels	KPIs
Computerization	▪ % of government data digitized ▪ PC adoption among public agencies ▪ Basic ICT Literacy levels of public officers
Process Automation	▪ Number of processes automated ▪ Response time of automated processes
Process Efficiency	▪ Reengineering of processes ▪ Customer satisfaction levels of agencies ▪ Return of Investment from ICT investments (savings in manpower. reduction in response time)
Integrated Government	▪ Number of common data bases ▪ Number of common systems (Email. HR. Finance etc.) ▪ Number of cross agencies processes (e.g. centralized procurement)

Fig. 2.5 KPIs for operational efficiencies

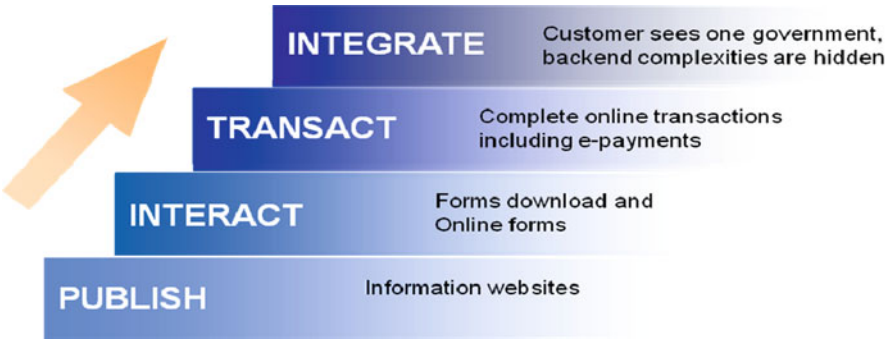


Fig. 2.6 Singapore's G2BC (e-services) maturity framework

Levels	KPIs
Publish	■ Number of informational websites by agencies ■ Information on government services available online
Interact	■ Electronic forms ■ Online queries and responses
Transact	■ Number of e-Services ➢ Online submission of data ➢ Online payments ➢ Online responses (e.g. issuance of licenses) ■ Adoption of e-Services (ratio of online versus counter services) ■ Customer Satisfaction of e-Services
Integrate	■ Cross agencies one-stop shops ■ Adoption of e-Services (ratio of online vs. counter services) ■ Customer Satisfaction of e-Services

Fig. 2.7 KPIs for e-services

Services (OSCARS), Online Passport Applications, Military Service Portal for National Servicemen (NSPortal), and Schools—Joint Admission Programme.

The key benefits reaped are easy and convenient online access, elimination of or reduced counter visits, reduced cost to customers, and reduced overall turnaround time. The G2BC Maturity Framework in Fig. 2.6 shows the stages from which Singapore has progressed from publishing of information content to online interaction and transactions to integration of e-services, presenting a "One Government" front to the end-users with tracking of KPIs for each level of maturity (Fig. 2.7). This wave of development has resulted in 100% of all government services in Singapore that are feasible to be provided electronically are already online.

An example of an innovative e-government application to facilitate government to business transactions and achieve "many agencies, one government" vision is the online application system for integrated services (OASIS)—OBLS (see https://licences.business.gov.sg). Starting a new business often required multiple regulatory approvals

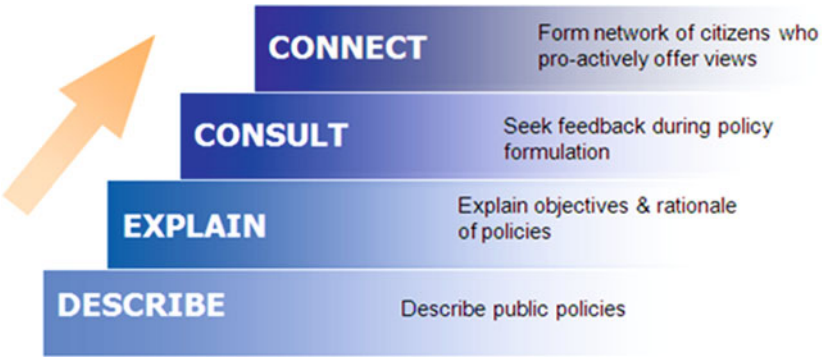


Fig. 2.8 Singapore's G2C (e-governance) maturity framework

and licences involving a tedious, complex and time-consuming process. To start a public entertainment outlet required licences approved by at least seven agencies regulating business registration, use of premises, food hygiene, liquor distribution, fire safety and tax collection. The project was initiated arising from feedback from business entrepreneurs and pro-enterprise panels regarding the problems associated with application of business licences. The project was then undertaken by MTI and IDA with about Singapore $10 million funding from MOF. Task forces were formed to review and re-engineer the processes involving 154 licences from 30 agencies. About 25 licences were either removed or reduced significantly in scope, 82 licences were simplified, rationalised and integrated for implementation into the OBLS portal. The OBLS implementation saw 80% of new start-ups applying for and obtaining the required licences online through OBLS. The average licence processing time reduced from 21 to 12.5 days, with 43 licences processed within 3 days, 42 licences processed within 7 days, and new business registration reduced from 5 days to 2 h. This has resulted in an estimated savings of Singapore $11.4 m in the first year.

For Government-to-Citizens (G2C), the guiding principles are informed citizenry and value opinions of citizens. The G2C implementations included public consultations, e-referendum, e-voting, new media to explain government policies. The G2C implementations include Reaching Everyone for Active Citizenry @ Home (REACH) Portal, public consultations by more than 40 agencies seeking online feedback on various topics, including National Budget, Healthcare, Education, Religious Affairs, National Security, Telecommunications and ICT, Media and Broadcast, Labour, Sports, Transportation and Public Housing. The key benefits reaped are having a greater sense of ownership by citizens as well as better decisions and implementation of policy by the government.

The G2C Maturity Framework in Fig. 2.8 shows the stages from which Singapore has taken to progress in e-governance from describing public policies to explaining and consulting on policy details and feedback to connecting with citizen networks to gather proactive views for policy formulation. Some rules of the game include having all feedback sent to the relevant agencies, and every agency is committed to reply to feedback within stipulated time (Fig. 2.9).

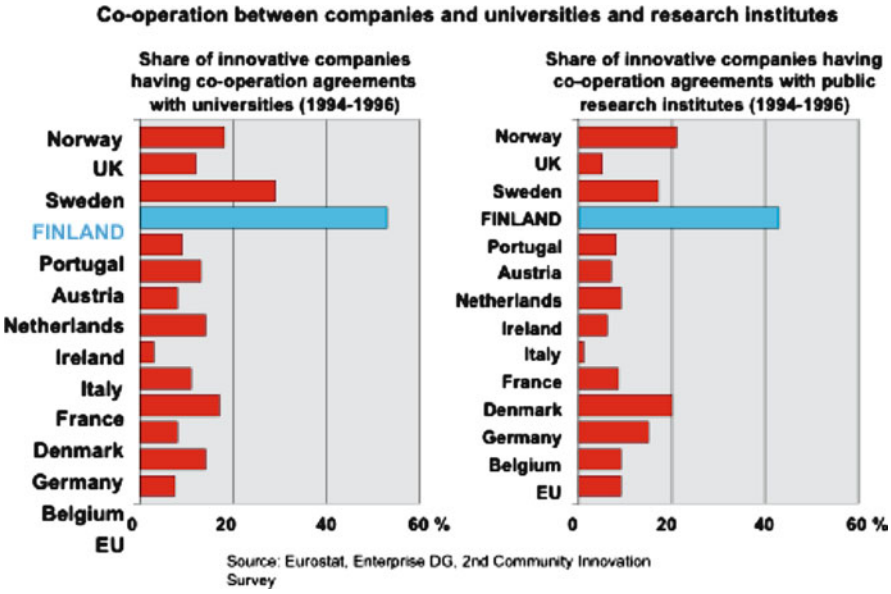


Fig. 2.9 KPIs for e-governance

Key Enablers for Successful e-Government in Singapore

The key enablers of the Singapore e-government Framework adopted within the Government and at National Level are: Infrastructure, ICT literacy, capability development, stakeholder conversion and adoption, and governance (Fig. 2.10).

- *Infrastructure*

In terms of shared infrastructure and services, Singapore has implemented a shared Government-wide computing infrastructure and suite of services on a Standard Operating Environment (SOE) for desktop (i.e., operating system, core applications), messaging (email system) and network (intra- and inter-organisation computer networks) and enabled for its government agencies and public service. It consists of Government-wide Common Services and Hosting environment for Government Agencies' Web Sites, Applications and e-Services (SHINE) to enable secure hosting for rapid deployment of online services. SHINE is operated on a Public–Private Partnership (PPP) model. Besides the eGov services, the shared e-services technical infrastructure provides common services such as e-Payment Gateway, Single Sign-On/online authentication via SingPass, etc. In terms of common data sharing across government agencies, the single instance of critical databases are maintained by respective data custodians: People Hub (Citizen Data) by Ministry of Home Affairs, Establishment Hub for Corporate and Business Data by Ministry of Finance, and Land Hub for Geospatial Land Data by Ministry of Law, Vehicle Hub (Vehicle-Owner Data) by Ministry of Transport, etc. The whole Public Service Infrastructure is securely housed in the Government Data Centre.

	Within Government	National Level
1 Infrastructure	Govt Infrastructure and Services	National Infocomm Infrastructure
2 IT Literacy	Public Sector	Citizens and Business
3 Capability Development	IT Champions &Project Managers	IT Manpower & Infocomm Industry
4 Stakeholder Conversion & Adoption	Change Management	Customer Adoption
5 Governance	IT Governance & Management	IT Legal Framework

Fig. 2.10 Key enablers for successful e-government

Fig. 2.11 Singapore's infocomm training framework

- *IT Literacy*

Using the Infocomm Training Framework, IDA has identified infocomm training needs for different segments of the Singapore population and comprised five levels (L1–L5) of infocomm training programmes to meet Singaporeans' specific needs in infocomm skills. From promoting an e-lifestyle to workforce training to capability development, the framework focused on different levels of infocomm competency to enhance quality of life and to improve employability (Fig. 2.11).

IDA then worked closely with the private sector, community groups and other government agencies to provide opportunities for infocomm skills training. Various initiatives and strategic partnerships were put in place to increase the infocomm literacy level of both the workers and the general public, including:

- Level 1—National IT Literacy Programme (NITLP): training for the non-infocomm literate to equip them with basic computing and Internet skills to improve their quality of life and enhance their employability. Targeted at workers, homemakers and senior citizens.

- Level 2—The Infocomm Competency Programme (ICP): to train workers in the essential infocomm skills for the competitive workplace.
- Level 3—The E-Business Savviness Programme (EBSP): to develop a pool of skilled manpower with e-business skills and knowledge and able to champion e-business transformations within companies, thereby benefiting the industry with enhanced infocomm expertise of the workforce.
- Level 4—Strategic Manpower Conversion Programme (SMCP): to convert non-infocomm professionals to become infocomm professionals.
- Level 5—Critical IT Resource Programme (CITREP): for infocomm professionals to upgrade their skills in critical, emerging and specialised infocomm areas, thus accelerating the development of these skills that were urgently required by the industry.
- Level 6—Infocomm Training and Attachment Programme.

- *Capability Development*

The Singapore Government needs both IT champions and project managers to see through e-government implementation. The IT Champions are usually forward-looking senior management (e.g., Ministers, CIOs) who embrace change, evangelise technology and passionate about e-government; and they are primary agents of e-government adoption and reform within the government. On the other hand, the Project Managers are working-level officers who collaborate with solutions providers to turn e-government initiatives into reality; and they serve as the bridge between private-party vendors and internal government end-users.

At national level, there is a need to build capabilities in the broader infocomm sector and the e-government industry to meet the challenges of e-government development, and this involves building the whole ecosystem such as the schools and Institutes of Higher Learning, professional bodies, etc. An example is the National Infocomm Literacy and Upgrading Roadmap where there are courses or programmes such as e-Business knowledge for non-IT Professional, Conversion programmes for non-IT Professionals to IT Professionals, as well as courses to deepen skills for current IT Professionals.

- *Stakeholder Conversion and Adoption*

The need for good change management or stakeholder transition for successful e-government cannot be stressed enough. Change Management is important as many e-government initiatives involve significant changes to business processes as technology alone cannot achieve significant improvements, and human beings are resistant to change by nature. Hence, change management is a systematic approach to guiding an organisation in dealing with change and it involves everyone from top management to bottom worker, tackles the issue of transiting from State A to State B, and eases the introduction of changes and brings about a smooth transition.

The appreciation of the different types of customers and hence adopting different approaches to manage change for each type of customers would increase the success rate for e-government implementation (See Fig. 2.12). For example, IDA saw increased adoption through CitizenConnect Centres which are located near to

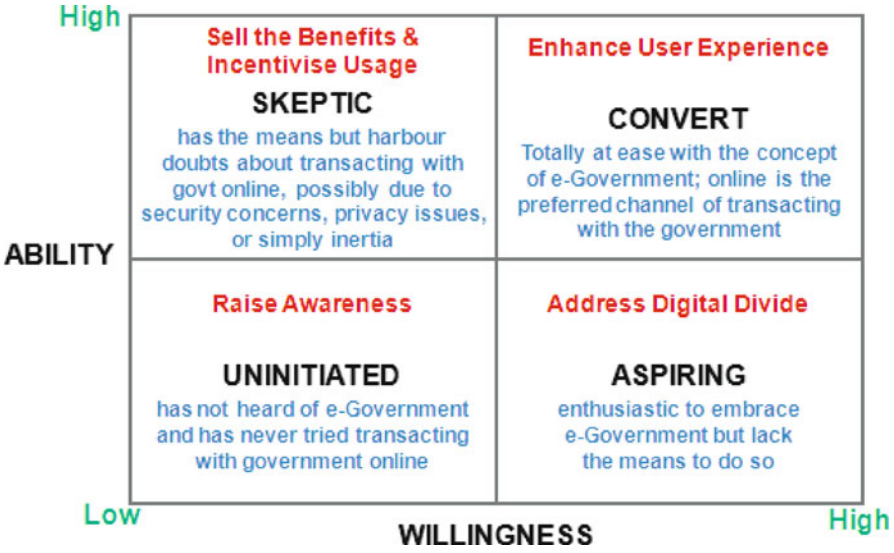


Fig. 2.12 Customer adoption—use different approaches for different customers

homes/workplaces, and provide internet access to Government websites, as well as personalised help by CitizenConnect officers to search for Government information and transact with Government online at no charge,

- *Governance*

According to Peter Weill, MIT Sloan Centre for Information Systems Research, IT Governance is a framework of accountability and decision rights to achieve desired behaviour in the use of IT. The key components of IT Governance and Management include:

- Leadership and Governance Structure
- Laws, policies, Standards and Best Practices
- Funding and Procurement
- Benchmarking and Performance Measurement

The leadership and governance structure has been discussed earlier.

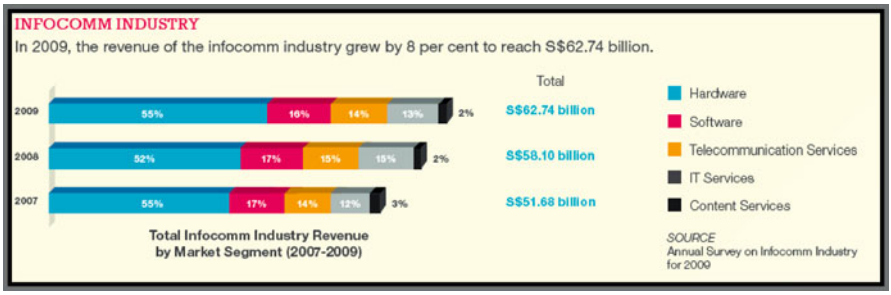
At the national level, Singapore has a conducive legal and policy environment that is crucial to build confidence when engaging in electronic transactions. Its existing legislations were studied to ensure that suitable legal frameworks are in place to create an environment conducive fore-government implementation. Examples include the offer and acceptance of contracts made electronically and the authenticity of the contracting parties (Electronic Transaction Act), Computer Misuse Act, Use of electronic records as evidence in courts (Evidence Act), and Intellectual Property Issues, etc. Annex 1 discusses the key cyber laws that govern the adoption of ICT-enabled practices.

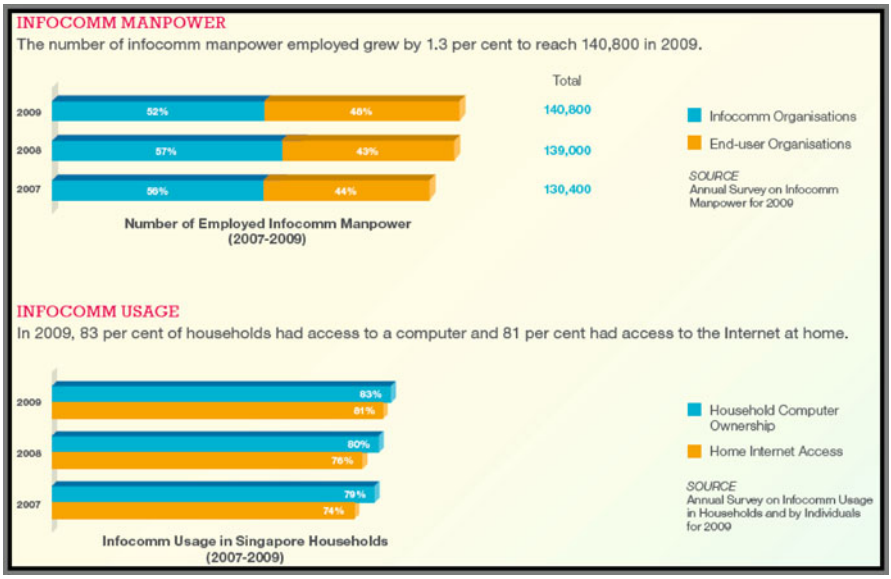
Singapore Infocomm Industry in 2010

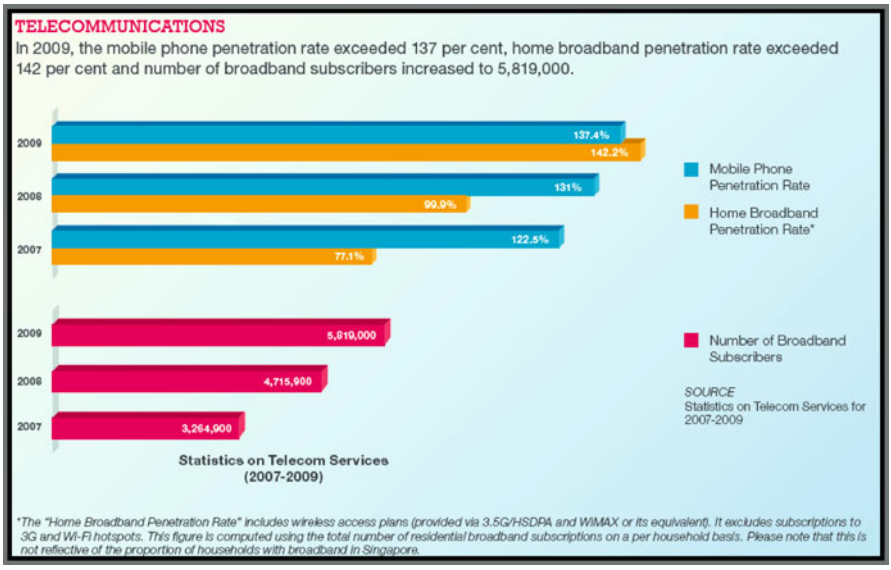
Despite the global economic downturn in the 2008 and 2009, the infocomm sector in Singapore has shown resilience and registered growth in 2009. The infocomm industry revenue grew by 8% to reach Singapore $62.74 billion, while export revenue increased by 14.6% to reach Singapore $40.44 billion, constituting about 64% of total infocomm industry revenue.

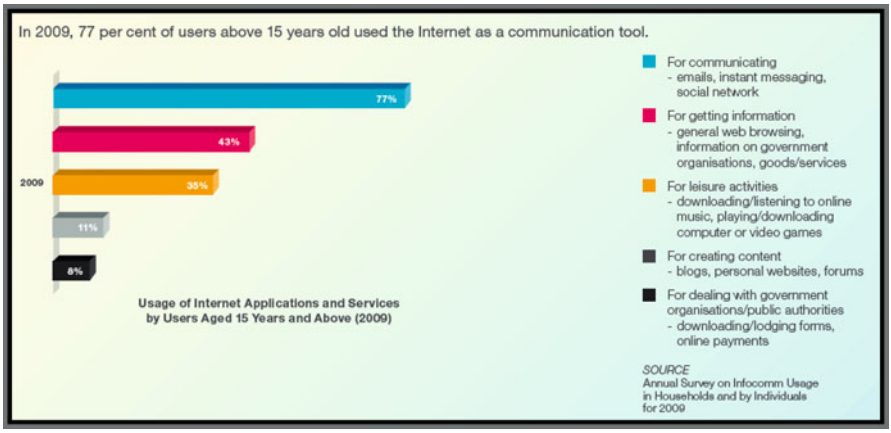
The number of employed infocomm manpower also grew by 1.3% to reach a total of 140,800 jobs in 2009. Infocomm is very much a part of the daily life of our people in Singapore today. In 2009, 83% of households have access to a computer at home, 80% of households have access to broadband, and 95% of households with school-going children have access to computers.

Overall, 78% of enterprises use computers, 75% use the Internet and 69% have broadband access. Mobile phone penetration is at 137%, or more than 6.8 million mobile subscriptions.









In addition, Singapore continues to receive international recognition for its infocomm development and usage. It has topped the Waseda University e-Government Ranking for three consecutive years from 2009 to 2011, consistently ranked among the top three in the e-government indices of the World Economic Forum Global IT Report from 2009 to 2011, and ranked second for overall Networked Readiness in 2010 and 2011, respectively. In the United Nations e-Government Survey 2010 of 192 countries, Singapore was ranked eleventh for the e-Government Development Index and ninth for the e-Participation Index.

Key Lessons

While the basic pillars of ICT strategies adopted by countries around the world are more or less consistent, the varying level of economic success achieved by countries through ICT achievements lie in the execution of these strategies. This is where Singapore has excelled. Possible factors that have helped to facilitate and allow for continuous, stable execution of ICT programmes and initiatives are highlighted below. Some of the lessons that can be learnt from Singapore's ICT development journey are highlighted as follows:

1. *Stable Political Leadership*

The political context in Singapore is especially critical because the public service leadership is accountable to the Cabinet, which is made up of Ministers from the same political party that has ruled the Nation since 1959. The political leadership's confidence in winning elections meant that they were able to adopt a decision-making approach that addressed long-term solutions and sustainable policies in all aspects of the nation's development, rather than short-term political popularity. Their confidence set the tone for rationality, systemised thinking and meritocracy in the development of the civil service, and the strength of the political leadership significantly influences the values and principles of the public sector. It is this political stability that has enabled Singapore to progress and evolve through its national IT plans and related policies, thus preserving continuity in infocomm development and providing catalyst for future renewal.

2. *Industry Collaboration—Getting the Private Sector To Do More*

The dual aspects of private-sector leadership and government involvement have been mutually reinforcing. As the vital role of the private sector in national, regional and international ICT development has been well established, there was no need to reinvent the wheel. So Government intervention was mainly used to create the initial supply push in terms of creating the opportunities and providing conducive working partnerships.

While government retained its traditional role of owner and operator of key ICT assets and infrastructure in the early years, there was active industry participation in government projects through tenders, calls for collaboration (CFC), competitive dialogues and technology trials. In 2007, excluding the SOE tender, more than 290 companies were awarded 653 contracts worth a total value of Singapore $820 million. In terms of contract value, local companies secured 64%, with the rest going to MNCs (IDA, 2008). The government worked with industry on technology trials, such as the Government Technology Experiments and Trials Programme (TREATS). In 2009, the Singapore government has carried out more than 20 technology trials under the TREATS Programme, many of which have led to procurement.

CFC are issued regularly to bring together various players in the industry to innovate in government-funded trials. CFC have been issued for mobile payment, involving handset manufacturers, banks and service providers coming together to develop a first-of-its-kind mobile payment infrastructure in Singapore. Collaboration between industry and schools has also enabled the use of broadband for an enhanced teaching and learning experience. Through the facilitation of the government, constant

dialogue and experimentation, new infocomm solutions were developed and adapted for innovative use, with government taking the lead role in most instances. This was the *modus operandi,* while the Government concurrently focused its effort on developing a vibrant ICT sector that would eventually be able to take the lead in delivering innovative government services.

After two decades of strategically deploying policies, programmes to nurture and grow the infocomm industry, the industry has evolved as an important engine of growth for the country. Singapore also boasts a pool of more than 90% of Fortune 1,000 technology companies that have made Singapore a key node in their global network and innovative local enterprises that produce ingenious solutions and quality services that have made their marks in both the domestic and international markets.

With a dynamic, innovative and competent pool of infocomm companies, Government has gradually shifted from planner, implementor and owner of infocomm and its assets, to that of master-planner, facilitator, providing the catalyst and conducive environment in which infocomm is able to thrive, grow and diffuse. Through innovative partnerships with the private sector, the government is able to now tap on innovation of the private sector, protect against technology obsolescence and create further employment in the development, implementation and delivery of IT projects. In doing so, the government is further catalysing the growth of the infocomm industry.

3. *The Pace of Telecommunications Liberalisation and the Importance of Competition*

One of the underlying drivers of ICT adoption is the cost of telecommunications infrastructure and the extent of Singapore's connectivity to the region. Singapore's telecommunications market was fully liberalised (down to basic telephony services and lifting the cap on foreign ownership of telecommunications companies in Singapore) only in 2000, although certain telecommunications services (e.g., mobile phone services, Internet access provision) had been opened up several years earlier. This phased approach gave regional competing economies an edge in attracting internationally competitive telecommunications players into their markets and to lay submarine cables to establish a network of connectivity to the region. Prior to liberalisation, infrastructure cost had been one of the factors that led companies to consider establishing their regional headquarters in countries other than Singapore. After four years of liberalisation, the telecommunications market in Singapore is now highly competitive (with IDD call charges to popular destinations falling by more than 60%, for instance), and this has led to greater innovation and availability of services in the market.

While the government-led, strategic supply-push approach in propelling Singapore's development of many of its physical infrastructure such as its airport and seaport, had worked well, it appears that this approach did not have the same impact in its attempt to jumpstart broadband diffusion. The government's intervention appeared to have played a part in the initial slow uptake of broadband due to the lack of competition and price constraints. Operators complained of regulatory and administrative burdens, and these regulations also reduced the flexibility of operators to develop targeted service packages.

However, after that initial slow start, a significant increase in competition between broadband providers (within different modes of access) and lower underlying cost

structures (due to market liberalisation) significantly boosted broadband subscription. The 2003–2004 surge in broadband subscription attests to the effectiveness of competition in bringing about greater demand and market maturity, and thus higher penetration. Continuous effective competition was essential to sustaining the industry's growth as it allows new services that are being planned for the future to catch on at a much faster rate.

4. *Balancing Investment in "Soft Infrastructure" is equally important*

The pace of broadband adoption in Singapore is illustrative of this. By most accounts, Singapore got the "hard infrastructure" right. That is, the physical networks were rapidly rolled out in the compact island. However, despite the government's earlier efforts in the late 1990s to improve broadband penetration through incentives and other funding schemes, there was limited success in spurring penetration and adoption. The initial slow take-up may be attributed to the lack of "killer applications" available on the network and the lack of and/or tight control over internet content.

The local content providers faced fierce competition from the US and other English-speaking rivals. Moreover, the country's small size made it difficult for local content providers to enjoy economies of scale. The lack of local content, coupled by the various controls employed by the authorities to control access to Internet content contributed significantly to the somewhat low adoption rates.

On the other hand, there were areas in the "soft infrastructure" side where Singapore did well and are noteworthy. High emphasis was given to education and awareness. Accompanying the involvement of the community groups and schools, significant investments were also made to support specific adoption programmes among low-income households, different ethnic groups and late adopters.

5. *The Willingness to Innovate and Take Risk*

The ability and willingness to take risk, innovate and secure the first mover position clearly has its advantages. Singapore's bold moves in earlier years resulted in a large number of systems being deployed, some more successful than others. For example, in the late 1990s, an initiative to deploy interactive multimedia kiosks in areas of high pedestrian traffic did not result in a viable business model that could be sustained. However, after the turn of the century, a new generation of kiosks providing bill payment and other ancillary services has found a niche area to thrive in. Another example of the risk-taking nature of innovation was the National Library Board's decision to use radio frequency identification (RFID) to electronically tag library books. Although RFID was a relatively untested technology at that time, the library's highly computerised and automated borrowing and return system has turned out to be a success. Library members are able to borrow and return books, and even pay fines for overdue books, through an entirely automated system.

As Singapore's technology deployment capabilities (to operate and adapt technologies) are now close to the world frontier, focus is now on developing capabilities to create new technologies (to innovate and pioneer new technologies). A budget of $750 million was set aside in FY2007 to develop R&D capabilities under the purview of A*STAR to intensify industry development efforts and catalyse greater commercialisation of technologies by leveraging multi-disciplinary capabilities of

Science and Engineering Research Council's (SERC) Research Institutes (RI). However, despite financial support, innovation remains an uphill task. The Singapore system has often been criticised as one with too many rules and too harsh a stigmatisation of non-conformist behaviours. These characteristics are said to stifle Singaporeans' ability to innovate, think independently, take risk and engage in entrepreneurship. Many have also criticised the system for producing a generation of instruction followers and managers without the enterprising and innovation spirit. The society's intolerance for failure is seen as a further hindrance to risk-averse mindset characteristic of the average Singaporean.

The innovation infrastructure also has a large lifestyle component, the development of which takes place within the parameters of the country's larger political and social objectives. A slow, conservative and incremental approach to greater political and social openness typically adopted and preferred by the Government puts Singapore at a disadvantage compared with some other Asian cities which are able to adopt a far more experimental approach to setting social limits.

However, as part of its efforts to encourage innovation, the government has attempted to loosen up the regulatory environment and the government's grip on the social and political lives in Singapore. Committees have been set-up to identify areas where the government may be able to lighten rules and regulations so as to make it easier for individuals to start and operate a business. Schools are revamping their curricula to inculcate a stronger innovation mindset in students. Various public campaigns have been launched to raise awareness of the fruitfulness of innovative pursuits.

Despite its commitment to research and development, and increasing public and private expenditure on R&D, Singapore still lags behind. A recent study by EIU (2008) that measures how competitive and complete a country's IT industry and environment is, ranked Singapore twelfth out of 66 economies in research and development. While Taiwan had one patent registered for every 2,000 people, Singapore had only one patent for every 47,000 people. In the latest Global Information Technology Report (2007/2008) by the World Economic Forum, Singapore was ranked 23 in its capacity for innovation behind other developed countries like US, UK, Japan and Korea.

6. *Having a headstart in establishing the National Resource/Data Hubs*

Where governments in most countries lament the challenges in performing data unification and sharing among its agencies to enable service delivery, Singapore had a headstart in setting up the Data Hubs (People, Establishment, Land) since 1994 to support e-services across government agencies. Despite the initial pains of unifying the People Data, Company/Business Data, and Land Data, in terms of setting data standards and unique identifiers (IDs), formulating the data management, governance and legal framework to capture, maintain and propagate the data, the appointed authorities bit the bullets and pushed through to see the Data Hubs properly set up and maintained. These Data Hubs have since been the bedrock for government e-services to thrive on at the "whole-of-government" level, enhancing productivity and integrity. For example, after an applicant has logged in to an e-service, say "to file his income tax" using his SingPass, the Personal Data Service can auto-populate the online e-form

with his personal data such as Name, Address, Gender from the People Data Hub, without him having to key in his particulars. This saves times and ensures data consistency and accuracy during online transactions, while at the same time provides ease of access and enhance customer experience in dealing with the government.

7. *Need for Dynamic Governance*

Dynamic governance is about how a governance system can remain relevant and effective by continuing changing, innovating and adapting to new and emerging needs in a changing environment. The capacity and capabilities to change, in short dynamic governance, are crucial for sustained and sustainable growth and e-development, and the critical success factors as seen in Singapore are:

- Having committed political and public service leaders with vision and high aspirations for Singapore to set the tone for many e-developments in public sector strategies, structure and systems.
- Creating an environment for continual learning via institutional learning, where people are consciously learning and seeking to apply new ideas and explore different ways of doing their work better, or observing different systems and their outcomes, and incorporating their new learning and knowledge into the system to improve performance, or sensitive to new citizen or customer requirements and learn new knowledge and skills to meet these emerging needs; and effective execution via systems based on commitment to making pragmatic policy decisions, rewarding people on merit and performance, building strong institutions with structures and systems to sustain action, evaluating policy options on helicopter qualities, analysis, imagination and realism, and having a strong results orientation and accountability.
- Creating innovative processes, agile structures and systems by embedding dynamic capabilities in the change management programmes, integrating change capabilities into operational and management processes, as well as being deliberate in introducing process redesign with strategic intent, supported by effective feedback mechanisms for continuous learning.

Fast Forward Twenty-First Century: Intelligent Nation, Global City

While early investments in infocomm have paid off significantly, to stay ahead of the competition and raise its infocomm competencies will require a bold perspectives and renewed vigour. In 2006, the Government brought together expertise from the Public, Private and People sectors to envision how infocomm can be made even more accessible to everyone—to work, live, learn and play—thus enriching the lives of Singaporeans, enhancing the country's economic competitiveness and boosting the growth of the infocomm industry here.

Intelligent Nation 2015, or iN2015, is Singapore's infocomm masterplan to prepare the nation for the future. The plan outlines its vision to turn the country into "An Intelligent Nation, a Global City, Powered by Infocomm." Innovation, integration

and internationalisation are the basis of this masterplan. The capacity to innovate and create new business models, solutions and services will enable Singapore to be more competitive in a globalised environment. Equally important is the ability to integrate resources and capabilities across public and private institutions. The masterplan sets bold targets for 2015:

- Singapore to be No. 1 in the world in harnessing infocomm to add value to the economy and society
- Achieve a two-fold increase in value-added[1] of the infocomm industry to Singapore $26 billion
- See a three-fold increase in infocomm export revenue to Singapore $60 billion
- Create 80,000 additional jobs[2]
- Have at least 90% of homes using broadband
- Ensure 100% computer ownership for all homes with school-going children

The iN2015 Masterplan is not only about economic competitiveness. It explores ways to ensure that the elderly, less-privileged and people with disability can also enjoy connected and enriched lives or self-improvement and life-long learning. This is to bridge the digital divide and create opportunities for all.

To achieve the targets, the masterplan outlines four key strategies:

- To establish an ultra-high speed, pervasive, intelligent and trusted infocomm infrastructure
- To develop a globally competitive infocomm industry
- To develop an infocomm-savvy workforce and globally competitive infocomm manpower
- To spearhead the transformation of key economic sectors, government and society through more sophisticated and innovative use of infocomm

Building Next Generation Nationwide Infocomm Infrastructure

The Next Generation Nationwide Broadband Network (Next Gen NBN) capable of ultra-high speeds of up to 1Gbps and beyond will be a strategic enabler for virtually infinite possibilities for innovative services such as interactive IPTV, software-as-a-service, high-definition video conferencing and other bandwidth-intensive applications. The infrastructure will also be IPv6 compliant and will enable an exciting host of new broadband-enabled services and applications, such as immersive learning experiences, telemedicine, high-definition TV, immersive video conferencing and

[1] Value added of the infocomm industry refers to the contribution of the industry to the gross domestic product (GDP). Value add comprises the compensation of employees, operating surplus, the consumption of fixed capital and the excess of indirect taxes over subsidies (Definition from the Singapore Department of Statistics).

[2] Of the 80,000 new jobs, 55,000 jobs are expected to be infocomm jobs in both infocomm and user sectors. The remaining 25,000 jobs are supporting jobs in infocomm industry.

grid computing. As at June 2010, the Next Gen NBN has covered about 35% of homes and buildings in Singapore and is on track to reach 60% coverage by the end of 2011, and 95% coverage by 2012.

OpenNet, the appointed Network Company, commenced its commercial operations of offering wholesale fibre services in April 2010, while Nucleus Connect, the appointed Operating Company, commenced offering co-location and inter-operability testing services in May last month. Many downstream operators, such as Retail Service Providers and Application Service Providers are in talks with both companies on procuring their services. Complementing the wired network is the Wireless@SG network with more than 7,500 hotspots offering free Wi-Fi services with speeds of up to 1 Mbps. To date, there are close to 1.6 million unique wireless broadband subscribers clocking an average of approximately 10.1 h monthly. Together with their partners, the operators have rolled out a variety of enterprise services such as facility monitoring, cashless payment systems, location-based services and digital advertising.

As the Next Gen NBN is being rolled out to provide an open-access environment to encourage the development of more services, it is deemed important to enable different service providers to easily interconnect with one another so that information from their subscribers can easily reach subscribers from another service provider's network. This is hence enabled by the Singapore Internet Exchange or SGIX which was commercially launched in June 2010. SGIX is a neutral Internet Exchange which provides local and foreign telecoms service operators a neutral and highly efficient Internet traffic exchange facility to exchange their Internet traffic. SGIX will serve as a central point of Internet traffic exchange, thereby also attracting foreign telcos to interchange their international Internet traffic through Singapore, and strengthening Singapore's position as an attractive infocomm hub.

Alongside the deployment of national infocomm infrastructure, programmes are developed to facilitate the delivery and adoption of new services that meet market needs. The Lighthouse Series is a series of industry forums and workshops aimed at informing and engaging industry players to use the Next Gen NBN to deliver new and innovative services, while the BEACON series focuses on educating enterprises, consumers and government end-users on the benefits and possibilities of Next Generation services.

Developing a Globally Competitive Infocomm Industry

The presence of a vibrant infocomm industry fuels the growth of other economic activities and in turn adds jobs to the economy. Singapore's excellent infocomm infrastructure has made it a preferred destination to anchor shared IT services. Global infocomm-user MNCs like UOB, BNP Paribas International Private Bank and Daimler have chosen Singapore to set up IT hubs to support their worldwide business operations. IDA has also attracted infocomm MNCs such as Equinix, Salesforce.com and Amazon Web Services to Singapore. Besides infocomm investments, these MNCs provide innovative platforms, generate sophisticated demand

for infocomm services, and create high-value ICT jobs and business opportunities for infocomm local enterprises (iLEs).

To drive the development of more innovative infocomm solutions, IDA collaborates with MNCs like Cisco, Platform and Oracle to set up innovation centres in strategic and emerging technology areas. As at June 2010, there are seven such innovation centres with a total investment of almost $80 million. As part of its efforts to infuse innovation and new business models and capabilities, IDA works with its wholly owned subsidiary, Infocomm Investment Pte Ltd (IIPL), to attract world-class global infocomm start-ups and entrepreneurs to use Singapore as a development and engineering base. Since 2008, it has attracted some 40 start-ups from countries such as the United States, Israel, Sweden, China, Germany and Finland, bringing more than $50 million in project investment.

One key focus of the industry development efforts is to spur infocomm innovation by helping iLEs create IP that is commercialisable. The Infocomm Local Industry Upgrading Programme (iLIUP) promotes strategic and mutually beneficial partnerships to enhance the capabilities and competitiveness of iLEs as they tap on the expertise and network of the MNC partners. Since 2006, iLIUP has helped 165 iLEs to develop more than 230 new or enhanced products/solutions, and trained close to 1,100 infocomm professionals. The Technology Innovation Programme (TIP), in partnership with SPRING, aims to encourage Singapore-based infocomm enterprises to use technology to develop or improve products, processes or business models as part of overall business strategy. IDA and SPRING have supported more than 30 enterprises, generating infocomm investments of over $20 million. The Technology Enterprise Commercialisation Scheme or TECS is another scheme that IDA has partnered with SPRING since 2009. TECS has supported 16 start-ups based on strong technology IP and a scalable business model, generating $9 million in project spending towards technical development of products or services.

To help more local Singapore companies make inroads into overseas markets, IDA has in place various internationalisation programmes. “Made-in-Singapore” infocomm solutions have earned a good reputation for being of high quality. To extend this mindshare internationally, the Infocomm Singapore Brand was created to help iLEs market their products and solutions overseas. The brand has seen good take-up by iLEs and is used extensively at international trade events such as GITEX, Mobile World Congress and imbX. The Overseas Development Programme (ODP) serves as a platform for iLEs to team up with leading infocomm MNCs to establish an international presence. Tapping on the business networks, products and services of lead partners, iLEs can reach a bigger market. Since 2006, 126 iLEs in partnership with 15 MNCs have benefited from this programme.

IDA International was established in February 2009 to provide e-government consultancy to foreign governments and to support the implementation of infocomm solutions overseas. IDA-I has provided local companies market connections to countries as far as the Caribbean, Africa and South America which are interested to adopt and adapt Singapore’s experience in using ICT solutions to provide world-class public services. In addition, the Global Business Development Centre of Excellence or GBD COE, a joint effort by IDA, IDA International, IE Singapore,

and SiTF, continues to help the Singapore infocomm industry scale up global business development and increase business opportunities in overseas markets. The GDB COE activities are steping up to develop more promising new markets, provide advisory on market knowledge and possible business structure models, and enable more effective go-to-market activities.

Developing Infocomm-Savvy Workforce and Globally Competitive Infocomm Manpower

In developing infocomm-savvy workforce and globally competitive infocomm manpower, IDA has set themselves the target of creating 80,000 additional jobs by 2015. As of 2009, it has reached the half-way mark, with more than 41,000 additional jobs created. It has seen a continued growth of employed infocomm manpower, with a growth of 1.3% growth in 2009 to reach a total of 140,800 jobs.

IDA has adopted a multi-pronged approach for competency development with programmes like Techno-Strategists for professionals to acquire hybrid skills in various sectors like Financial services, Healthcare, Hospitality and Retail. The iLEAD programme was launched to train and develop infocomm professionals in emerging areas such as Cloud computing, Green IT, ICT Security and network engineering. Through its competency roadmap, ICT job roles are reviewed and included in the National Infocomm Competency Framework (NICF), and aligned with Enhanced Critical Infocomm Technology Resource Programme (CITREP) training courses. The NICF 2010 has a total of 250 job roles with more than 70 organisations having signed up to adopt NICF. Together with the Workforce Development Agency, industry partners and institutes of higher learning, four Infocomm Continuing Education and Training or CET Centres for professionals have been set up to pursue professional upgrading. There was collaboration with the local universities and 34 industry partners to nurture industry-ready undergraduates through industry attachments and professional certification and upgrading.

In the area of developing a pipeline of infocomm talent, IDA has organised various student outreach programmes on infocomm career possibilities, infocomm clubs at schools, and national infocomm competitions. The National Infocomm Scholarship and Integrated Infocomm Scholarship were also setup, with a total of 181 and 52 scholarships for the two programmes, respectively awarded in 2010.

Hence in achieving an infocomm-savvy workforce, IDA continues to engage in various initiatives to attract talent to study infocomm, provide students in our universities and polytechnic institutions with a world-class infocomm education, and upgrade our infocomm professionals in their careers.

Transforming Key Economic Sectors, Government and Society

Singapore has seen, on the business front, the infocomm usage growing steadily across the enterprises. In 2010, household computer ownership has reached 83% and mobile phone penetration is now at 137.5%.

Singapore leads in e-government globally, and infocomm continues to bring about changes in the way the Government serves and interacts with citizens. The iGov2010 vision is to connect with citizens through infocomm. Through the annual e-gov perception surveys, we see an increase in satisfaction with the quality of e-gov services and information. Continuing with its e-gov journey, IDA is currently formulating the next e-gov masterplan. The next wave of e-gov will see new models of collaboration with the private and people sectors, leveraging emerging technologies and social trends.

The nine sectors identified in the iN2015 masterplan for sectoral transformation through infocomm are: digital media & entertainment, education, financial services, healthcare, manufacturing & logistics, land and transport, tourism, hospitality & retail, government and society. Their progress as at 2010 is as follows:

- In the Digital Media and Entertainment space, IDA has put in place the Digital Marketplace Programme, which aims to establish Singapore as Asia's trusted hub for managing and distributing digital content by attracting key media service providers, content owners, and aggregators. It has attracted eight industry projects to hub content and services in Singapore as well as implemented two accelerator projects such as the world's first content fingerprinting contextual advertising and iScreener online platform for the Asia Television Forum. With the Connected Games Programme, two Games Resource Centres have been launched—the Nanyang Polytechnic Games Resource Centre in collaboration with Sony Computer Entertainment focuses on building Playstation development capabilities while the Unreal Technology Lab at Singapore Polytechnic provides training and access to the Unreal Engine.
- In Education, IDA has various programmes that aim to foster an engaging and transformational learning experience through the innovative use of infocomm. The six FutureSchools are collaborating with 15 industry players to develop 50 new products and services for learning, with some products starting to be piloted in the classrooms this year. The Experimentation@Schools programme will catalyse the development of innovative ICT tools in areas like Collaborative Learning and Learning on the Move. To support MOE's third ICT masterplan, the Learning Digital Exchange was implemented to provide quality digital resources for all teachers.
- In the Healthcare sector, the vision of integrated health services is being increasingly enabled through the innovative use of ICT. There are several ongoing programmes designed to equip healthcare providers across the continuum with the tools and electronic healthcare information to improve the quality and continuity of care. These programmes include the National Electronic Healthcare Record initiative and new initiatives in the primary, intermediate and long-term care sectors.
- For Small Medium Enterprises (SMEs), there are various initiatives to make infocomm accessible to them. The SME Infocomm Resource Centres have assisted more than 7,000 SMEs to learn and adopt infocomm. Through the SME Infocomm Package, IDA has supported some 4,000 SMEs to establish their first web presence. IDA has also supported more than 100 SMEs with a total of $6 million in grants to transform their businesses with infocomm, through the TIP jointly administered by IDA and SPRING. Earlier in 2011 the iSPRINT

programme, a $25 million initiative, was introduced by IDA in collaboration with SPRING and IRAS (which caters to SMEs' different infocomm needs). Moving forward, IDA will look at initiatives that provide sectoral assistance to SMEs in sectors such as logistics, tourism and education.

- For the Transport sector, the Infocomm@AirHub Programme promotes integrated and intelligent processes to reduce costs and improve productivity. IDA signed an MOU on the e-freight@Singapore programme in Jan 2010 with CAAS and four international and local trade associations. To enhance Singapore as a leading Air Logistics Hub, it aims to establish e-messaging standards and platforms for data exchanges and interconnect more than 100 stakeholders across the air logistics supply chain. To elevate Singapore as a global destination for aerospace maintenance, repair and overhaul (MRO), it is looking at streamlining processes across up to five extended MRO value chains and catalysing the development of applications for optimal deployment of resources.
- For the Financial sector, IDA's Next Generation e-Payment Programme will quadruple the number of contactless Point-of-Sales (POS) terminals from 5,000 to almost 24,000 by end 2011. This represents a joint investment of $16 million by IDA and the industry. By leveraging the huge base of over six million CEPAS cards currently used for public transport, this initiative will bring greater convenience to consumers by enabling seamless use of CEPAS cards for payment in various cash-based segments such as food courts, provision shops and convenience stores. When fully deployed, the terminals are expected to generate over 94 million e-payment transactions a year, converting a significant number of cash-based payments to e-payment. In the longer term, this network of contactless terminals will form a key supporting infrastructure for future innovative services, such as Near Field Communication-enabled mobile e-payment.
- In the Tourism, Hospitality and Retail sector, the Digital Concierge Programme aims to catalyse the growth of mobile services ecosystem in Singapore by encouraging the development of transactional, location-based and mobile commerce services for consumers and enabling businesses to target their customers more effectively through the mobile channel. IDA awarded six companies in April 2010 through the Digital Concierge Call-for-Collaboration to jointly invest a total of $10 million over the next two years to develop and deploy common mobile shared services and enablers. These include a directory of businesses, location positioning integrated with the telcos and remote payment. All enablers will be accessible by businesses and third-party mobile service developers alike, allowing them to bring to market a wide variety of transactional, location-based and mobile commerce services.
- In the area of trade and logistics, the TradeXchange was commissioned in 2007 to facilitate the exchange of information within the community. It provides a neutral and secure multi-party collaborative platform to integrate trade and logistics processes. A Call-For-Collaboration was recently awarded to four consortia involving 22 companies in the trade and logistics sector. Industry and government will jointly invest $6.3 million on projects to integrate key processes in marine cargo insurance, freight management and trade financing through TradeXchange as the multi-party collaborative platform. Through such integration,

companies will enjoy greater operational efficiencies, clearer supply chain visibility, faster shipment turnaround and increased productivity. For instance, suppliers can electronically apply for financing directly from their procurement systems to banks connected to TradeXchange.

- Beyond enhancing the economic competitiveness of the nation and the infocomm industry, the iN2015 vision is also about enriching lives through infocomm. IDA has three digital inclusion initiatives that bring infocomm to the public:
  - The NEU PC Plus Programme for needy students has benefited around 9,000 needy households through the provision of affordable computers, broadband access and software.
  - The Silver Infocomm Initiative tackles the digital divide by honing our senior citizens' IT proficiency, while addressing their needs for affordability and accessibility to infocomm training and computer resources. As at 2010, over 18,000 senior citizens have attended such training activities.

The Infocomm Accessibility Centre has provided for the disabled community, tailored IT training to almost 3,000 people with disabilities, including the use of assistive technology tools to help them maximise their potential in school, at work and in everyday life.

The global infocomm landscape continues to evolve and present new opportunities as Singapore continues on its iN2015 masterplan journey. Responding to the fast evolving environment, several strategic areas like Cloud Computing, Business Analytics and Green ICT, which have emerged recently in 2010–2011, will be considered by IDA for incorporation into the iN2015 programmes.

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Appendix I: Legal and Regulatory Policies

Telecommunications Act

The Telecommunications Act of 1999 (The Telecoms Act), passed by Parliament in tandem with the IDA ACT, provided much of the legal basis for IDA's actions as industry promoter and market regulator.

The Telecoms Act empowered IDA with the right to provide all telecommunications services within Singapore and gave it the authority to transfer that right to operators through its power to issue licences. IDA was also able attach conditions to licences, and it modifies those conditions where necessary.

Apart from licensing, the Telecoms Act also gave IDA three general options through which it could implement regulations. IDA could issue:

- "Codes of practice" and "standards of performance" that apply to all licensees offering services;
- "Directions" to specific licensees, instructing them to alter their behaviour and giving them a time limit for compliance; and
- "Advisory guidelines".

IDA also had the authority to allocate radio communications spectrum for both public sector and private sector uses. IDA collaborates with the Media Development Authority (MDA), the broadcast regulator, for the latter to assign frequencies to broadcast after IDA has decided on the national spectrum allocation for broadcasting service and cleared the technical operation for broadcast transmitters.

Beyond policy and regulation, IDA was tasked to promote the development of info-communications within Singapore. In general, its promotional activities can be grouped into three categories: (1) outreach to residents and companies to promote the use of information and networking technologies; (2) promotion and development of Singapore's info-communications industry itself; and (3) outreach beyond Singapore's borders to stimulate investment and provide an outlet for exports. IDA pursues these, in part, through organised and well-funded programmes to proactively subsidise and sponsor the development and adoption of new technologies, applications, services and business models. Initiatives and promotional activities range from technology fairs and expositions to providing seed money for research and development efforts.

Electronics Transactions Act

The Electronic Transactions Act, administered by IDA, was passed in 1998 as an enabling legislation to remove the uncertainty around the legality of contracts that are formed electronically, to give recognition to electronic signatures and to clarify the liability of network service providers that merely carry traffic. It establishes the voluntary licensing of certification authorities as trusted third parties in the online world to provide the basis for other trust relationships to be established. The Electronic Transactions (Certification Authority) Regulations stipulate the requirements for a certification authority to obtain a licence in Singapore, and the accompanying Security Guidelines for Certification Authorities (IDA 1999) stipulate the technical security requirements that must be met. There are also provisions in the Electronic Transactions Act that enable government agencies to easily implement electronic systems to transact with the public without the need to amend their own parent legislation.

Computer Misuse Act

The Computer Misuse Act, administered by the Ministry of Home Affairs and the Singapore Police Force, was passed in 1993 to deal with increasing incidents of computer crimes that were not readily caught by the provisions under the existing

Penal Code. Before its enactment, criminal acts involving computers did not clearly fall under traditional crimes such as theft or criminal breach of trust, thus making it difficult for the public prosecutor to bring charges against offenders. The Act thus created new offences, specifically unauthorised access and modification of computer systems. In 1998, the Act was further amended to address new attacks that had evolved with the spread of the Internet (e.g., denial-of-service attacks). It also recognises that some computer systems are critical to Singapore (e.g., the system for banking and finance, emergency services and public services) and thus metes out harsher punishment for offenders who gain unauthorised access to such systems.

In 2003, the act was amended again to make provisions in two specific areas. The first is for the Minister of Home Affairs to be able to authorise a person or an organisation to take steps necessary to prevent or to counter a threat to national security, essential services, defence, or foreign relations of Singapore, where there are reasonable grounds to believe that such a threat exists, before the offence is committed. The provision also grants added protection for the informants of such threats. The second area is for certain offences under the act to be compounded, thus allowing the police greater flexibility in taking action in incidents of minor offences. The act, since its enactment in 1993, has been extra-territorial in nature—that is, it applies to any person, regardless of nationality or citizenship, both outside and within Singapore. In particular, it will apply if the computer, program or data relating to an offence is in Singapore. The act does not require every computer crime to be reported. However, the MAS has required that all incidents involving financial institutions to be reported to it.

Public Key Infrastructure and Licensing of Certification Authority

The Electronic Transactions Act (Cap 88) (ETA) and the Electronic Transactions (Certification Authority) Regulations (ET(CA)R) provided for a voluntary licensing regime of CAs and empowered the Controller of Certification Authorities (CCA) to regulate and license the activities of CAs in Singapore. The Director-General (Telecommunications) of the Infocomm Development Authority of Singapore (IDA) is the CCA. As CAs perform a trusted role in verifying the identities of parties in electronic transactions, the CCA seeks to provide the assurance that the CAs' responsibilities are met and that these services are made available with high integrity, security and service standards. Only CAs that meet the standards set up by the Controller are licensed. There is currently one licensed operating CA in Singapore—Netrust Pte Ltd as of 14 June 2002.

A licensed CA enjoys the following benefits:

- Evidentiary presumption for digital signatures generated from the certificates it issues. With the presumption, the party relying on the signature merely has to show that the signature has been correctly verified and the onus is on the other party disputing the signature to prove otherwise. Evidentiary presumption hence

assures online merchants of the security of their transactions when they use such signatures to validate electronic contracts and transmit them over the Internet (or by other electronic means).
- Limited liability under the ETA. The CA will not be liable for any loss caused by reliance on a false or forged digital signature of a subscriber as long as the CA has complied with requirements under the Act. The CA will also not be liable in excess of the reliance limit amount specified in the certificate, even if it failed to observe some of its obligations.
- Licensing of a CA by the Controller is an indication to the public that the CA has met stringent regulatory requirements and is therefore trustworthy and deserving of consumer confidence.

Personal Data Protection

Singapore has both a strong common law tradition as well as appropriately structured statutory provisions to regulate use of personal data. Under the general law, confidential information may be protected under a duty of confidence. Personal information is also protected under sector-specific laws such as the Banking Act, Statistics Act, the Official Secrets Act and the Statutory Bodies and Government Companies (Protection of Secrecy) Act. There is, however, no overarching legislation for the protection of personal data in Singapore.

In February 2002, the National Internet Advisory Committee (NIAC) released a draft "Model Data Protection Code for the Private Sector" which is modelled on internationally recognised standards. The IDA and the National Trust Council (NTC) conducted a public consultation on the code. Based on comments from the industry and members of the public, the Model Code was fine tuned and released in December 2002 for private sector adoption.

The Model Code is a generic code that is available for adoption by the entire private sector. It applies to any private sector organisation that collects and installs personal data in electronic form, online or offline, using the Internet or any other electronic media. In the e-commerce area, the NTC has aligned its trust mark programme with the principles of the Model Code.

Intellectual Property Rights

In order to strike a balance between the protection of rights for owners of creative works and increased public access to intellectual property, Singapore ensured that its intellectual property and copyright laws are harmonised with the underlying principles in global laws on intellectual property rights (IPRs). For example, IPRs are accorded the standards of protection as prescribed by international agreements such as the World Trade Organisation's Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, and the Berne and Paris Conventions. The lead agency

for IPR protection in Singapore is the IPOS. The Infocomm Development Authority of Singapore (IDA) provides support in the info-communications aspects.

While the Internet has extended the reach of providers of information and other forms of content, it has also changed radically the ease to reproduce, distribute and publish such information and content. This has posed new challenges for intellectual property protection. The Copyright Act (Cap 63) was amended in August 1999 to reinforce Singapore's commitment to provide a strong and conducive IPR regime to encourage the growth of a knowledge-based economy and promote electronic commerce and creative innovations. The amendments aimed to:

1. Improve copyright protection and enforcement measures for copyright owners in the digital environment, thus promoting the use of the Internet for business. For example, the amendments—
   - Extended copyright protection to multimedia and interactive productions which qualify as intellectual creations;
   - Clarified that copyright owners enjoy protection against the making of electronic and transient copies of their work; and
   - Provided the conditions allowing an additional avenue whereby copyright owners may require Internet Service Providers to "take down" materials which may be guilty of copyright infringement, even before the owners initiate enforcement proceedings against the actual infringes.
2. Promote legal certainty in the usage of the Internet by clarifying the rights and obligations of copyright owners, intermediaries such as network service providers, and users such as educational institutions. For example, the amendments allowed end-users to browse materials made available on the Internet. The amendments also spelt out when intermediaries such as Internet Service Providers are exempted from liabilities.

Spam Control Framework

Spam is a complex, multi-faceted issue. As such, Singapore adopts a multi-pronged policy approach to address spam related concerns from users. This approach serves as a concerted effort by the public and private sectors to address the issues and curb spam in Singapore. This includes public education (including the use of appropriate technology measures), industry self-regulation, anti-spam legislation and international cooperation. The three major Internet Service Providers (ISPs), Pacific Internet (PacNet), SingNet and StarHub, under the facilitation of IDA, have come together to set up anti-spam guidelines. These guidelines serve as guiding principles to be adopted jointly by the three ISPs to help reduce e-mail spam for their subscribers. The DMAS launched an E-mail Marketing Code of Practice for its members. It also set up a Consumer Communications Preference Programme to allow e-mail users to register their preference not to receive unsolicited commercial e-mails. IDA and the Attorney-General's Chambers of Singapore (AGC) have completed joint consultations on a legislative framework to control e-mail and mobile spam in

Singapore. The proposed legislative framework seeks to balance the legitimate interests and concerns of different groups such as consumers and ISPs on the one hand, and marketers on the other.

Bibliography

Dynamics of the Singapore Success Story: insights by Ngiam Tong Dow, 2011.
Dynamic Governance: Embedding Culture, Capabilities and Change in Singapore. By Boon Siong NEO and Geraldine CHEN, World Scientific, 2007.
E-Government in Asia: enabling public service innovation in the 21st century. Compiled & edited by James SL Yong, Times Edition, 2003.
IDA Annual Survey On Infocomm Manpower for 2010, Apr 2011.
Briefing by RADM(NS) Ronnie Tay, Chief Executive Officer, Infocomm Development Authority of Singapore, at iN2015 Media Conference at imbX 2010, Singapore Expo.
NUS-eGL Sharing on Singapore's e-Government Maturity Model at ADB, 2010.
Infocomm Development Authority of Singapore, iN2015 <Imagine Your World. Reports by the Steering Committee and various Project Committees.
Lee Kuan Yew: Hard Truths to keep Singapore Going. By Han Fook Kwan, Straits Times Press, 2011.
E-Government Masterplan 2011–2015: Collaborative Government, IDA, 2011.

Chapter 3
Information Society and Consensus Formation in Finland*

Peter T. Knight and Jorma Routti

Introduction

Finland, a Nordic country bordering Russia and Sweden with a territory the size of Germany but a population of only 5.4 million in 2011, managed in the 1990s a high-profile breakthrough to the forefront of the international information society. The case of Finland is interesting for two reasons. First, Finland transformed itself in a short period from a resource-intensive economy into a knowledge economy very much driven by the information and communications sector. Second, this transformation coincided with a major economic crisis in the early 1990s. Recovery from a deep recession and major structural transformation took place simultaneously.

Finland's early industrialization took off in the latter part of the nineteenth century. It was based on abundant forest resources and initially on imported and later newly developed Finnish technologies. In the second half of the twentieth century, Finland had one of the highest rates of investment in Europe and from the Finnish forest and related metal industries successful global companies emerged as the economy rapidly moved into the top tier of Organization for Economic Cooperation and Development (OECD) countries.

*The main text of this chapter was completed in 2008 and has been only slightly altered to reflect this. A brief epilogue discusses some more recent developments, but the principal lessons of the Finnish experience remain the same.

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DOI 10.1007/978-1-4614-2086-6_3,

Table 3.1 Finland's rankings in international comparative studies

Study	Year	Rank
World Economic Forum (2007a) *Global Competitiveness Report 2007–2008, Global Competitiveness Index*	2007	6 of 131
World Economic Forum (2007a) *Global Competitiveness Report 2007–2008, Business Competitiveness Index*	2007	3 of 127
World Economic Forum (2007b) *Global Information Technology Report 2007–2008*, Network Readiness Index	2007	6 of 127
Economist Intelligence Unit e-readiness rankings 2008	2008	13 of 70
Accenture (2005) *Leadership in Customer Service: New Expectations, New Experiences* (e-government)	2004	6 of 20
OECD (2007) Pisa Science	2006	1 of 57
OECD (2007) Pisa Problem Solving	2006	1 of 57
OECD (2007) Pisa Mathematics	2006	1 of 57
OECD (2007) Pisa Reading	2006	2 of 57

In the 1990s Finland went into deep economic recession caused by an overheated economy, newly unregulated financial markets leading to a domestic banking crisis similar to the global crisis that began in 2008, and loss of attractive barter trade with the collapse of the Soviet Union. Many traditional Finnish industries with less competitive technologies and cost structures and limited market access suffered. Unemployment and government debt reached alarming levels. Finland's response to these difficulties was to craft new policies, strategies, and action plans. They were largely centered on increasing investments in Research and Development (R&D), enhancing open competition, and emphasis on information and communication technologies (ICT).

Today, Finland is not only one of the most open economies in the world, but also one of the leading ICT- and knowledge-based economies, ranking high in a number of international comparative studies (Table 3.1).

R&D investment as a percentage of GDP is one of the highest in the world—about 3.5%. Finland's innovation system generates a supply of new knowledge that yields clear economic and social benefits. This innovation system is considered one of the best in the world. Higher education enrollment is well above the OECD average; the number of researchers in relation to population is higher than in any other country. During the 1990s the economy oriented strongly toward ICT, and by the end of the decade Finland had become the most ICT-specialized economy in the world.

This remarkable e-transformation is exemplified by the rapid growth of Nokia and a powerful telecommunications cluster that has grown up around it. But it also based on long-term investments in knowledge and competence, complementary public sector activities, and citizens' active interest in ICT.

Such developments do not come easily, especially in the midst of a recession. Finland's path to success has been tough. The country got into deep trouble and had to undertake difficult fiscal and other policy changes to join the European Union and become internationally competitive. But national institutions for the formation of national consensus, including special programmes in economic policy management

and national strategy issues for national leaders conducted over decades, helped enormously in conceiving and executing these changes.

Finland's accomplishments have been the subject of intensive studies. International organizations, such as the World Bank and the World Economic Forum, have sought to analyze the country's accomplishments and institutions, to see what is behind its high standings in competitive ranking of regions and countries. Four times in the early 2000s Finland was ranked number one by World Economic Forum competitiveness index. Such rankings show fairly high degree of volatility and thus the possibility of rapid advances or decline is common as well as the emergence of winners and losers. This makes it important to study the factors of success and failure.

e-Development (in Finland known as Information or Knowledge Society Development), innovation systems, and consensus formation are discussed in this chapter in the wider context of structural changes in Finland's economy. The analysis and results presented here draw on studies conducted in Finland, including three consecutive national information society strategies formulated beginning in 1995 (Finland 1995, 2006b; Sitra 1998), and the World Bank book *Finland as a Knowledge Economy—Elements of Success and Lessons Learned* (Dahlman et al. 2006). The possibility of rapid improvement in international competitiveness exemplified by Finland is encouraging and the lessons learned can be useful to other countries, including the transition economies and developing countries. While Finland's institutions and policies cannot be transplanted directly to other countries, we believe many of Finland's experiences may serve as useful models that can be adapted to conditions elsewhere.

Overall Process of Information Society Strategy and Program Formulation

Since the mid 1990s, Finland has prepared three national information society strategies, which have set policy frameworks for its e-development. Subsequent to the publication of these three strategy documents, action plans were developed to implement them. Perhaps as important as the strategies themselves were the methods that were used to develop a national consensus behind them to secure their implementation.

In 1993, in the depths of the recession, Finland's Ministry of Trade and Industry prepared a new industrial strategy (Finland 1993) giving a central role to the ICT sector. In 1994 the Ministry of Transport and Communications prepared a *National Outline Policy for the Development of Information Networks 1995–1998* (Finland 1994) and the Ministry of Finance presented the report, *Finland—Towards an Information Society, A National Outline* (Finland 1995) presenting a vision of Finland as an advanced information society based on networking and becoming a world-class performer in the implementation of information and communications technology.

The second strategy, entitled *Quality of Life, Knowledge and Competitiveness, 1998–2005* (Sitra 1998), was prepared by the Finnish Innovation Fund (Sitra), an independent public fund under the supervision of the Finnish Parliament established in 1967 to promote the welfare of Finnish society. Since its establishment, Sitra has sought to promote stable and balanced development in Finland, the qualitative and quantitative growth of its economy, and its international competitiveness and cooperation.

The information society development theme was addressed in 1997–1998 in dozens of background reports commissioned by Sitra. The development of the information society as a national vision was recorded as: *Finnish society develops and utilizes the opportunities inherent in the information society to improve the quality of life, knowledge, international competitiveness and interaction in an exemplary, versatile and sustainable way*. In light of international comparisons, this vision has also been realized well, even if Finland has lost its position as the absolute frontrunner.

In the spring of 2003 the government of Finland began the implementation of four major policy programs to facilitate cross-sectoral cooperation in fields deemed to be of strategic importance. The Information Society Program, that ended in 2007, was one of those four programs, and was led and co-ordinated by the Prime Minister with the help of the Program Director. In September of 2003, the government appointed the Information Society Council (chaired by the Prime Minister and consisting of key representatives of the public administration, private sector enterprises, interest groups, and other civil society organizations) to serve as the negotiating and coordinating body between the various actors in society and oversee implementation of Information Society Program for the years 2003–2007.

The aim of the Information Society Program was to increase competitiveness and productivity as well as social and regional equality by utilizing ICT throughout society. The Program was also designed to maintain Finland's position as one of the leading producers and users of ICT in the world. In addition to these objectives, the Program set a target of promoting citizens' well-being and quality of life.

An information society for all was selected as the Program mission. An information society for all includes citizens (skills to use information society services), the public administration (reforming operating models and increasing efficiency through ICT), and enterprises (promoting competitiveness through ICT) perspectives (Finland 2007, p. 47).

The Government's strategy divided implementation of the Information Society Program into eight subsections:

1. Telecommunication infrastructure and digital television
2. Citizens' ability to utilize the information society and secure information society
3. Education, working life, R&D
4. Utilization of ICT in public administration
5. Development of social welfare and health services
6. Development of e-business and digital content and services
7. Government information management
8. Legislative measures to promote development of the information society

Table 3.2 Some metrics on Finland's e-development through 2006

	Start of the 2000s	2006
Number of broadband connections	315,000 (06/03)	1,309,800
Broadband availability	75.7% (06/03)	95.8%
Households with a broadband connection	15% (spring/03/ broadband) 29% (spring/00/ Internet)	56.5%
Internet use, 15-74-year olds	50%	79%
Internet use, 60-74-year olds	[a]	31% of women and 42% of men
Internet use, over the age of 74	[a]	4% of women and 10% of men
Made an online purchase	10%	49%
Participated in a computer course in the last 3 years	[a]	32%
Uses an online bank	[a]	63% of Finns 81% of Internet users
Feels capable of using an online bank	38%	77%
Citizens' trust in online banking	[a]	92%
Enterprises employing more than 5 people that have a broadband connection	39% (02)	77%
Enterprises employing more than 10 people that have a broadband connection	50% (02)	88%
Wage-earners using IT in their work	66%	75%
Authenthicated customer transactions in the Social Insurance Institute's electronic services	8,165 (08/04)	125,484 (08/06)
Number of the Tax Administration's TYVI users (automatic data flows between enterprises and the public sector)	50,000 (02)	180,000(forecast)

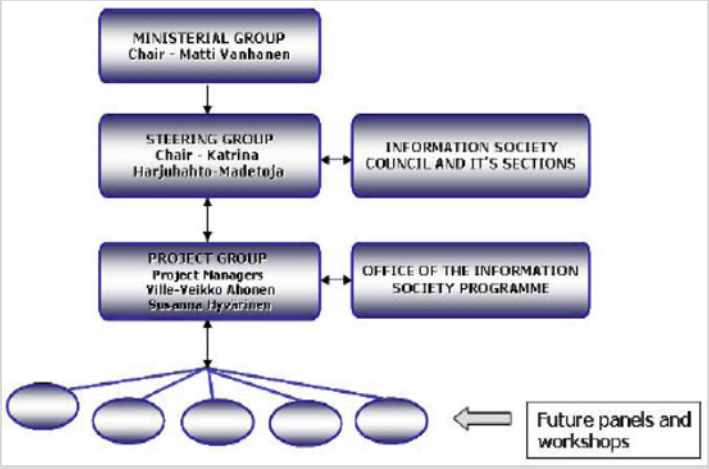
Source: Finland 2006b, p. 13
[a]Information unavailable

One of the key aims of the Information Society Program was to boost cooperation between and reform of public administration structures in order to ensure the availability and quality of public services. Reports provided detailed analyses of strengths and weaknesses, made policy recommendations, and included statistical appendices providing metrics on progress in attaining the strategic objectives and comparisons of Finland's achievements with those of other countries. The accomplishments over the period 2000–2006 are summarized in Table 3.2.

In January 2006 the preparation of a new National Knowledge Society Strategy for 2007–2015 was initiated by the Ministerial Group on the Information Society Program and published in September of that year by the Prime Minister's office (Finland 2006b). That strategy outlines a national vision and strategic intent concerning the kind of information society sought, and the process by which it was drafted is described in Box 3.1.

Box 3.1 Preparation of the National Knowledge Society Strategy for 2007–2015

The National Knowledge Society Strategy was drawn up in close cooperation with actors in many areas of society, including about 400 expert participants from central and local government, institutes of higher education, business, and industry and various organizations. Strategy preparation was preceded by an online questionnaire aimed at information society actors and a preliminary debate in the steering and monitoring group of the Information Society Programme. The official organization for the strategy process is presented in the diagram below.



The Ministerial Group on the Information Society Program was responsible for initiating the strategy process and for its general guidelines. The Information Society Council and its sections monitored the progress of the work and commented on the different versions of the strategy. The task of the steering group was to guide practical preparation work and decide on the key guidelines of the Strategy. A project group comprising representatives of various ministries handled the preparation and organizational work in cooperation with the Office of the Information Society Program.

During spring 2006, the Strategy content was prepared in a series of future panels and workshops involving about 150 experts. The future panels were used to outline what Finland will be like in 2015, and the workshops addressed the strategic intents and proposals for measures regarding development areas of the Strategy.

Source: Finland (2006b), p. 41, 43.

> The Strategy was drafted to support the transformation of Finland into an internationally attractive, human-centric and competitive knowledge and service society. Development of skills and creativity, bold renewal of structures and operating models, and efficient utilization of technology will make this possible, even under conditions of increasing global competition.
>
> In order to achieve the set targets, steering and project groups of the strategy defined the main projects for 2007–2011and initiation of a policy program for reforming public sector service structures.
>
> - Increasing connection speeds for information networks and ensuring the interoperability of the information society infrastructure.
> - Ensuring the prerequisites for lifelong learning
> - Reforming the rules for working life and developing leadership and supervisory work
> - Reforming the innovation system
> - Further development of the copyright system
> - Promotion of digitalization of business in small and medium enterprises
> - Influencing internationally, especially at the EU level, and close cooperation with Asian countries and neighboring regions

In addition to the main projects, the Strategy includes 72 proposals for measures intended to ensure Finland's transformation from an industrial society to an internationally attractive, human-centric and competitive knowledge and service society (Finland 2006b, p. 3).

From the vantage point of 2006, the authors of the strategy conducted a SWOT analysis and came up with the list of strengths, weaknesses, opportunities, and threats set forth in Table 3.3.

To take advantage of its strengths, reduce its weaknesses, benefit from perceived opportunities and confront the threats on the horizon, the authors of the strategy document developed a guiding vision of the kind of society Finland should have in the year 2015. The main elements of this vision and areas of focus for the strategy are set forth in Fig. 3.1.

Guidelines and measures aimed at reforming the service sector, improving quality of life and developing sustainable competitiveness in enterprises occupy a prominent position in the National Knowledge Society Strategy. These themes were approached from various angles: development of knowledge, application of existing and new information, creativity and innovation, structural and functional reforms, networking, and the utilization and development of technology. In the words of the authors:

> As a small country, we have selected knowledge development as our international success factor. Finland's success and competitiveness in the future can only be based on the continued and purposeful growth of productivity, quality and innovation in working life. The key factors in knowledge-based growth are flexible and networked work communities and their knowledge capital. This will require changes and investments in the adult, further and upgrading education systems (Finland 2006b, p. 19).
>
> A renewing, human-centric, and competitive Finland will:
>
> - Successfully reform its structures, operating models, services and product offering
> - Utilize throughout society the product, process, and service innovations made possible by digitalization; the resulting changes of which will be reflected in society as competitiveness, success, high service quality, and well-being
> - Encourage creativity and innovativeness as well as personal growth throughout society

Table 3.3 SWOT analysis from the strategy for 2007–2015

Strengths

- Ethos and morale of work
- Good free-of-charge education system
- Trust in electronic services and societal actors
- Citizens' readiness and desire to utilise electronic services
- Positive attitude towards ICT
- Technology expertise
- Good foundation for the national innovation system
- Open and safe society

Opportunities

- Successful reform and continuous development of effectiveness
- The creation of new business opportunities
- Structural reforms of the public and private sector and the innovation system
- National and international cooperation and networking
- Global markets, customers and export
- Social media and civil activity
- Sustainable development, energy and environmental sectors
- Finland's good international reputation

Weaknesses (in the following areas)

- Fragmented research and development
- Commercialisation and exploitation of innovations
- Sectoral and silo thinking, lack of intersectoral cooperation
- Understanding of the strategic nature of IT administration and ICT
- Lack of user and customer perspective in product and service development
- Utillisation and application of existing information and knowledge
- Digital content copyright questions (including employment copyright and multi-channel issues)

Threats

- Slow reaction to global changes
- Inability to reform structures and operating models, continuation of fragmented activities
- Growing regional and social inequality
- Deficiencies in skills and lifelong learning
- Vulnerability of the information society infrastructure
- Difficulty in reconciling work and family life
- Transfer of decision-making, production, ownership and expertise to other countries
- Reduction in external and internal entrepreneurship

Source: Finland 2006b, p. 14.

- Promote social and regional equality
- Cooperate with the private and public sector and boldly cross over traditional sector borders
- Do interactive and target-oriented international cooperation
- Implement a strategy-oriented operating model in innovation activities, in which education, research and product development and the utilization of their results form a balanced approach
- Support innovative and market-oriented R&D activities

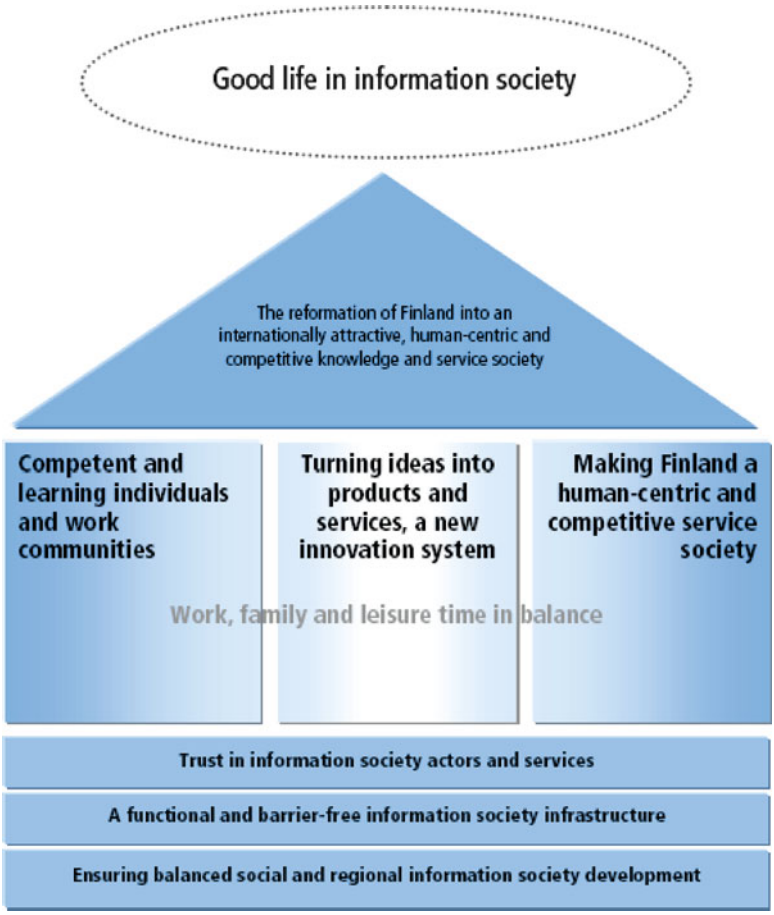


Fig. 3.1 National knowledge society strategy vision for 2015 and focus areas. Source: Finland 2006b, p. 21

- Invest in everyday innovations and content and services that make daily life easier for people and organizations
- Export successfully technology, product, service, and process innovations to global markets
- Effectively apply international technology, product, service, and process innovations in the private and public sectors
- Create opportunities for all members of society to utilize their own potential as fully as possible and appreciate various types of expertise
- Offer citizens opportunities to influence the development of society and express themselves
- Promote tolerance and interaction between cultures (Finland 2006b, p. 23)

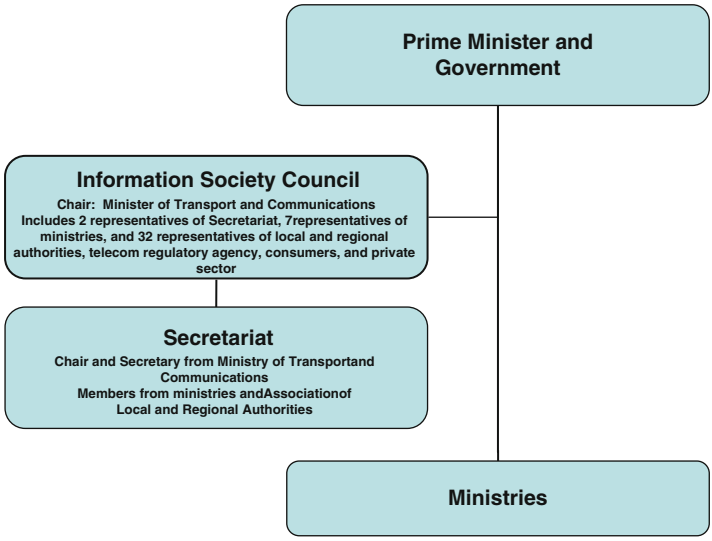


Fig. 3.2 Organization of Finland's ubiquitous information society advisory board

The information society is becoming a "ubiquitous" information society—more and more a part of citizens' everyday lives where everyone can be connected with everything, whenever and wherever. In June 2007, the new Finnish government that took office in April of that year passed a resolution adopted the term "ubiquitous information society," specified the most important aims and priorities for speeding up e-development in 2007–2011, and announced a decision to develop an action plan for the years 2008–2011, all within the framework of the strategy for 2007–2015 elaborated in 2006. This resolution also announced the formation of a new Ubiquitous Information Society Advisory Board, Chaired by the Minister of Communications, and charged it with developing an action plan for the years 2008–2011. The Board was expected to provide insight on the identification of priorities for the national information society policy as well as on the setting of ambitious but realistic goals.

Figure 3.2 shows the new institutional arrangements for coordination of Finland's e-development. They may be considered as a combination of two models (Shared Responsibility for Implementation and Policy Coordination with Leadership from Head of Government) described in Hanna (2007).

In terms of information society development, the key measures of the Government's term of office the Action Program foresaw five priority areas: improving information security, accessibility, and consumer-orientation; developing the information infrastructure with new capabilities for mobile identification, electronic invoicing and universal service; improving the innovation system; developing new content and services; and development of expertise and the regulatory framework. The priority projects in each of these are outlined in Table 3.4.

The Ubiquitous Information Society Advisory Board reports to the Government annually on the progress of key projects presented in the action program. The action program was supplemented flexibly during the Government's term of office and updated according to new measures or perceived shortcomings.

Infostructure and Connectivity

Developing Finland's infostructure has been an objective of the information society strategies, and in January 2004 a National Broadband Strategy was published. That strategy sought

- To promote competition within and between all communications networks.
- To promote the provision of electronic services and content.
- To stimulate demand for broadband services.
- To continue and develop special support measures in those areas in which there is insufficient demand for the commercial supply of broadband facilities (Finland 2004).

Figure 3.3 shows the rapid development of broadband connectivity through January 2007. In a final report on this strategy published that same month, the Ministry of Transport and Communications informed the government that:

The growth in the number of broadband connections in Finland was the fastest in the world in the first 2 years of the strategy period, and even in the third year it was the third fastest in Europe. The number of connections increased from about 300,000 at the start of the strategy period by well over a million, totaling 1,500,000 in January 2007. Finland's ranking rose from sixth to third in Europe and from fifteenth to seventh worldwide.

The regional availability of broadband has improved due to efforts not only by telecom operators but also principally by the municipalities and regional councils, whose regional broadband strategies are being put into effect in all parts of the country. By 2008, access to fixed network broadband services was possible for more than 96% of Finnish households. This figure stood at 75% at the start of the strategy period. It should also be noted that over half of all Finnish households have acquired a broadband connection.

The provision of wireless connections complementing the fixed network will allow the remaining households to be brought within reach of broadband (Finland 2007a, p. 1).

The penetration of broadband access has continued especially among small enterprises. The transmission speeds of enterprises' broadband connections are usually quite high.

Finland has reached a very high level of digital inclusion (Table 3.5). According to interviews carried out in spring 2008, more than 3.2 million Finns, or some 83% of the 16 to 74-year-olds, had used the Internet during the 3 months preceding the

Table 3.4 Priority projects in the Ubiquitous Information Society Action Program 2008–2011

Projects to develop basic requirements for the information society
National information security strategy to be updated by the end of 2008
National accessibility strategy to be updated during 2008 and necessary measures to be proposed to ensure unhindered access to information society services
Action program to be prepared to improve the consumer's position in offering of information society services
Projects to develop information society infrastructure
Conditions for the introduction of mobile identification will be established during 2008. Reform of legislation on certification services will be initiated. A resolution on ways to implement electronic identification will be prepared by the end of 2008
The national broadband strategy will be updated and a Government resolution on the strategy prepared by the end of May 2009. During 2008 the level of universal service obligation covering the whole country will be evaluated
Under the Advisory Board, an Electronic Invoicing Working Group will be established with the task of assessing measures to accelerate the adoption of electronic invoicing both in the public and private sectors and particularly in the consumer segment
Projects to develop the innovation environment and market
Information society development opportunities and needs will be taken into consideration in the national innovation strategy, and the strategy will be executed effectively
An Economic and Industrial Policy Working Group will be established under the Advisory Board. The Group will present its proposals for improving the operating conditions of the Finnish communications business and for promoting competitiveness
The outcome of the Government consultation on copyright will be implemented effectively and quickly, and the work of the Ministerial Working Group on Copyright will be integrated with the work of the Information Society Advisory Board
Projects to develop content and services
The EU audio–visual services directive will be brought into effect to provide a clear legislative framework for the offering of on-demand services. Legislation will be brought up to date in respect of new distribution channels for television programs, and necessary changes to operating license policy assessed
The transfer to high-definition television transmissions and other television technologies will be modestly promoted according to the market situation
A domestic and international online distribution market will be developed for cultural content
A large-scale multichannel one-stopshop/customer service center reform will be implemented by the central government and municipalities together
Electronic web portals will be implemented for citizens as well as companies and organizations
On top of the health-care electronic infrastructure efficient civic services will be built in cooperation with the public sector and business life. The utilization of information and communications technology will be promoted in social services
Projects to develop expertise and preparedness
In 2008 the private sector will initiate an extensive evaluation project to develop and safeguard software and other information technology expertise in Finland. In cooperation with business life, a project will be initiated to test information and communications technology opportunities in the development of learning environments, teaching and study
The cooperation of various actors will be tightened in the development of a safe media and network environment. At the same time, clear operating practices will be defined to promote, among other things, media literacy in children and young people as well as the responsible use of the media and the Internet. In addition, the self-regulation measures of various Internet organizations will be examined, as will the degree to which a changing media environment corresponds with legislation

Source: Finland (2007b), pp. 10–15

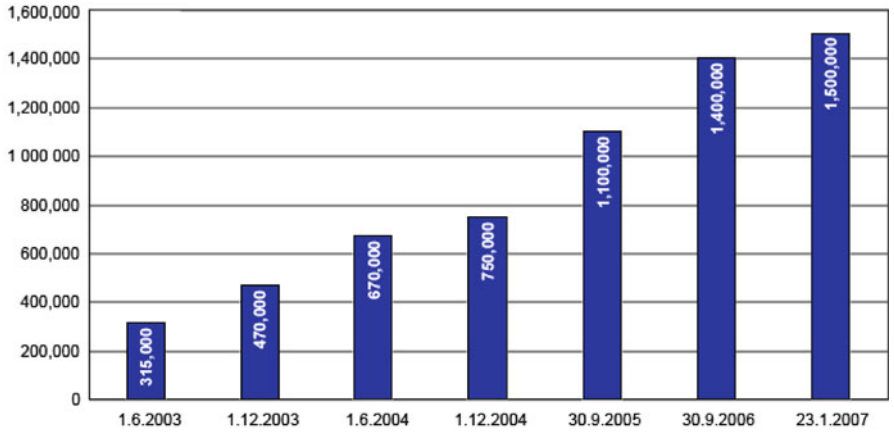


Fig. 3.3 Number of broadband connections in Finland, 2003–2007. Primary Sources: Ministry of Transport and Communications, Statistics Finland, FICORA. Secondary Source: Finland (2007a) Figure 1, p. 8

Table 3.5 Proportion of Internet users and purposes of use in the three preceding months in 2004–2008, percentage of 16- to 74-year-olds

	2004	2005	2006	2007	2008
Proportion of Internet users	70	73	77	79	83
Ordering or purchasing online	20	25	29	32	33
Sale of second-hand goods, products, and services at online flea markets, online market places, and auction sites	8	9	12	13	15
Online banking	50	56	63	66	72
Searching information on education and training courses	20	21	23	35	36
Use of browser-based news services	[a]	[a]	[a]	[a]	19
Reading blogs	[a]	[a]	15	26	31
Browsing travel and accommodation websites	42	48	53	57	58

Source: Survey on ICT usage in households and by individuals 2008. Statistics Finland www.stat.fi/til/sutivi/2008/sutivi_2008_2008-08-25_tie_001_en.html

[a]Data not asked

interview. In 2004 the corresponding percentage was 70. Internet use has become the norm: 78% of the population was going online weekly. Of the under 40-year-olds the Internet was used by nearly everyone, but the proportion of users starts to fall at age 40 and more clearly after reaching the age of 50. A good four in ten of the 60 to 74-year-olds used the Internet. However, in recent years Internet use has increased relatively the most among the over 60-year-olds.

Of the purposes of use presented in Table 3.5, online banking and browsing travel and accommodation websites were the most popular. Every third user had made online purchases. More and more second hand goods were being sold on Internet flea markets. Almost one-fifth of the users had subscribed to browser-based news services. The number of blog readers had doubled from 2006, and every third Internet user reported reading blogs.

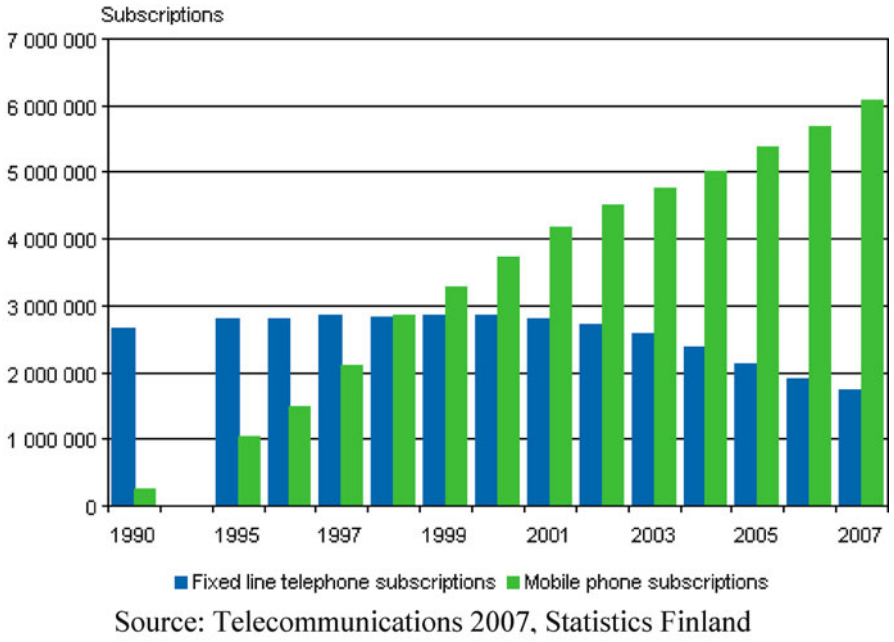


Fig. 3.4 Numbers of fixed line and mobile telephone subscriptions in 1990 and 1995–2007. Source: Telecommunications 2007, Statistics Finland. www.stat.fi/til/tvie/2007/tvie_2007_2008-06-05_kuv_001_en.html

As for fixed and cellular telephones, Finland has a very high penetration rate, with over 1 cellular per inhabitant in 2007. The number of fixed lines, as in many other countries, has been falling (Fig. 3.4).

Human Resources: Education Systems for the Knowledge Economy

In the knowledge economy, where the majority of the jobs involve information gathering, processing, and production, proficiency in these basic literacy skills forms the foundation for the efficient functioning of the society. Basic education provides the basis for developing these skills. Equal opportunity to acquire education is necessary for recruitment of the best talents needed for knowledge economy development. As shown in Table 3.1, Finland's basic education system is truly world class. Finland was first of 57 countries in OECD's 2006 Program for International Student Assessment (PISA), which surveys the knowledge and skills of 15-year-olds, in three of the four categories measured (science, problem-solving, and mathematics) and was in second place in reading.

The vision of lifelong learning lies at the heart of the Information Society strategy of the European Union (EU), outlined in its eLearning Program.[1] A major driver for this objective resides within the rapid demographic change of labor force and the need for continuous education. Network-assisted training has been suggested as a means for flexible and efficient "change of generation."

The development efforts on Internet-based schooling have produced a range of virtual learning environments and large differences exist among and within countries in the use of information technology in schools.

For the development of online tertiary level education in Finland, the Finnish Virtual University (FVU, www.virtuaaliyliopisto.fi) was established in 2001 as a cooperative project organization among all 21 Finnish universities. Together, the universities provide services that help students to find more flexible ways to study, and university staff to make the best use of new educational technologies. New technologies are also used to promote nation-wide networking among subject fields and other points of common interest. FVU's mission is to

- Help universities to carry out wide-ranging cooperation, promoting online learning and teaching
- Provide online information resources
- Develop compatible information systems
- Develop the basic infrastructure of full-scale electronic access services.

FVU also pursues these three objectives internationally, especially in Europe. Its goal is to harmonize universities' information systems and to share services to benefit students, teachers, researchers, and administrators. The organization has developed a national database that includes all the online courses provided by Finnish universities and targeted at graduate or postgraduate degree students, and that includes online student counseling. The teaching staff of the member universities, in turn, is provided online access to tools, materials, and support for the design and implementation of virtual courses. The ultimate aim of the Virtual University project has been to establish original operating models and services as part of permanent activities of universities.

Innovation Systems

USA, Japan and Germany have traditionally been heavy investors in R&D while recently Israel and Sweden have surpassed their levels. So has Finland where investments rose rapidly from 1.5% level in 1985, and from less than 1% level earlier, to investments averaging about 3.5% of GDP over the period 2000–2007 (Fig. 3.5).

High-technology exports (most of these high-tech exports are ICT products and services) accounted for about 5% of total Finnish exports in the early 1990s. Exports

[1] See http://ec.europa.eu/education/programmes/elearning/programme_en.html.

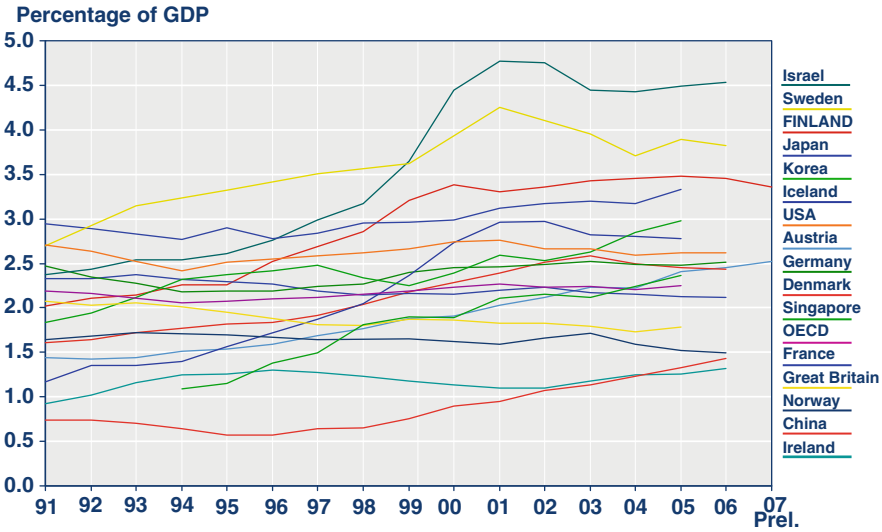


Fig. 3.5 R&D expenditures as a percent of GDP in selected countries, 1991–2007. Primary Sources: OECD, Main Science and Technology Indicators, and Statistics Finland; Secondary source: Tekes

were largely dominated by the forest industries, which still play a major role in the economy. However, dependence on the cyclical forest industry made the Finnish economy vulnerable and required frequent devaluations of the currency. Today this is not possible due to common Euro currency regime. In 2006 Exports of Finnish high-tech products totaled €11.2 billion or 18% of total exports of goods (Fig. 3.6). The increase in the share of high-tech exports has diversified exports as a whole and reduced dependence on a single industrial sector. It has also brought a significant positive balance to the high-technology trade, where exports are about twice the value of imports. This achievement of major structural change is of world record magnitude, largely based on telecommunications industries, new high-tech companies and knowledge industries.

ICT-Enabled Industry Transformation

The issue today is not high-tech vs. traditional industry. ICT is transforming user industries like forestry. The division of industries into low- and high-technology categories can be very misleading. Today all industries need to employ high technology contributions to maintain their competitiveness.

For instance, pulp and paper industries are today very high-tech industries (Fig. 3.7). Paper machines run at speeds of 120 km/h in manufacturing multicoated papers. Much of the development work for forest industries has been done in other

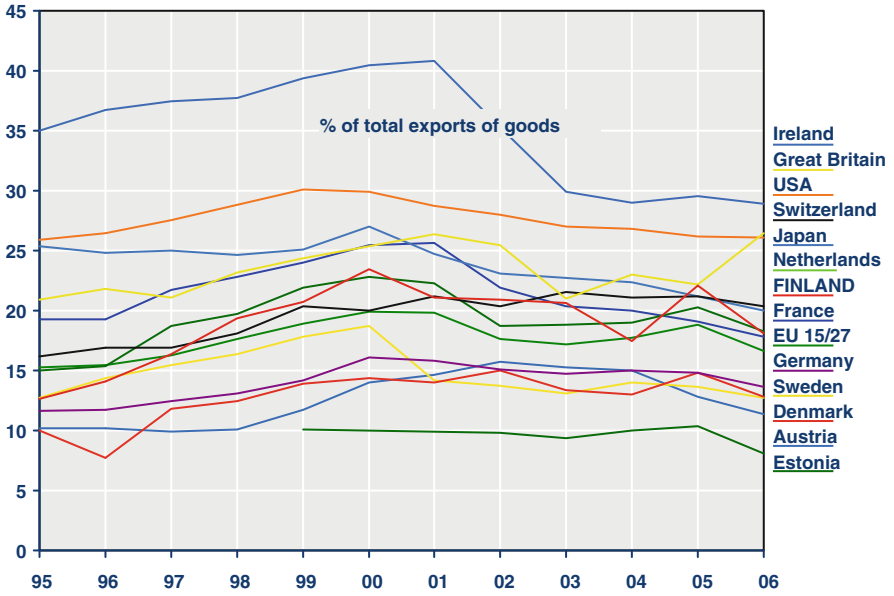


Fig. 3.6 High technology exports of selected countries, 1995–2006; Primary source: Eurostat; Secondary Source: Tekes

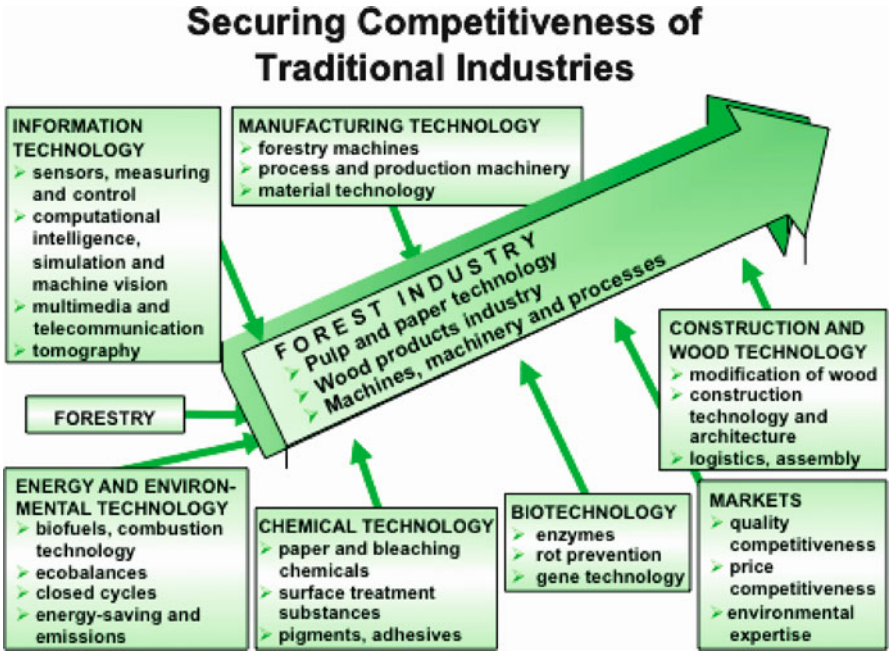


Fig. 3.7 Securing competitiveness in Finland's Forest Industry

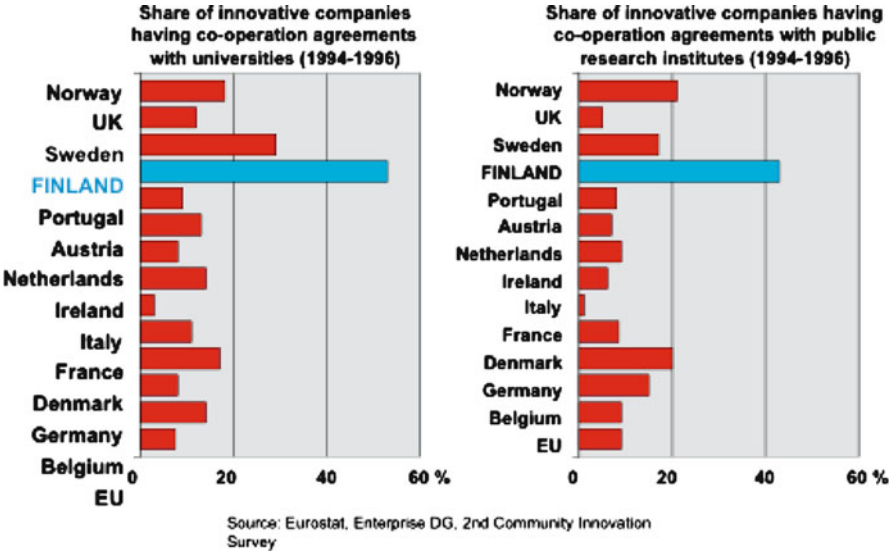


Fig. 3.8 Cooperation between companies, universities, and research institutes

industrial sectors and the results have then been injected into the forest industry sector. Thus, the forest industries have maintained their competitiveness and profitability, and have grown into the world dominance.

The situation is very similar in other traditional industries and also in agriculture. The erosion of employment cannot be compensated by creation of new industries if the traditional sectors are left in decline.

It is also very important to secure the competitiveness of small- and medium-size companies. They need to have access to the best technology but typically can not afford to have their own research personnel and facilities. Hence, they need access and collaboration with research capacities of universities and research centers. Such links are particularly strong for small- and medium-size companies in Finland (Fig. 3.8).

Competitive Funding and Integrated Innovation System

The key element of a successful R&D funding system is the independence of funding agencies and an appropriate balance between institutional (e.g., via budgetary allocation to universities and institutes conducting R&D) and competitive project-oriented funding, whether from the public or private sector (Fig. 3.9). The independence of funding agencies from policy formulation organizations lessens the pressures for political favoritism, allows flexible use of funding instruments and financial engineering as well as building up competent funding agencies with highly qualified personnel.

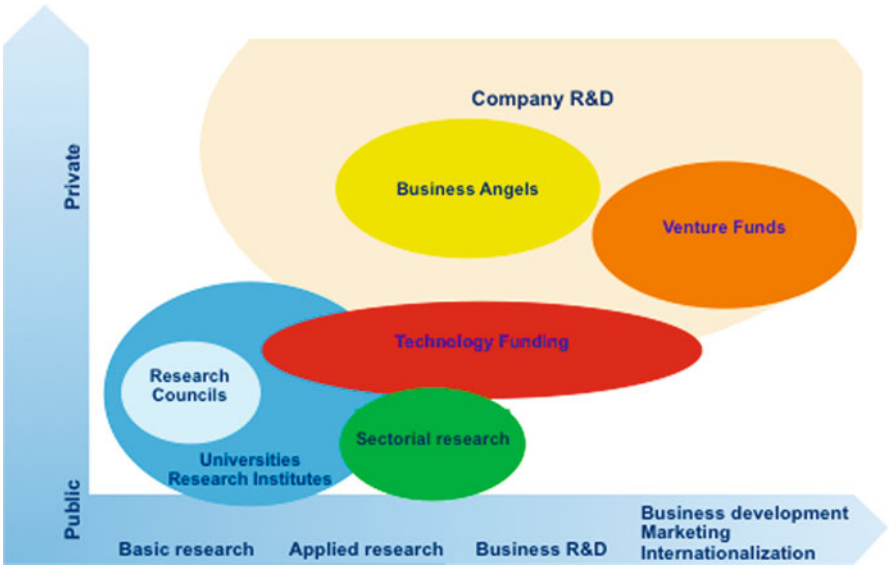


Fig. 3.9 Innovation and funding system in Finland. *Source*: Tekes

Competitive funding is closely related to independent funding agencies. In many countries, institutional funding still plays the leading role in innovation funding—for example, research universities are often directly funded by the Ministry of Education or Ministry of Science and Technology. In such a system money diffuses down through the system and an individual researcher has to be content with the success of her bosses in securing resources. Institutional funding is needed to assure the functioning of the basic educational and research institutions, but it needs to be complemented by competitive funding that offers many advantages.

First, it is easier to reorient funding than institutions. Thus new fields, such as nanotechnology, can be launched much faster than by trying to redirect old institutions to prioritize nanotechnology. With competitive, project-oriented funding, money will flow to the teams best prepared to undertake the research, independent of their institutional affiliation. Second, competitive funding makes it possible for talented and entrepreneurial researchers to receive much larger resources. Third, it is easier to set up multidisciplinary projects and university–industry partnerships to assure the utility of applied and technological research. And fourth, since all international funding is competitive, experience in competing for resources on a national level is mandatory for international success, as in competitive sports.

Innovation funding systems also need to be fully integrated so that no gaps are left in the support systems. Here again, funding agencies have a much better chance for success in including public–private partnerships than sector-based schemes. Finland's integrated funding system, portrayed in Fig. 3.9, is the result of several decades of planning and development of innovation polices. There is a full range of

different kinds of funding, involving both public and private sector funding agencies, spanning the full spectrum of R&D from basic research to heavily product-and-market-oriented development.

It is also important that the innovation policy questions are placed high enough in the agenda of public and corporate decisions. In Finland the highest policy organization is the Science and Technology Council chaired by the Prime Minister and including Ministers of Education and Trade and Industries, and maybe most importantly, the Minister of Finance.

Innovation and ICT Industry

In Finland the move to knowledge-driven growth was closely linked to the emergence of ICT and Nokia's success in focusing on mobile telecommunication in the late 1980s. This led to Nokia transforming itself from a diversified conglomerate into a company highly focused on wireless telecommunications and its emergence as the leading global mobile telephone company with some 35% market share worldwide (Fig. 3.10).

However, the ICT industry had started already in the 1960s by supplying process control, factory automation, and information technologies to key export industries. An important aspect of this stage of industrialization was also the opening up

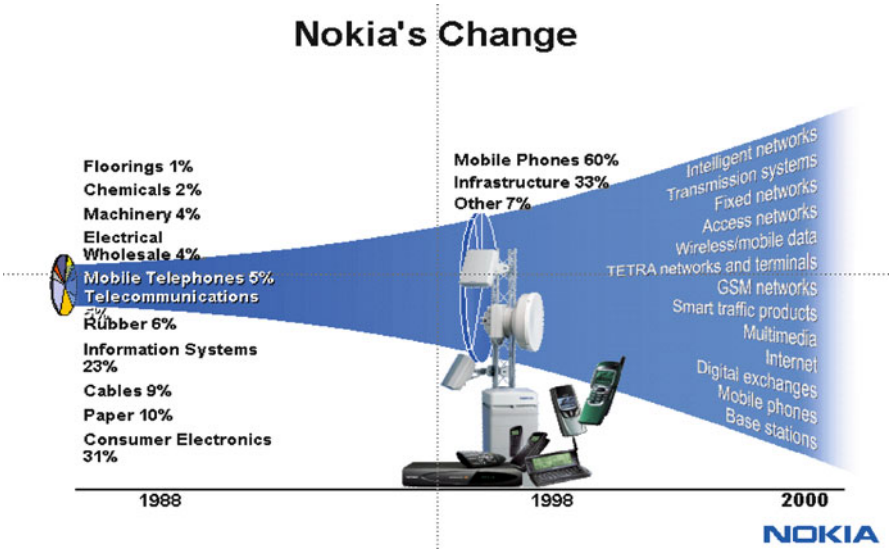


Fig. 3.10 Nokia's transformation, 1988–2000

Fig. 3.11 Services in the mobile information society

of the economy, when the internationalization of production really took off. The role of policies changed dramatically during this time. Innovation and technology policies became the focus of overall industrial and economic policies. The basic policy orientation shifted from traditional market interventions toward upgrading and creating sophisticated production factors and improving the overall business environment.

In the future we will see the convergence of different platforms and channels into wideband systems. Telecommunication has the potential of eliminating the disadvantages of peripheral locations and becoming an equalizer of opportunities.

Access through Internet and mobile communications helps to establish presence and collaborations on the global scale. This has accelerated the adoption of new design and operational tools for all industries as well for service sectors, including banking and financial services (Fig. 3.11).

Knowledge economies are evolving toward network systems where small research studios can be in collaboration with large international corporations. The evolution towards network economies is accelerated by modern telecommunications linking scientists, industrialists and policy makers all around the world.

The explosion of the number of new communication channels has created a great demand for new content, for instance in the mobile information society. Creative content industries represent the next wave of evolution after technologies. The very paradigm of value chains is changing rapidly (Fig. 3.12). The monopoly of distribution companies is disappearing, and the focus of investments is changing from distribution

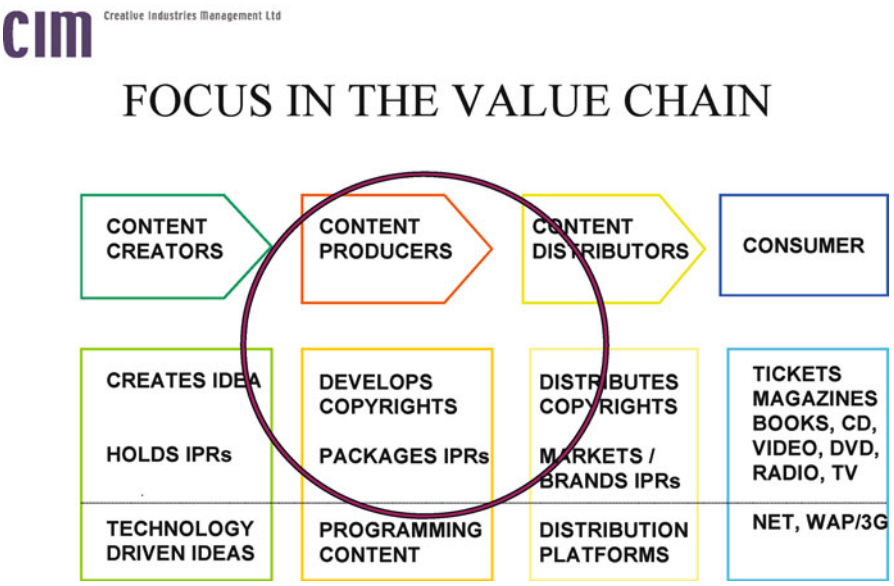


Fig. 3.12 Focus in the value chain

to content production. Entrepreneurial companies seeking channel-independent distribution will focus increasingly on content production as illustrated in the circled area in Fig. 3.12.

The content industries require local presence and global access. Not every country can have global information and communication giants, but they all need to be active in content creation based on local needs, languages and cultures.

Consensus Programs and National Strategies

Economic Policy and National Strategy seminars organized for key decision makers in Finland by Sitra, the Finnish National Fund for Research and Development, have contributed in an important way toward information society by building consensus in domestic economic and social policies and in wider international areas (Box 3.2). Today many countries are expressing an interest in sharing these experiences.

Box 3.2 Sitra's Economic Policy Management Seminars

Programs in economic policy management and national strategies have been organized by Sitra beginning in 1977. Sitra is organized as a foundation, and was established by the Finnish Parliament, to which it reports. More than 1,500 policy makers took part in these programs. The participants included most members of the Parliament during their first term, other decision makers in public sector, and industrial, economic, labor, and media leaders.

The length of the management programs is 1–2 weeks including visits to relevant organizations. Programs are structured to define the policy objectives and to choose the policy instruments, such as taxation structures, distribution of resources in different sectors, investments and incentives, and interest and currency policies that before the recent euro currency regime were of great importance on national level.

Some 20–30 lectures are given by the best domestic and international experts, each followed by a thorough discussion. They started with fiscal and monetary policies, then proceeded to structural questions in different sectors and ended up with discussion of long-term development options.

The most important part of the program is the common exercise of defining the policy objectives and the budgetary and other instruments to reach them. Participants play the roles of ministers a shadow cabinet where they assumed the roles of the different ministers. The exercise has been supported by competent economists and the best simulation models for the national economy, typically the same models as used by the Ministry of Finance and the Bank of Finland. Participants can request briefings by the different government agencies, just as would a parliamentary commission.

These Sitra programs are seen as means of building national consensus around how to achieve more general societal goals, such as quality of life, equal and fair opportunities, wealth generation and its distribution, balance between competitiveness and social security, environmental aspects, and sustainability. These goals are widely shared in the Nordic countries and considered part of the "Nordic Model" (Anderson et al. 2007). Legitimate differences in opinions remain, and are encouraged, concerning how to attain these goals, but it is important that there is a reasonable common understanding or consensus of causes and consequences of different policies.

Since Finland joined the European Union many policy issues have become more international and the horizons of the Finnish corporate world have become global. The economic policy management programs hence have been complemented by distinctively internationally oriented programs. Issues of European integration and currency regime, international organizations (e.g., World Trade Organization and World Bank), and developments in China, Japan, Russia, and the United States were introduced. The programs include international speakers, studies, and visits to the organizations and countries mentioned.

Reaching consensus on economic and social policies is neither easy nor desirable unless based on open debates. Policy objectives related on one hand to economic growth and employment and on the other to budget and trade balances and low inflation are often conflicting. In the short term, growth and employment gains can be obtained at the expense of balance and inflation while in the longer run such perceived benefits are quickly lost. Furthermore, the priorities attached to these different objectives are a matter of political preference. A young person entering the labor market prefers growth and employment while a retired person with fixed income favors stability and low inflation. One of the principal lessons conveyed in the national economic management seminars organized by Sitra is that economic policy involves strategic trade-offs between competing objectives, and long-term structural investments resulting from these strategic choices.

The interest of the Parliament of Finland in future studies and policy formulation is exemplified also by the establishment of the Committee for the Future as one of 15 standing committees. As of November 2008, it was still the only one of its kind in the world. Its task is to conduct active and initiative-generating dialogue with the government on major future challenges. The committee also has been given the special task of following and using the results of research on future trends (see www.parliament.fi).

Turning a Crisis into an Opportunity: Lessons from the Finnish Experience

What has actually happened in Finland between the early 1990 and today? Can we explain it? Are there any lessons to be learned?

The first basic lesson is that it is possible to make a dramatic recovery in GDP, undertake a major restructuring, and turn a crisis into an opportunity. A second important observation from the Finnish case is that a knowledge economy is an ensemble of elements that must be at least roughly in balance. ICT form one the basic pillars of the knowledge economy—and in the case of Finland became also a major element of economic structures—but other elements are important for information society and e-development. Technological infrastructure and innovation systems are in general necessary but not alone sufficient requirements for economic growth and development. Growth and development also require an educated labor force, competent entrepreneurs, proper economic incentives and opportunities. Recent economic research has convincingly shown that education above all is strongly complementary to technological advancement (Dahlman et al. 2006).

A third conclusion is that institutions and policies matter. The Finnish transformation to information society and knowledge-based economy was to a large extent a business-driven process, but policies and institutions played a role, too. There was a clear shift in policy-making in Finland in the 1990s. High priority was given to sound macroeconomic policies to overcome the recession, but at the same time there was a shift to microeconomic policies, i.e., innovation, technology, and education

policies. It was recognized that competitive edge of an economy is created at micro level: in firms, innovation and policy organizations, and educational institutions.

Finnish experience confirms what the recent economics literature emphasizes—institutions and organizations play an even more important role in economic growth than we have thought so far. In the case of Finland two key elements are worth mentioning: the education system and consensus-building mechanisms.

Education affects both supply of and demand for innovations. Human capital and skilled labor are instrumental in generation of new technologies, but the demand side is equally important. New technologies are not demanded and adopted without sophisticated users. The Finnish education system emphasizes egalitarian values: equality by gender, region, and socioeconomic background. In terms of e-development, the digital divide can not be accepted and competitiveness requires the recruitment of and opportunity for all talent.

Economic policy and national strategy programs organized for key decision makers in Finland have contributed in an important way to its knowledge economy by building consensus in domestic economic and social policies and in wider international arenas. The change in policy regime in the 1990s would probably not have been possible without preceding consensus-building efforts.

A final implication from the Finnish experiences relates to the importance of focusing not only on what can be learned from the past, but also on anticipating and preparing for the future. This is one of the key lessons of the Finnish example and explains to some extent why Finland not only was able to make such a dramatic transformation to a knowledge-based economy, but also why it has been able to remain so competitive for a relatively long time.

Knowledge has become the major source of economic growth and social development all around the world. As a consequence of globalization, ICT-driven dissemination and utilization of knowledge and information has accelerated significantly—new ideas and innovations spread throughout the world economy faster than ever.

Knowledge-based growth and development can offer new opportunities for both developed and developing economies. In particular, ICT and e-development can provide new means for developing countries to speed up and even leap-frog phases of development. Adoption of ICT can also enhance integration into the global economy. For developed countries, the knowledge-based economy provides new opportunities for further specialization, improving productivity, and achieving sustainable development.

Epilogue

Many things have changed since the above text of this chapter was drafted in 2008. Rather than updating the whole text it is more instructive to write an epilogue. The lessons learned in the original text remain valid but several new orientations have been chosen in light of recent local and global developments.

Significant changes that have occurred include the following:

- The rapidly changing balance between the economic powers
- The emergence of knowledge economy as the mainstream of advanced countries
- The heightened concerns of threats of climatic changes and long-term sustainability
- The content rather devices and networks becoming the major driver of ICT industries
- The immediate and lasting impacts of the financial crises since of 2008

The recent financial crisis has accelerated the changes already happening and left immediate and long-lasting impacts on Finland's economy. Significant changes had to be made to recover from these difficulties and while much progress has been achieved many challenges still remain.

The financial crisis has been the first major recession in the networked global economy and has been compared with the great depression of the 1930s. Catastrophic consequences have been avoided through globally coordinated economic policy measures, but structural changes have become significant. The economic weight of Europe and the United States has diminished in proportion to China and India and other emerging economies.

The impact on Finland's economy has been quite severe. In many ways Finland became the victim of its own success. The country had developed a strong export-oriented economy concentrating in investment rather than consumer goods. Exports and GDP shrunk more than at any other peacetime period. The investments typically come late in the economic cycles and hence the recovery will be slower than in many other countries.

These difficulties were compounded by already long-foreseen challenges of changing global economic structures, aging population and changing support ratios, and the maintainability of the Nordic welfare society system while balancing the public sector budgets. The public debt has grown more than the European average, though from a better starting point than elsewhere.

Latest developments point to increasing optimism and success in maintaining the balance and improving competitiveness while preserving the key elements of welfare society. However, this requires improvements in public sector productivity closely linked to the success of ICT solutions in this field.

Accelerated efforts have been put in place to reach such goals. The number of local administrative units will decrease significantly and new harmonized ICT systems are being developed for e-government, health, and educational systems. In the university world larger and more integrated universities and alliances have been formed, also adopting new and more streamlined foundation structures, like in the new Aalto University combining the Helsinki University of Technology, Helsinki School of Economics and the University of Art and Design.

Also the innovation systems have been oriented more towards user needs and market demand rather than the earlier technology-push modes. The venture capital industry has diminished in importance, as elsewhere in the world, and has concentrated more in restructuring operations rather than in start-ups and seed capital.

New challenges also face the Finnish telecom giant Nokia. While it has maintained the largest global market share in mobile telephones, it is facing tougher competition especially in the advanced smart mobile phones. New operating systems and generations of new devices are now coming to the markets, and the very high production efficiencies and wide market access show promising possibilities for the future years, hence the new partnership with Microsoft in smartphone development.

In this chapter the growing importance of content was analyzed and emphasized. In recent years this trend has accelerated and today content has become the principal driver of the ICT industries. For instance in mobile telecom systems hardware manufacturers provide technology platforms with operating systems and user devices, telecom operators provide network connections and roaming services, but the content is typically provided by independent companies and entrepreneurs rather than by hardware suppliers or telecom operators.

However, the need to provide platforms for content creation and distribution sets requirements for hardware and network systems. Harmonized operating and distribution systems and a limited number of technology platforms rather than a multitude of operating systems and end user devices facilitate the content business. These trends favor networking between large and small companies and individuals rather than vertical integration used in many other industries.

The principal messages and conclusions of our chapter remain valid. The importance of successful ICT strategies and implementations has only grown in the recent developments in globalized and networked societies. These developments pose many challenges especially to smaller nations and regions but they also offer exciting possibilities for new and small players whether in central or peripheral locations around the world. Sharing experiences and adopting best practices still offer the most expedient avenues for realizing such benefits.

Bibliography

ACCENTURE. *Leadership in Customer Service: New Expectations, New Experiences.* The Government Executive Series, April 2005.

ANDERSON, Torben M. Bengt Holmström, Seppo Honkapohja, Sixten Korkman, Hans Tson Söderström, and Juhana Vartiainen. *The Nordic Model - Embracing globalization and sharing risks*. Helsinki: Taloustieto Oy for The Research Institute of the Finnish Economy (ETLA), 2007

CASTELLS, Manuel and Pekka HIMANEN (2002). *The Information Society and the Welfare State - The Finnish Model*. Nova York: Oxford University Press.

DAHLMAN, Carl, Jorma ROUTTI and Pekka YÄ ANTTILA (2006). *Finland as a Knowledge Economy: Elements of Success and Lessons Learned.* Washington, DC: World Bank Institute.

ECONOMIST INTELLIGENCE UNIT, E-readiness rankings 2008—maintaining momentum. Available at http://a330.g.akamai.net/7/330/25828/20080331202303/graphics.eiu.com/upload/ibm_ereadiness_2008.pdf.

eu2006.fi.(2006).*Presidency Conclusions*. Helsinki.(available at http://ec.europa.eu/information_society/eeurope/i2010/docs/high_level_group/i2010_presidency_conclusions.pdf.

LEMOLA, Tarmo (2002). "Convergence of national science and technology policies: the case of Finland". *Research Policy* 31, 1481–1490.

FINLAND, Information Society Council (2005). *Toward a Networked Finland*. Helsinki: Prime Minister's Office, February. 2005. ISBN: 952-5354-86-5 Available at http://www.vnk.fi/julkaisukansio/2005/tietoyhteiskuntaneuvosto/verkottuva-suomi/en.pdf.

FINLAND, Information Society Council (2006a). *Efficiency and Vitality in Future Finland*. Helsinki: Prime Minister's Office, February. ISBN: 952-5354-97-0. Available at http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/elinvoimainen-suomi/en.pdf.

FINLAND, Information Society Council (2006b). *A renewing, human-centric and competitive Finland: The National Knowledge Society Strategy 2007–2015*. Helskini: Prime Minister's Office, September. ISBN: 978-952-5631-24-1 Available at http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/tietoyhteiskuntastrategia/en.pdf. Society Strategy 2007–2015

FINLAND, Minsistry of Education (2000). *Higher Education Policy in Finland*. Helsinki.

FINLAND, Ministry of Finance (1995). *Finland—Towards an Information Society, A National Outline*. Helskini.

FINLAND, Ministry of Trade and Industry (1993). *National Industrial Strategy for Finland*. MTI Publications 3/1993

FINLAND, Ministry of Transport and Communications (1994). *National Outline Policy for the Development of Information Networks 1995–1998*. Helsinki, November 30.

FINLAND, Ministry of Transport and Communications. *National Broadband Strategy*. Helsinki: January 29, 2004. Available at http://www.laajakaistainfo.fi/english/strategy.php.

FINLAND, Ministry of Transport and Communications (2007a). *National Broadband Strategy—Final Report*. Helsinki: Publications of the Ministry of Transport and Communications 11/2007. Available at http://www.laajakaistainfo.fi/english/nationalbroadbandstrategy_finalreport.pdf.

FINLAND, Prime Minister's Office (2004). *Finland's competence, openness and renewability. The final report of the 'Finland in the Global Economy' project*. Helsinki: Prime Minister's Office Publications 26/2004. Available at http://www.vnk.fi/tiedostot/pdf/en/91776.pdf.

FINLAND, Ubiquitous Information Society Advisory Board and Secretariat. (2007b) *Ubiquitous Information Society Action Program 2008–2011*. Helsinki. ISBN: 978-952-201-727-7.

FINNISH NATIONAL FUND FOR RESEARCH AND DEVELOPMENT - SITRA (1998): *Quality of Life, Knowledge and Competitiveness, 1998–2005*. Helsinki: SITRA, 1998.

HANNA, Nagy K (2007). *e-Leadership Institutions for the Knowledge Economy*. Washington: World Bank Institute.

Hernesniemi, H.; Lammi, M. e Pekka YLÄ-ANTTILA (1996). *Advantage Finland. The Future of Finnish Industries*. ETLA Series B-113 and SITRA 1249. Helsinki: Taloustieto Ltd., 1996.

OECD (2002). *Measuring the Information Economy*. Paris: Organization for Economic Co-operation and Development.

OECD (2007). *PISA 2006 Science Competencies for Tomorrow's World*. Paris: OECD.

PORTER, Michael (1990). *The Competitive Advantage of Nations*. London: McMillan.

ROUTTI, Jorma (2001). *Research and Innovation in Finland—Transformation into a Knowledge Economy, Catching the Knowledge Wave*, Conference, Auckland, New Zealand, 1–3 August.

ROUTTI, Jorma (2002). *Economic Policy and National Strategy Programs in Finland*, World Bank and Ministry of Foreign Affairs, Helsinki, Finland, March 26–28.

ROUTTI, Jorma (2005), Research and Innovation in Finland—Transformation into a Knowledge Economy, in KUKLISNKI, Antoni and KrzystovPAWLOVSKI(Eds.) *Europe—The Strategic Choices*. Nowy Sacz, Poland.

ROUVINEN, Petri and Pekka YLÄ-ANTTILA (2003). Little Finland's Transformation to a Wireless Giant, in DUTTA, LANVIN E PAUA (eds), *The Global Information Technology Report—Towards an Equitable Information Society*. Oxford University Press/World Economic Forum: New York & Oxford.

WORLD ECONOMIC FORUM (2007a). Global Competitiveness Report, 2007–2008. Palgrave McMillan. Ranking available at http://www.gcr.weforum.org/.

WORLD ECONOMIC FORUM (2007b). Global Information Technology Report, 2007–2008. City: Palgrave McMillan. Ranking available at http://www.weforum.org/pdf/gitr/2008/Rankings.pdf.

ZYSMAN, John (2004). *Finland in a digital era: How do wealthy nations stay wealthy?* Helsinki, Prime Minister's Office publication 25/2004, 2004. ISBN 952-5354-67-9. Available at http://www.vnk.fi/julkaisukansio/2004/j25-finland-in-the-digital-era/pdf/fi.pdf

Useful www Addresses

http://www.aka.fi Academy of Finland

The Academy of Finland is the prime funding agency for basic research in Finland. Other key agencies funding science and technology in Finland are Tekes, the Finnish Funding Agency for Technology and Innovation, and Sitra, the Finnish Innovation Fund. The Academy operates within the administrative sector of the Ministry of Education.

http://www.research.fi

Research.fi contains key statistics and other data on Finnish science and technology. There are also links for more in-depth information: statistical and other publications, documents and databases.

http://virtual.finland.fi/

Virtual Finland is produced by the Department for Communication and Culture's Unit for Public Diplomacy at Finland's Ministry for Foreign Affairs. The site provides a wide range of information about Finland.

http://www.stat.fi/index_en.html Statistics Finland

Statistics Finland is the official statistical agency and a large array of statistics is available online.

http://www.cimfunds.com CIM Creative Industries Management

As a venture capitalist CIM makes equity investments for a limited time span into content companies: entertainment, education, and intellectual property rights (IPR) industries. CIM helps companies develop their operations and gain international markets. CIM expects good commercial return for its investments. CIM Finance & Research Ltd is a Helsinki-based financial advisory and fund management company founded in 2001. The founders are Messrs Heikki Masalin and Jorma Routti. We develop and manage innovative financial instruments independently and powered by prominent financial institutions as well as public and private investors. CIM Finance & Research Ltd has both its own personnel and some shared personnel with sister company, CIM Creative Industries Management Ltd.

http://www.culminatum.fi Culminatum Ltd Oy Helsinki Region Centre of Expertise

Culminatum is a development company owned by the Uusimaa Regional Council, the cities of Helsinki, Espoo and Vantaa, and the universities, polytechnics, research institutes and business community of Helsinki region. Culminatum manages the Centre of Expertise Program within Helsinki Region over the current third program period 2007–2013. This program promotes utilization of the highest international standard of knowledge and expertise in business, job creation and regional development.

http://www.digibusiness.fi

The general objective of the digibusiness cluster programme is to facilitate the development of digital content products and services. The competence cluster aims at enriching the lives of the citizens as well as intensifying corporate and public-sector operations. Digibusiness Finland focuses on developing content business expertise in companies in the field to penetrate the international markets. The activities are intended for growth companies.

http://www.etla.fi ETLA, the Research Institute of the Finnish Economy

ETLA, the Research Institute of the Finnish Economy, is the leading private economic research organization in Finland. Established in 1946, ETLA has throughout its existence been quick to apply new methods and approaches to shed light on current economic issues. From early on, ETLA has charted the effect of education and research on productivity and growth. In the 1990s ETLA contributed significantly to the revamping of Finland's industrial policy on the

basis of identified industrial clusters. More recently, ETLA has analyzed factors that foster innovation and facilitate adoption of new technology, and thereby promote the development of a knowledge economy.

http://e.finland.fi

This site offers accurate and up-to-date information on Finnish ICT know-how and Finnish Information Society functions and solutions in a nutshell, introducing Finland as what it has rapidly become—a country where Information Society of tomorrow is a reality today. The daily updated site offers information in the form of timely expert articles, statistics, and fresh news on a wide range of Information Society-related topics under the main headings of e-Business, e-Government, e-Education & e-Culture, Mobility, and Research & Development.

Finnish Venture Capital Association http://www.fvca.fi

The Finnish Venture Capital Association was established in 1990. The actual members of the association are entities acting in the Finnish private equity and venture capital markets. The goal of FVCA is to develop private equity and venture capital as an industry and promote the interests of its members in Finland. FVCA is a member of the European Private Equity & Venture Capital Association (EVCA).

Information Society Programme of Finland http://www.infosoc.fi

The aim of the Government Information Society Program is to improve competitiveness and productivity, to promote social and regional equality and to improve citizens' well-being and quality of life through effective use of information and communications technologies. The Information Society Program is one of the Government policy programs. The other policy programs are Employment Policy Program, Entrepreneurship Policy Program and Civil Participation Policy Program.

Parliament of Finland, Committee for the Future

http://web.eduskunta.fi/Resource.phx/parliament/committees/future.htx

The Committee deliberates parliamentary documents referred to it and, when requested to do so, makes submissions to other committees on future-related matters, which are included in their spheres of responsibility and have a bearing on development factors and development models of the future. The Committee conducts research associated with futures studies, including their methodology. The Committee also functions as a parliamentary body that conducts assessments of technological development and the effects on society of technology.

http://www.sitra.fi Sitra, Finnish National Fund for Research and Development

Sitra, the Finnish Innovation Fund is an independent public fund which under the supervision of the Finnish Parliament promotes the welfare of Finnish society. Since its establishment, Sitra's duty has been to promote stable and balanced development in Finland, the qualitative and quantitative growth of its economy, and its international competitiveness and cooperation. Sitra was set up in conjunction with the Bank of Finland in 1967 in honor of the 50th anniversary of Finnish independence. The Fund was transferred to the Finnish Parliament in 1991.

http://www.tekes.fi Tekes, Finnish Funding Agency for Technology and Innovation

Tekes is the main government financing and expert organization for research and technological development in Finland. Tekes finances industrial R&D projects as well as projects in universities and research institutes. Tekes especially promotes innovative, risk-intensive projects.

http://www.tieke.fi Finnish Information Society Development Centre, Tieke

Tieke promotes e-Business in Finland and internationally. It provides expertise and services both to companies and individuals. The aim is to provide standards, practices, and policy for the international e-Business of the future.

Chapter 4
A Decade of e-Development in South Africa: Sufficient for a "Services (R)evolution"?*

Lucienne Abrahams and Arthur Goldstuck

South Africa Economy and Society: A History of Mobility and Rise of a Services Economy

South Africa's history is one of migration and mobility, due to successive centuries of continental migrations, its colonial history, the separate development policies pursued between 1948 and 1990, its social diversity and its relative political openness. During previous centuries, migration and mobility were key features of South Africa with workers migrating from rural areas and neighbouring states to the mines and towns to work, often in menial, low-income jobs. In the late nineteenth and twentieth century, mining and subsequent manufacturing activity laid the foundations for the growth of a services economy. Following democratisation in 1994, South Africa became an attractive destination for the mobile middle class and for people working in service industries across the continent. These and other trends laid the foundation for the emergence of an era of mobile communications in Africa.

For the purposes of this discussion, mobility arises when economic conditions require the constant movement of people outside a fixed workplace, in order to engage in economic activity. Thus, economic mobility could be between the workplace (including home) and a range of other points in an economic network, or between the home and several constantly changing points in a geo-economic space in order to facilitate the flow of goods and services. Mobility, in this sense, is more typical

* This chapter builds on the work *The State of e-Development in South Africa: A view from the end of the first decade of the 21st century* by the same authors, a 2010 LINK public policy paper.

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of economic activities in the services sector than in the agricultural, mining or manufacturing sectors. It is the services sector that requires workers and consumers to be mobile in order to provide or receive a service. Since people in this sector are highly mobile, they can benefit significantly from services that are mobile, facilitated by mobile communications technologies. This relationship between mobility, communications technology and the services sector is an important perspective from which to look at South Africa. This is because the services sector is the largest contributor to GDP at around 66% as compared to manufacturing at 14.8%, mining at 9.6% and agriculture at 2.5% (AfDB 2011). It shows the highest contribution to annual GDP growth and it is the most innovative sector, the sector which is most undergoing transformation from a linear industrial model into a virtual adaptive-network model. Manufacturing and agriculture have been in decline over the period 2005–2010 and even before that, limiting their sectoral impact on economic growth. Thus, while Information and Communication Technologies (ICTs) in manufacturing and agriculture are important, these sectors are unlikely to be the sites of e-transformation of the economy in the next 2 decades.

What is today the City of Johannesburg was founded on the migration of people from across continents, just a little more than 130 years ago; and in 2011 Johannesburg, the most populous part of South Africa with more than 3.5 million people, experiences significant in-migration from other provinces and from the continent at large. People of many origins live and work in this city and seek increasingly innovative and affordable ways to communicate with families and households remaining elsewhere. Similarly, entrepreneurialism in a middle-income economy requires mobility in order for small traders to secure income, as well as for large corporations to conduct business in overseas markets. Six million South Africans have Internet access on their phones. Of these, 39% of urban users and 27% of rural users are browsing the Internet on their phones (Goldstuck 2011). Given the attractiveness of mobile devices, features and applications to consumers, South Africa's future economy and society may come to rely more on mobile voice and data communications for its development than it does today.

South Africa's industrial economy is concentrated in six metropolitan municipalities, including Johannesburg, Tshwane, Ekurhuleni, Cape Town, eThekwini and Nelson Mandela Metro.[1] The services sector fans out from these highly urbanised centres to the lesser-known regions of rural KwaZulu-Natal, Mpumalanga, Limpopo and the Eastern Cape, providing an income base and other economic flows for firms and households, including low-income households and small-scale rural businesses. The economic expansion of these rural geographies, which are largely dependent on services sector activity, requires, amongst other resources, affordable access to ICT infrastructure and electronic services, including high bandwidth services, in

[1]Ekurhuleni and Tshwane are two of the three metropolitan municipalities in Gauteng province. Ekurhuleni incorporates the historical manufacturing hub of the East Rand, while Tshwane incorporates the city of Pretoria and the administrative centre of national government. eThekwini is in the KwaZulu-Natal province and includes Durban; Nelson Mandela Metro is in the Eastern Cape province and includes Port Elizabeth.

order to access and create economy-relevant content, knowledge and trade opportunities. Furthermore, there are significant levels of mobility between the metros and the less-urbanised areas, seeing regular movement on a daily and weekly basis, in addition to mobility amongst that section of the population that travels to the rural home base once a year.

In this chapter, the following three questions are posed: How well is South Africa positioned in terms of its e-development? How does South Africa fare with respect to its policy leadership and performance of the key institutions that contribute to e-development? Is the level of e-development sufficient to promote socio-economic transformation through a "services revolution"? The concept of "e-development" is used here to signify a time in which societies advance due to the socio-economic effects of very rapid information flows, and development is enhanced through the integration of digital information and communication technologies in the economy and everyday life.

The chapter adopts Hanna's e-development analytical frame (Chapter 1), which depicts the linkages amongst key elements of e-transformation, namely the relationship between leadership through policies and institutions, ICT industry development, information infrastructure evolution, human resource development and advances in e-government, e-business, e-society. Hanna observes the centrality of leadership in the complex processes of change, from societies formed through many centuries of industrialisation, towards societies in which economic success and social well-being is increasingly shaped by the rapid digital communications. It can be inferred from this particular view that weaknesses in leadership by policy or regulatory institutions will negatively affect the progression of e-development and the value gained by particular social and economic constituencies. The chapter uses this framework to analyse data from ten distinct studies conducted by the authors over the period 2009–2010.

It further acknowledges Melody's (2002a) analytical frame with respect to the information society, which emphasises the role of ICT in facilitating development in services-based economies. Melody's framework, incorporating a requirement to review information infrastructure, e-society, e-business and e-government, is useful because it draws attention to the predominance of the services sector in the twenty-first century economy. This is certainly applicable to South Africa, where the growth and strengthening of the services sector has played a significant role in economic development in the last 2 decades.

The State of e-Development

South Africa is comprised of nine provinces (See map in Fig. 4.1), has a population of 49 million people and billion. South Africa's 2007 investment climate profile (AfDB 2009, pp. 314–315) gave mixed views on the quality of infrastructure and innovation, reporting that only 36% of firms were using the Internet to interact with clients and suppliers, while only 12.4% of firms were using technology imports,

Fig. 4.1 Map of South Africa. *Source*: www.places.co.za

including communications technology imports, in their businesses. It is necessary to dig deeper into the state of ICT infrastructure and services to see a clearer picture of e-development as it emerges.

Information Infrastructure: Network, Services and Media Sectors

The South African telecoms sector is characterised by having only a few players, hence limited competition and high market concentrations in major market segments. There are three firms operating in the fixed-line market (Telkom, Neotel and Dark Fibre Africa), four in the mobile market (Vodacom, MTN, Cell C and Telkom) and three firms or consortia in the undersea cable market (Telkom, Seacom and the Eassy consortium of telecoms operators which incorporates a special purpose vehicle for Internet service provider [ISP] participation).

Only since 2009, have all telecoms players including ISPs been licenced to build their own network infrastructure, prior to which service providers were required to lease their facilities from the incumbent operator, Telkom, at high prices.

Infrastructure for mobile communications has been deployed over the past 16 years, densely in the metros and towns, with increasing reach to small towns and rural villages, as well as along national and provincial arterial roads, the main purpose being to connect visitors to South Africa's attractive nature and eco-tourism spots.

The market for value-added services in South Africa is largely composed of Internet access and services and wireless applications services. The ISP market has matured over the last 15 years and there are an estimated 726 ISPs operating across the country. The wireless applications market has approximately 250 service providers, offering an open field for innovation in, for example, redesigning Internet applications for the mobile/wireless telephony environment and creating mobile commerce solutions. This market is likely to develop substantially in the next decade with regard to business ICT services.

South African Internet users are now served by three undersea cable systems effective 2009, the Eassy and Seacom cables landing on the KwaZulu-Natal north coast linking South Africa to the Middle East, with onward connections to the UK and India; and the SAT3/SAFE system with landing points at Melkbosstrand and Mtunzini, linking South Africa to Europe and the Far East. The WACS and ACE cables are scheduled to bring in even higher bandwidth from 2011. The 80 Gbps capacity available to the African continent in 2008 was upgraded to 5.4 Tbps by 2010 and is scheduled to be 17 Tbps by 2013, of which 8.4 Tbps will be available to South Africa (Goldstuck 2010, p. 47) (Fig. 4.2).

Broadband (ADSL) and mobile broadband (3G) technology lagged behind the introduction of Internet-based services such as online banking, travel and accommodation bookings, research and educational content in the early part of the decade, the irreversible shift from low-bandwidth dial-up to broadband becoming a feature of the communications landscape only in 2008 (Goldstuck 2010, p. 136), opening up the market for electronic services. Broadband provisioning is a highly concentrated market, fixed broadband is offered by Telkom and Neotel, fixed wireless broadband by Telkom, iBurst and Sentech and mobile broadband by Telkom, Vodacom, MTN and Cell C. Most ISPs are offering fixed broadband services, however, this is usually reselling Telkom's ADSL services, as local loop unbundling has not yet been regulated. Municipal broadband infrastructure has been built or is in the process of being built by four metropolitan municipalities including Johannesburg, Ekurhuleni, Tshwane[2] and Cape Town, but service provision to firms and households has yet to be launched. Fixed and mobile broadband packages with a data transfer limit from as low as 50 MB to as high as 10 GB are on offer and mobile broadband has rapidly become the preferred mode of access away from the workplace. The maximum speeds on these packages range from 384 Kbps to 10 Mbps for fixed-line broadband, and from 1 to 42 Mbps on mobile broadband. These are theoretical maximums and are seldom

[2]Ekurhuleni and Tshwane are two of the three metropolitan municipalities in Gauteng. Ekurhuleni incorporates the historical manufacturing hub of the East Rand towns, while Tshwane incorporates the city of Pretoria and the administrative centre of national government.

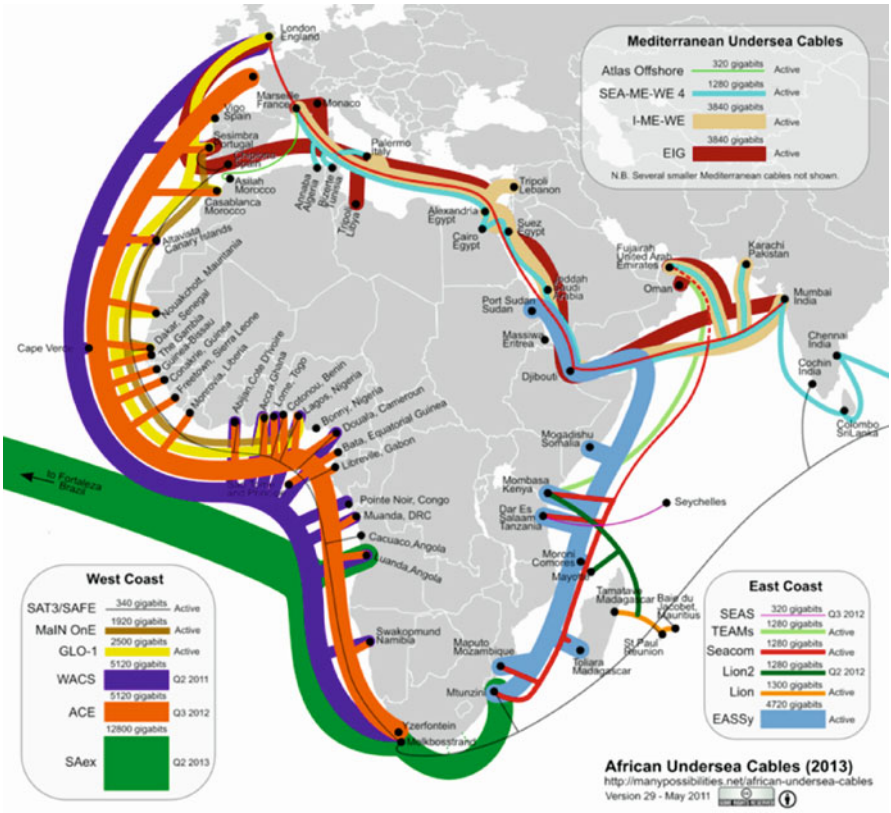

Fig. 4.2 Emerging undersea cable system for Africa (South Africa). *Source*: Song (2011), http://manypossibilities.net/african-undersea-cables/

seen in practice. Figure 4.3 illustrates the increase in broadband access between 2003 and 2010 and it is estimated that there will be 3.5 million unique broadband users by end 2011.

A crucial area of technology development and regulatory focus for an increasingly mobile national and continental population is the management of the radio-frequency spectrum, specifically the assignment of spectrum for mobile and fixed broadband services. Following initial award of GSM spectrum licences (900 MHz) to Vodacom and MTN in the 1990s, spectrum assignment has only again begun to receive attention in the last decade, with mobile operators being given licences to operate in the 1,800 MHz band (GSM) and the 2,100 MHz band (3G). Neotel was awarded a licence to operate CDMA in the 800 MHz band and licences were awarded to iBurst, Sentech and the two fixed-line operators for wireless broadband services (WiMAX) in the 2.6 and 3.5 GHz bands (Song 2010). Freeing up of spectrum for novel uses and technology innovation in, for example, cognitive radio is beginning to emerge on the agenda, but the pace of e-development here remains slow.

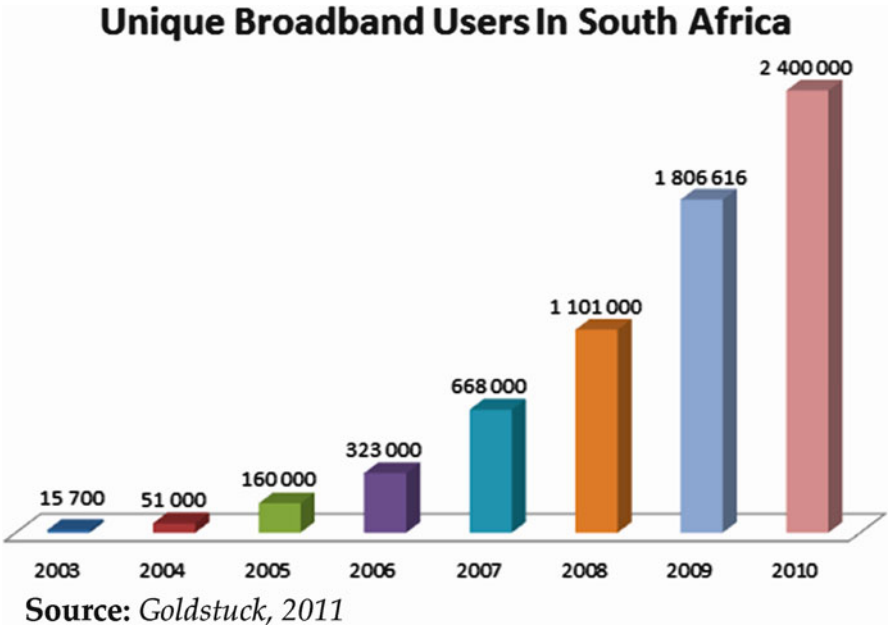

Fig. 4.3 Exponential increase in broadband usage 2003–2010. *Source*: Goldstuck (2011)

A range of broadcast and value-added electronic services (Internet, other) are available, connecting a proportion of South African firms and households to global communications and to the services sector, though lack of affordability means that the majority of households do not have access to digital content and programming. The local broadcast market comprises the multimedia network operator and broadcast network provider, Sentech; the multi-channel South African Broadcasting Corporation (SABC, 15 public broadcast radio stations covering all 11 languages[3] and 3 commercial radio stations), free-to-air station eTV and satellite subscription service provider Multichoice Holdings. In addition, there are 13 licenced private commercial radio stations and 126 community radio stations. Four pay-TV channels were licenced in 2007, including TopTV a competitor to DStv. However, there is no effective competition in the pay-TV market. Strong local contender Telkom Media, a subsidiary of the incumbent telecoms network operator, struggled to develop a viable business model, was bought out by a Chinese investor and, now called Super 5 Media, was granted a third 6-month extension to launch broadcast services by the regulator, ICASA, requiring it to begin by September 2011. Lack of competition in the sector means delays in bringing innovations such as video-on-demand, IPTV and other interactive digital media to South African audiences.

[3]Languages are Afrikaans, English, IsiNdebele, IsiXhosa, IsiZulu, Sesotho, Sesotho sa Leboa, Setswana, siSwati, Tshivenda and Xitsonga.

Radio and TV broadcasting is still a largely analogue environment for the majority of the country's viewers. South Africa's broadcast infrastructure is more than 15 years old, but not yet obsolete. Digital migration stalled during 2009–2010 because of policy inconclusiveness regarding the choice of a digital migration standard. The DVB-T2 standard has now been adopted by South Africa and the SADC region and the original switch-on date scheduled for November 2008 was delayed until December 2013. Much remains to be done to ensure that South African households will be able to receive the digital signal, requiring government to address possible subsidies for up to 4.5 million set-top boxes to address the needs of the 10% of households who do not access TV due to reasons of lack of affordability.

Slowly, the historical bottlenecks in Internet access are being opened. In 2007–2009, broadband emerged as a key network infrastructure. In 2009, competition emerged in the undersea cable market enabling market segments like universities to access cheaper bandwidth through their consortium, TENET,[4] though consumers are not yet benefitting from affordable international bandwidth due to continued high retail prices. Furthermore, in 2011 initiatives in spectrum policy and regulation may open up the availability of this scarce resource. Collectively, these features could create a new landscape for e-development, but this future is still vague and uncertain. Looking back over the first decade of the twenty-first century, we may see a greater number of inhibitors than enablers of e-development. Future policy initiatives will need to address the necessary linkage between e-development on the one hand and the major areas of economic activity, namely (r)evolution in the services sector.

ICT Industry Development: Co-Evolution with the Services Sector

The information technology sector is a highly competitive industry, characterised by many players building IT networks for corporate business, for government and large organisations like universities and with an extensive range of firms offering software and services. There is only very small-scale local manufacturing of electronic goods, but South Africa has the benefit of increasingly affordable electronic devices due to bulk importing.

The IT market, led by multi-nationals like IBM, Cisco and Tata[5] and local companies like Dimension Data and arivia.kom,[6] was estimated at USD9.5 billion in 2010 (BMI 2010, p. 1), with more than 2,428 companies and a workforce of 141,929 people operating across the hardware, software and IT services markets (Schofield 2009, p. 2). The total ICT workforce is significantly larger when we include firms across all sectors that employ ICT workers, but there remains a significant skills shortage.

[4]Tertiary Education NETwork, a consortium for universities that buys bandwidth at wholesale prices.

[5]Through its indirect subsidiary Financial Network Services Pty Ltd. (Africa).

[6]Two of the top five companies in the IT sector.

The sector enables the increasing utilisation of ICT goods and services as tools for business operations, communications and transactions. South Africa's large and medium-sized companies have extensive digital operations, incorporating converged services across IT, mobile voice and Internet platforms. On the other hand, small companies, employing 50 people or less are more limited in their deployment of IT, using only the minimum requirements, except in sectors such as tourism where both voice and Internet are necessary business requirements. The top three areas for ICT priority usage in firms in 2009 were ranked as follows: application development, network infrastructure, and business intelligence/knowledge management. Other areas of usage include customer relationship management, information security, mobile computing, software as a service and web development (Schofield 2009, p. 3). Provincial and metropolitan level government and public sector institutions are large-scale IT users, effectively utilising electronic document management systems rather than paper bulk storage systems. But, smaller sub-national governments have fewer resources due to a lower tax base and hence are less likely to have IT integrated into or facilitating their operations.

South Africa has historically had a software development capability, but this has remained at a very low level of maturity, with the software industry operating largely at CMMI level 1, though a few individual firms may operate at a higher level.[7] A larger proportion of IT practitioners worked in the software than in the hardware environment in 2009, 46% as compared to 35%, designing bespoke solutions, database management systems and e-commerce solutions, and implementing packaged solutions (Schofield 2009, p. 8). For 15 years, the IT sector has been a co-creator of firm-level capacity to generate innovations in banking, online retail, tourism and hospitality and other services.

Innovation in the economy is a necessary condition for development, thus also for e-development where ICT can enable innovation in the services and other economic sectors. How well does South Africa wear the label of being an "innovative developing country"? In the most recent year for which comprehensive data is available (2008/2009), gross expenditure on R&D was 0.92% of GDP[8] or approximately ZAR21 billion, placing South Africa below China and the Russian Federation, but higher than India in terms of GERD; there were 1.4 full-time equivalent (FTE) researchers per thousand of the workforce and a total of 19,384 FTE researchers, 39.7% of whom were women (DST 2010, pp. 9 and 13). In the period 2000–2009, South Africa created an increasingly innovation-oriented business and academic environment, consistently increasing its annual R&D expenditure by almost ZAR2 billion per annum. However, the global financial crisis slowed innovation investment between 2008 and 2010. As reported in a recent science and technology indicators

[7]CMMI or Capability Maturity Model Integration is a framework for software management, where at the initial level 1, performance of the software is unpredictable; while at the highest level 5, software engineering process improvement is institutionalised.

[8]GERD is the gross domestic expenditure on research and development as a percentage of GDP.

report (NACI 2009, pp. 20–21), the country's research effort[9] is highest in the geology, petrology and mining fields (activity index 7.7), but low in computer science and engineering; information technology and communication systems; artificial intelligence, robotics and automation; electrical and electronic engineering, where South Africa's innovation activity is considerably lower than the world average (activity index between 0.3 and 0.5 for these fields).

Innovation adoption is moderate, as can be expected in a developing country where innovations are attractive, because there is considerable need for new productive technologies and new services, but they are not necessarily affordable. Given that, innovation adoption is dependent on income for both firms and households, those innovations which will bring the greatest returns per investment rand are likely to be most attractive. Thus, the relative power of communications technologies, as against their cost of adoption and use, positions ICT as an early adoption technology, as compared to health or other production technologies.

ICT-enabled innovation has been most observed in the services sector, a key sector promoting economic growth throughout the 1990s, laying the foundation for further growth in the twenty-first century. While value-added in all economic sectors grew steadily between 1970 and 2007, value-added in the financial and insurance sectors increased fastest overall, particularly after 2000. The financial services sector contributed 17.3% (nearly one-fifth) to GDP in 2007, including exports of services to the value of ZAR16.4 billion. There is also consistent foreign direct investment in the attractive retail banking sector (TIPS 2009a). This strong sector growth occurred during a period in which mobile and Internet banking were not yet as popular channels as they are in 2011. Nearly a decade of growth in real gross domestic fixed investment in financial services between 1999 and 2007 has helped to build a financial services sector with a well-integrated electronic services component, including an informational dimension and a transactional dimension. However, South Africa has not developed a broad services sector strategy, despite attempts to do so in 2004–2008 and innovation strategy does not focus on the services sector.

The third largest component of the services sector is wholesale and retail, hotels and restaurants, contributing 14% to GDP. The sector is relatively volatile in income terms and is easily undermined by economic shocks, whether local or global, such as recessionary shocks. This can be observed from the fluctuations in annual contribution to GDP between 2000 and 2008 from a high of 8% in 2001 to 0.5% in 2008. Investment in the sector is significant at over ZAR10 billion a year since 2001 reaching ZAR23 billion in 2008 (TIPS 2009b). The sector has not evolved consistently in terms of its online profile, though cinemas and increasing numbers of restaurants take online bookings; and the hotel and accommodation sector is very well represented online, offering the capacity for online reservations and payments

[9]The activity index, used in the National Science Indicators Database, Institute for Scientific Information, Philadelphia, gives an indication of a country's research effort in particular fields relative to the world average, with an activity index of 1 indicating equivalence between the research effort for the country and the world average.

across the full price range and for all provinces. Advertising for the sector is still more powerful in the print media, with more limited advertising available in the broadcast and online media.

The travel and tourism sector took a big knock with the global slump, with arrivals down from 9.9 million in 2009 to 8.0 million in 2010. However, the sector still generated income of ZAR101.3 billion in 2009 and ZAR189.4 billion in 2010 (7.9% of GDP), the increase being partly due to a boost from the international soccer world cup. An interesting feature of travel and tourism is that (in 2009) domestic tourism benefitted from 30.3 million trips by 15 million people, contributing ZAR22.4 billion to GDP (SA Tourism 2009). For both foreign and domestic tourists, mobile voice and Internet communications are important media for staying in touch with the home or work base and for making travel decisions, hence the travel and tourism sector drives revenue to the communications sector. Most tourist venues, including hotels, bed and breakfast accommodation, bars and many restaurants have special "hotel" pay-TV packages, which earns major revenues from this market.

The sector also drives innovation in services, for example, electronic location services such as *iFind*, where the subscriber sends an SMS to the *iFind* number and receives information about the location of particular venues. The domestic tourism campaign "Sho't Left" can be accessed at www.shotleft.co.za and is aimed primarily at the youth market. South Africa's public sector tourism agency specifically documents the objective to "enhance creativity and innovative practices" in its annual report and reports on the use of websites, international television and cinema and online global marketing to push the development of the sector. In 2009, 1,272 billion consumers visited South Africa's tourism websites and left 88 million online impressions (SA Tourism 2010, pp. 17 and 52), indicating strong adoption of electronic means of information access for the sector. The agency notes the value of e-marketing "International research shows the digital platform to be the preferred travel research method, regardless of language or location, and positioning South Africa online allows us to access this rich resource and drive travellers to our shores" (SA Tourism 2010, p. 64) and reports that website traffic grew 350% in 2009, following the agency's revitalised online presence directed at more than 230 countries and territories, its call centre and national tourism phone number for local and international mobile roaming access.

Government services include the large services sub-sectors of education, health, policing and local government services, as well as the much smaller sectors of trade and industry, environmental management, low-cost housing and the many administrative functions across departments. The South African government is generally a good user of computing infrastructure for administrative purposes. But it has been a poor user of electronic communications services for interaction with the public, largely due to the absence of guiding policy after 2001, limited initiatives at cross-governmental collaboration on building e-services and lack of a holistic innovation-based approach to e-governance (Abrahams 2009). The government sector is one where many new opportunities lie for e-development that is for the enhancement of government services and communications through the effective application of advanced digital infrastructure and technologies.

Small and medium enterprises (SMEs) operate primarily in the services sector, drawing revenue from wholesale and retail, travel and tourism and services to government and business. Small-scale tour operators, local craftspeople and people who use their homes as tourist accommodation, offering the "South African tourism experience", are a new cohort of mobile and Internet users and this is a market sector that will grow in the next decade, taking e-development into the low- and middle-low-income sectors of the economy through global marketing and communications.

By contrast, the communications sector contributed 5% to GDP. Between 2000 and 2008, investment in the sector grew by 14% per annum including backbone networks, mobile, broadband and pay TV. As revenue for the communications sector moves beyond voice traffic and becomes increasingly data driven, further investment is essential. However, growth is dependent on sectors such as financial services, wholesale and retail, hotels and restaurants and will fluctuate with development in these sectors. The communications sector also earns revenue on the continent. As Africa's GDP has "more than doubled" (Ryan 2011) over the decade 2000–2010, this has generated increased revenue flows to South African firms. For example, it is reported that mobile communications firm, MTN, generated USD1 billion in revenue in Nigeria alone (Ryan 2011), though much of this revenue may remain outside South Africa, flowing to investors, manufacturing suppliers and strengthening new markets.

Since households access electronic services, we need to look at the contribution of the information technology sector to household computing and Internet access. There has been at least a decade of household computer use, laying the foundation for volume firms such as Matrix Warehouse and Incredible Connection, selling computers and peripherals at prices affordable to most middle-income and some lower middle-income households. Low levels of household penetration of computers may begin to improve as large numbers of second-hand laptops come into the marketplace, though the second-hand market is underdeveloped as regards hardware sales and maintenance. More agile, cheaper devices such as netbooks and tablets are also likely to be attractive to the household market.

The electronic content industry is relatively small and still in the early stages of development. International broadcast content is generally supplied by commercial digital satellite television broadcaster DStv, whose subscribers are likely to have access to a far greater range of information on world politics, international disasters, movies, sports and general knowledge than viewers of channels on the SABC, the public broadcaster. The more prolific local producers of Internet content are the media, financial, retail, tourism and entertainment sectors, some provincial and all metropolitan governments. An area of content building that is only just getting going is that of online educational content, as computer access in schools has slowly become more widespread, offering limited pre-packaged content rather than creative, constantly-updated content over the Internet. The local TV, film and advertising sectors are based almost exclusively in Johannesburg and Cape Town, but the future of this sector as an electronic content generator and innovator is still relatively unexplored. Given the country's 11 official languages, including 9 indigenous languages,

there is opportunity for creative work in TV, advertising and educational content, but the relatively small audiences for the majority of local languages means that limited content is produced other than in IsiZulu, IsiXhosa, Sesotho, Afrikaans or English.[10]

ICT Human Resources and Skills

The total ICT workforce, comprised of ICT core workers (developers, designers, practitioners) and ICT end-users (using ICT for work purposes across all economic sectors) has been estimated to be in excess of one million people for most of the decade to 2010. As regards core workers, the majority of ICT practitioners (60%) are employed in the IT sector, with the other major employment sectors being financial services, government, education and training, and the manufacturing/engineering sector (Schofield 2009, p. 7). As regards ICT end-users, the largest proportion of workers is in the community services sector, in financial and business services, manufacturing, as well as wholesale and retail trade (Akoojee et al. 2007, p. 20). A gender-based analysis of the ICT workforce was most recently undertaken in 2005 (James et al. 2006) and revealed that 64.4% of the total workforce were women, though men dominated the core workers component and women the end-users component.

These figures show the distribution of the ICT workforce to be predominantly in the broad services sector, ensuring business continuity. South Africa has no effective foothold in the global markets for ICT manufacturing, though a few companies, like UEC, produce digital satellite decoders for markets in the Far East and on the African continent. The broadcast industry has a relatively high level of creative and technical skills available to the local TV content industry, which produces local drama, commercials, news and some limited, yet excellent documentary work (Ngcobo 2010). While facilitation for international crews working on films and commercials is fairly well established, this is still a nascent industry, not yet engaged in large or long-term cultural content projects.

The size and capacities of the existing ICT workforce makes it an important foundation for e-development. Fifteen years ago, South Africa had virtually no skills base in mobile communications, in advanced computing, in managing technological and services convergence, now telecoms and IT companies employ a significantly wider range of skills than in the previous decade. However, the main message emerging from a series of reports on ICT human resources is that this is an area of national skills shortage, where several tens of thousands of core ICT practitioners with adequate training and education are needed (James et al. 2006; Akoojee et al. 2007; Schofield 2008, 2009) on an annual basis. In a recent skills survey of IT firms,

[10] Additional languages include IsiNdebele, Sesotho sa Leboa, Setswana, siSwati, Tshivenda and Xitsonga.

75% of respondents maintained that the skills shortage is detrimental to business operations, while particular respondents raised concerns about limitations to business viability, business efficiency, global competitiveness and impact on economic growth (Schofield 2009, p. 6). The banking and financial services sector is regarded as a thriving sector with high demand for IT skills, but shortages are experienced in the areas of software project management, systems integration and architecture, information security, database administration and other high level skills at the top of the skills pyramid for large-scale IT projects (Dwolatsky 2010).

In a 2010 SME survey conducted in Gauteng province, a large proportion of end-users, between 50 and 60% of respondents, reported that they had no confidence or lacked confidence in conducting everyday tasks such as installing computer software, using email, participating in online discussions, making calls over the Internet, using search engines and electronic record keeping. Between 20 and 40% of respondents said that they were either confident or very confident (Abrahams and Burke 2010).

While no in-depth review of ICT skills exists with respect to the knowledge base and capacities of core workers or end-users, the studies quoted here offer an insight into the general trends, strengths and weakness of human resources for e-development. The 2007 review of "ICT skills at the intermediate level" (Akoojee et al. 2007, p. 22) estimates that the majority of the ICT workforce, or nearly 70%, had further education (non-degree) qualifications, while less than a quarter of the workforce had higher education qualifications. The absence of effective maths and science education or curriculum advancement in foundation subjects for computer science, electronics engineering and computer-user skills at school level creates barriers to increasing the supply of young people to meet demand for skills in the economy.

Key institutions concerned with ICT skills development include the Department of Communications, the Department of Basic Education, the MICT SETA,[11] The Computer Society of South Africa (CSSA) and the Joburg Centre for Software Engineering (JCSE). Each of these institutions plays a specific role in the human resources landscape: the Department of Communications hosted a national skills summit in 2010 aimed largely at fostering greater investment in skills development in the IT sector, while the MICT SETA is a counterpart institution engaged in promoting the design, implementation and financing of workplace skills plans for the better part of the last decade.

The Department of Basic Education and the provincial departments of education are co-responsible for creating future generations of secondary education graduates with a combination of skills required either to enter the ICT workforce or to be advanced ICT users in business and society. School-level education programmes have been critiqued as being narrowly targeted to the final 3 years of schooling rather than taking a life-cycle approach, spread across government departments but not well co-ordinated (James et al. 2006, p. 30), or lacking reliable Internet connectivity

[11] MICT SETA = Media, Information and Communications Technology Sector Education and Training Authority.

and effective governance (SAIDE 2010). It has been argued that "One of the key challenges is the availability of skills, competencies and financial resources at the provincial level to launch initiatives with the regularity and on a scale where they will make significant impact" (James et al. 2006, p. 30).

Organisations like the CSSA and the JCSE are interested in the professional development of the electrical and information engineering and software sectors. The JCSE was established in 2005 with seed funding from the metropolitan government, the City of Johannesburg, that saw economic potential in supporting a home-grown software sector. Now largely supported by industry funding, the JCSE offers advanced post-graduate training programmes, but the current level of software development capacity is a barrier that will require strategic decisions at industry level to foster globally competitive software development (or not). Discontinuities in the human resource development pipeline for ICT core skills training occur at the end of secondary schooling, and again at the end of undergraduate study, since a very small proportion of the student population selects post-graduate study in computer science, software programming or electrical and information engineering.

e-Society: Persistent Digital Divide

South African media reaches a market of approximately 31.5 million people including the print and electronic media (OMD 2010). According to the AMPS[12] rolling 12-month survey statistics reported by OMD, 47% of all adults were reached by any AMPS newspaper, 47% by any AMPS magazine, 90% by radio and 85% by TV (last 7 days prior to survey), 11% by Internet (last 4 weeks prior to survey) and 85% by outdoor billboard advertising. As elsewhere in the world, South Africa has witnessed the integration of electronic communications with the services sector in those services that facilitate economic activity—banking and finance, commerce, trade and travel services. These services enable economic activity in manufacturing, construction, mining and agriculture, all of which rely on communications. This rise in electronic business communications in the major cities has raised awareness of its value among the general population, through the demonstrated economic efficiency of transactions and the myriad of engagements and interactions that voice and Internet offer. Households are thus becoming increasingly attracted to and engaged in online activity for economic interactions and for social networking, as many firms market their e-services. Since 2008, interest has swung to mobile voice and mobile Internet, as mobile broadband provides a better connectivity solution for highly mobile workers in the services sector, in the academic and research sector and amongst the managerial echelon in the public and private sectors.

[12] AMPS = All Media and Products Survey conducted by the South African Advertising Research Foundation.

However, digital inclusion and exclusion operate side-by-side negatively affecting e-development. While more firms and households go online each day, only 20% of the population will be online by 2014 and it is estimated that it will take until 2020 for 50% of the population to be online (Goldstuck 2010, p. 8). Aiming for universal access will require a greater than 15% increase in Internet penetration for every year during the next decade, in order to reach 50% Internet access and usage at the end of that decade. For this to happen, major policy and regulatory changes will be required as the mobile and Internet markets are not currently providing a sufficient stimulus for such growth. The majority of firms (which are small or micro) and the majority of households (which are large and low-income) experience numerous obstacles to digital access. They lack the income, assets, access to communications infrastructure and/or availability of content in services in local languages needed to take advantage of the digital revolution. In some cases they also do not believe in any potential value to be gained.

In Gauteng province, which has the largest population and the largest economy, mobile networks are extensive and broadband networks are on the rise, creating the infrastructure necessary for Internet-based business and social interaction. Gauteng exhibits high levels of ICT usage, since it has a high concentration of business as well as government administration given to the presence of national and provincial government and three metropolitan municipalities. The province also hosts six universities and a large number of the country's science performing agencies, all of which are power users of ICT. Gauteng is highly urbanised, while all other provinces have large rural populations. No other province comes close in its level of communications infrastructure development, as the density of lines is strongly related to population density and urbanisation.

Gauteng has an estimated population of 10.4 million living in an estimated 3.1 million households. While unemployment is high at around 30% of the population, the penetration of mobile telecommunications in 2010 is greater than the 80.3% of households recorded in 2007 (Table 4.1), reaching 94.9% of households according to a 2010 survey (Abrahams and Burke 2010). The survey shows a faster rate of mobile telephony adoption (an increase of nearly 15% in 3 years) as compared to Internet adoption (an increase of less than 2% in 3 years). Another divergent trend is household Internet access between metro and non-metro areas. The 2007 figures show that Internet adoption in the non-metro areas is only half that of the metro areas. While the 2010 survey did not test this specifically, it found that Internet access in non-metro local municipalities was exceptionally low, such as is the case in Westonaria, historically a service town to the mines, the economy of which has become eroded as nearby mines closed. While the gap between household mobile and Internet access for Gauteng and for the rest of South Africa does not appear large, it is noted that the data for South Africa is reflective of the higher access for Gauteng and the other three metro areas—Cape Town, eThekwini Metro (with Durban as the main city) and Nelson Mandela Metro (Port Elizabeth is the main city). More detailed statistics (StatsSA 2007b; Comninos et al. 2010) reveals that household mobile and Internet access in rural towns and environs has remained low throughout the last decade.

Table 4.1 Proportion of households with a mobile phone and access to Internet facilities by municipality, Gauteng and South Africa 2007 and 2010

	2007			2007		2010	
Gauteng municipalities: district, local and metro	**Households: mobile phone**	**Households: Internet access**	**Total households**	**Percentage households: mobile phone**	**Percentage households: Internet access**	**Percentage households: mobile phone**	**Percentage households: Internet access**
Sedibeng District	175,834	13,212	241,223	72.9	5.5	Municipal level data not yet publicly available	Municipal level data not yet publicly available
Emfuleni Local	143,139	8,586	196,480	72.9	4.4		
Midvaal Local	18,049	2,306	24,265	74.4	9.5		
Lesedi Local	14,706	2,320	20,479	71.8	11.3		
Metsweding District	38,222	3,120	46,502	82.2	6.7		
Nokeng tsa Taemane	12,196	930	14,838	82.2	6.3		
Local	26,025	2,190	31,665	82.2	6.9		
Kungwini Local							
West Rand District	137,528	13,468	186,850	73.6	7.2		
Mogale City Local	71,462	9,797	94,288	75.8	10.4		
Randfontein Local	30,234	2,111	40,459	74.7	5.2		
Westonaria Local	34,766	1,444	50,675	68.6	2.8		
West Rand District	1,065	116	1,429	74.5	8.1		
Ekurhuleni Metro	675,350	89,170	849,349	79.5	10.5		
Johannesburg Metro	950,768	165,989	1,165,014	81.6	14.2		
Tshwane Metro	571,920	88,048	686,640	83.3	12.8		
Gauteng	**2,549,681**	**373,007**	**3,179,579**	**80.3**	**11.7**	**92.8**	**17.1**
South Africa	**9,090,231**	**900,612**	**12,500,609**	**72.7**	**7.2**	**88.0**	**10.1**

Source: Derived from StatsSA (2007a) Tables GP12 and GP15 and StatsSA (2010c), Figures 27 and 28

While mobile penetration is generally high, it is estimated that there are still an exceedingly large number of rural municipalities with mobile penetration below 70% of households (Table 4.2). As regards Internet access at home, six provinces have lower than 8% access. Only in provinces with metropolitan municipalities, where the population exceeds a million people, namely in Gauteng, Western Cape and KwaZulu-Natal, does Internet access at home approach or exceed 10% of households. While household Internet penetration has increased since 2007 and is estimated at approximately six million users for 2010 including business and academic users (Goldstuck 2010, p. 137), the relatively slow rate of increase in household Internet access in Gauteng, an estimated 6% over 3 years (StatsSA 2010c), is a predictor of a similarly slow rate of increase in the rest of the country.

Table 4.2 elaborates the proportion of provincial households with mobile voice and Internet communications, and for each province, the local municipality with the lowest proportion of mobile voice or Internet communications, or both. This data reflects the gap with respect to universal service at the household level that has to be addressed through a combination of market and regulatory mechanisms. The purpose of addressing this gap is not merely to create digital access, but to create a strong country-wide foundation for the effective economic integration of households into the productive and distributive economies, through e-development. On the productive side, communications technologies and electronic services can position households to engage in forms of economic activity not possible without them, such as trading from home. On the distributive side, they can position households to gain specific benefits, such as accessing services from home.

The adoption curve for mobile voice communications shows a relatively rapid increase in the 6-year window between the 2001 Census and the 2007 Community Survey, with a national increase in household penetration of 40%, more than double 2001 levels. Internet penetration levels appear to be advancing more slowly, presumably due to a combination of the higher cost of equipment, of regular access and services, and lower levels of infrastructure availability outside the metro areas. Many of the most marginalised local municipalities have more than 10,000 households, see Table 4.2.

It is unsurprising that advanced telecoms networks were installed first in the three metropolitan areas of Johannesburg, Tshwane and Ekurhuleni. What is surprising is that access is quite so low in a country needing communications and other infrastructure to pull itself out of its historical economic slump. In the Eastern Cape in 2007, a province with a population of 6.5 million, 14 local municipalities had less than 1% household Internet penetration, while in KwaZulu-Natal, a province with 10.2 million people, 13 local municipalities had less than 1% household Internet penetration. This data reveals some of the characteristics of the digital divide in South Africa, where middle- and high-income households will have the necessary resources to access electronic services and educational content, thus boosting their economic capacities, while for the vast majority of households, the current and next generation of the economically active population will remain excluded from electronically mediated economic activity. Mobile broadband adoption is increasing rapidly in the

Table 4.2 Proportion of households with a mobile phone and household Internet access by province, 2007 and 2010

	2007					2010	
Provinces (population)	Households: mobile phone	Households: Internet access	Total households	Percentage households: mobile phone	Percentage households: Internet access	Percentage households: mobile phone	Percentage households: Internet access
Eastern Cape (6.5 m)	971,310	50,422	1,586,735	61.2	3.2	79.9	3.8
Ikhwezi Local	1,144	83	2,567	44.6	3.2		
Free State (2.7 m)	548,090	32,975	802,872	68.3	4.1	85.1	6.9
Mohokare Local	5,530	121	10,216	54.1	1.2		
Gauteng (10.4 m)	2,549,681	373,007	3,179,579	80.3	11.7	92.8	17.1
Westonaria Local	34,766	1,444	50,675	68.6	2.8		
KwaZulu-Natal (10.2 m)	1,606,906	123,921	2,234,129	71.9	5.5	88.5	8.0
Ndwedwe Local	12,656	202	26,408	47.9	0.8		
Limpopo (5.2 m)	856,869	21,345	1,215,935	70.5	1.8	90.2	3.1
Fetakgomo Local	13,322	237	21,851	61.0	1.1		
Mpumalanga (3.6 m)	728,132	35,148	940,403	77.4	3.7	92.3	6.3
Seme Local	13,820	968	21,605	64.0	4.5		
Northern Cape (1.0 m)	163,558	14,315	264,653	61.8	5.4	75.6	6.0
Karoo Hoogland Local	1,105	216	2,982	37.1	7.2		
North West (3.2 m)	646,156	26,479	911,120	70.9	2.9	86.4	6.0
Maquassi Hills Local	11,325	421	20,330	55.7	2.1		
Western Cape (4.5 m)	10,191,530	223,001	1,369,180	74.5	16.3	85.4	18.7
Laingsburg Local	819	144	1,966	41.7	7.3		

Source: StatsSA (2007b), compiled from basic results for all provinces and StatsSA (2010c), Figures 27 and 28

cities. At relatively lower cost than fixed broadband,[13] it may unlock Internet access and usage outside the cities in a few years. But in the course of the past decade, the market has failed to bring widespread Internet connectivity to the home.

There has been much interest in public access centres such as telecentres, multi-purpose community centres and digital lounges, as regards their potential contribution to bridging the digital divide. During the late 1990s and into the 2000s, more than 500 such centres were launched in rural provinces, many by the Universal Service Agency and by institutions such as the Council for Scientific and Industrial Research (CSIR). In addition, the Government Communications and Information System (GCIS) promoted multi-purpose community centres (MPCCs) in urban and rural towns. While a few telecentres remain, they were poorly resourced from inception, both in terms of telecommunications and Internet connectivity, as well as the organisational and entrepreneurial capacities required to make them function effectively. In addition the slow pace of emergence of e-government services and e-education applications on one hand, and the general lack of small-scale business solutions for SMEs or informal sector businesses on the other have resulted in the failure of the original telecentres and MPCCs to attract audiences or to be sustainable.

Public access initiatives that have achieved greater success are those based in some of the country's more than 1,200 public libraries, many of these library Internet access points based in poor communities in the City of Cape Town and in the rural areas of the Western Cape, or the digital lounges established in Gauteng in the late 2000s. These initiatives by provincial and metropolitan governments, often working with non-governmental organisations, represent only a very small contribution to addressing the digital divide, as discussed further below.

e-Society: ICT Usage, Online Media and Social Networking

Table 4.3 shows the make-up of the Internet user population—those who use the Internet on a regular basis for commercial and social transactions, but excludes users whose main form of access is through Internet cafés, municipal libraries or other public facilities. Broadband usage far exceeds low-bandwidth dial-up usage, possibly because most services require high-speed bandwidth. More households use wireless than fixed-line ADSL access and many subscribers use wireless as a secondary form of access away from the workplace. This emphasises the mobility requirements of many Internet users, whether mobility is based on increasing telecommuting, or greater mobility due to working in the services sector, or being mobile for social purposes such as being connected during periods of holiday travel. However, SMEs still predominantly use ADSL access.

Users accessing the Internet through public access points will typically represent a lower volume of Internet usage, but there is little data available regarding who

[13] The cost of a 3G card is lower than the cost of an ADSL connection, while mobile broadband can be bought in smaller units than ADSL.

Table 4.3 Internet subscribers and users

Total wireless b/b subscribers	Unique wireless b/b users	ADSL b/b users	Total broadband users	Dial-up Internet users	Corporate users (mainly leased lines)	SME users (additional, mainly ADSL)	Academic users	Total Internet user population
1,494,000	930,000	630,000	1,560,000	250,000	2,060,000	506,000	540,000	5,300,000

Source: Goldstuck (2010, pp. 75–137)

these users are, for what purpose they use the Internet, what they spend on Internet access or how long their Internet sessions last. A tour of public access points in municipal libraries in two rural towns in the Western Cape (Genadendal, a historic mission station, now with only limited tourism and Struisbaai, a fishing town where many jobs have been lost due to the decline of the fishing industry) sheds some light on public use. In Genadendal, the main users are school-children researching educational projects, while in Struisbaai a local organiser translates information from the website http://Windfinder.com from English into Afrikaans, advising the fishing community of the best times to go out to sea. http://Windfinder.com offers up-to-date information on predicted wind speeds and wind gusts, as well as wave direction, wave height, cloud cover and rainfall for various times of the day and is thus a valuable information resource, assisting the fisherfolk in day-to-day decision-making and limiting the wastage of scarce economic resources. Here, Internet access is communal rather than individual, though young children who use the service exhibit individual needs and interests.

Consumer surveys of Internet usage in South Africa (Nielsen 2009) show a marked increase in the number of unique browsers, the number of page impressions, the number of sessions, time spent and average time per user. The greatest increase between 2007 and 2008 was the increase in the total number of hours consumers spent online. Though there are no available consumer surveys for 2010, it is almost certain that these indicators are increasing if the increase in broadband subscription and usage is considered. Nielsen (2008) studies present a basic view of consumer activity, illustrating that increasing numbers of South Africans are going online to find jobs, to view news and sport and to trade in the real estate and automotive sectors. Goldstuck (2010) classifies six kinds of mobile users, which can be organised in four clusters:

(a) Young, low-income users, where income is a key factor in limited mobile usage (grassroots).
(b) Older, middle-income users, where e-services adoption is lower than expected considering income and may be largely attitudinal (ostriches and elephants).
(c) Young, middle-income users, where e-services adoption is good and likely to increase with age and income (magpies and lion cubs).
(d) Users across the age spectrum, where income and attitude are key factors in greater mobile usage (sophisticats).

South Africa's mobile consumer has banking as a high priority (see Fig. 4.4), with 34% of banking customers using either the mobile phone, the Internet, or both to conduct banking transactions. In order to ensure security of transactions, banks offer instantaneous SMS and email notifications for all credit card and Internet transactions, providing the capacity for immediate validation and query (Table 4.4).

The tourism and hospitality sector exhibits significant mobile and Internet usage, with tourists being perhaps the most supremely mobile population, accessing both fixed and mobile networks. In 2010 alone, South Africa had more than eight million tourists (SA Tourism 2011) contributing an estimated 7.9% or ZAR189.4 billion to GDP (SA Tourism 2010) of which a small proportion of tourism spend would go to mobile and Internet communications, both from the visitor's purse and

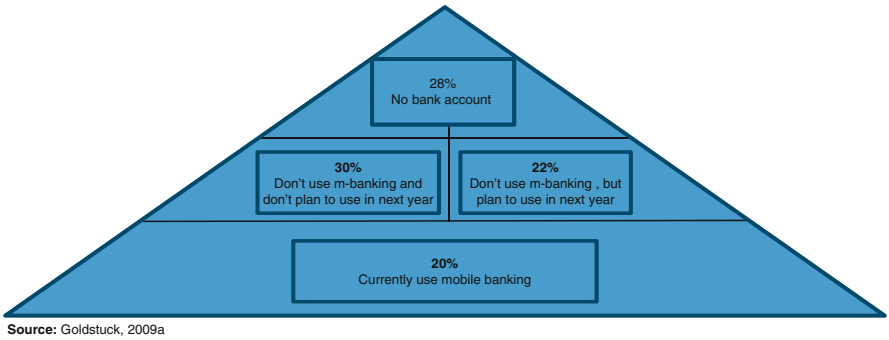

Fig. 4.4 Online banking in South Africa, 2009. *Source*: Goldstuck (2009a)

from the tourism and hospitality sector, not including the roaming costs. The majority of tourists or 5.7 million people were from countries on the African continent (SA Tourism 2011), reflecting the mobile continental population who travel to South Africa to study, to visit with families or to buy goods for micro and small businesses and who therefore do not seek business visas.

Social networking sites such as Facebook and Twitter gained popularity in 2009, with South Africa reported as among the top 30 countries by number of Facebook users (Hernandez et al. 2010, p. 5). In addition to individual users, non-governmental and community-based organisations are keen users of social media because of their confirmed role in strengthening democracy. The broadcast media are high-volume users of social networking media as distribution channels for their content, thus creating additional means to attract customers and to attract revenue through premium SMS. Business networking media such as LinkedIn and blogging are popular amongst communities of interest, in particular amongst academic institutions (Fig. 4.5).

Online media, social media and electronic commerce all add to the emerging reality of a services sector that is going mobile, potentially readying itself for a revolution in the way it does business. From the perspective of the annual ICT skills survey, Schofield (2010) arrives at a similar conclusion "What we can see from the data is the growing influence of social networks on the skills required in the ICT sector, combined with the increasing use of mobile devices as business tools". However, South Africa is not yet experiencing the "3G" revolution sweeping China, where a huge transition in mobile and Internet usage is occurring, based on the rise of the interactive content industry which is drawing attention to the new flexibilities and enhanced content capacities of next generation broadband networks and mobile content design (BuddeComm 2011). It may not be far behind the curve, if innovations such as the Mahala[14] Community Trading Platform (Seeber 2011) increase in number and value to particular user groups.

Unlike in many developing societies such as the Philippines, Egypt and other Arab countries, there is no specific series of events where ICT can be said to be

[14] "Mahala" is the Zulu word meaning "free".

Table 4.4 Trends in mobile and mobile Internet usage—South Africa

Classification	Age	Spend: average monthly income	Increasing level of sophistication in mobile usage	Percentage of market (%)
Grassroots (low usage)	16–35	ZAR ≤ 200 of ZAR1,723	60% of this group have bank accounts and 17% bank using the mobile phone; only 3% have Internet access on the mobile phone; main features used are typically calls or SMS, camera or diary/organiser	30
Ostriches (low usage)	36+	ZAR ≤ 200 of ZAR3,229	74% have bank accounts, 15% use mobile phone banking, but only 3% have mobile phone Internet access; use on average one feature	18
Elephants (low usage)	25+	ZAR201+ of ZAR4,598	84% have bank accounts, but only 19% use mobile phone banking and only 12% have mobile phone Internet access; use on average two features	10
Magpies (medium usage)	16–35	ZAR ≤ 200 of ZAR2,046	67% have bank accounts, 15% use mobile phone banking and 46% have mobile phone Internet access; use five or more features	23
Lion cubs (medium usage)	16–24	ZAR201+ of ZAR3,135	79% have bank accounts, 27% use mobile phone banking and 20% have mobile phone Internet access; use approximately three features	11
Sophisticats (high usage)	19–45	ZAR201+ of ZAR7,584	100% have bank accounts, 46% use mobile phone banking and 65% have mobile phone Internet access; use on average seven features	9

Source: Goldstuck (2009a)

enabling the democratisation of South African society and social change. In the 2011 municipal elections, the two major political parties, the ANC and the DA[15] used social media extensively to communicate with voters and the election conversation also took place on news websites, blogs and web forums (Memeburn 2011). There are many NGOs using the Internet to promote democracy and human rights, though their reach is mainly in the metropolitan centres, including organisations such as Women'sNet, SANGONeT and others.

> Women'sNet is a feminist organisation that works to advance gender equality and justice in South Africa using Information and Communication Technologies (ICTs). They offer training and facilitate content dissemination and creation that supports women, girls, and related gender organisations and networks to take control of their own content and ICT use. The website (www.womensnet.org.sa) is a hub for information by women, about women and gender, and has a focus on South African and African content. They help women to find the people, issues, resources and tools they need for social activism (Akinsanmi 2010, p 20).

Since 1994, South Africa's media have increasingly become the public space for democratic debate, as the numbers of non-governmental and community-based organisations declined, largely due to the shift of international funding from NGOs and CBOs to government. Although the community-based sector has revived, it has not attained the same size and power that it enjoyed during the challenge for democracy. The most vocal and influential organisations have been the trade unions, such as COSATU, pushing for increased wages, against the government's support for undemocratic regimes such as Zimbabwe and against corruption in the public sector; and those in the health sector, challenging government's stance on HIV/AIDS. It is largely through the print and broadcast media that these views and positions are expressed, noting that the media have a significant electronic presence. However, the point is that at this stage of development, there is limited material in the sphere of socio-political advocacy that is digital.

The most notable example of demand-driven governance in recent years has been the service delivery protests in urban townships and in small, rural towns fighting the failures of local government to provide basic services such as water, sanitation and a clean environment. These protests have, in the most part, been conducted in the streets rather than online. Despite the expressed intention of government to create electronic communications platforms for consultation on 5-year municipal development plans (IDPs), there are few, if any, local governments where decision-makers and citizens are engaged in online communications with respect to government accountability and citizen participation in governance.

Electronic Business, Electronic Commerce

Electronic business and commerce are most visible in the services sector—in banking and financial services, tourism and entertainment, and in academia. The trend towards

[15] ANC is the African National Congress and DA is the Democratic Alliance.

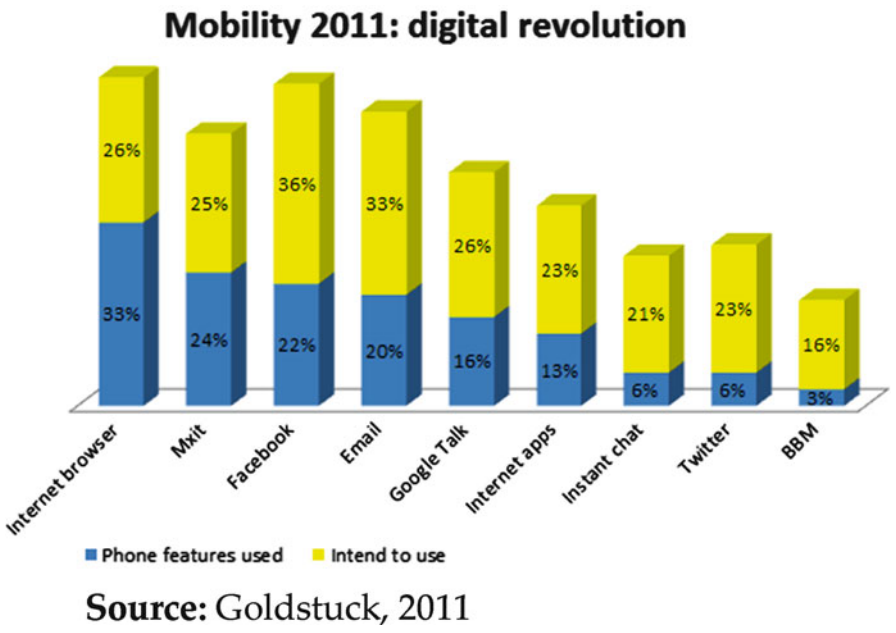

Fig. 4.5 Mobility survey 2011: mobile usage and intended usage. *Source*: Goldstuck (2011)

e-business can be observed, inter alia, from the increased data usage and revenue reported by telecoms firms. The 2010 Internet survey (Goldstuck 2010, pp. 120–123) reported that there were more than two million corporate users in 2009. Telkom, the dominant player in the data services market, reported multi-billion rand revenue of ZAR10.6 billion for the year ending 31 March 2011, though this was not increasing as rapidly as may have been expected. The most notable finding of the survey was that corporate users were experiencing improved Internet access, i.e. better performance due to higher bandwidth. There are few studies examining electronic business across the range of industry sectors. Thus, while analysis of the limited available data suggests that electronic business is gaining ground in the services sector including banking and advertising and has been slow to form in the manufacturing sector, sector studies are needed to provide greater insight into the trends occurring here.

There were 4.6 million South Africans banking online at the end of 2009 (Goldstuck et al. 2010) and an estimated five million in 2010. Low-cost banks such as Wizzit, a division of the South African Bank of Athens Limited, and Capitec are taking up the slack in the unbanked market, though this requires new business models and non-traditional partnerships with retailers in order to get close to the customer. These are green-field innovative ventures which can bring the prospects of e-development within reach of the low-income consumer.

> The tipping point appears to have been reached. (Banking and telecoms) Regulators have defined their legislative structure; cellphone operators have come to terms with operating in

the stricter banking environment; consumers have learnt to trust transactions by phone; and banks are devising business models to make money from this service (Claasen 2010).

In the small- and medium-sized sector, SMEs are predominantly ADSL users, with 73% of firms surveyed using ADSL as compared to only 8% using wireless broadband (Goldstuck 2010, p. 79), possibly due to greater reliability and quality of throughput. A further 30% of SMEs use wireless broadband as a back-up form of access. This may also be an indication that more SMEs operate from fixed premises, as the 2009 SME and entrepreneurship survey (Kew and Herrington 2009) suggests. However, it will be interesting to examine future trends in SME broadband adoption and analyse whether mobile substitution will occur as economic evolution takes place in the SME sector. The top five services for ADSL usage are legal services IT software, employment services, hotels and communications, ranging from 100 to 85% ADSL usage, though ADSL penetration is at least 75% across the top 14 services including financial services and manufacturing. ADSL penetration in the SME sector is greatest in wholesale, construction, agriculture and mining, but relatively low amongst those SMEs that service the government and education sectors (Goldstuck 2010, pp. 80–81).

It has been estimated that there are approximately 2.4 million SMEs in South Africa. Of these, approximately 487,125 use the Internet and each small business that gets connected adds between 1 and 20 additional users to the population of Internet users, effectively adding 756,000 users to the Internet user population according to the latest available figures. An important perspective on the SME sector, gained from research on the Gauteng province, is that between 53 and 63% of SMEs in BSM[16] categories 3–6 are doing business from home (African Response 2006), using ICT including switchboards, email, Internet, websites and in some instances a small network. While usage was generally low, it was highest in the services sector and next highest in the sale of goods. An SME and entrepreneurship survey (Kew and Herrington 2009) argues that the nature of ICT usage in SMEs is relatively basic and recommends the greater availability of customised small business solutions to enhance the value of connectivity.

e-Commerce is relatively widespread, with services offered by ticketing websites like http://Strictlytickets.com, online booking options for movies, and the presence of point-of-sale devices in both urban and rural areas enabling electronic transactions at restaurants, automotive service centres and most retail outlets. The mini-automatic teller machine (ATM), a South African innovation, uses the banking network to enable cash withdrawals at retail outlets, where the customer can exchange an ATM receipt for cash and the retailer is reimbursed by the relevant bank, distinct from the "cashback" models in the UK and Europe which use the point-of-sale devices. This mini-ATM is popular in rural areas, because it reduces the cost to banks of transferring large amounts of cash by road and reduces the banking costs of the retailer.

[16] Business Sophistication Measure: The market research presents seven BSM categories, of which BSM 1 is largely informal, BSM 7 is the most formalised of SMEs and BSM categories 3–6 present increasing levels of formality.

Electronic Government

The services components of government that have the greatest interface with the public are health, education, policing and social development. Hence, these departments are the top candidates for advances in electronic services. However, there has been only limited application of ICT in these services segments, mainly to render back-office administration more efficient, but the electronic interface with the public has not been established and hence the facilities required for e-development in these services sectors have not been fostered. National health information is still managed as it was in 1995—paper-based rather than electronic (van den Heever 2011)—and other services departments have not emulated the services sector trend of using ICT to advance the quality of services information and transactions with customers.

The citizens' information portal Batho Pele[17] Gateway available at www.gov.za, electronic filing of tax returns and the Government Employees Medical System are a few of the more successful applications of electronic government at national level. However, the successful systems tend to focus on e-administration and government ICT applications have had limited impact in terms of creating a rapid evolution of the public services sector.

At the provincial level, the Gauteng and Western Cape governments have focused on a few large-scale programmes (see Table 4.5).

The website for GautengOnline Schools provides links to other sites hosting educational material, but the project has not yet evolved to become a full-scale e-learning programme using a combination of phone and computer-based technologies. By 2010, there were as yet no online textbooks or other supporting learner materials. Anecdotal evidence from a variety of sources indicates that the centralised content management system is not attractive to teachers and schools as it places quite severe constraints on how the computer may be used as a learning tool. By contrast, the emergency medical services and police operations centre show effective use of ICT towards e-development in these particular service fields.

Low levels of Internet penetration into households and small businesses have a negative effect on the push and pull for innovations in digital public services. This may partly explain the absence of electronic government services in the remaining seven provincial governments. At local government level, metropolitan municipalities such as the City of Joburg and the City of Cape Town have a well-developed web presence, which is likely to contribute to stimulating ICT usage amongst middle- and high-income households. Poor communities have very limited Internet access through projects such as SmartCape (www.smartcape.org.za), a public access and content service available at community libraries across Cape Town.

Raising the levels of accessibility and availability of e-services, in the Western Cape and other provinces, to the levels required to meet communities' information and services needs will require long-term commitment, as well as government and

[17] People First.

Table 4.5 Selected e-government projects in two provinces

Province	Project	Purpose	Level of success
Gauteng	GautengOnline Schools	To utilise ICT in support of learning	Computers in approx. 1,100 schools, but limited access to educational content—a centralised system where material is made available from a central source, hence poorly utilised in schools
	Gauteng Emergency Medical Services	To ensure rapid response in dealing with disasters and medical emergencies	Enables effective dispatch and tracking of emergency vehicles, as well as management of emergency services across municipal boundaries
	SAPS (South African Police Services) Gauteng Operations Centre	To manage citizen calls and dispatch policing services	Digital information management system enables easy processing of high data volumes. Availability of crime intelligence for decision-making and rapid response
Western Cape	Cape > gateway	To provide "easy access to government information and services" (http://www.capegateway.gov.za/)	Access to a wide range of information on services from agribusiness to disaster relief and special needs transport
	Edumedia Online	Online educational resource repository	Fair access to a wide range of learning materials which can be accessed either from school or another location

Sources: Abrahams (2009) and Abrahams and Reid (2008)

industry funding. It will also require a greater pressure on government to innovate, for example, through offering mobile content and services for the large numbers of the population who are mobile between the cities, smaller towns and rural settlements, thus augmenting communications with health audiences, schools and communities. Creating ICT service platforms in health and social security can enable government to consider services innovations and even policy innovations that are not possible without the heightened information and knowledge management capability that electronic information systems bring. For example, the analytical capability of decision-support tools can enable provincial and local government to do better targeting of specific services towards highly segmented public audiences, as compared to the historically more generic provision of the same services to all. Such a change would constitute a services revolution in the public service sector.

Leadership for e-Development: Policy and Regulatory Environment and Institutions

The first policy framework on telecoms and the role of ICT in development was the Reconstruction and Development Programme (RDP) of the African National Congress, published in 1994 before the ANC became the ruling party in government. The document was elegant and the product of a consultative process with civil society and industry. The RDP heralded the inauguration of democratic governance and was seen as the basis for a coalition of interests. The framework made key statements on the economy, including that "Telecommunications is an information infrastructure and must play a crucial role in South Africa's health, education, agricultural, informal sector, policing and safety programmes…The telecommunications sector is an indispensable backbone for the development of other socio-economic sectors" (ANC 1994, p. 34). The framework included references to universal affordable access to telecommunications; to developing a modern telecommunications and IT system; and to the formation of a strong telecoms manufacturing sector. It also made some poor judgements against liberalising the telecoms market, arguing that "the basic infrastructural network must remain within the public sector" (ANC 1994, p. 109). An RDP ministry was established in the Presidency, as a co-ordinating ministry. Soon after its establishment, as ministers settled into their respective posts and duties, the RDP ministry came to be seen as an unwelcome super-ministry and it was closed down.

In this early setting, two of the smallest ministries were the Ministry of Communications and the Ministry of Science and Technology, both crucial to foster a radical new economic formation, not merely post-apartheid, but for late twentieth century global competitiveness. The ministries were comparatively weak, given meagre budgets in relation to their challenging mandates. In particular, the Ministry of Communications made its first errors with respect to its failure to introduce competition in the fixed-line market. The incumbent fixed-line operator, Telkom, was granted an extended period as a monopoly provider, which by a variety of means, including

ministerial delay and error, meant that it was the only player in the fixed-line telecoms market until late in 2007 when Neotel commenced operations. Moreover, the introduction of this second fixed network operator has brought only limited change and little effective competition in either the business or household markets, being seen as "an ineffectual competitor to Telkom" (Guest 2011, p. 34). Some limited price change is looming in the sector, as a result of regulation rather than competition, as the 2010 call termination regulations, which set down significant reductions in fixed and mobile call termination rates over 3 years, took effect in March 2011.

Many erratic policy positions followed, inter alia the creation of an effective monopoly in the fixed-line market, a duopoly in the mobile market, policy failure in universal access and service and late focus on broadband. The policy-maker has pursued a position against introduction of full competition in the telecoms market over an extensive period—1996 to date. Universal access policy has been an unremitting failure, with so little movement that the need for universality in fixed-line access has been made irrelevant by effective mobile substitution in the voice market and the requirement for broadband as the basis for accessing electronic services. Lewis (2010, p. 2) argues that "The country has now arguably achieved universal access … in respect of mobile voice telephony—despite, rather than because of, sector policy". The Universal Service and Access Agency (USAASA) was established as a distinct policy advisory and regulatory agency to foster universal access, however, it failed in at least two respects. It focused on establishing telecentres, rather than on research-based policy advice to government. Despite being a small agency, it took on the mammoth task of creating other institutions to bridge the digital divide. This often involved investment in bricks and mortar, putting in the infrastructure and services and creating the institutional environment for community use of the telecentres. Despite being able to use the Universal Service Fund, effectively a tax on consumers and business users, for this purpose, the role of institution and capacity-building to advance the progression of telecentres over time could not possibly have been played by a single, small public sector agency.

Furthermore, the responsibility to provide explicit written policy advice to government on key issues in universal service, for example, the definition of needy persons or the attributes of universal service, was not seen by USAASA's leadership as a pivotal role. Unlike many other policy advisory bodies in the broader science and technology and innovation space, that put their budgets and decision-making processes into high-gear bringing new policy ideas into being, the USAASA delivered almost no written policy advice in its entire term spanning more than 10 years. The absence of any serious research programme, despite the requirements for this in the Telecommunications Act 1996, meant that USAASA was not alert to the trends and shifts occurring in e-development and therefore did not adapt their thinking from universal fixed-line access to mobile access to broadband Internet access for communities.

Perhaps a singular focus that the USAASA should be credited with is that it has been the only agency to put its resources into rural communities. The Ministry of Communications encouraged a policy of under-serviced area licencees (USALs) and licences were duly awarded to USALs in circa 2004/2005, but these licencees

never gathered the financial capital or other capacities required to take infrastructure to rural under-served communities, nor was it possible to construct a viable business model for effective infrastructure and services provision. Thus, the USAL approach failed.

A more effective aspect of policy and regulation was the provision for universal service obligations (USOs) contained in the telecommunications licences awarded to fixed and mobile operators. These USOs included obligations to introduce access lines, specified geographical coverage and required provision of 120,000 public payphones (Telkom), 81,500 community service telephones (mobile operators) and high-speed internet connectivity to 2,500 public schools and 2,500 public clinics (Neotel) (Lewis 2010, p. 5). It cannot be verified whether these obligations were implemented in full, as there has been no apparent regulatory enforcement or regulatory audit. However, the push from mobile operators through the innovation of very low-cost pre-paid mobile voice access, in combination with the physical availability of community service telephones, which are telephones at a fixed location that operate using the wireless networks of mobile operators, gave mobile telecommunications a particularly high and attractive profile over fixed access. This led to high levels of access (60% or more) when viewed at the provincial level and higher levels of mobile as compared to fixed access in many poor, rural environments, as suggested in Table 4.2. The challenge for the future is to translate mobile telecoms access into effective usage that produces visible social and economic value for low-income users. This relates to the need for lower access prices and the stimulation of content development for this segment of the South African economy, a broad area for interrogation for possible ex-ante regulation.

As regards the evolution of the legislative framework for e-development, preparation for convergence in technologies, markets and services commenced in 2002 and the Electronic Communications Act replaced the Telecommunications Act in 2005. The e-commerce law (RSA 2002), the Electronic Communications and Transactions Act, legalised the digital signature and other key aspects of e-commerce practice. The Act required the Minister to present an e-strategy for adoption by Parliament, setting out an electronic transactions strategy, universal access strategy and promotion of e-commerce with respect to small, medium and micro-enterprise (SMME) amongst the measures to achieve the goals of being a competitive global player "to promote the Republic as a preferred provider and user of electronic transactions in the international market" (RSA 2002, s 5 (4)(c)). The law required collaboration amongst national government decision-makers in order to include an e-government component in the national e-strategy. This strategy did not emerge in the stated 3-year period, but the Information Society and Development Plan (ISAD Plan) was released in 2006, though this plan has not been gazetted as a national e-strategy.

In the decade to 2010, the landscape of electronic government policy has been bleak, consisting of three main policy documents—*Electronic Government: The Digital Future* (DPSA 2001), a 2003 White Paper on e-Education (DoE 2003) and the 2006 ISAD Plan (The PNC on ISAD c2006). The e-government policy adopted a technology, IT security and e-administration angle and did not express itself on the role of electronic media in improving public services through e-health or other

services applications. The e-education policy may have been satisfactory in print, but in practice e-education did not take off in any significant way, possibly because no budget plans were developed and hence no fiscal transfers to e-education could take place, noting that education is a provincial mandate. The ISAD Plan drew attention to e-health and e-education, but coming from one of the smallest government departments with no leverage, very little attention was paid to it by other national departments or provincial administrations. Subsequent to 2006, two initiatives were presented, but do not appear to have been implemented—the electronic provision of six pro-poor services including social grant applications and the "one-laptop per teacher" plan. While e-administration continues to make progress at the government-to-government level, this is largely the effect of computerisation of public administration, rather than electronic government.

The introduction of broadband policy in 2010 was perhaps 9 years behind the curve of broadband market development as the major players, including the metropolitan municipalities, had all long adopted their specific broadband strategies and a mobile broadband substitution effect may already be emerging. National policy is unlikely to change the direction of market developments in the near term, certainly not to the extent that it will see broadband infrastructure development in low-income areas. As a case in point, the establishment of the state-owned broadband entity, Broadband Infraco Limited, has not yet created substantial upward movement in public broadband access. Broadband Infraco was established by legislation in 2007 with the express intention of creating a state-owned enterprise that could meet the high-speed bandwidth needs of mega-projects such as the Square Kilometre Array radiotelescope bid (SKA). The risk of losing this international competitive bid could not be compromised by the high prices charged by the incumbent fixed-line operator. In addition, the legislation expressed its purpose as the expansion of broadband infrastructure to under-serviced areas. However, it will be phenomenally expensive to route this infrastructure beyond its current positioning as national backbone infrastructure or to compete with existing fixed and mobile operators at the subscriber level. Yet, policy and regulation for effective broadband connectivity is necessary if firms and households are to take advantage of the many new broadband-enabled services and smart devices becoming available; and if ICT services innovation is to reach into poor and rural communities to offer services that people need.

Public policy has dealt extensively with building an orientation towards economic innovation, particularly emphasising the role of science, engineering and technology (SET) innovation. The 1996 White Paper on Science and Technology gave rise to a series of more specific policy statements, including the National Biotechnology Strategy 2000, the National Research and Development Strategy 2002, and the Innovation Plan 2008. Collectively, these and other policy statements, as well as a small though increasing R&D investment flow, gave rise to the stronger emergence of innovation in industry, construction and the broad services sector. Of particular interest is ICT-based innovation in the services sector, particularly in the banking and financial sector, which has led the ICT adoption curve in business. However, the range of public policy initiatives in the broad SET sector is not matched by public policy initiatives in the ICT and telecoms sectors, which have been neglected on

the policy front. The ICT R&D strategy set down by the Department of Science and Technology in 2007 effectively focused public R&D funding for ICT towards a single institution, the CSIR. While this investment in publicly funded R&D in a public science agency is a necessary part of any broad strategy and the CSIR is an important participant in the innovation system, this approach to ICT R&D funding is too narrowly located to achieve significant innovation impact at the grassroots level. The OECD (2007) review of South Africa's innovation policy points to this problem in its findings "shortcomings of current policy responses", arguing that the concept of an innovation system has been narrowly applied "with too much focus on the role of public R&D-performing institutions" (OECD 2007, p. 8) and a failure to effectively integrate the role of business enterprises and innovation-generating activities other than R&D.

Similarly, micro-economic policy, the responsibility of the Ministry of Trade and Industry, has failed to pay attention to the services sector and its needs, amongst which communications inputs are important. Despite work on policy for the services sector in the mid-2000s, there is today no services sector policy which could act as a lightning rod for e-development. Nevertheless, network infrastructures, including roads, energy and telecommunications have shown strong growth in the past decade, creating the potential for, if not a guarantee of, e-development.

A major player in sector development and governance is the regulator, the Independent Communications Authority of South Africa (ICASA 2009), a converged telecoms and broadcasting regulator established in 2000, integrating previously separate regulators. It is responsible for taking regulatory actions in pursuit of government policy and legislation, in particular to promote development of the broad ICT sector as a competitive economic sector facilitating development in other sectors. However, many of the issues that the 2005 convergence legislation raised for attention were only concluded several years later, and in some cases only after legal challenges to government. This was the case with awarding new licences for electronic communications networks and services or converting existing telecoms licences (licences awarded or converted in 2009); regulating interconnection, specifically call termination rates (regulations gazetted in 2010); and with spectrum management (draft regulations and some final regulations gazetted in 2010). The reluctance to foster competition resulted in more than a decade of high prices (Smit et al. 2008) and the resulting "high access—low usage" scenario for mobile and "low access—low usage" scenario for Internet described in Table 4.2. Average revenue per user (ARPU) for broadband has declined in the period 2004–2010, even while prices have fallen (BMI-T 2010). Policy sluggishness as regards high prices saw the first interventions coming only in late 2009 and leading to regulatory action in 2010 to reduce fixed and mobile call termination rates between 2011 and 2013, an important component of the telecoms pricing structure, but not the only one and not touching on the crucial broadband pricing issue.

Other weaknesses in policy, regulation and strategy in the past decade included the failure to act on the undersea cable monopoly, leaving the market to develop slowly; late attention to key issues in spectrum management including spectrum assignment and fees; and weaknesses in promoting the content sector including the

protracted process for licencing pay TV, the muddle of digital migration; lack of focused attention to creating effective electronic government and the absence of a human resources leadership approach for the present and next generation of the productive workforce. These weaknesses are not those of the communications policy-makers alone, but also of the broader policy community with respect to public administration, trade and industry and the major services departments—health and education. Many, though not all, of these matters are now receiving attention.

A ministerial initiative culminated in July 2010, in the National eSkills Plan of Action (NeSPA). Aiming to address the "calamitous" skills shortage, the (still) draft plan conceives of e-skills as "the ability of people to use and create all forms of ICT to improve life opportunities in their personal and educational spaces; work environments; community interactions, and participation in and contribution to governance processes". The document explicitly refers to e-literacy for employment readiness, as well as skills for e-participation and e-democracy to promote interactive engagement in governance processes, e-business skills, as well as e-community skills aimed at increasing self-reliance and social cohesion. The goals for e-skills development are presented as employment readiness, effective e-governance and service delivery, business development, socio-economic development and research and development (DoC 2010, pp. 2–7).

Practical suggestions include the establishment of *e-skills knowledge centre network hubs* as providing the institutional arrangements which will foster skills development; cross-sectoral collaboration amongst government, industry and higher education; and pricing mechanisms for affordable mobile and Internet connectivity. The plan operates at a level of generality that makes it difficult to understand the possible future evolutionary path for industrial workers, domestic workers and young people who have no access to the Internet, whether via a mobile phone or computing device, whether at home, school or the workplace.

There are two distinct layers, levels or systems of e-transformation in South Africa, namely the mobile ecosystem and the Internet ecosystem. Until 3 years ago, these were distinct and in some ways defined the digital divide in South Africa. Due to the basic societal need for communication and the aggressive marketing of mobile communication, funded by the high profit margins the networks were able to achieve, mobile use became universal in South Africa by 2008. At that point, however, Internet access was still confined to the upper economic segments of society and growth in the Internet user base had been well below 10% for most of the decade. This left penetration, too, at below 10%. This seeming contradiction between saturation of mobile devices among the adult population and only 1 in 10 South Africans having Internet access underlined both the opportunity and the gap in digital South Africa.

The demands on government to liberalise telecommunications tended to fall on deaf ears, even as government claimed the objective of a competitive environment. Two events broke the logjam. The first was a court victory by Altech against the regulator and the Department of Communications (DoC), forcing ICASA to issue electronic communications network licences to all value-added network service providers, 419 companies at the time. The second was the DoC backing off a threat to

block the Seacom undersea cable if it did not have majority government shareholding. With that, the commercial Internet landscape shifted more dramatically than it had since it emerged in South Africa in 1993–1994. Investment in infrastructure, start-up companies and marketing campaigns intensified. As a result, 2008 saw the beginning of a sharp rise in the number of Internet users in South Africa.

In 2010, another fundamental shift occurred. The number of smartphones sold in South Africa reached a critical mass, with more than five million in use. This helped to fuel an explosion in mobile Internet access in South Africa, and the biggest number of new Internet users in a single year in the country's history, 1.5 million, taking the user base to 6.8 million. This trend will continue as smartphone penetration intensifies. It is expected that, by 2013, more smartphones than normal phones will be sold in South Africa. By 2014, it is possible that the Internet user base will reach ten million, or more than 20% of the population. This most visible symbol of the crossing of the digital divide is fuelled not by specific efforts to do so, but by the converging of two separate industries, namely the mobile and the Internet industries, with the first now being the major driver for the second. A decade ago, this could not have been possible.

What has been the contribution to such a shift from the policy-maker, regulator, market, consumers? In many ways, the failure to liberalise was a catalyst for exactly the developments that liberalisation were meant to allow. When policy-makers and regulators tried to hold back newcomers and new technologies, the industry rebelled and began looking for alternative approaches, including court challenges and establishing consortia like Seacom and Dark Fibre Africa. The latter made possible the partnerships between Neotel, MTN and Vodacom to share trenching infrastructure for national fibre grids. These, in turn, are the backbone for the expansion of data networks in South Africa, as well as new partnerships that further expand the fibre and mobile networks, such as the Fibreco joint venture between Cell C, Internet Solution and Convergence Partners.

Over this period, partly due to Internet user growth and smartphone roll-out, the data demands on mobile networks have also intensified, with the networks reporting up to 55% annual growth in data use. This has meant that fibre roll-out has not kept pace with demand. The consumer, therefore, has become as important as the corporate customer in pushing the networks' upgrade efforts. In 2010 alone, Vodacom budgeted R6-billion for network upgrade. According to Dark Fibre Africa, their own fibre roll-out will only meet the "fibre to the tower" needs of the cellular industry by 2014. Thus, beyond policy and legislation, change has been ushered in by the mobile providers, the ISPs and the broad user community through the integration of a multiplicity of applications into the social and economic spheres.

But there is an obstacle to market-driven approaches. While inexpensive offerings such as an e-wallet or mobile payments systems are on the increase, more bandwidth-hungry services such as mobile Internet and mobile TV will remain out of reach for the majority of the population if based solely on the current high-cost market-driven approaches. Amongst a few initiatives to bring down the cost of service, five out of the six metropolitan municipalities have been engaged in building broadband infrastructure. The City of Johannesburg is engaged in a project to introduce 900 km

of fibre-optic broadband around the city in five rings, reaching poorly served areas of the city, such as the Diepsloot informal settlement. This is a public–private partnership between the City of Johannesburg and Ericsson (City of Joburg, 6 May 2011), aiming to promote broadband connectivity in the city for e-learning, e-government, e-health and e-business. The partnership will focus only on core infrastructure to leverage the last mile, but will not compete with household broadband provisioning by the private sector. It aims instead to bring down the private sectors costs, in order to reach more households more quickly. The metro will offer public broadband access at its own community development centres. However, it is not yet apparent that local government interventions will be able to help reduce the growing digital divide.

Whereas South Africa could be riding the wave of digital economic change, it is not yet positioned towards the transformation of economy and society through digital media and electronic services. A few problematic characteristics of the leadership and institutional environment can be observed: Policy and regulatory behaviour appears to rest on the view that disruptive effects such as those that competition or innovation would bring are not desirable. In this, innovation paradigms and current ICT policy are worlds apart. Policy and regulation has tended to be mechanistic, with the regulator ICASA addressing a list of "regulatory issues" such as licencing, number portability and handset subsidies, apparently without a strategic regulatory agenda founded in an understanding of the key interventions that would unlock greater digital access and use. Furthermore, there have been few attempts to engage in monitoring and evaluation (M&E) studies on the state of information society development, the Gauteng provincial government being the first to formulate an M&E framework in 2010. This places South Africa in the response categories: "as ICT is a new and pervasive technology and options abound, we should focus on pilots, micro-interventions and quick wins with no need for overarching national strategy"; and "given speed and uncertainties of technological change, focus on short-term adaptation and serendipity" (see Chap. 1). Policy failures with respect to the information society would seem to arise from policy failures in transformation of the state, economy and society. For example, the schooling system is in crisis with very low completion rates for secondary schooling and evidence that students fare poorly at language, mathematics and physical science (FFC 2011, pp. 72–74). Similar scenarios of policy weakness apply in other portfolios, such as health, where services are in decline and in trade and industry, where policy has not been responsive to the needs of manufacturing, the services sector or small, medium and micro-business.

Despite these impediments, when we review these evolutionary changes in policy and regulation during the first decade of the twenty-first century, we observe five major areas of policy and regulatory change that may contribute to e-development in the next decade. These are

(a) Recognition of the forces of convergence and the resultant transition from telecommunications regulation to electronic services regulation.
(b) Reduction of call termination rates with possible downward pressure on prices.

(c) Attempts, albeit weak attempts, to create enabling policy frameworks for broadband provisioning at national and more importantly at local levels.
(d) Opening up of the undersea cable market.
(e) Attention to the regulation of the radio-frequency spectrum resource.

Collectively, these efforts may create a stronger foundation for e-development in the next decade, but these efforts are by no means sufficient for a services (r)evolution or e-democracy and will require continued ex-ante regulation to promote competitive and innovative markets in e-enabled services for the foreseeable future.

It is clear from the actions and trends discussed here, that South Africa is entering a new era on the other side of the digital divide. While a large proportion of the population remains on the wrong side, never before has so much effort been put into creating a national digital infrastructure. The culmination of this will be that the majority of the adult population could be using the Internet in some form by the end of this decade.

Many lessons have been learned in the process, not least that policy-makers and regulators have a responsibility to facilitate and ease the adoption and roll-out of technology and infrastructure, rather than create obstacles in its way. Recent history offers a clear warning that current regulatory obstacles remain a spike in the wheel of telecommunications progress. This progress will happen, but despite policy-makers, rather than because of them. Perhaps the main lessons from the decade 2000–2010 are the following: (a) Information society (e-development) policy must be systemic across all parts and spheres of government, with multiple active players, even if the results are uneven because of varying capacities and resources; and (b) Policy and regulation require rapid design and implementation, just to stay slightly behind the curve of market development, to pick up the slipstream of innovation and extend it into regions of market failure.

From this perspective, major challenges exist with respect to the "state of the state" and the "capacity of the state", two closely related concepts necessary for socio-economic development in general and e-development in particular. Piccard (2005, pp. 365–366) argues that "The ANC did not inherit a strong state but a weak one", citing numerous sources including Grundy (2000, p. 45) "The capacity of the state to mobilise the necessary resources…the general inadequacies of the infrastructure and human resources left many expectations un-fulfilled" and Bardill (2000, p. 115) "[Capacity problems] include the lack of effective leadership and vision; underdeveloped forms of strategic planning and review; the lack of managerial competence … and the generally low level of skills and capacity throughout the service as a whole". These views are echoed in the 2007 OECD review which finds evidence of failure to consider "the whole innovation sphere"; resources too thinly stretched to reach critical mass with respect to particular innovation focus areas; lack of implementation of identified strategic priorities; limited specialisation with respect to innovation capability and governance; and limited integration "to develop more holistic forms of policy for the innovation system" (OECD 2007, pp. 8–9). Thus, it can be argued that the ANC did not only inherit a weak state, but continued to preside over a weak state, as it failed to increase its policy and implementation capabilities and capacities.

A small policy department such as the Department of Communications, in a weak state with limited capacities, when confronted with major large-scale infrastructure challenges in a new technology paradigm which requires multi-sphere, multi-departmental action, can either rise to or be dazed by the challenge. The slow, conservative gait of the policy-maker with respect to "seeing" the future information society, the actions that either held back progress (failure to introduce infrastructure competition) or were ill-designed to achieve progress (universality policy) or failed to materialise (promoting ICT usage in key sectors such as manufacturing, the services sector and in particular the public education sector, by rallying counterpart ministries) and the absence of any firm response from the broader executive—this action and inaction speaks of a weak state. Similarly, a small poorly resourced regulator, historically cowed or captured by on occasion the policy agency and on occasion the operators, will need to wage a concerted campaign to produce appropriate ex-ante regulation, based on a well-structured agenda. It has also been argued earlier in this chapter that information society policy was uncreative, often adopting positions from other policy environments rather than designing policy from the contextual base of South Africa, and often uninformed by public debate or comment.

Yet states can change, often pushed by external factors. But are such external factors present in South Africa? The first decade of the twenty-first century has seen innumerable street protests in both urban and rural areas, demonstrating against poor local government services. Communities have been most vocal about water and sanitation. They have not been as vocal about health, education or ICT access. Thus, the space has been left to small advocacy organisations which can be more easily ignored.

Conclusion: Building the Twenty-First Century Through Policy and Regulation for e-Development

SA cannot be said to have an e-transformation strategy, as the ISAD Plan 2006 is a set of goals rather than a strategy for e-development. Furthermore, the responsibilities assigned to departments in terms of the plan have been more honoured in the breach than effectively pursued. The national e-skills plan, though new and potentially interesting, is vague on detail and disconnected from other levers for e-development. Provincial and municipal policy and strategy are largely concerned with infrastructure connectivity issues such as broadband or access centres, rather than with e-services. Government is battling in its attempts to address the challenges of transformation in the schooling system, promotion of local economic development and SME advancement. Its energies appear to be more focused on being in government, than in succeeding at development. Pulling success out of the hat of a colonial history and separate development was never going to be easy. But, if government is not addressing the fundamentals of socio-economic transformation, then cross-cutting sectors like ICT are not seen for their potential value.

In order for e-transformation to occur in the society, it is necessary that the ICT sector should co-evolve with the major economic sectors, with advances in the ICT sector pushing forward development in mining, manufacturing, agriculture and services, which are evolving because of other innovations in addition to ICT. With respect to the limited achievements of the past decade, South Africa's state of evolution of broadband, of mobile and Internet access, of electronic content for e-business and e-government, of ICT skills and of institutional leadership is such that the country is not in a state of rapid progress towards economic transformation, as would be desirable for an economy seeking the kind of economic development that reaches beyond middle and high-income households in the urban centres. In particular, given the size and relative importance of the services sector in terms of its contribution to GDP, its importance in household consumption and its role as the key site of value creation by SMEs, ICT infusion and diffusion in the services sector is not yet fostering a services (r)evolution. A complex co-evolution process may, however, in future years constitute a rough, but well-trodden path through the challenges in bringing about the development of a country devastated by separate development (apartheid) to one where cumulative development over a few generations addresses the worst excesses of separateness and poverty.

Alternatively, South Africa can become a failed e-development case. There are four possible contributing factors. First, government's approach to policy, service delivery and development is mechanistic and short-termist, rather than employing responsive and adaptive policy and regulatory approaches. Policy and regulation follows a linear approach credible in the industrial age, an age which is a comfort zone for many decision-makers. In particular, planning is short-term and budgets are designed on a yearly basis with little attention to long-term budgeting for major development-focused transitions. The regulator is hobbled by lack of real independence and limited resources for intensive research. It tends to focus on distinct elements of regulation, a piecemeal approach rather than an overarching one. Second, the frictions typical of a developing economy and society, which give rise to chaos and complexity, are seen as undesirable by policy-makers and bureaucrats, though these are often the factors that drive evolution and transformation. The desire for certainty in the face of complexity tends towards policy as a form of control, rather than policy as a way of working with the flows and viscosity of societal change. The associated business processes are poorly developed or absent, meaning that policy cannot be implemented and is quickly taken over by events. Third, policy for the various economic sectors is split amongst multiple departments at three levels of government, leading to policy vacuums in many provinces and local municipalities; leading also to policy and planning taking place in one ministry or department disconnected from policy and planning in another department, for example, policy formulation in the communications vs. policy formulation in trade and industry or economic planning. Fourth, long-term planning, monitoring and evaluation have not existed historically, though an overarching planning function has been established in the Presidency. It released its diagnostic report in 2011. Monitoring and evaluation as a set of instruments to inform policy is not yet making an impact. These four factors mitigate against a constructive role for policy in e-transformation in South Africa.

What changes are required in the policy and regulatory environment? Concerted action by government will be required to achieve e-development—futuristic thinking at the policy level, possibly through a dedicated information society foresight programme, research-based decision-making at the regulatory level and well-planned, ethical practice at the operational level. A policy agenda should be designed to focus attention to fostering ubiquitous household and workplace broadband for access to Internet and mobile digital content; promoting e-development in the broad services sector not just in banking and tourism; and investment in e-skills advancement throughout the 12 years of schooling, further and higher education. A regulatory agenda should address complementary issues that will promote an information society, including competition with respect to broadband (fixed and mobile) provisioning and pricing, aimed at bringing connectivity to in excess of 50% of households and firms, within given geographic areas, within a set timeframe, laying the foundation for access to new services, a wide range of applications and broadband-enabled services innovation.

What should inform future policy and regulation? Four essential features are proposed: advancing mobility; stimulating the services sector to become an e-services sector; pushing broadband to the household; and promoting ICT in schools.

Given the mobility fostered by the migration of the workforce between cities and rural localities, as well as the mobility within cities particularly for the services sector workforce, e-development in South Africa today appears to follow the trend of mobility. Mobility in communications arises, not only from the capacities of information and communications technologies to foster mobility, but more specifically from the adoption of mobile communications devices and services by people who are already mobile due to history and context. Mobile communications is an important foundation for the information society in South Africa because it is open to innovation, yet affordable. Fixed broadband connectivity will, however, remain important for business and to get households on to the net.

The facilitation of services through electronic media is vital to South Africa's economic future. There are no prospects that the socio-economic status of the majority of South African households will change for the better in the next 2 decades. There will be no growth spurt from oil, mining or high value-added indigenous technologies. Many innovations in mobile applications and e-services are bubbling under and could reshape the landscape, setting an alternative future for the decade to 2020. While electronic services will not be the only platform for fostering development, they have been an important spur for improved services in upper- and some middle-income households (Abrahams and Burke 2010) and there is no particular reason why they should not be an important spur for SMEs and for middle-income and low-income households, given that they bring informational and transactional capability, as well as access to knowledge within easy reach. South Africa may also be able to position itself more effectively in global markets for services through constituting an e-services orientation.

Given the extent of market failure as discussed in this chapter, households may be an important level at which to pitch future policy and regulation for broadband access. Policy and regulatory interventions should consider an approach to universal

access and service that puts household and workplace broadband on the agenda for all local municipalities with more than 10,000 households, whether this development is through stimulating the market through appropriate regulatory interventions, some infrastructure building by provincial governments, or a combination of market stimulation combined with (at best) limited direct contributions from government. As has been argued earlier, the overlap between household and workplace is significant for many small and micro-enterprises, creating an even stronger rationale for broadband policy as economic policy, not merely communications policy.

In combination with a push towards household broadband Internet access, the effective introduction and use of ICT in schools can lead to the creation of learning environments where student and teacher have access to a greater volume and variety of content and where the variety of media makes learning attractive, rather than just routine. Even a small fraction of attractiveness in the learning environment may awaken energies currently lacking in most public school environments. Of the many areas of government services that could be selected for focused attention, it is argued here that schools are *particularly* important, because they are the sites of development of future generations of young South Africans, those who will build the future economy and society. In this next decade, schools will need more than computers, that is more than just inanimate computing devices. They will need animated, content-driven electronic media services—educational podcasts, blogs and wikis and other services yet to be invented, low-cost services generated by teachers and other educational content producers, services that are already available and require elimination of the access barriers that exist in the schools environment.

A shift in thinking is required to focus the regulatory effort towards e-development of the economy and society, rather than the historical focus of policy and regulation towards telecommunications or broadcasting or the particular mechanics of the emergence of these sectors. While the evolution of the these two sectors (telecoms and broadcasting) is important, they are even more important from the perspective of their contribution to the development and revitalisation of other sectors, including strong sectors such as the services sector, declining sectors such as the industrial sector and weak sectors such as mining and agriculture. This is what is meant by policy futurism. Regulatory position papers should sketch out the future of economic development for various sectors in the country with respect to how the integration of ICTs in that particular sector can revitalise the sector, for example, the services sector or e-commerce. Such work can underpin greater regulatory independence and accountability, avoidance of regulatory capture and give regulatory action new vigour.

References

Abrahams, L. (2009). e-Governance policy 1999 – 2009: Paths and limitations to progress, *Journal of Public Administration,* Volume 44, Number 4.1, Special issue December 2009.

Abrahams, L. & Reid, L. (2008). eGovernance for social and local economic development: Gauteng City Region Perspective, *Public Policy Research Paper No 9*, LINK Centre, University of the Witwatersrand, Johannesburg.

Abrahams, L. & Burke, M. (2010). Observing evolution of the information society and e-government in Gauteng province, 2010 Report. Report for the Gauteng Provincial Government, by the LINK Centre, University of the Witwatersrand, Johannesburg.

AfDB (2011). South Africa: Recent economic developments and prospects, Table 2: GDP by sector. African Economic Outlook, AfDB, OECD, UNECA and UNDP, retrieved on 30 June from www.africaneconomicoutlook.org/en/countries/southern-africa/south-africa/.

AfDB (2009). *The Africa competitiveness report 2009*. African Development Bank and the World Bank, Tunis.

Akinsanmi, T. (2010) Networked NPOs in the global south: Knowledge management and organisational effectiveness, Masters dissertation, Graduate School of Public and Development Management, University of the Witwatersrand, Johannesburg.

ANC (1994). The reconstruction and development programme. The African National Congress, Johannesburg.

African Response (2006) Finscope small business survey report Gauteng 2006, prepared December 2006 for Finmark Trust and Gauteng Enterprise Propellor, Johannesburg.

Akoojee, S., Arends, F. & Roodt, J. (2007). *ICT skills at the intermediate level in South Africa: Insights into private provision and labour market demand*, Human Sciences Research Council, HSRC Press, Cape Town.

Bardill, J. (2000). Towards a culture of good governance: The Presidential Review Commission and public service reform in South Africa.Public Administration and Development: the International Journal of Management Research and Practice. 20 (2): 103–118.

BuddeComm (2011). *China – Telecoms, mobile, broadband and forecasts.* BuddeComm, Sydney, retrieved on 9 July 2011 from www.budde.com.au/Research/China-Telecoms-Mobile-Broadband-and-Forecasts.html#execsummary.

BMI (2010). South Africa information technology report (Executive Summary), Quarter 2, 2010, Business Monitor International, accessed on 29 April 2010 from www.businessmonitor.com/it/south_africa_information_technology_report.

BMI-T (2010). SA telecoms industry: a changing landscape. Presentation at University of the Witwatersrand, 24 August 2010.

City of Johannesburg (2011). Presentation to Smart City workshop, University of the Witwatersrand, Johannesburg, 6 May 2011.

Claasen, L. (2010). Money in your phone. Financial Mail, 5 March 2010, Business Day Financial Mail, Johannesburg.

Comninos, A., Esselaar, S., Gillwald, A., Moyo, M. & Naidoo, K. (2010). South African ICT Sector Performance Review 2009/2010, Towards Evidence-based ICT Policy and Regulation, Volume 2 Policy Paper 6. Research ICT Africa, Cape Town, retrieved 20 December 2010 from www.researchictafrica.net/publications/ICT_sector_performance_reviews_2010/South_Africa_ICT_sector_performance_review_2010_-_Vol_2_Paper_6.pdf.

DoC (2010). National e-skills plan of action: e-Skilling the nation for equitable prosperity and global competitiveness, Draft 11 October 2010, Department of Communications, Pretoria retrieved- 12 March 2010 from www.doc.gov.za/index.php?option=com_docman&task=cat_view&gid=109&Itemid=541.

DoE (2003). *White Paper on e-Education*. Department of Education (DoE), Pretoria.

DPSA (2001) Electronic government: The digital future, A public service IT policy framework, Department of Public Service and Administration, Pretoria.

DST (2010). *National survey of research and experimental development 2008/9: High level key results.* Human Sciences Research Council, Centre for Science, Technology and Innovation Indicators for the Department of Science and Technology (DST), Pretoria.

Dwolatsky, B. (2010). Interview with the Head of the Joburg Centre for Software Engineering, University of the Witwatersrand. 17 March 2010, Johannesburg.

FFC (2011). Budget analysis and exploration of issues to increase performance in basic education and health, Chapter 6 in Submission for the Division of Revenue 2012/13. Financial and Fiscal Commission (FFC), Midrand.

Goldstuck, A. (2010). Internet access in South Africa 2010, A comprehensive study of the Internet access market in South Africa. World Wide Worx, Johannesburg.

Goldstuck, A. (2011). Mobility 2011. World Wide Worx, Johannesburg.
Goldstuck, A. (2009a). The mobile consumer in SA 2009. World Wide Worx, Johannesburg.
Goldstuck, A., Dagada, R. & Gillowey, K. (2010). Online banking in South Africa 2010. World Wide Worx, Johannesburg.
Grundy, K. (2000). South Africa: Transition to majority rule, transformation to stable democracy, in York Bradshaw and Stephen Ndegwa (eds). The uncertain promise of Southern Africa, pp.27–66, Indiana University Press, Bloomington, USA.
Guest, K. (2011). Neotel hangs up on Ajay Pandey: Can the operator redeem itself? iWeek, ITWeb, Issue 238, 30 March 2011.
Hernandez, J., Leza, D. & Ballot-Lena, K. (2010). *ICT regulation in the digital economy*. International Telecommunication Union Global Symposium for Regulators 2010, retrieved 25 January 2011 from www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/GSR10-paper2.pdf.
James, T., Smith, R., Roodt, J., Primo, N. & Evans, N. (2006). Women in the information and communication technology sector in South Africa. icteum consulting and CSIR Meraka Institute, Pretoria.
ICASA (2009). Individual electronic communications services. ICASA Notice, Independent Communications Authority of South Africa (ICASA), Sandton, accessed from www.icasa.org.za/LegislationRegulatory/LicensesandLicensees/ElectronicCommunicationsNetworkService/Individual/tabid/166/ctl/ItemDetails/mid/949/ItemID/183/Default.aspx.
Kew, J. & Herrington, M. (2009). ICT and entrepreneurship 2009, Research report for the Small Enterprise Development Agency, Graduate School of Business, University of Cape Town, Cape Town.
Lewis, C. (2010). Achieving universal service in South Africa: What next for regulation? LINK Centre, University of the Witwatersrand, Johannesburg.
Melody, W. (2002a). Preparing the Information Infrastructure for the Network Economy, World Telecommunications Markets. *International Handbook of Telecommunications Economics*, Volume 111, page 11.
Memeburn (2011). South Africa votes: The "online chatter" [statistics]. Memeburn, retrieved on 30 June 2011 from http://memeburn.com/2011/05/south-africa-votes-the-online-chatter-statistics.
Nielsen (2008). South Africa's most engaging sectors and websites. Nielsen news release, London, 11 July 2008, accessed 3 March 2009 from www.nielson-online.com/pr/pr_080711_ZA.pdf.
NACI (2009). South African Science and Technology Indicators 2009. National Advisory Council on Innovation (NACI), Pretoria.
Nielsen (2009). What happened to the South African Internet in 2008? Nielsen news release, London, 8 January 2009, Accessed 3 March 2009 from www.nielson-online.com/pr/pr_090108_ZA.pdf.
Ngcobo, Z. (2010). Interview with the Head of Drama, South African Broadcasting Corporation. 17 March 2010, Johannesburg.
OECD (2007). Review of the South Africa's Innovation Policy (draft version). Organisation for Economic Cooperation and Development (OECD), Paris.
OMD (2010). South Africa and SADC media facts 2010. OMD South Africa, Johannesburg.
Piccard, L. (2005). *The state of the state: Institutional transformation, capacity and political change in South Africa*. Wits University Press, Johannesburg.
RSA (2002). Electronic Communications and Transactions Act, No. 25 of 2002. Republic of South Africa, Government Gazette No. 23708, 2 August 2002, Pretoria.
Ryan, E. (2011). Time to sell the African success story. Business Day 23 March 2011, Business Report p.21.
SA Tourism (2011). Total tourists, Table A – December 2010. Retrieved 23 March 2011 from http://www.southafrica.net/sat/action/media/downloadFile?media_fileid=43979.
SA Tourism (2010). South African Tourism annual report 2009/2010. SA Tourism, Pretoria.
SA Tourism (2009) South African Tourism Annual Report 2009/2010, SA Tourism, Pretoria.
Schofield, A. (2010). 2010 ITWeb-JCSE skills survey: Summary of main fundings. IT Web and Joburg Centre for Software Engineering, Johannesburg.

Schofield, A. (2009). 2009 ITWeb-JCSE skills survey: Summary of main findings. ITWeb and Joburg Centre for Software Engineering, Johannesburg.
Schofield, A. (2008). 2008 ITWeb-JCSE skills survey. ITWeb and Joburg Centre for Software Engineering, Johannesburg.
Seeber, G (2011). The revolution in mobile payments is finally here. City Press Business, 8 May 2011.
Smit, D., Neilsen, B. & Roetter, M. (2008). International peer benchmarking study on the cost to communicate in South Africa. BMI-Techknowledge, Johannesburg.
Song, S. (2011). African undersea cables. Retrieved 30 June 2011 from http://manypossibilities.net/african-undersea-cables/.
Song, S. (2010) Open spectrum for development: South Africa case study, Association for Progressive Communications (APC), October.
StatsSA (2011). Gross domestic product, 1st quarter 2011. Statistical Release P0441, 23 February 2010, Statistics South Africa (StatsSA), retrieved 30 June 2011 from http://www.statssa.gov.za/publications/P0441/P04411stQuarter2011.pdf.
StatsSA (2010a). Gross domestic product, 3rd quarter 2009. Statistical Release P0441, 23 February 2010, Statistics South Africa (StatsSA), retrieved 2 December 2009 from http://www.statssa.gov.za/publications/P0441/P04413rdQuarter2009.pdf.
StatsSA (2010b). Quarterly labour force survey, Quarter 4 2009. Statistics South Africa, Pretoria.
StatsSA (2010c). General household survey 2010. Statistical Release P0318, Statistics South Africa, Pretoria.
StatsSA (2007a). Community survey 2007 – Basic results Gauteng. Statistics South Africa, Pretoria, accessed on 15 December 2010 from www.statssa.gov.za/publications/Report-03-01-27/Report-03-01-272007.pdf.
StatsSA (2007b). Community survey 2007 – Basic results provinces. Statistics South Africa, Pretoria, accessed on 16 December 2010 from www.statssa.gov.za/community_new/content.asp.
The PNC on ISAD (c2006). Towards an inclusive information society in South Africa. Presidential National Commission on the Information Society and Development, Pretoria.
TIPS (2009a). *Climate change risks and opportunities for the South African economy: Economic sector review: Financial services, insurance and business services*. Trade and Industry Policy Secretariat (TIPS), Johannesburg.
TIPS (2009b). *Climate change risks and opportunities for the South African economy: Economic sector review: Wholesale and retail trade, hotels and restaurants*. Trade and Industry Policy Secretariat (TIPS), Johannesburg.
van den Heever, A. (2011) Conversation with Dr Alex van den Heever, Chair: Social Security Programme, Graduate School of Public and Development Management, University of the Witwatersrand, Johannesburg, April.

Bibliography

Abrahams, L. & Goldstuck, A. (2010). The state of e-development in South Africa: a view from the end of the fi rst decade of the 21st century. *Public Policy Research Paper No 11*, LINK Centre, University of the Witwatersrand, Johannesburg.
Goldstuck, A. (2010). Internet access in South Africa 2010, A comprehensive study of the Internet access market in South Africa. World Wide Worx, Johannesburg.
Goldstuck, A. (2009b). Online media in South Africa 2009. World Wide Worx, Johannesburg.
Goldstuck, A. (2009c). SME survey 2009. World Wide Worx, Johannesburg.
Horwitz, R. & Currie, W. (2007). 'Another instance where privatization trumped liberalization: The politics of telecommunications reform in South Africa –' A ten year retrospective. *Telecommunications Policy, Vol. 31* (2007), pp. 445–462.

Kok, P. & Collinson, M. (2006). Migration and urbanization in South Africa. Report 03-04-02, Statistics South Africa, Pretoria, retrieved 15 December 2009 from http://www.statssa.gov.za/publications/Report-03-04-02/Report-03-04-02.pdf.

Majozi, T., Mbuli, N., Ferguson, K. & De Vaal, P. (2009). Engineering, in Diab, R. & Gevers, W. (eds) *The state of science in South Africa*. Chapter 10, pp. 263 – 275, Academy of Science of South Africa (Assaf), Pretoria.

MDDA (2009). Trends of ownership and control of media in South Africa. Report prepared by Z-Coms, 15 June 2009, Media Development and Diversity Agency (MDDA), Johannesburg.

Melody, W. (2002b). The triumph and tragedy of human capital: Foundation resource for building network knowledge economies. LINK Centre, University of the Witwatersrand, Johannesburg, retrieved 13 February 2010 from http://link.wits.ac.za/papers/wm20020918.htm.

MTN (2008–2010). MTN Group annual reports, 2008–2010, MTN, Johannesburg, available at www.mtn.com/Investors/Financials/Pages/annualreports.aspx.

NACI (2008). South African Science and Technology Indicators 2008. National Advisory Council on Innovation (NACI), Pretoria.

NITF (n.d.). After ISAD, Reviewing the ISAD conference: Towards the information society in South Africa. National Information Technology Forum (NITF), Johannesburg.

OECD (2009). Key ICT indicators. Organisation for Economic Cooperation and Development (OECD), Paris, retrieved 16 March 2009 from http://www.oecd.org/document/23/0,3343,en_2649_34225_33987543_1_1_1_1,00.html.

Open Society Institute (2002). 'Budapest Open Society Initiative'. Retrieved 10 December 2009 from http://www.soros.org/openaccess/read.shtml.

RSA (1996a). The Information society and the developing world: A South African approach, South African Government position paper. Information Society and Development (ISAD) conference, May 1996, Gallagher Estate, Republic of South Africa (RSA) Johannesburg.

RSA (1996b). Chair's conclusions to the ministerial meetings. Information Society and Development (ISAD) conference, May 1996, Gallagher Estate, Republic of South Africa (RSA) Johannesburg, retrieved 20 June 1997 from http://www.csir.co.za/isad/chaircon.htm.

RSA (2009). Development indicators 2009. The Presidency, Republic of South Africa, Pretoria.

Smith, K. (2002). What is the 'knowledge economy'? Knowledge-intensive industries and distributed knowledge bases. United Nations University Intech, Maastricht.

StatsSA (2006). Migration and urbanisation in South Africa. Statistics South Africa, Pretoria, accessed on 15 December 2009 from www.statssa.gov.za/publications/Report-03-04-02/Report-03-04-02.pdf.

StatsSA (2007c). Transport, post and telecommunication industry survey. Statistical Release P7000, Statistics South Africa, Pretoria, retrieved 15 December 2009 from http://www.statssa.gov.za/publications/P7000/P70002006.pdf.

StatsSA (2008a). Key indicators. Statistics South Africa, Pretoria, retrieved 27 December 2008 from http://www.statssa.gov.za/keyindicators/keyindicators.asp.

StatsSA (2008b). Post and telecommunication industry 2006, Statistical report 75-01-01(2006), Statistics South Africa, Pretoria, retrieved 15 December 2009 from http://www.statssa.gov.za/publications/Report-75-01-012006.pdf.

StatsSA (2009). Annual financial statistics. Statistics South Africa, Pretoria, retrieved 15 December 2009 from http://www.statssa.gov.za/publications/P0021/P00212008.pdf.

Stiglitz, J. (1999). Public policy for a knowledge economy. Department for Trade and Industry and Center for Economic Policy Research, London, 27 January 1999, retrieved 8 March 2010 from www.avj.ro/node/181669/docs/knowledge-economy.pdf.

Stones, L. (2008). Ruling against minister paves way for lower telecoms prices. The Weekender, 1 – 2 November 2008, cover page.

Telkom SA Ltd (2010). Annual report 2010. Telkom SA Limited, Pretoria, available at https://secure1.telkom.co.za/ir/financial/annual-reports-2010.jsp.

TIPS (2009c). *Climate change risks and opportunities for the South African economy: Economic sector review: Communications*. Trade and Industry Policy Secretariat (TIPS), Johannesburg.

Vodacom Group (2010). Vodacom group annual report 2010. Vodacom, Midrand, available at www.vodacom.com/pdf/annual_reports/ar_2010.pdf.

Chapter 5
The Philippines: The Quest for Genuine e-Development

Sherwin E. Ona, Estefanie Ulit, and Nagy K. Hanna

Introduction

After more than a hundred years of independence and its outstanding growth performance during the 1950s and the 1960s, the Philippines today has been regarded as a perennial development laggard—unable to achieve sustained economic growth thus earning the label of an "antidevelopment state." The country faces numerous development challenges. In this chapter we analyze recent and ongoing efforts to break the antidevelopment cycle by harnessing information and communication technologies (ICT). We review selected ongoing Philippine ICT for development (ICT4D) initiatives and the characteristics of these initiatives. We classify these initiatives as "traditional"—disjointed, unsustainable, and short-term oriented.

Overall, the chapter provides an overview of the socioeconomic development thrust from 1986 to 2010 and the evolving role of ICT in the Philippine's successive development strategies. It analyzes the Philippine national ICT strategies, e-policies, ICT institutions, and selected public sector led-ICT4D initiatives and the role of the private sector in supporting the Philippine ICT industries.

We present the Philippines as being at a critical point in its history, facing the choice of either continuing "traditional" approaches or adopting a transformational approach for ICT's role in national development. Although the ongoing ICT revolution holds much promise, realizing its fruits remains a daunting challenge for the Philippines. Citing the need to break the antidevelopment cycle, we reiterate the need for the Philippines to adopt an e-transformation perspective and consider ICT's transformational role. We believe that this perspective can help policy makers chart a path towards genuine e-development.

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History of Development and ICT Strategies (1986–2010)

Why did the Philippines fail to achieve sustained economic growth? The following observations provide snapshots of how this failure manifested in Philippine society, thus earning the country the reputation of being a development laggard (Lim 2010).

On the economic front, GNP per capita has lingered at $1,000 for the past 20 years. In 2010, the Philippine Central Bank estimated the country's external debt at US $53.1 billion (equivalent to 33.9% of GDP) while public sector debt amounted to US $31.3 billion. With debt servicing amounting to 20% of the approved 2010 national budget (Reuters 2010), and with weak tax collection in recent years, government's ability to make strategic investments for its people and economy is severely restricted.

On the Millennium Development Goals, the Philippine is off track by 40% of the 21 indicators including that of poverty, hunger, infant mortality, and maternal health (Paredes 2010). Roughly 30% of the population is living below the $1.35/day Asian poverty line. It has been argued that since the Philippines is espousing "pro-rich" growth strategies, prevailing poverty will continue (Newsbreak 2008).

Aside from economic mismanagement, historians and political analysts contend that the State and its resources were often used to further personal or class interest. This dysfunctional nature of the Philippine system is attributed to a complex interplay of internal and external forces, structural and other factors (Bello et al. 2004). This interplay results in a boom-bust cycle or an antidevelopment cycle (Quimpo and Kasuya 2010).

Although most of the antidevelopment characteristics present in the Philippines developed through decades of mismanagement, much has been done to break this vicious cycle, demonstrating the Filipino aspiration to lift the country from the shackles of poverty. The restoration of democracy through the 1986 People Power Revolt and growth-oriented economic policies have enabled the rebuilding of democratic institutions and allowed for a modest expansion of the economy. Recognizing the need for sustained economic growth and the diffusion of growth benefits, the medium-term development plans of the Philippines reiterated the need to harness the potentials of a globalized economy through internal and external opportunities. With the new democratic space came the need for economic expansion by opening the economy to new players, tapping foreign investments, encouraging public–private partnerships, and diffusing the benefits of a liberalized economy through relevant social programs.

The first Aquino administration (1986–1992) focused on the restoration of democratic institutions, emphasizing rural poverty alleviation and addressing the government's growing public debt. Central to this strategy was the enactment into law of the Comprehensive Agrarian Reform Law in 1988. Although severely hampered by lack of funds and intervention by landed elites, the ensuing Comprehensive Agrarian Reform Program (CARP) proved to be a catalyst for major reform efforts geared toward increasing rural productivity. The Local Government Code (LGC) of 1991 espoused the concept of decentralization by devolving to local government units (LGUs) frontline services such as health, education, and social services.

During the Ramos administration (1992–1998) the main reforms were clearly focused on increasing Philippine competitiveness in the global economy. Heavy

investments in infrastructure and regulatory reforms in the service industry, such as the telecommunications sector, were put in place with the intention of pump-priming the economy and increasing its global competitiveness. On the issue of poverty alleviation, the law on social reform and poverty alleviation called for the identification of minimum basic needs and adoption of a participatory approach in dealing with poverty. Empowering local governments through decentralization and devolution of resources was also part of the reform-oriented thrust of the Ramos administration (Thompson and Macaranas 2006).

The short-lived Estrada administration (1998–2001) recognized the need for a more broad-based approach to address rural poverty. Coining its strategy as "Linggap para sa Mahirap" (Caring for the Poor), the program's main intent was to identify the 100 poorest families in each province and provide a package of assistance including livelihood and food staples.

The Arroyo administration (2001–2010) continued the push for global competitiveness by increasing investments in infrastructure, small- and medium-scale enterprise (SME) development, and by tapping the potential of global outsourcing. Known locally as the "Beat the Odds" program, the Arroyo administration also focused on poverty alleviation through rural development via the "Kapit-Bisig Laban sa Kahirapan" (*KALAHI*) program. The KALAHI program addressed the challenges of diffusing the benefits of economic growth by providing human development services, employment creation, and livelihood opportunities.

Overall, the effects of most of these rural poverty alleviation programs were marginal, with most suffering from budgetary constraints and sustainability issues (Abinales and Amoroso 2005). Table 5.1 provides a snapshot of the development agenda espoused by the various administrations from 1986 to 2010, and the accompanying national ICT strategies and institutions.

Having garnered a commendable mandate during the May 2010 elections, the new Aquino administration, with its promise of bureaucratic reforms, good governance, and sustained economic growth, is expected to continue the economic policies of its predecessor. With a respectable GDP growth of 6.8% in 2010, hopes are high that the new administration will usher a new era of genuine economic growth and improved public perception of government.

Role of ICT in National Development

As early as the 1990s, Philippine development plans reflected a strong recognition of ICT as an enabler of productivity and economic growth. This recognition was further enhanced through the supplemental plans as reflected in the National IT Agenda 21 (1997), the e-Philippines Strategy (2000) and the Strategic ICT Roadmap (2006), and in efforts to enhance ICT institutions. From merely a computer center in the late 1970s, the National IT and E-Commerce Promotion councils were created in 1994 and 1998, respectively. These two councils were later merged in 2000 into the IT and E-Commerce Council (ITECC). Responding to the global trend toward convergence of telecommunications and information technology, the Philippines

Table 5.1 Summary of Philippine development initiatives (1986–2010)

Administrations	Medium-term development agenda	Enacted laws on development and ICT	Strategic ICT policies
Aquino Administration (1986–1992)	Restoration of democracy	Comprehensive Agrarian Reform Law	Administrative guidance for the use of ICT in improving delivery of government services
	Increasing rural productivity	Local Government Code (LGC) of 1991	
	Emphasis on social equity through land reform		
Ramos Administration (1992–1998)	"Philippines 2000"	Agriculture and Fisheries Modernization Act (RA 8435)	National IT Plan (IT21)
	Increasing global competitiveness	Social Reform and Poverty Alleviation Law	Creation of the National IT Council and the E-Commerce Promotion Council
	Addressing basic needs of marginalized sectors	Public Telecommunications Act	
Estrada Administration (1998–2001)	"Angat Pinoy 2004"	E-Commerce Act (RA 8792)	e-Philippines strategy
	Addressing needs of the poorest of the poor		Creation of the ITECC
Arroyo Administration (2001–2010)	"Beat the Odds"	Human Security Act (RA 9372)	e-Philippines
	Sustained economic growth	Anti-Child Pornography Act (RA 9775)	Strategic ICT Road Map
	Increase economic competitiveness	Election Modernization Act	Creation of the CICT

recognized the need to give more prominence and authority to the ITECC by creating a presidential commission. By 2001, the Commission on Information and Communications Technology (CICT) replaced the ITECC.

Plans were also accompanied by laws and policies to promote the use of ICT to enable agriculture and fisheries modernization; promote good governance, through the LGC, the automated elections and the poverty alleviation laws; and enhance human security, through the human security and antipornography laws.

Overview of Current ICT4D Initiatives

This section looks at how ICT is being used to achieve sustained economic growth. It presents a snapshot of digital Filipinos and their ICT-enabled society. Then it provides an overview of the various ICT-related government-led responses to break the antidevelopment cycle by discussing the following: (a) National ICT strategies,

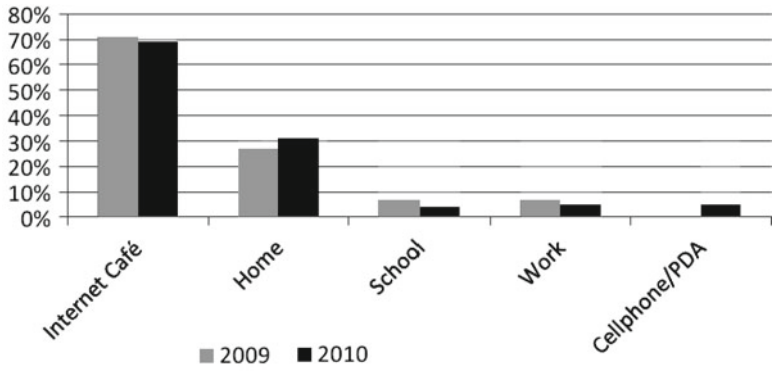

Fig. 5.1 Internet access locations (Yahoo-Nielsen 2010)

(b) ICT institutions, (c) Philippine e-policies, and (d) ICT4D programs. Finally, it reviews encouraging developments in the private sector-led cyber-services, telecommunications, and semiconductor manufacturing industries.

Profile of the Digital Filipino

There were 2.5 million subscribers for the 488 National Telecommunications Commission (NTC)-registered Internet service providers (ISP) in 2009, accounting for only 3% for the total population (De la Pena et al. 2009). However, Yahoo estimates that 16% of the Philippine population is browsing and using the Internet. This has been facilitated by a remarkable rise in the number of Internet cafes, community e-Centers (CeCs) and other public access points where users who cannot afford the subscription fees of the ISPs in the country can still access the Internet.

In addition, Fig. 5.1 shows that a majority of Filipino internauts rely on Internet cafes to connect to the Internet. However, from 2009 to 2010 there is a slight decrease in the percentage of Filipino internauts who go to Internet cafes for Internet connectivity, as well as those who go to school and work to go online. These declines may be compensated by the increase of Internet access at home by 4%. Furthermore, there is a noticeable rise in the percentage of Filipinos who use mobile devices to connect to the Internet, from 0 to 5%. Those who use mobile devices for Internet access have sending/reading instant messages and e-mails as their top online activities (Ibid).

Another feature of the Philippine digital society is the widespread utilization of mobile phones. There are currently 90 million mobile subscribers, with the mobile penetration rate at 96% for the total population (Mendes et al. 2007). This consequently results in heavy usage of short messaging service (SMS) by Filipinos, which led to the Philippines being dubbed the "texting capital" of the world. Aside from exchanging information, Filipinos use SMS as a means of mobile commerce through

the passing of usage credits among the subscribers and consumption promotions, such as "text-to-win" promotions, in exchange for monetary rewards (Ibid).

Although the use and development of SMS applications seem to be reaching its saturation point, the utilization of electronic commerce by Filipino consumers seems to be growing at a slower pace. The Philippines is considered one of the slowest e-commerce adopters with an estimated 55% of its online population never making a purchase over the Internet and 59% of local online shoppers not making any purchase in the last 3 months in 2008 (Nielsen Global Online Shopping Report 2008).

ICT-Related Government-Led Initiatives

The following represents government-led initiatives mainly pertaining to the utilization of ICT for attaining national development goals.

National ICT Strategies

Table 5.2 provides a summary of the various national ICT strategies, visions, and action agendas adopted by the Philippines from 1997 to 2006.

At present, there are ongoing efforts to revise the 2006 Strategic ICT Roadmap. An overview of the Philippine Digital Strategy (PDS) (2011–2016) is discussed as follows.

National ICT Plan for the 21st Century (1997) (National Information Technology Council 1997)

The National IT Plan for the 21st Century (IT21), prepared in 1997 under the Ramos administration, envisioned a Philippines that is a knowledge-based economy. Putting emphasis on the need to focus on IT being an enabler for productivity and innovation, IT21 sought to push the goals of the 1992–1998 medium-term development plan, which was coined as Philippines 2000. This development agenda outlined the steps to prepare and equip the Philippines to attain a "New Industrialized Country (NIC)" status by early 2000. Aside from access to ICT and the upgrading of skills consistent with a knowledge-based economy, it also recognized the need to develop a market-based approach to the development of the local telecommunications industry. This required the enactment of laws and policies to open the local market to new players.

IT21 was based on the vision of transforming the Philippines as Asia's Knowledge Center. The National Information Technology Council (NITC) was established to handle the production of the agenda document. It was drafted in constant consultation with international and national agencies such as the United Nations Industrial

Table 5.2 Summary of national ICT strategies

National ICT strategy	Vision	Action agenda
National ICT Plan for the 21st Century (1997)	Philippines as a "New Industrialized Country" (NIC)	Manpower development (technical and professional)
		R&D investments in high-growth sectors
	Philippines as Asia's Knowledge Center	Industry and private sector partnerships
		Establishment of telecommunications infrastructure for information sharing and accessibility
e-Philippines Strategy (2000)	Improvement of the quality of living through ICT	Manpower provision for IT services (BPO)
		ICT diffusion in government, business, community development, and education
Strategic ICT Roadmap (2006)	Philippines as an Information Society empowered through ICT	Push for ICT diffusion through the development of relevant content and access
		Infrastructure development for cyber-services
		Human capital development

Development Program (UNIDO), the Legislative and Executive Development Council (LEDAC), the Cabinet, and the National Economic and Development Authority (NEDA).

IT21 focused on the action agenda for the use of IT to enable the Philippines to become the leading country in IT education and professional training, and harness the use of information and knowledge for application in business and the arts. Telecommunications technology was regarded in the plan as the underlying infrastructure to support national information sharing and accessibility in the industry, government, and education sectors. The plan envisioned the use of IT applications in governance specifically for information dissemination, to provide citizens access to government services, and for coordination among national and local government units. The IT21 plan proposed how ICT would be integrated in the educational sector through the growth of computer schools and training centers. Additionally, proposals for significant investments in local research and development were cited in IT21. Investments in R&D were seen as an imperative in order to ensure high-quality IT products and services that would be competitive in the global market. High-growth sectors such as telecommunications, software development, and e-commerce were identified as targets for R&D investments.

Support structures were put in place to enable the implementation and sustainability of the programs under the action agenda. In addition to laying out network and telecommunication infrastructures, the development of techno-parks and cyber-cities were coordinated for investments. Project investments were intended to be made possible by also establishing partnerships with the industry and private

Fig. 5.2 e-Philippines development areas. *Source*: United Nations Public Administration Network (2000)

sectors. Policies and procedures were to be streamlined to promote a more welcoming business environment for both local and foreign investors.

Furthermore, IT21 outlined a legislative agenda and implementation program. The proposed legislative agenda focused on foreign ownership and security of information, while the program centered on increasing Internet connectivity, modernization of government, establishment of ICT flagship projects, restructuring of IT organizations, and technological reform in education and research.

The e-Philippines Strategy (2000) (United Nations Public Administration Network 2000)

The e-Philippines Strategy (e-PS) under the Estrada administration (1998–2001) was seen as a continuation of the IT21, but focused on improving the quality of living through the use of ICT. Aside from its use in the sectors of education and government, ICT was regarded as a possible source of livelihood for Filipinos. The e-PS agenda generally focused on business development, legal and regulatory environment, information infrastructure, and human resource development.

While still considering hardware and electronics manufacturing as a profitable industry, the e-PS shifted emphasis to IT foreign investments and the provision of an affordable manpower pool for IT services, particularly outsourcing. Moreover, the construction of high-rise buildings, instead of "parks" and "cities," was approved to serve as additional support structures for IT-enabled services.

Meanwhile, the development areas in the e-PS were categorized into four sub-plans as shown in Fig. 5.2. Each of the sub-plans/programs had corresponding projects and action agenda intended to be accomplished by 2010. Programs on e-government are centered on the interconnectivity of government agencies in order to provide accessible information and integrated services. Initially, in line with this, the e-government portal and other ICT systems were developed. e-Government plans also proposed establishing institutions, specifically a Department of Information and Communications Technology (DICT), to oversee technology development in the country. Under e-commerce plans, various communication channels were to be converged in order to provide more affordable access to the public. An e-commerce sub-plan and program were established to address the ICT-related needs of small, micro, and medium enterprises (SMMEs). Consequently, laws for web presence and consumer protection were created. Likewise, the e-community area identified projects for improving literacy, health services, and livelihood in various municipalities.

Respectively, there were projects on the establishment of multipurpose telecenters; e-health portal for Municipal Health Office (MHO) services; and AgriNet for information on crop marketability, agricultural geography, and weather. Additionally, e-tourism was promoted to increase economic growth and improve this source of revenue in rural areas. In addition, the e-PS included e-knowledge which gave priority to the enhancement of ICT-related knowledge and skills in both basic education and professional training.

Finally, the e-PS stressed that the President of the Philippines would direct ICT development in the country. Thus, in 2000, the chairmanship of the ITECC was transferred to the President of the Republic of the Philippines as signed in Executive Order No. 18—an amendment to Executive Order 264, which merged the previous National Information Technology Council (NITC) and the Electronic Commerce Promotion Council (ECPC) to form ITECC.

Strategic ICT Roadmap (2006) (Philippine Strategic ICT Roadmap 2006)

The Philippine Strategic ICT Roadmap identified flagship projects and key strategic initiatives of the Arroyo administration (2001–2010). The roadmap and associated principles asserted the following:

- ICT plays a critical role in economic growth and development
- ICT is a tool for empowerment of individuals and good governance
- The emergence of the Philippine Information Society will give way to the rise of Sovereign Individuals
- To achieve the full vision of an information society, it is necessary to adopt a multi-stakeholder approach through creative institutional arrangements and partnerships with the private sector and civil society
- There is a need to develop human capital to ensure effective utilization of ICT
- Emphasis should be placed on the creation of local digital content and the need to ensure access and its availability

ICT diffusion projects carried out under the roadmap focused on empowering local communities. Local governments were prioritized through the e-LGU project, which provided LGUs with a Real Property Tax System and Business Registration and Licensing System. Community e-Centers (CeC) were also established, in partnership with the private sector, to provide municipalities with access to information via the Internet. These projects served as a conduit for efficient delivery of government services, and as a venue to promote participation by underserved communities (Philippine CeC Roadmap 2007).

The need for upgrading the ICT infrastructure was recognized by launching the Philippine Cyber Corridor (PCC) in 2005. Under a private-public partnership (PPP) arrangement, the project intended to provide a nationwide network-telecommunications backbone for companies primarily engaged in providing cyber-services in the areas of animation, business process outsourcing (BPO), medical transcription, and software development.

Human capital development was also considered an important pillar of the roadmap. Through the National ICT Competency Standards (NICS), the roadmap initially targeted public school teachers in the basic and primary education levels. The roadmap also outlined initiatives to promote cooperation with other government agencies especially the Department of Education (DepEd), and the Technical Education and Skill Development Authority (TESDA) for vocational training.

Pushing for a New National ICT Strategy (2011–2015)

In the third quarter of 2010, the CICT initiated a review of the 2006 Strategic ICT Roadmap. It is expected that by the second half of 2011, the revised ICT roadmap, renamed as the PDS, will be ready for approval and implementation by the Philippine government. Initially, the PDS is focusing on four ICT subthemes: Human capital development, e-government, infrastructure, and cyber-services. The PDS is expected to chart ICT's development in the Philippines up to 2016. It adheres to the overall theme of digital inclusion right down to the village (*barangay*) level. As of May 2011, the PDS is undergoing consultations with the various sectors of society, including business, civil society, academe, and government.

ICT Institutions

Along with strategic and implementation targets, the national ICT strategies clearly envisioned the development of public sector ICT institutions. With the rapid developments happening within the domain of the information/knowledge society come the changes in the Philippines' perspective in developing its ICT institutions.

Commission on Information and Communications Technology

Recognizing the need to harness ICT and coordinate private and public sector initiatives, the government created a National IT Council (1994) and an E-Commerce Promotion Council (1998). The global trend toward convergence of IT and telecommunications systems presented a new challenge for the Philippines. As a result, a merger of the councils took place in 2000 and the CICT was created in 2001. Consequently, the National Computer Center (NCC) and the Telecommunications Office were placed under the administrative supervision of CICT.

CICT is now the primary government agency tasked to oversee planning, policy directions, program coordination, and implementation of ICT-related endeavors in the Philippines. Recognizing the need for leadership in pushing for an expanded role for ICT in the country's development agenda, CICT was placed directly under the Office of the President, Republic of the Philippines. As the lead agency for ICT-related initiatives in the Philippines, the commission was mandated to push the e-Philippines strategy by providing ICT infrastructure and resources for nation-building and global competitiveness, promoting the use of ICTs in different sectors, creating a policy and legal environment to benefit various ICT stakeholders, guaranteeing

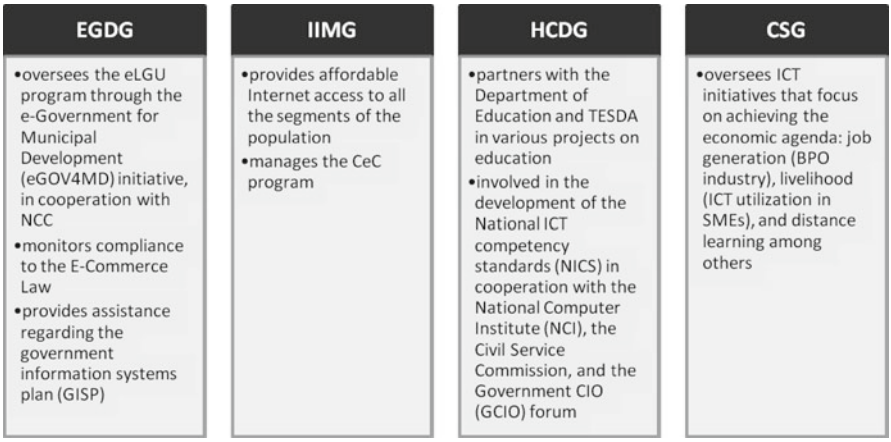

Fig. 5.3 Commission on Information and Communications Technology (CICT) subunits

connectivity and universal access to ICT and services, advocating ICT manpower development, and instituting a regulatory system for ICT user protection (Commission on Information and Communications Technology 2006a).

Within the CICT are subunits that are tasked to handle various projects as described in Fig. 5.3. These subunits are comprised of the E-Government Development Group (EGDG), Information Infrastructure Management Group (IIMG), Human Capital Development Group (HCDG), and Cyber-Services Group (CSG) (Ibid).

Aside from the CICT, other government agencies are involved in ICT development, with their own project plans.

Department of Science and Technology (DOST)

The Philippine Council for Advanced Science and Technology Research and Development (PCASTRD) and the Advanced Science and Technology Institute (ASTI)—under the Department of Science and Technology (DOST)—are the main research entities addressing critical application areas of ICT and supporting ICT-based entrepreneurship (De la Pena et al. 2009). PCASTRD supports ICT research and development through the following (PCASTRD 2009):

- Funding of ICT R&D projects particularly along internet technologies and software engineering
- Granting of scholarships for graduate programs in ICT in PCASTRD-accredited universities
- Organizing and sponsoring information seminars, conferences, and workshops on ICT

With its mandate of "conducting scientific research and development in the advanced fields of ICT and microelectronics," ASTI's main research areas include advanced networking, wireless technologies, and network applications and software (ASTI Research and Development Programs 2011).

Department of Trade and Industry

Department of Trade and Industry's (DTI's) main role is to contribute to the country's goal of achieving economic growth towards poverty reduction. The department's mandate calls for the expansion of Philippine exports, increase in investments, and the development and promotion of the country's micro, small, and medium enterprises (Department of Trade and Industry 2008a). The department's efforts to promote entrepreneurship and export development endeavor to provide an ICT-enabled environment to promote local products and services. DTI is also the agency tasked to manage ICT parks and the Philippine Export Development Council, which identifies ICT services as one of its priority exports (De la Pena et al. 2009).

With the Philippines being recognized as a leading provider of cyber-services and semiconductor manufacturing, DTI is actively partnering with private sector organizations such as the Business Processing Association of the Philippines, (the Philippine Software Industry Association), the Animation Council of the Philippines, Inc., and Semiconductor and Electronics Industries in the Philippines, Inc. (Department of Trade and Industry 2008b).

National Telecommunications Commission

As an attached agency of the Department of Transportation and Communications (DOTC), the NTC is a regulatory agency providing an environment that ensures reliable, affordable, and viable infrastructure and ICT services accessible to all (National Telecommunications Commission 2005).

In general, the creation of national ICT strategies throughout the years has been characterized as a multi-sectoral/multi-stakeholder effort. Government was cognizant of the crucial role of the private sector and civil society in the crafting of the national ICT strategies.

In conclusion, the Philippine has created a variety of institutions to lead the development and implementation of national ICT polices and strategies. However, no formal assessment has been made of ICT leadership institutions or their capacities, nor their interactions, among themselves and with other political and economic institutions. Lacking such assessments, we can only draw broad characterizations, without pinpointing the underlying factors contributing to current performance. It appears that the sum is less than the parts. Roles, responsibilities, and programs tend to overlap, and are not strategically and synergistically managed. Accountability for performance remains weak. Moreover these institutions suffer from common civil service constraints that hinder their ability to compete with the private sector in this dynamic sector and to attract highly skilled staff.

Philippine e-Policies

More systematic and frequent assessments of ICT institutions in the Philippines are needed in view of the diverse and frequent institutional innovations pursued, and of the significant gap between stated aspirations and results on the ground. There are also some successes, notably in public–private partnerships and programs to promote the ICT industry, and formal assessments can improve these programs and draw lessons more broadly for e-transformation in the Philippines and other developing countries.

National ICT strategies have long recognized the role of enabling policies to support and sustain the momentum of ICT4D initiatives. Table 5.3 provides a snapshot of some of the prominent laws that were legislated to support the implementation of the ICT development agenda, and strategies include the Public Telecommunications Policy Act, the e-Commerce Act, and the Election Modernization Act.

The Public Telecommunications Policy Act of 1995 is seen as one of the landmark laws of the Ramos administration. It provided for liberalization of the telecommunications industry, thus breaking its decades-long monopoly. The enactment of the law cleared the way for the entry of new players in the industry, promoting competition and protection of consumer welfare.

The E-Commerce Act of 2000 aimed to accelerate the Philippines' progress in the global business arena. It recognized electronic forms of transactions as valid and reliable. It provided for government offices to have Internet connectivity and for the general public to have universal web access (National Computer Center 2000). Furthermore, DTI was designated to supervise the development of electronic business transactions and was tasked to monitor business activities on the Internet, which covered emerging methods for commerce such as electronic retailing and online content licensing. Corresponding punishments and penalties were also set for computer-related crimes including hacking, cracking, piracy, and online defamation to protect companies and consumers alike.

The Election Modernization Act was enacted in January 2007. The law recognized the need to ensure accuracy, transparency, and security in the election process. Thus, statutes prescribing a random manual audit (RMA), presence of security standards in the ballot and in the counting machine, among others, were required as part of the safeguards. Finally, the law mandated COMELEC to conduct a nationwide information campaign to educate the population and further allay negative public perception about the automated election system (AES).

Recognizing the need for additional policies due to the evolving nature of the Philippine Information Society, the 2006 strategic ICT roadmap stated the importance of legal frameworks as the basis for plans and activities, created in coordination with essential stakeholders and the private sector, and well supported by the general public (Philippine Strategic ICT Roadmap 2006).

Table 5.3 Enacted Philippine e-policies

Public Telecommunications Policy Act (RA 7925)	A healthy and competitive environment shall be fostered, one in which telecommunications carriers are free to make business decisions and to interact with one another in providing telecommunications services, with the end view of encouraging their financial viability while maintaining affordable rates
E-Commerce Act (RA 8792)	Involves the collective use of electronic media and technology in facilitating different business and government transactions including product and service exchange, and the acknowledgement of contracts
Election Modernization Act (RA 9369)	Commission on Elections (COMELEC) acquired flexibility in the choice of new information technologies, focusing its attention on tallying and canvassing on one hand and transmission of votes on the other

As part of the roadmap's legislative agenda, proposals for the enactment into law of four bills, summarized in Table 5.4, were put forward to the Philippine Congress. As of May 2011 they are pending at various levels of the legislative process.

Government-Led ICT for Development Initiatives

A 2005 inventory of ICT4D applications in the Philippines provided a snapshot of ICT4D projects (Table 5.5). These projects were planned and implemented by the government in partnership with the private sector, NGOs, and other government agencies. ICT applications included the use of websites, information systems, local area networks, and SMS technologies. A majority of the projects are under e-government and e-learning development initiatives.

Projects under e-government initiatives were mostly geared toward information dissemination and the improvement of revenue collection for LGUs. Projects included geographic information systems (GIS) for revenue generation and emergency/disaster response. e-Learning projects aimed at distance learning, ICT skills development, and content development. Research and educational institutions and libraries were also networked to provide shared access to knowledge resources. Furthermore, e-learning programs afforded access to new technologies through the establishment of training centers and mobile classrooms (Tiglao and Alampay 2005).

ICT infrastructure projects were categorized under e-science, which involved the provision of telecenters, broadband access, database repositories, and open-source software and freeware. Other ICT applications have yet to be explored. The use of ICTs for livelihood and economic growth is progressing. e-Business applications are either company- or customer-specific, to improve customer service and reach broader markets. e-Agriculture projects cater to research and extension, thus providing farmers, fishermen, and other stakeholders with access to knowledge. e-Employment systems aim to provide work opportunities by integrating job-posting and matching facilities. e-Health projects provided information systems for the management of

Table 5.4 Proposed e-policies (legislative bills)

Creation of DICT	Cyber-security bill	e-Government bill	FOI bill
Proposes the creation of an executive department focusing on ICT, basically calling for the merging of government ICT functions and units	Seen as a factor in creating a more stable ICT environment and at the same time providing more legal basis for law enforcement agencies to prosecute cyber-criminals	Provides frameworks and models for the procurement, development, and use of ICT for the purpose of dispensing government services and employing good governance	Requires government agencies to release pertinent information on its transactions upon request of citizens and concerned groups and penalizes government officials for not adhering to its transparency statutes

Table 5.5 ICT4D projects in the Philippines

Category	ICT application	Number of projects
Political/governance/ empowerment	e-Government/e-governance	277
Economic/livelihood	e-Business	44
	e-Employment	15
	e-Agriculture	24
Social/education	e-Learning	129
	e-Health	23
	e-Environment	32
Infrastructure/access	e-Science	59

Source: Tiglao and Alampay (2005)

medical data including patient records, hospital supplies inventory, and even information on diseases and their corresponding treatments. As for e-environment, GIS were developed to map out information on Philippine topography and environmental conditions (Ibid).

In an effort to make government more accessible to its constituents, the Office of the President initiated the creation of the Official Gazette acts as temporary portal of the Philippine government (http://www.gov.ph). Aside from being an information dissemination platform for the Office of the President, the Official Gazette serves as a gateway to the various national government agencies through the departmental links provided. The other branches of government (legislative and the judiciary) can also be accessed through the gazette. The gazette also allows the downloading of official policies and laws as well as policy discussions on national issues and concerns.

Recognizing the power of online media, the Office of the President maintains a separate website (http://www.op.gov.ph) highlighting the various activities and programs of the current Aquino administration. Unlike the Official Gazette, the official website of the Philippine president exudes a more personal approach in communicating with the general public. Additionally, the Office of the President utilizes popular social networking sites (e.g., Facebook) to reach a wider audience.

Private Sector-Led ICT Industry Initiatives

The strategies and programs initiated by the government provided a positive impact on the growth of the private sector-led ICT industry in the Philippines. In fact, the steady growth of this industry coupled with remittances from overseas Filipino workers were seen as factors that partially shielded the Philippines from the full effects of the 2007 global economic crisis. Focusing on cyber-services, telecommunications, and semiconductor manufacturing, the private sector-led ICT industry played an important role in the increase of the GDP in recent years, thus becoming a significant contributor to national development.

Growth in the local cyber-services sector has mainly focused on software development, BPO, and contact centers. Table 5.6 presents a comparison of the 2005, 2006, and projected 2010 revenue figures generated by the cyber-services sector that show this sector's strategic niche qualities. In fact by 2008, the BPO subsector revenues were pegged at US $6.8 billion, placing the Philippines as the second largest BPO industry in the world next to India. In fact, with US $5.7 billion projected revenue for 2010, local and international observers are projecting that the Philippines would be the global BPO industry leader in 5 years time (Esguerra and Balana 2010). The contact center subsector is still seen as the fastest growing segment in the local ICT industry with 112 contact centers nationwide. While medical transcription grew by 97% (De la Pena et al. 2009) by 2006, the animation subsector's revenue amounted to US $54 million, which is equivalent to a 38% growth rate.

Prospects for growth are also evident in the Philippine telecommunication sector. By end of 2008, mobile penetration in the Philippines was 75% (International Telecommunications Union 2009) and by 2010, it was expected to be at 90–95% (for a population of 95 million Filipinos). With the expected maturity of the mobile phones, broadband Internet service is seen as the next battleground. Philippine telecom giants Smart Communications and Globe Telecoms estimate broadband users at around 2.3 million, with both companies recognizing the huge potential for growth in the service (Montecillo 2010).

With an estimated 2.5 million wire-line connections (only 10% of Philippine households), landline connections have continued to lag behind mobile ones. Substantial efforts are being made to close the gap. As an example, the major local player Digital Telecommunications Philippines (Digitel) is expanding its wireless digital landline, SunTel, to cover the central and southern Philippines. Digitel plans to utilize its existing 7,000 cell sites coupled with agreements for interconnection with Globe Telecoms (Abadilla, November 2010). Local telecommunication companies were pushing for the adoption of the new generation networks (NGN), with pilot testing of its capabilities being done in 2006.

Regarding ICT manufacturing, the Philippine semiconductor manufacturing sector has exhibited phenomenal growth for the last 10 years. According to the Semiconductor & Electronics Industries in the Philippines (SEIPI) that in 2010 alone, this ICT industry sector registered total of US $2.3 billion worth of investments. The same year also registered robust growth in the sector with an additional 25,000 jobs created, a 41% increase in exports, and with total investments increasing

Table 5.6 Job generation and revenue growth in Philippine cyber-services

Cyber-services sectors	2005	2006	2010
Customer contact	112,000	179,200	506,500
Back office	22,500	40,500	337,000
Software development	12,000	15,600	44,600
Medical transcription	5,500	13,800	114,700
Animation	4,500	6,800	24,400
Others	6,750	10,100	55,600
Total	*163,250*	*266,000*	*1,082,800*
Revenues (US $ M)	*2,184*	*3,484*	*12,793*

Source: Asia e-Government Forum (2008)

by a staggering 384% (SEIPI 2010). With the Philippine semiconductor sector supplies 10% of the world's semiconductor manufacturing services, prospects for growth seem to be bright. As a matter of fact, SEIPI projects that by 2016 total investments in the sector will total to US $50 billion.

More Is Yet to Come?

Can the Philippines expect more growth to come from its ICT industry? Most likely. In 2010, the Philippine IT market growth was pegged at US $2.6 billion, as compared to US $2.4 billion in 2009. Multinational vendors are progressively expanding to reach markets in Cebu and Davao, mostly targeting manufacturing plants and SMEs as prospective clients. Aside from ICT products for the consumer market, vendors are also exploring cloud computing service opportunities in the Philippines, particularly for document management systems and web security. Furthermore, the country's computer hardware expenditure is projected to reach US $1.7 billion and the software market US $284 million in 2010. This increase in the demand for hardware is driven by the growth in the BPO sector as well as the promulgation of government initiatives which require computer hardware resources (Companiesandmarkets.com 2010). Indeed, we can expect robust growth in the Philippine ICT industry in years to come.

In summary, government played a relatively successful role in supporting the rapidly growing private sector-led ICT industry particularly in telecommunications, cyber-services, and semiconductor manufacturing, even though it has yet to become an effective user of ICT for improving services for the poor and the economy at large. National ICT strategies have continued to evolve, initially focusing on opening the monopolized telecommunications industry, and the creation/diffusion of ICT-enabled services to develop a robust ICT market. Subsequent national ICT priorities have progressed toward improving the quality of life through the creation of a more digitally inclusive society and a reform-oriented use of ICT in governance. Enacted laws on automated elections, SMEs, poverty alleviation, agriculture, and fisheries modernization aimed to diffuse the benefits of ICT especially to marginalized groups and for political reform. As will be discussed later, progress on the latter priorities of diffusion and inclusion has been uneven and the results are mixed.

Finally, the phenomenal growth of the private sector-led ICT industry can be attributed to the enactment of laws and policies that opened the once monopolized Philippine telecommunications industry and liberalized entry of foreign investors particularly in the semiconductor manufacturing sector. Government's resolve encouraged the entry of local and foreign players into the market. The introduction of new players and services will definitely lead to more growth opportunities for this industry. These are promising signs for the Philippines. Will the Philippines capture these opportunities and harness the full potential of ICT for sustainable national development?

Public Sector-Led ICT for Development Initiatives

This section highlights the actual, "on-the-ground nature" of public sector-led ICT4D initiatives. How do strategic plans and policies translate to actual on-the-ground implementation and results? This section discusses selected public sector-led initiatives of ICT4D which are crucial in understanding the potential and constraints to successful ICT4D. It provides an in-depth look at three public sector-led ICT4D areas, namely the e-LGU program (e-Government), ICT in Education (e-Learning), and the use of ICT in the electoral process (e-Governance).

e-Government Initiatives in Local Government Units

The passage of the LGC of 1991 aimed to reform the governance environment. It espoused a decentralization theme: decentralize power from national to local governments and diffuse resources to local authorities, recognizing that most problems are local and that local solutions are more appropriate. The enactment of the LGC increased the allocation of the national budget to local governments from 3 to 18%. A total of 70,000 government personnel previously assigned to national agencies were transferred to local authorities (Wescott 2005). Furthermore, the LGC mandates LGUs to include the use of information systems for services such as investments and job placement, tax and marketing, and public library maintenance (Lallana and Soriano 2008).

The LGC also envisioned the creation in every *barangay* (village) of an information and reading center as a basic facility. It also recognized the role of civil society, and encouraged participation in the public governance sphere. It became a tool to promote more community-level involvement in governance. The concept of Participatory Local Governance (PLG) brings community-based governance through participation (or involvement) of different stakeholders such as LGUs, NGOs, Peoples' Organizations, and the private sector.

Table 5.7 e-Government stages of Philippine local government units (LGUs) for 2005

	Cities (%)		Provinces (%)		Municipalities (%)	
UN-ASPA Level	2005	2009	2005	2009	2005	2009
Stage 1	36	9	39	16	85	73
Stage 2	47	67	47	53	11	21
Stage 3	14	22	14	28	3	4
Stage 4 and 5	0	0	0	0	0	0
Without website	3	1	0	2	1	1
Total sample (*n*)	115	125	79	81	1,500	1,499

Sources: Romero (2005), National Computer Center (2009)

Moreover, the e-commerce act of 2000 mandated the use of ICT in national and local government units. These laws were seen by many as a solid legal foundation for pushing the development agenda through the empowerment of LGUs.

Recognizing the importance of empowering LGUs through ICT and its inherent challenges, the Philippine government developed an e-government strategic framework that is citizen-centric. It has three basic components namely: (1) provision of digital connectivity; (2) human capital development; and (3) development and deployment of useful applications and generation of relevant content. The following were identified as key results for e-government in the local level:

- Generation of public resources (revenue generation)
- Promote local entrepreneurship
- Adequate delivery of public services
- Mobilization/engagement of citizens
- Promotion of transparency and accountability

Benchmarking e-Government at LGUs

By 2004–2005, a sustained drive to push ICT to LGUs became part of the government ICT strategy, known as the e-Philippines strategy. Table 5.7 shows an assessment of the e-government initiatives in the LGUs in 2005 and 2009, while Table 5.8 presents the different stages of e-government according to the UN-ASPA framework. The assessment shows that a majority of the municipalities are still in Stage 1, while the cities and provinces by 2005 are already in Stage 2. Most of the municipal websites are either inaccessible or nonfunctional.

A study commissioned by the Asia Foundation, known as the CALDEM report, provided possible explanations of why the municipalities have been lagging and what are the hindrances in e-government at the local level. The study, as summarized in Table 5.9, shows: (a) essential elements of an e-government strategy for LGUs; (b) factors that hinder LGUs from implementing e-government projects; and (c) strategies to overcome the challenges to e-government in the local level.

Figures pertaining to the 2009 ratings on e-government stages for cities show an increase in the number of Philippine cities falling within Stage 2 and 3 for 2009

Table 5.8 UN-ASPA stages of e-government

Stage 1	Emerging web presence • Sites serve as a public information source • Static information on the government is provided • FAQs may be found • Contact information is provided
Stage 2	Enhanced web presence • Access to specific information that is regularly updated • A central government homepage may act as a portal to other department sites • Useful documents may be downloaded or ordered online • Search features, e-mail, and areas for comments are accessible
Stage 3	Interactive web presence • A national government website frequently acts as a portal • Users can search specialized databases • Forms can be downloaded and/or submitted online • Secure sites and passwords begin to emerge
Stage 4	Transactional web presence • Users will be able to conduct complete and secure transactions online • The government website will allow users to customize a portal in order to directly access services based on specific needs and priorities • Sites will be ultimately secure
Stage 5	Fully integrated web presence • Country provides all services and links through a single portal • No defined demarcation between various agencies and departments • All transactional services offered by government will be available online

Source: National Computer Center (2005)

Table 5.9 CALDEM report on e-government in LGUs

Essential elements of an e-government strategy	• Delivery of local government services (real property taxes, business licenses, etc.) • Delivery of national government services • Development of a government services portal • Focus on citizen-centric applications
Factors hindering e-government strategy implementation	• Lack of access to information on the track records of contractors • Tedious and long drawn-out process of procuring ICT equipment • High cost of ICT equipment and services • Inconsistent data • Training facilities are inadequate for ICT education
Strategies to overcome challenges in e-government	• Make the Information System Strategic Plan more relevant • Provide guidelines or advise on the creation of ICT units or offices • Capacitate LGUs in systems development, project management, service improvement, etc. • Facilitate e-government/ICT benchmarking between LGUs and CMM ratings of LGUs and commercial software providers • Assist the e-procurement service in gathering and providing information about ICT contracts

Source: Romero (2005)

(Table 5.7).[1] Similarly, more provinces have advanced to stage 2 (53%) and stage 3 (28%) categories.

These improvements in e-government stages by cities and provinces can be traced to the implementation of the government's e-government agenda particularly focusing on LGUs. With the CALDEM findings at hand, the NCC and CICT adopted the e-LGU program to assist LGUs in developing their respective websites. This comes hand in hand with individual efforts of the LGUs to improve their respective e-government capabilities.

To further empower LGUs in utilizing ICT's potentials, the CICT has adopted the e-government for Municipal Development (eGov4MD) program which aims to diffuse ICT benefits in the LGUs. eGov4MD is a collective initiative among various stakeholders which includes the CICT, the Canadian Executive Service Organization (CESO), and the NCC. It seeks the full deployment of flagship LGU-based ICT applications namely: the real property tax system (eRPTS), the Business Permits and Licensing System (eBPLS), and the Treasury Operations Management System (eTOMS). These applications are meant to enable LGUs, especially the rural municipalities, to improve revenue collection and management, streamline processes to reduce transaction cost, and generally improve the relationship between the LGU and its constituents. ICT human capacity development programs are also part of the eGov4MD initiative (eLGU Journal 2010). Box 5.1 summarizes some eGov4MD achievements as of 2009.

As of 2010, small successes and enormous challenges have emerged in diffusing ICT in the LGUs. Some 1,585 local officials from 632 LGUs have been reached by the various e-LGU initiatives. An estimated 100 pilot LGUs have formulated comprehensive information systems planning assisted by the CICT. There are some success stories of eGov4MD implementation. A number of municipalities have expressed their willingness to adopt the eGov4MD application package (Ibid). Capable LGUs are independently developing their respective e-government services. Empowered, these LGUs took the initiative to develop e-government systems and in some cases partner with the private sector to deliver ICT services to its constituents. These independent initiatives may be one of the factors that can explain the increase in LGUs stage 2 and 3 levels. Cases in point are the Municipality of Bacoor, Province of Cavite and the i-Naga program of Naga City (Box 5.2).

A key facet of the e-government initiatives in LGUs is the implementation of the Community e-Center (CeC) project launched in 2007. The CeC envisions maximum ICT diffusion by providing access to telecommunications and Internet services to the *barangays*.[2] As part of its sustainability agenda, the CeC provides training to the community members. This is usually in partnership with the LGUs, NGOs, and other community stakeholders. As of December 2010, the CICT placed the number of operational CeCs at 1,027 nationwide.

[1] It should be noted though that the 2009 survey utilized a different sample size as compared to the 2005 survey and was done by a different entity.

[2] *Barangays* are considered the smallest political unit in the Philippines.

Box 5.1 eGov4MD Achievements as of 2009

- Deployment of eBPLS in 60 municipalities and eRPTS in 27 municipalities
- Training and deployment of technical staff and volunteer advisers
- Development of Municipal IT Plans and creation of ICT Committees
- Establishment of eGov4MD, Inc. to provide technical support and training
- Enrolment of mayors as e-governance champions

Box 5.2 e-Government Services by Philippine LGUs

Leveraging ICT for e-Government in the Municipality of Bacoor, Cavite Province

The Municipality of Bacoor recently unveiled its new SMS-based application called NETCAST. In partnership with SMART Telecommunications, the service enabled the Municipal government to use NETCAST's SMS service to push information to constituents. NETCAST offer LGUs capability to send out regular or scheduled announcements, facilitate information exchange, and feedback.

Aside from NETCAST, the Bacoor Municipality subscribes to the idea of full e-governance for the benefit of its constituents. With this idea, significant investments were made to ensure Wi-Fi connectivity in public schools, installation of CCTV cameras for traffic monitoring and crime prevention, barangay computerization projects as well as online service (http://www.bacoor.gov.ph) ("Tech works for Bacoor Mayor," Philippine Star 2009).

iGovernance Program of Naga City, Province of Albay

The iGovernance Program is part of Naga City's continuing initiative to promote empowerment of its citizenry in all facets of governance through functional partnerships and innovative participation mechanisms.

The "i" in iGovernance stands for the following elements:

- inclusive governance which seeks to embrace rather than exclude individuals, peoples, and sectors in running government
- information openness which demonstrates that information is power; and it is truly empowering when placed in the hands of the citizens

(continued)

Box 5.2 (continued)

- interactive engagement which puts a premium on information exchange through continuing dialog between authority and constituency
- innovative management which engenders a culture of excellence sustained by creativity and innovation

iGovernance involves the use of both paper-based tools and Internet technologies to disseminate information to the community. The City Government refers to their website (http://www.naga.gov.ph) as a tool for engaging citizens. The website contains online services such as tracking of building permits, an e-library, and renewal of business permits. It also has the Citizen's Charter and an online forum.

The Citizen's Charter is a guidebook on the key services being delivered by the city government to its customers, including the procedures, response time, personnel responsible for each service, requirements checklist to facilitate service delivery, schedule of fees, and location maps of the offices handling the services.

The iGovernance Program also encourages civic participation through the use of SMS and e-mail technologies (Romero et al. 2006).

Challenges and Opportunities

Experience shows that many Philippine LGUs, especially rural municipalities, are still grappling with issues regarding cost, availability of ICT personnel, and political priorities. Even with eGov4MD applications being distributed for free by the NCC-CICT, the needed investment in computers and IT equipment is still considered substantial. In remote municipalities, the question of basic infrastructure, including electricity, and the presence of competent IT staff, is a pressing concern. Local government officials in these areas often see investments in IT as a "non-priority." Expenditures on IT and automation initiatives are seen as competing with other priority concerns such as social programs, waste management, and infrastructure development among others.

At present, there are LGUs that are having difficulties in maintaining their respective CeCs. Indeed, CeC sustainability hinges on cost and the availability of relevant content. CeCs also face competition from privately owned Internet cafes. Although it must be noted that successful CeCs are those that utilized community-relevant content such as the Department of Agriculture's Farmers' Information and Technology Services (FITS), local leadership and political commitment are vital factors in the maintenance of CeCs. Currently, many local efforts are underway to revisit the concept of CeCs and review their operation.

The Need for a Change in Paradigm

The current push of the e-LGU program to improve transactional capabilities of the LGUs is commendable but inadequate. Aside from revenue generation, other governance areas should be included as part of the e-LGU agenda. These areas can be online participatory mechanisms for sectoral groups and income generation for constituents, among others.

A paradigm shift is needed: from top-down, government-led e-government for LGUs, to locally led partnerships that engage all key stakeholders: LGUs, local civil society, and the private sector, as well as line agencies of the national government e.g., Department of the Interior and Local Government (DILG), the Department of Agriculture (DA), and the Department of Trade and Industry (DTI) among others. Best local practices from other municipalities and provinces should be considered and shared.

Strong political commitment from local officials is essential to mobilize the needed financial resources and specialized personnel. Evident from examples in Box 5.2 is the ability of these LGUs to bridge the private–public divide. There is a need to craft training programs for LGU officials that will explore models for financing and project sustainability. Local civil society organizations (CSOs) should be part of the e-government thrust of the LGUs.

Mechanisms to ensure long-term commitment of the LGU can also be provided through local-provincial ordinances, nurturing support from the LGU's IT career staff, and facilitating organizational change. Rethinking current work practices should be integral to e-government efforts (Magno 2010). Finally, there is a need to assess and evaluate e-LGU and CeC projects on an ongoing basis to ensure their efficacy.

Demand for Good Governance in Public Services

New factors may help contribute to this paradigm shift from top-down, government-led, and supply-driven e-government initiatives, to a new paradigm where demand for good governance and accountability from citizens and social intermediaries is strengthened and used to complement and reinforce supply-side initiatives. In recent years the numbers of social intermediaries (NGOs, professional associations, etc.) has increased and their efficiency and reach has grown in the Philippines and many developing countries. Universal use of ICT (particularly mobile and shared access to the Internet) has allowed fairly small groups to become more effective and far reaching in better monitoring various aspects of adherence to compact at the provider level. The combination of these two factors makes for a powerful mechanism to strengthen demand-side governance and social accountability for government services, and to engage citizens in providing feedback on services and co-innovating better services (Box 5.3).

Box 5.3 Accountability and Governance for Service Provision

In between the discrete events of elections, there are periods of continuous governance that affect various aspects of the life of a citizen—provision of excludable services (most notably health and education), access to non-excludable services—public roads, other infrastructure, guarantees of individual, and collective rights (e.g., property rights, right to access information, etc.). The individual citizen does not have the resources (time, the technical knowledge, etc.) to assess the ability and the willingness of the state to cater to all these needs. Also, once the citizen empirically, through her own experience, finds out that the quality of services provided by the state or the provider is low she will most likely conclude that the cost of taking on the institutions of service provision is much higher than the uncertain benefit of redress. The cost of organizing like minded citizens on ad hoc basis may be equally forbidding and, considering lack of experience in such interactions, if mounted, may be ineffective. Yet, for the quality of governance in a country it is important that the time between service provision and the feedback is narrow and the redress (the completion of the accountability loop) happens quickly, so that adjustments to services provided and the rights guaranteed happen quickly and deficiencies do not result in disruptions of services and engrained institutional distortions. For all these reasons citizens delegate oversight and (re) negotiations of some aspects of the social contract and service provision to the social intermediaries (SIs).

The SIs can range from very informal ones—a group of concerned activists, to increasingly more formalized ones—officially registered NGOs, trade unions, professional associations, etc. If delivery of services in a county or a sector has the oversight of a strong set of formal and informal SIs, asymmetry of information for the public is diminished and both the state and the providers feel more pressure to cater to the needs of electorate or (in a more authoritarian setting) population in need of inclusion or appeasement.

The SIs are expected to (1) effectively watch over the quality of legislation governing service provision as well as over the quality of services provided (2) signal the need for redress, (3) advocate the necessity for change in legislation or practice of service provision with the state, (4) renegotiate the contract, and (5) oversee adjusted and improved service provision.

While the role of all SIs is to improve the quality of services provided by the state or the provider, different SIs have different comparative advantages in helping the closing of accountability loop. While (1) less formal SIs are better equipped to generate and disseminate information about the quality of service provision (their voice recently enhanced by advent of ICT tools), (2) bigger, more formal SIs have the structure, the staff, and the resources to monitor the quality of service provision on the ground.

(continued)

Box 5.3 (continued)

In democratic settings SIs are created as the result of bottom-up mobilization and preserve their connection to citizenry via mobilization for collective action. SIs gain legitimacy in the eyes of the citizens through their ability to advocate on behalf of the citizens or to mobilize general public for participation in collective action. SIs can be engaged in mobilizing citizens for participation in collective actions or serve as proxies for citizen participation themselves. Citizens in turn can support with a lesser or greater level of intensity and personal and/or financial involvement a particular cause singled out by an SI.

For example, a campaign against online violence against women (e-VAW) has gained prominence in the Philippines. Through the "Take Back the Tech" or "Take Control of Technology to End Violence against Women" project, local SIs represented by NGOs together with other civil society groups and government agencies are actively pursuing this advocacy against this new form of violence against women. The Foundations for Media Alternatives (FMA), an NGO seeking to democratize ICT systems and resources for citizens and communities, is leading activities to build awareness about e-VAW. Local consensus building activities are also being undertaken with the intention of proposing a National Action Strategy for e-VAW (TakeBackTheTech 2005).

When SIs oversee the providers, their role in this capacity is defined more narrowly since it follows the compact that has been made between the state and the providers. The role of SIs interacting directly with the providers is to ascertain that (1) the compact between the state and the provider adequately reflects the interests of the group they represent and (2) the providers are providing services according to the rules and plans set out in the compact. For e.g., SIs overseeing budget implementation make sure that the agencies responsible for budget allocation and sector specific use of resource are fulfilling their tasks in accordance with the particular budgetary regulations. Others monitor adequate provision of services by the providers according to the established rules.

Education

The main government institutions responsible for the educational system are: the Department of Education (DepEd), Commission on Higher Education (CHED), and the Technical Education and Skills Development Authority (TESDA). Each establishes programs and initiatives in both skills training and knowledge development. Taken as part of the educational reform agenda of the Congressional Commission on Education (EDCOM) in 1992, the "trifocalization" and the redefinition of the educational structure of the Philippines allowed each sector to concentrate its efforts in the respective areas: DepEd for basic education, CHED for tertiary education and graduate studies, and TESDA for technical-vocational educational training (TVET) (Commission on Higher Education 2010).

Each of these institutions takes part in integrating ICT in education for human capital development and improving the quality of the educational system. From the human capital perspective, ICTs are considered as necessary tools to enhance worker skills and information accessibility, essential for both good governance and positive economic development (Arinto 2006).

The ICT Plan for education was developed by the DepEd in 1996 to strengthen the human resource base of the Philippines. It is a 10-year program comprised of phases starting from planning and analysis from 2000 to 2001, execution and monitoring in 2002–2008, and evaluation in 2009.

The plan's four thrusts are: (1) technology integration in mathematics, science, and English by means of upgrading the curriculum; (2) setting standards for monitoring performance and accountability through an improved delivery support system; (3) improving fund generation by identifying effective financing schemes; and (4) organizing diverse training programs for human resources retooling. The ICT plan is centered on providing accessible technology, equipment, and facilities for various education stakeholders for research and development. Technology integration serves as a foundation for the plan's focus on IT competence by creating ICT-based instructional materials, training public school teachers on ICT literacy, using innovative technologies in training, and providing schools with the necessary educational packages.

Other Strategic ICT Actions in Education

- Creation of an ICT integration framework
- Allocation of funds through the General Appropriations Act (GAA)
- Provision of tax incentives for the placement of needed ICTs in public schools
- Setup of mobile IT classrooms
- Development of the 2002 Basic Education Curriculum (BEC)
- Emphasis on the use of ICT for capacity development, basic education, and lifelong learning in the 2004 Medium-Term Development Plan (MTDP)

The ICT plan also includes the following government development programs (Ibid):

- Curriculum and Materials Development: for the ICT usage in core subject areas
- Staff Development: for teacher training in ICT
- Facilities and Acquisition Development: for obtaining computer hardware and software
- Advocacy and Promotion: for the promulgation of awareness on the benefits of ICT
- Technology Access and Development: for accounting existing ICT facilities and equipment in schools
- Monitoring and Evaluation: for measuring the effectiveness of delivery systems and other instructional materials

The CICT plays a vital role in providing the infrastructure and manpower resources to enable implementation of programs that support computer literacy and ICT skills development. Aside from the IIMG, the HCDG in particular provides a significant contribution to ICT literacy. HCDG focuses on the development of

Table 5.10 Personal computers for public schools (PCPS) project phases and outputs (2001–2005)

	Phase 1 (2001–2003)	Phase 2 (2003–2005)
Setup computers	19,920	12,320
Number of school beneficiaries	996	1,232
Number of computers per school	20	10

Source: Department of Trade and Industry, 2008c

competencies specific to ICT by promoting the ICT expertise training, formulating ICT policies for integration in education, supporting ICT initiatives and research in various disciplines, and determining ICT competency standards in the government (Commission on Information and Communications Technology 2006b).

Programs and Projects

The key programs and projects pursued under the IT Plan for education are: ICT infrastructure (personal computers for public schools), ICT-based education (cyber education), ICT literacy (NICS), alternative learning (e-learning for out-of-school youth (OSYs)), and distance learning (ICT literacy skills for teachers and student). These are briefly described below.

- ICT Infrastructure: Personal Computers for Public Schools (PCPS)

  The PCPS project was initiated by the DTI in 2001, when Japan awarded a P600 million grant, through its Non-Project Grant Assistance Countervalue Funds to the Philippine government. This initiative was in recognition of the youth's need for adequate computer literacy skills and the Philippine's capability to provide IT services in the global arena, thus prompting the development of a "continuous pool of manpower" in the IT sector.

  The PCPS project was composed of three phases, spanning 2001 to 2007. Table 5.10 presents the number computers that were set up in the first and second phases. The second phase of PCPS also included the provision of computer servers and network infrastructure to 250 LGUs for their respective public service automation initiatives. The third phase, from 2005 to 2007, with Japanese funding, provided 47,100 computer packages to 3,714 public high schools nationwide. The first two phases reduced the computer deficit in public schools from 76 to 55%, and, after the third phase was completed, was further reduced to 37%. Additionally, phases 1 and 2 included computer literacy training programs for public school teachers on basic computer operation, computer integration in classroom instruction, troubleshooting, and preventive maintenance (Department of Trade and Industry 2008c).
- ICT-based Education: Cyber Education Project

  The Cyber Education Project (Cyber Ed), established in 2007, aimed to enhance the existing educational program through distance education. It seeks to bridge the gap between various stakeholders in urban and rural schools. Besides CD-based educational materials such as coursewares and activity-based learning,

the project involves the use of satellite-based technology in delivering training and lessons through live presentations, virtual workshops, media downloads, and instructional TV programs. It also serves as a medium for teachers to access professional development materials and training activities. The materials are evaluated by national experts to ensure the quality and appropriateness of the lessons. Through this project, the administrative sectors in the Philippines—namely the central office, regional offices, division offices, and public schools—will be interconnected (DepEd:EducNews 2010).

- ICT Literacy: NICS

  The NICS contain a definition of the required knowledge and skills of an individual involved in an ICT field. Such standards are used to measure achievements of targets for education initiatives, and to eventuate performance and professional development. CICT Circular No. 01 of 2010 propagated the use of the NICS and included the creation of standards according to identified job roles and expectations from the government, business, educators, workers, and students.

  The identified standards were the result of collaborations between government agencies and private stakeholders. The competencies were grouped according to a standard, skill set, or a corresponding job role including basic, advanced, teachers, application developers, civil servants, network professionals, career executive service officers, and CeC knowledge workers. Performance indicators and underpinning knowledge were also specified for each competency (National Computer Center 2010).

- Alternative Learning: eSkwela Project

  The eSkwela project started in 2006 by CICT in partnership with the Bureau of Alternative Learning Systems (BALS) under DepEd. Unlike most educational projects of the government, this project adopts an informal educational structure for lesson delivery. The program's ultimate beneficiaries are the OSYs. It addresses their need for basic education. It prepares OSYs for the Accreditation and Equivalency Test. Instruction is delivered through the use of developed e-learning modules that contain multimedia components and interactivities based on the existing printed modules from BALS. The printed modules are reviewed and converted into digital media content in partnership with State Universities and Colleges as well as individual volunteers from private institutions. Aside from the OSYs, the project's immediate beneficiaries are the implementers comprised of the center manager, learning facilitators, and network administrators who are trained for program sustainability.

  Part of the program is to establish learning centers in a chosen community, which houses the computer units with Internet connectivity, e-learning modules, and other multimedia peripherals. Currently, there are 52 eSkwela sites in the Philippines, which is about half of the target 105 sites to be implemented by March 2011. Initially, in the pilot sites, CICT provided the infrastructure for the selected communities. After the project was implemented in the pilot sites, the implementation model was altered based on field experience. The field implementation model (LGU-based, school-based, or church based) dictates the composition of the field implementers appropriate for the community. The eSkwela

project is currently in the transition phase of transferring the full operation and implementation of the learning communities from CICT to BALS.

- Distance Learning: iSchools (Commission on Information and Communications Technology 2006c)

  The project is centered on the development of ICT literacy skills, particularly for teachers and students in public high schools. This is in line with the government's agenda of establishing an Educational Digital Network, which seeks to bridge the digital gap by providing access to various sources of information and instructional software.

  The project envisioned the acquisition of computer units and broadband Internet connectivity for all public high schools in the Philippines by 2010. Hardware and software assistance for the beneficiaries is provided through Regional Help Desks and Maintenance Shops. Additionally, part of the iSchools program is Educators Training that aims to enhance the school stakeholders' ICT competencies in order to sustain the program in their respective institutions. The project also involves the creation of a digital library of instructional media and educational content accessible to schools throughout the country (Ibid). As of 2007, there were 1,100 schools nationwide wherein the iSchools project has been implemented.

Challenges and Opportunities

There is a great deal of support coming from the communities that are the main beneficiaries of the programs. Establishing good relationships with the target communities and getting them directly involved in the programs gives them a sense of ownership, which will eventually provide the means to carry on the project. Stakeholders' sense of ownership of the ICT for Education (ICT4E) programs allows for a positive outlook on the programs' sustainability. Partnership with industry companies provides ample support in research and instructional development through sponsorships and incentives for scholarships, research facilities, ICT infrastructure, mentoring programs, ICT-based learning programs, and innovation and incubation projects.

The ICT plan shows promising developments in Filipino ICT literacy. However, problems exist with regards to successful implementation. Despite claiming a significant share of government budget, resources for education are still inadequate to support projects that involve the use of ICT. Aside from the shortage of funds, there is still a lack of awareness in the top-level of government concerning the use and benefits of ICT for teaching and learning. This deficiency may have been responsible for past reductions of the budget for ICT4E. The 2011 budget allocation for education shows some increase but does not necessarily favor plans for ICT in education. DepEd priority initiatives and expenditures are centered on infrastructure development for the Education For All program. By 2011, the number of children enrolled in preschool is targeted to increase from 1.9 to 2.5 million (Luistro 2011).

Even with the availability of IT infrastructure and equipment in urbanized locations, most prospective users in rural areas are not able to benefit from the e-learning

modules and other online instructional materials due to the lack of resources in the provinces. Although several of the above programs have been cross-cutting, and have involved multiple stakeholders, there are also isolated initiatives from various sectors in the country that result in duplication of efforts and eventually, waste of resources. These independent efforts stem from the existence of educational institutions within government agencies. Turf issues also contribute to the problem of sporadic and fragmented programs as there is no clarity with regards to corresponding ICT4E responsibilities. Furthermore, the government sectors implementing ICT4E programs do not monitor such projects for effectiveness.

Political Reforms Through Poll Automation

The conduct of elections is seen as one of the main ingredients for democracy. Elections are the main avenue for expressing the sovereign will of the people, underlining the democratic principle of true power residing in citizens. The Philippines has the distinction of having the longest history of democratic elections in Southeast Asia. Through decades of Spanish colonization up to the American occupation at the onset of the twentieth century, the Philippine electoral system and processes, while imperfect, generally were seen as democratic tools for political legitimacy.

However, despite the country's long tradition of democracy, elections in the Philippines continue to be plagued by inefficiencies, errors, endemic occurrences of violence, and wholesale and retail fraud. Elections are often perceived to be subverted and manipulated to favor certain interests and groups eager to use this democratic cloak to legitimize their ascent to power and their access to national resources. Philippine elections have been described as classic examples of the Herculean struggle between those who want to preserve the integrity of its democratic institutions and those who want to use these very same institutions to advance their narrow interests.

Electoral reforms in the Philippines have been elusive. For decades, efforts toward electoral reform and modernization have become a battleground for these two forces. More recently, the increasingly evident potentials of ICT have added new possibilities and challenges to the struggle for credible elections. Like the proverbial two-edged sword, ICTs must be seen as tools that can either serve or subvert a purpose. Their design and use, particularly in a context as sensitive as national elections, must be exercised with careful forethought and diligence, especially in light of the vast amount of resources that they entail.

Efforts toward reform and change are constantly gaining ground through the enactment of laws supporting reform. The impact of these initiatives is amplified by an increasingly vibrant civil society, with one of the most notable features being the active participation of the Parish Pastoral Council for Responsible Voting (PPCRV) and the National Movement for Free Elections (NAMFREL) to name a few. Other reform-oriented legislative proposals in the pipeline are the Anti-turncoatism bill; the Campaign Reform bill; a bill strengthening the role of political parties; and the Freedom of Information bill.

The May 2010 national and local elections were hailed by various sectors as being a success in terms of their relative speed during the precinct tally and transmission of the results to the canvassing centers. Using the SAES-1800 model of the precinct count optical scan (PCOS) machine, the usual 2-month process of manual counting, tallying and canvassing was dramatically slashed to a few days. In fact, many AES critics even declared that "they [were] glad to be proven wrong" and that "COMELEC has luck on its side," adding to the initial euphoria that characterized the first national automated elections in the Philippines.

However, as the days progressed, problems and malfunctions pertaining to the AES began to surface, suggesting that democratic institutions need more than a technology-centric solution to address sociopolitical challenges. In an assessment made by the College of Computer Studies, De La Salle University of the May 2010 elections entitled "Towards Strengthening Electoral Reforms through ICT," the following were identified as general weakness of the May 2010 automated elections system (Roxas et al. 2010):

- Gap between the intent of the law and actual implementation policies: COMELEC failed to craft relevant policies to address the basic tenets of a good IT project implementation, e.g., source code review, RMA, performance audit, and procedures for electoral protest.
- Failure to incorporate good governance practices: Since ICT is being used as a tool for electoral reform, it is but proper for COMELEC to adhere to principles of good governance: (a) Transparency—all performance data must be released to enable scrutiny an independent third party; (b) Participation—COMELEC should ensure maximum participation by civil society groups and election watchdogs; (c) Accountability—full-scale investigation must be launched to address allegations of fraud and graft.
- Failure of COMELEC to adopt best practices in IT project management and system implementation.

Automating Elections in the Philippines: Is There a Need to Change Perspectives?

For the May 2010 elections, US $252 million was spent on automation. Considering that the use of the AES for the May 2010 elections was under a lease agreement, the question is: can the Philippines afford a recurring cost for automated elections?

The May 2010 elections should be treated as both a learning experience and wake-up call for Filipinos to address financial sustainability of automated elections. The De La Salle University study puts forward a list of recommendations that can be explored for future automation endeavors:

- Creative arrangements can be explored for the purpose of automating the elections such as technology transfer agreements, multi-election agreements, and local assembly-quality assurance options. Government-to-government technology purchase options can be explored to lessen allegations of irregularities.

- As much as possible, local IT experts can be utilized as third party evaluators or consultants to ensure that the chosen technology is adapted to meet local needs and demands
- There is a need to upgrade the ICT capabilities of the poll body. An ICT-enabled COMELEC can definitely contribute to the effective use of ICT and the reduction of unnecessary cost in project management and systems implementation.

Assessing the Traditional Approach to ICT4D

The Philippines is at a development crossroads: it can continue on the traditional path or adopt a transformational approach to ICT4D. This section aims to provide a limited assessment of the current ICT4D initiatives in the Philippines that we argue have followed the traditional path. "Traditional approach" public sector-led ICT4D initiatives have the following characteristics:

- Centrally driven, top-down, or bottom-up but not centrally supported
- Often disjointed or unconnected with other similar initiatives of other agencies or departments
- Often donor-driven pilot projects, lacking the resources for scaling-up
- Lacking a long-term perspective
- Lacking impact assessment and learning mechanisms
- Inadequately attending to sustainability

How are these traditional characteristics reflected in Philippine ICT4D initiatives? Let us take two instances: (a) Nature of National ICT Strategies and (b) Public sector-led ICT4D initiatives.

Nature of National ICT Strategies

While all the MTDPs from 1986 to 2010 recognize the enabling quality of ICT for national development, interpretations of the term "enabling tool" vary from one political administration to the next. In just a decade (1997–2006), the Philippines experienced numerous changes in its "strategic" ICT plans (Fig. 5.4), interpretations of the enabling role, and in e-leadership institutions. These changes occurred as soon as a new ruling administration (a new president for this matter) assumed office. This led to wasteful and short-term activities that did not provide for institutionalization of strategic ICT philosophies, strategies, and goals.

Developing countries with a limited resource base like the Philippines cannot afford to change priorities in strategic areas such as ICT4D, which demands long gestation and cumulative learning to realize deep transformation and significant payoffs. Changing the national ICT plan should be purposeful and mindful of the sociopolitical requirements and potential impact that the changes can effect. Changes in plans are expected, but should be based on formal assessments and evaluation mechanisms.

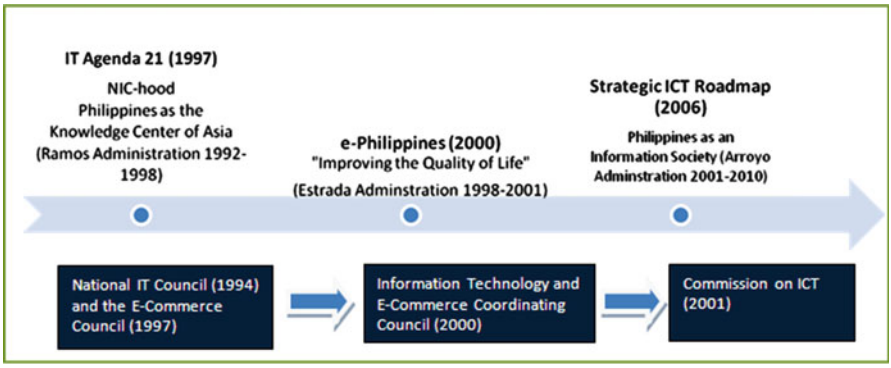

Fig. 5.4 Philippine national ICT strategies in a timeline

Table 5.11 Assessment of public sector-led ICT4D initiatives

ICT4D initiatives	Adherence to national ICT plans and policies	Support of national and local institutions	Availability of ICT skills	Availability of finance	Presence of assessment mechanism
e-Government in LGUs	HIGH	MEDIUM	LOW	LOW	LOW
ICT for education	HIGH	MEDIUM	LOW	LOW	LOW
Automated elections	HIGH	HIGH	LOW	HIGH	LOW

Public Sector-Led ICT4D Initiatives

Section "Public Sector-Led ICT for Development Initiatives" gave an overview of three public sector-led ICT4D initiatives. Table 5.11 provides an assessment of these initiatives according to five criteria derived from the e-development framework presented in Chap. 1.

Criterion 1: Adherence to National ICT Plans and Policies (HIGH)

All ICT4D initiatives are rated high in consistency with existing national ICT plans and policies. Both ICT for Education and e-LGU initiatives have been part of each national ICT plan since 1997. Also relevant laws have been enacted to support these ICT4D initiatives. e-LGU projects also needed crafting of local ordinances, while e-Skuwela and Automated Elections needed organizational policies to ensure commitment and sustainability of ICT4D projects.

Criterion 2: Support of National and Local Institutions (MEDIUM/HIGH)

Both e-LGU and ICT4E initiatives are rated medium in terms of national and local institutional support because they are mainly donor-driven and are centrally managed by CICT. Although pilot projects for both initiatives have their respective success stories, sustainability is in doubt once the external funding ceases and projects are turned over to their respective executive line departments and LGUs. This is true for the eGov4MD and CeC projects under the e-LGU initiative and the Alternative Learning projects under e-Skuwela.

Project ownership issues were also given a medium rating as current initiatives are being managed and implemented by CICT in coordination with the participating LGU for e-LGU and the DepEd for ICT4E. Little coordination exists across these potentially interdependent initiatives. This "silo-mentality" inhibits proper allocation of resources and sharing of expertise and experiences.

The Automated Elections initiative is rated high criterion institutional support as it fell within the sole jurisdiction COMELEC. Being a constitutional and autonomous office, COMELEC has a clear mandate of managing elections in the Philippines, and this clear mandate afforded to it by the constitution allows COMELEC to be more purposeful in its ICT initiatives. Allocation of resources for its ICT initiatives such as the automated elections is provided for by law. It is because of this clear mandate that COMELEC went all-out in pushing for automated elections for the May 2010 elections.

Criterion 3: Availability of ICT Skills (LOW)

All initiatives are rated low on skill availability, reflecting the shortage of ICT skills needed to design and implement these initiatives. There is a strong recognition of the need for ICT-trained personnel to implement and sustain efforts for all the initiatives. For example, the De La Salle University study of the 2010 Automated Election cited the need to transform COMELEC into an ICT-enabled organization (Roxas et al. 2010).

The effectiveness of these initiatives also suffered from shortage of e-leaders and ICT champions within the public sector. As an example, the LGU best practices (Box 5.2) points to the importance of having a local chief executive (e.g., Mayor, Provincial Governor, etc.) to own and lead e-government initiatives at the local level.

Economy-wide, scarcity of IT personnel, low salaries of skilled civil servants, and competition with the private sector and even job opportunities abroad are additional factors that contribute to the shortage of skills for public sector-led initiatives.

Criterion 4: Availability of Financial Resources (LOW/HIGH)

The low ratings were given to the e-LGU, CeC, and e-Skuwela projects where the need for additional financial resources will be evident once donor support is depleted.

The Automated Election projects of COMELEC are an exception to the prevailing scarcity and uncertainty of funds. COMELEC is bound to hold elections in accordance with a constitutional guarantee. With the perceived success of the first automated elections of May 2010, the Philippine Congress is expected to support the popular public clamor for poll automation.

Criterion 5: Presence of Assessment Mechanism (LOW)

All three ICT4D initiatives are rated low on the presence of formal evaluation and learning systems. Formal assessment and evaluation of public sector-led ICT4D initiatives comes as a mere afterthought. Being at the tail end of most ICT4D projects, evaluations efforts are usually downgraded and not institutionalized because of depleted resources.

A Transformative Approach to ICT for Development

The Philippines is currently adhering to a traditional path that has proven to be inadequate in breaking its antidevelopment cycle. We believe that a transformational approach is needed to leverage the enabling role of ICT and to break the antidevelopment cycle. This e-transformation strategy can be best characterized by: adoption of a holistic e-development paradigm, sustained growth of private sector led ICT industry, continuous engagement with stakeholders, building e-leadership capacity, and institutionalizing formal evaluation mechanisms (Fig. 5.5).

Adoption of an e-Transformation Paradigm

An e-development paradigm calls for a holistic and long-term strategy that enables and transforms the whole economy. Recognizing its cross-sectoral, cross-industry, cross-agency, and cross-hierarchical nature of e-development, this paradigm takes into account: (a) effective diffusion, (b) effective utilization of ICT, and (c) deep institutional, structural and capability changes in the economy and society (Hanna 2009).

The e-development perspective looks at ICT as a cross-cutting enabling tool for institutional change, process innovation, closer integration of government services, and collaboration among government agencies. This would entail both vertical and horizontal integration of government services in an effort to the break administrative silos, tap synergies, promote the strategic management and implementation of ICT programs, and ensure maximum diffusion of benefits and sustainability of initiatives.

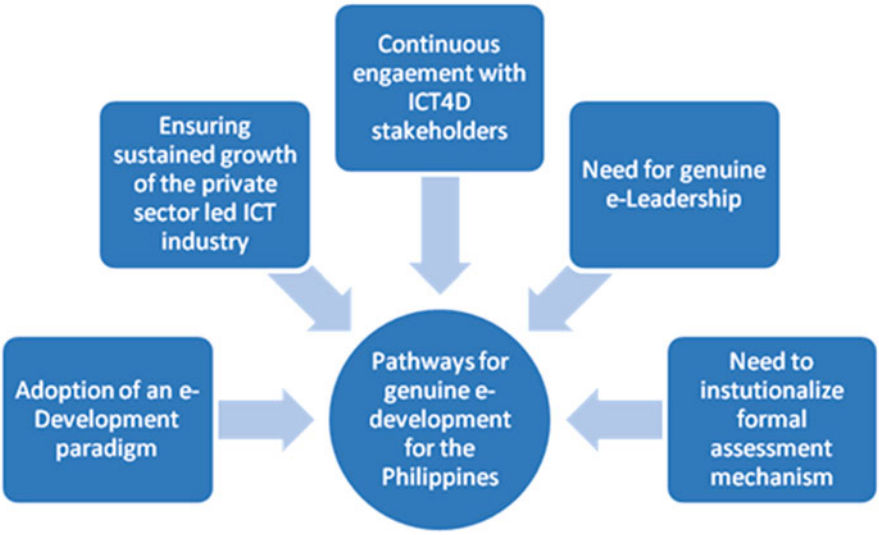

Fig. 5.5 Pathways for attaining genuine e-development for the Philippines

Finally, adoption of an e-transformation paradigm calls for the consideration of ICT's transformational role in other growth-service areas. It also means increasing attention to and systematic design of national ICT diffusion programs and targeting SMEs, lagging regions, and disadvantaged groups. Aside from areas mentioned in section "Public Sector-Led ICT for Development Initiatives," other areas that can be considered may include health informatics, tourism, agricultural productivity, and small and medium scale enterprises (SMEs) to name a few.

Sustained Growth of Private Sector-Led ICT Industry

Aside from private sector investment, reform-oriented government e-policies contributed to a robust industry growth. New e-policies such the legislative bills on cyber-security, intellectual property, and data security must be put in place to ensure dynamic grow of this industry.

A genuine e-development strategy must recognize the private sector's role in achieving its strategic goals. This role may extend beyond promoting the ICT industry to include partnerships with government and civil society to transform public and educational services, create sustainable Community e-Centers, diffuse e-business among SMEs, and improve the overall business environment.

While recognizing the growth potential of the ICT industries, an e-transformation perspective calls for linking the ICT sector to the national development strategy by looking comprehensively at the following:

- Need to expand its local market through backward integration of services
  With the current market being characterized as export-oriented, the Philippines should consider the expansion of its domestic ICT market in service of the rest of the economy. This can be done by integrating local service providers (e.g., academic institutions, local manufacturing firms, LGUs, national government agencies, etc.) with export-oriented ICT industries and by promoting the development of local ICT4D applications for high impact areas in key sectors of the economy.
- Ensure spill-over of technical know-how
  Expansion and the spill-over effect of technical know-how must be ensured. This can be done through the development of joint academic and vocational training programs between the private sector, government, and academic institutions.
- Consider possible export diversification strategies
  Aside from servicing its traditional export market (the United States and Japan), the Philippines should consider other emerging markets to decrease its vulnerability to global economic slowdowns (Lim 2010). These alternative markets may include China, South Korea, the Middle East, and ASEAN neighbors.

Continuous Engagement with Stakeholders

The dynamic and multi-stakeholder nature of e-development points to the need to continuously engage societal stakeholders. Government must act as a facilitator of the e-development process (Chap. 1), taking into account the needs and aspirations of stakeholders. This continuous engagement should communicate e-development goals and ensure stakeholder buy-in and support. This engagement process should be accompanied by a strategic communication plan for the e-development agenda.

Need for Genuine e-Leadership

Aside from the need for greater political commitment from national leaders, genuine e-leadership can be characterized as having the following characteristics:

- Existence of an authorizing environment
  This pertains to the need to create an environment where the function of authority can be exercised. This function of authority should have the ability to link development priorities across government agencies. Genuine e-leadership also requires active leadership not hostage to private sector interests.
- Clear mandate and responsibility for ICT institutions and other government line agencies
  An e-development agenda should articulate the roles and responsibilities of various public sector institutions. A clear legal and administrative mandate should be ensured to minimize possible resistance.

- Need to include the Department of Budget and Management (DBM) for expediency of resource allocation

  Inclusion of the DBM in the formulation of the e-development agenda and related plans is highly recommended. This is for the purpose of ownership and ensures the expediency of e-development initiatives.
- Continuous development of champions and sponsors

  Continuous development of e-development/ICT4D champions should be encouraged. Government training programs for local and career service executives should include topics/courses on e-development/ICT4D. The implementation of the proposed Government CIO training program should be pursued. CSOs and the academe should also play a role in this area. As part of their advocacy, research and continuous engagement with the public sector, CSOs, and the academe can be part of this critical mass that will ensure support for the e-development agenda.

Institutionalized Assessment Mechanisms

The need to institutionalize assessment and evaluation mechanisms is a key ingredient to an adaptive and learning e-development strategy. These mechanisms must be stakeholder-driven and institutionalized down to the project level. In summary, we have highlighted the attempts of the Philippines to break its antidevelopment cycle through ICT4D initiatives. The chapter presented the Philippines as being at a development crossroad: either to continue on its traditional route or chose a transformational role for its ICT4D initiatives. This new role for ICT in national development should subscribe to the tenets of e-transformation by viewing ICT as an enabling tool that can open new opportunities and options for social, institutional, and economic transformation. This transformational role for ICT can lead the Philippines to the attainment of a genuine e-development.

Will choosing a transformational route be an easy task for the Philippines? Surely not. A committed national effort will be necessary and reflected in political will, capacity, resources, and partnerships. The current initiatives of the new Aquino administration to create the PDS (2011–2016) should assess past initiatives and create a new national ICT4D framework to realize ICT's transformational role.

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References

Abadilla, E. (2010, November 26) Digitel expanding wireless landline service in Visayas and Mindanao. *Manila Bulletin*.

Abinales, P. & Amoroso, D. (2005). "State and Society in the Philippines." Anvil Publishing, Manila.

Arinto, P. (2006). Reflections on ICTs in Basic Education Policy and Practice in the Philippines. *2nd National ICTs in Basic Education Congress*. Retrieved from http://www.fit-ed.org/congress2006/Reflections%20on%20ICTs%20in%20Basic%20Education%20Policy%20and%20Practice%20i.PDF.

Asia e-Government Forum (2008). e-Government service integration and connection. Retrieved from http://www.korea.go.kr.

ASTI Research and Development Programs (2011). About ASTI. Retrieved from http://www.asti.dost.gov.ph/index.php?option=com_content&view=article&id=12&Itemid=26.

Bello, W., Docena, H., de Guzman, M., & Malig, M. (2004). *The anti-development state: the political economy of permanent crisis in the Philippines*. University of the Philippines, Quezon City.

Commission on Higher Education (2010). CHED Background. Retrieved from http://202.57.63.198/chedwww/index.php/eng/The-Commission.

Commission on Information and Communications Technology (2006a). About CICT. Retrieved from http://www.cict.gov.ph/index.php?option=com_content&task=view&id=45&Itemid=82.

Commission on Information and Communications Technology (2006b). Human Capital Development. Retrieved from http://www.cict.gov.ph/index.php?option=com_content&task=view&id=71&Itemid=108.

Commission on Information and Communications Technology (2006c). iSchools http://www.cict.gov.ph/index.php?option=com_content&task=view&id=80&Itemid=108.

Companiesandmarkets.com (2010). Philippines Information Technology Report Q4 2010. Retrieved from http://www.companiesandmarkets.com/Market-Report/philippines-information-technology-report-q4-2010-392114.asp.

De la Pena, F., de Rivera, T., & Diaz, P. (2009). *.ph Philippines*. The International Development Research Centre. Retrieved from http://idrc.ca/in_focus_competition/ev-140984-201-1-DO_TOPIC.html.

Department of Trade and Industry (2008a). About DTI. Retrieved from http://www.dti.gov.ph/dti/index.php?p=142.

Department of Trade and Industry (2008b). Bureaus—Priority Products and Investments. Retrieved from http://www.dti.gov.ph/dti/index.php?p=313.

Department of Trade and Industry (2008c). Personal Computers for Public Schools. Retrieved from http://www.dti.gov.ph/dti/index.php?p=443.

DepEd: EducNews (2010). How Can Cyber Education Benefit. Retrieved from http://www.deped.gov.ph/e_posts.asp?id=576.

eLGU Journal (2010, August) eLGU 2.0: expanding the eRevolution in local Governance. National Computer Center, Republic of the Philippines.

Esguerra, C. & Balana, C. (2010, November 14). India worries PH will be world's No. 1 BPO center in five years. Philippine Daily Inquirer. Retrieved from http://services.inquirer.net/print/print.php?article_id=20101114-303108.

Nagy K. Hanna. (2009). e-Transformation: Enabling New Development Strategies. New York: Springer.

International Telecommunications Union (2009, March 11). Mobile penetration rate reaches the mark of 75% at 2008-end (Philippines). Retrieved from http://www.itu.int/ITU-D/ict/newslog/Mobile+Penetration+Rate+Reaches+The+Mark+Of+75+At+2008end+Philippines.aspx.

Lallana, E. & Soriano, C. (2008). Towards universal internet access in the Philippines. *Ideacorp, Manila*. Retrieved from http://www.ideacorpphil.org/webfiles/documents/UIAPaperFinal-2Oct07.pdf.

Lim, J. (2010). Why the Philippines is a laggard in East Asia. *Philippine Institutions: Growth & Prosperity for All*. Quezon City, Philippines: Action for Economic Reforms Inc.

Luistro, A. (2011) DepEd's 270B budget will be spent wisely, not a single centavo will go to waste—Luistro. *Philippine Star*. Retrieved from http://www.philstar.com/Article.aspx?articleId=645669&publicationSubCategoryId=442.

Magno, F. (2010). Local Governance in the Philippines. The Innovative CIO and eParticipation in eGovernment Initiatives. Fairfax, VA, USA: IOS Press.
Mendes, S. , Alampay, E., Soriano, E. & Soriano, C. (2007). *The innovative use of mobile applications in the Philippines: lesson for Africa*. Department for Infrastructure and Economic Development, SIDA.
Montecillo, P. (2010, November 1) Globe Telecom's broadband subscribers breach 1-M mark. Philippine Inquirer.
National Computer Center (2000). E-Commerce Act. Retrieved from http://www.ncc.gov.ph/files/Ra8792.pdf.
National Computer Center (2009). National Government Agencies Charts. Retrieved from http://www.ncc.gov.ph/files/nga_chart0509.pdf.
National Computer Center (2005). UN-ASPA Stages. Retrieved from http://www.ncc.gov.ph/files/un-aspa5stagesegovt.pdf.
National Computer Center (2010). National ICT Competency Standards. Retrieved from http://www.ncc.gov.ph/nics/index.htm.
National Information Technology Council (1997). *IT21 Philippines Asia's Knowledge Center: IT Action Agenda for the 21st Century*. Retrieved from neda.gov.ph/ads/it21/it21.pdf.
National Telecommunications Commission (2005). Retrieved from http://portal.ntc.gov.ph/wps/portal.
Newsbreak (2008, August 28). 25.4M Filipinos are living below $1.35/day Asian poverty line. Retrieved from http://www.newsbreak.ph/2008/08/28/25-4m-filipinos-are-living-below-1-35day-asian-poverty-line/.
Nielsen Global Online Shopping Report (2008*). Trends in online shopping a global Nielsen consumer report*. Retrieved from http://de.nielsen.com/pubs/documents/GlobalOnlineShoppingReport-Feb08.pdf.
Paredes, D. (2010, February 19). Philippines fails the MDG. *Malaya*. Retrieved from http://global-balita.com/2010/philippines-fails-the-mdg/.
PCASTRD (2009). Information and Communications Technology. Retrieved from http://www.pcastrd.dost.gov.ph/index.php?option=com_content&view=article&id=27&Itemid=70&limitstart=1.
Philippine CeC Roadmap (2007) Commission on ICT, Republic of the Philippines. Retrieved from http://www.philcecnet.ph/files/downloads/4nxfcf3s.pdf.
Philippine Strategic ICT Roadmap (2006). Commission on ICT, Republic of the Philippines. Retrieved from http://www.unapcict.org/ecohub/resources/philippine-ict-roadmap.
Quimpo, N. & Kasuya, Y. (2010). *Politics of change in the Philippines*. Manila: Anvil Publishing, Inc.
Reuters (2010, February 9) *Philippines' Arroyo signs law on 2010 budget*. Retrieved from http://in.reuters.com/article/2010/02/09/idINIndia-46022120100209.
Romero, S. (2005). The e-Government Landscape in the Philippines. *Forging e-Government Ventures in the Philippines*. Manila: Development Academy of the Philippines.
Romero, S., Bautista, J., & Avedillo-Cruz, E. [eds.] (2006). *Forging local egovernment ventures: exemplars, lessons, and opportunities*. Manila: Development Academy of the Philippines.
Roxas, R., Ona, S., Borra, A., & Pineda, M. (2010). Towards Electoral Reform through ICT. De La Salle University, Manila, Philippines.
SEIPI (2010). World competition issues. Retrieved from http://www.wefonline.org/docs/seipi-wef04_world_competitition_issues.ppt.
TakeBackTheTech (2005). Foundation for media alternatives. Retrieved from http://www.take-backthetech.net/connect/foundation-media-alternatives.
"Tech works for Bacoor mayor" (2009, April 19). Philippine Star.
Thompson, W. & Macaranas, F. (2006): "Democracy & Discipline: Fidel V. Ramos and His Philippine Presidency". UST Publishing House, Manila.
Tiglao, N. & Alampay, E. (2005) Mapping ICT4D projects in the Philippines. ICT4D.ph. Retrieved from http://ict4d.ph/proceedings/Project_Inventory2.php#c.

United Nations Public Administration Network (2000). *E-Philippines Strategy*. Retrieved from http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan006170.pdf.

Wescott, C. (2005). E-Government in the Asia-Pacific Region: Progress and other Challenges. *Systemics, Cybernetics and Informatics. 3*(6).

Yahoo!-AC Nielsen (2010). *Yahoo-Nielsen Net Index 2010*. Retrieved from http://www.slideshare.net/yuga/yahoonielsen-net-index-2010.

Chapter 6
Comparative Experience and Lessons in e-Transformation

Nagy K. Hanna and Peter T. Knight

The four country case studies presented in this book cover different periods of time and are not part of an experimental design, but rather attempts by their authors to explore national experiences with some guidance from a common e-development framework. A companion book covers four additional countries of different sizes, conditions, and levels of development: Brazil, China, Canada, and Sri Lanka. Taken together, the two books cover a broad range of countries at different levels of development and take an international comparative approach to the study of e-transformation.

To facilitate the comparative analysis that follows, it will be helpful first to summarize the four country case studies presented in Chaps. 2–5. We then introduce some comparative data on these countries and eight criteria or dimensions on which we then seek to assess each country's experience. The next section presents our insights in terms of pursuing four fundamentals drawn from this analysis. We conclude by drawing some implications for aid agencies and final thoughts on further research.

Summary of Country Experiences

Singapore

Singapore is a compact, highly urbanized island city-state that has benefitted from continuity in political leadership and an early decision to push for progressive structural change and technological upgrading and towards creating a knowledge-based economy strongly leveraged by the use of ICT. Six successive ICT Master Plans have

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been implemented beginning in 1980. Singapore has become a highly competitive and developed country, with one of the best information infrastructure, cyber policy, and e-government in the world.

Singapore's e-Government has evolved in tandem with each National ICT plan to bring about exciting changes to the way the Singapore government works, interacts, and serves the public. Framing the strategic thrusts is an outcome-focused and stakeholder-centric Singapore e-Government Framework where the maturity of e-government is measured progressively and monitored by key performance indicators. This approach has been applied systematically to three major groups of stakeholders—employees, businesses and customers, and citizens—using a "whole of government" approach to achieve process efficiencies and integration across different agencies. For example, common databases were established for people, land, vehicles, and establishments upon which many different agencies and e-services draw.

Singapore has implemented a shared government-wide computing infrastructure and suite of services. IT competency has been pursued with increasingly sophisticated training for the general public, workforce, professionals, conversion from non-IT manpower to IT manpower, and IT specialists. IT champions and project managers have been identified to lead e-government implementation, and supporting programs nurtured in schools, institutions of higher education, and professional associations. Change management programs have been developed to facilitate changes in business processes and a legal and policy environment conducive to building confidence in electronic transactions has been built.

Collaboration between the government and private sector has been intensive. Government retained its traditional role of owner and operator of key ICT assets and infrastructure in the early years, but encouraged active private sector participation in government projects through tenders, calls for collaboration, competitive dialogues, and technology trials. Investment by international as well as local companies was strongly encouraged. As a dynamic, innovative, and competent pool of ICT companies grew, government gradually shifted from planner, implementer, and owner of ICT and its assets, to that of master planner, facilitator, and promoter of competition. Thus, it provided a supportive environment in which ICT companies were able to thrive, grow, and diffuse their products. Through innovative partnerships with the private sector, the government now is able to foster innovation in the private sector, protect against technology obsolescence, and create further employment in the development, implementation, and delivery of ICT products. In doing so, the government is further catalyzing the growth of the ICT industry and promoting industrial upgrading.

Finland

In the 1990s, Finland achieved a high-profile breakthrough to the forefront of the international information society, transforming itself in a short period from a resource-intensive economy into a knowledge economy very much driven by the ICT sector. This transformation coincided with a major economic crisis in the early 1990s, with recovery from a deep recession and a major structural change taking

place simultaneously. Unemployment and government debt reached alarming levels. Difficult fiscal adjustment and other policy changes were undertaken to join the European Union and become internationally competitive. But Finland also increased investments in R&D, enhanced open competition, and emphasized ICT. By 2000 the country had become the most ICT-specialized economy in the world. Today, Finland is not only one of the most open economies in the world, but also one of the leading ICT- and knowledge-based economies. R&D as a percentage of GDP is one of the highest in the world, about 3.5%, and the country's sophisticated innovation system is considered one of the best in the world.

This remarkable e-transformation was facilitated by a strong education system and impressive national institutions for the formation of national consensus, including special programs in economic policy management and national strategy issues for national leaders conducted over decades, which helped enormously in conceiving and executing these changes. Like Singapore, Finland had a succession of national information society strategies that set the policy frameworks for its e-development, beginning in 1993, in the depth of the recession. They were supported by institutions such as the Finnish Innovation Fund (Sitra) and an Information Society Council chaired by the Prime Minister and including key representatives of the public administration, private sector enterprises, interest groups, and other civil society organizations.

Finland has used its advanced ICT sector and technologies to transform user industries like forestry, pulp, and paper, maintaining their competitiveness and profitability. The situation is very similar in revitalizing other traditional industries and in agriculture. Key elements of Finland's innovation system are the independence of funding agencies and an appropriate balance between budgetary allocation to universities and R&D institutions and competitive project-oriented innovation funding, whether from the public or private sectors. Nokia exemplified Finland's move to knowledge-driven growth and focus on ICT, transforming itself from a diversified conglomerate in the late 1980s into a company highly focused on wireless telecommunications.

Finland's experience shows that it is possible to make a dramatic recovery in GDP, undertake a major restructuring, and turn a crisis into an opportunity. A strong ICT sector and the application of ICT to transform government and the economy were facilitated by a sophisticated innovation system, a well-educated labor force, competent entrepreneurs, proper economic incentives, and appropriate institutions and policies. Particularly important were the education and innovation systems, consensus-building mechanisms, and a capacity to anticipate and prepare for the future—the last being exemplified by the national information society plans and the Parliament's unique Committee on the Future.

South Africa

South Africa is a federal state characterized by great economic, social, ethnic, linguistic, and geographic diversity. Intense rural–urban and international migration has created a tradition of population mobility and the need for affordable mobile communications to maintain and build social and economic connections. The South African telecom sector

has only a few players, hence limited competition and high market concentrations in major market segments. Despite progressive liberalization, the state enterprise, Telkom, while no longer a monopoly, still has a dominant role and is active in the fixed, mobile, and cable markets. Only since 2009 have all telecom players, including Internet service providers, been freed from the obligation to lease facilities from Telkom, at high prices. Historical bottlenecks in Internet access are slowly being eroded. In 2007–2009 broadband emerged as a key network infrastructure; in 2009 competition emerged in the undersea cable market bringing greater and cheaper bandwidth to South Africa; and in 2011 initiatives and spectrum policy and regulation may improve the availability of this scarce resource. Together, these features could create a new environment for e-development, but this future is as yet uncertain.

Available statistics show that radio, television, and mobile telephony are used by the greatest percentages of the population, about 90, 85, and 75% respectively—only about 11% of the population was accessing the Internet in 2010, though mobile Internet usage has been increasing rapidly in recent years. There are huge differences in Internet usage between rural and urban areas, by income level, and age groups. In the business sector large companies make much greater use of the Internet than SMEs. Government usage is concentrated on internal administration, with relatively few e-government services offered to businesses and the general public. Most telecenters for public access have not been successful and sustainable, with the possible exception of some within public libraries. The lack of entrepreneurial skills and relevant content may be factors, together with price and the availability of Internet connectivity, affecting adoption rates.

South Africa cannot be said to have an e-transformation strategy—the only effort in this direction was the Information Society and Development (ISAD) Plan of 2006, presented 10 years after the ISAD international conference hosted by the Government. But that plan was a set of goals rather than a strategy for e-development. A new national e-skills plan is critical, but lacks detail and is disconnected from other levers for coevolution of the ICT sector with the other major economic sectors. Subnational policy and strategy is largely concerned with infrastructure connectivity issues like broadband or access centers, rather than with services. The many gaps in the policy landscape create an insufficient basis for e-transformation. What e-development is happening is the result of market forces, with little or no government role in setting coherent policies, and coordinating investments and building capabilities. What emerged has mostly benefited the established and emerging upper and middle classes.

Given the high mobility of the population, the rapid penetration of mobile telephony and the falling price of smartphones and tablets, mobile broadband probably offers the greatest promise for rapidly expanding Internet use and e-transformation in South Africa. But to realize its potential, mobile communications must be part of a holistic e-transformation strategy.

The Philippines

Despite the restoration of democracy in 1986, the Philippines has failed to achieve sustained economic growth, earning the county the reputation of being a development

laggard. Over the period 1986–2010 successive administrations have attempted to break what has been called an antidevelopment cycle through a variety of initiatives, with an increasing emphasis on harnessing ICT as a tool to achieve national objectives.

Beginning in the 1990s, successive national ICT strategies have evolved, initially focusing on opening the monopolized telecommunications industry, and the creation of ICT-enabled services. Subsequent national ICT priorities have progressed toward improving the quality of life through the creation of a more digitally inclusive society and a reform-oriented use of ICT in governance. Enacted laws on automated elections, SMEs, poverty alleviation, agriculture, and fisheries modernization aimed to diffuse the benefits of ICT especially to marginalized groups and for political reform.

Though formulated within national ICT strategies embedded in broader development plans, in practice most Philippine public sector ICT4D initiatives can be labeled as "traditional," that is disjointed, unsustainable, and short-term oriented. Roles, responsibilities, and programs tend to overlap, and are not strategically and synergistically managed. Accountability for performance remains weak. Moreover, ICT programs and institutions suffer from common civil service constraints that hinder their ability to compete with the private sector to attract highly skilled staff. More systematic and frequent assessments of ICT institutions in the Philippines are needed in view of the diverse and frequent institutional innovations pursued, and of the significant gap between stated aspirations and results on the ground.

Nevertheless, significant progress has been realized in developing e-policies, supporting legislation, infrastructure, institutions, human capital, applications, and public–private partnerships and programs to promote the ICT industry. The private sector has developed rapidly, particularly in cyber-services (software development, business process outsourcing, and contact centers), telecommunications, and semiconductor manufacturing. These achievements provide the basis for a paradigm shift if a comprehensive e-transformation approach is adopted. A committed national effort will be necessary—reflected in political will, capacity, resources, and partnerships. The current initiatives of the new Aquino administration to create the Philippine Digital Strategy (2011–2016) should openly and candidly assess past initiatives to provide a solid basis for sustained and inclusive e-transformation.

Comparative Analysis

The four country experiences summarized above and covered in detail in previous chapters are rich and diverse. Yet, they are selective abstractions from the complex realties of e-transformation. These country cases inevitably capture one phase or another of a country's long journey toward e-transformation. They are a composite of official policies and formal plans of a national ICT strategy, combined with implementation practices and results of such plans. Any attempt to make comparisons among these cases along any set of criteria or common dimensions therefore faces many limitations. Yet, a common set of core criteria for comparing the design and implementation can be most helpful in capturing the diversity of country

Table 6.1 Selected key indicators and Network Readiness Index (NRI) and selected component rankings by country

Country/criterion	Singapore	Finland	South Africa	Philippines
Population (millions), 2008	4.8	5.3	48.7	90.3
GDP per capita ($PPP), 2008	51,226	36,320	10,136	3,515
Mobile phone subscriptions per 100 population, 2008	138.1	128.8	90.6	75.4
Internet users per 100 population, 2008	73.0	82.6	8.4	6.2
NRI 2009/2010 (rank of 133)	2	6	62	85
Environment	9	5	39	95
Market	2	6	29	86
Political and regulatory	1	6	21	91
Infrastructure	21	8	72	107
Readiness	1	3	84	79
Individual	1	3	115	57
Business	5	4	43	86
Government	1	9	78	106
Usage	4	13	76	72
Individual	9	10	89	88
Business	9	10	44	35
Government	2	23	71	85

Source: Dutta and Mia (2010)

approaches and experiences and in generating some guiding principles and conclusions or hypotheses to be tested by further research in the sample countries and across more countries.

A summary of country economic levels and characteristics as well as country rankings on Network Readiness Index (NRI) and its key components[1] can facilitate comparative analysis.[2] Table 6.1 shows the diversity of countries covered, in terms of size of population, level of economic development, mobile and Internet penetration, overall NRI country rankings (of 2009/2010), and key NRI components: environment, readiness, and usage. These indicators provide a summary of some hard data on the context within which e-transformation strategies have been pursued and both hard and soft data on progress or actual usage of ICT by individuals, business, and government. While these readiness indicators suffer from several shortcomings, they can be useful in relating country e-strategy practices to some of the most common indicators being measured and shared internationally. Other contextual factors not captured in the table, such as the political and institutional development of the country, can be obtained from the country cases themselves. Such factors should be taken into

[1] For details see Dutta and Mia (2010), the 2010 issue of the World Economic Forum's annual publication: *The Global Information Technology Report.*

[2] Other traditional comparative indicators would be the growth rates and total factor productivity (TFP) indicators: all four cases show high levels of growth rates relative to their per capita income level, over the last decade, but TFP growth for both the Philippines and South Africa are lower and income inequality much higher.

Table 6.2 Assessing e-transformation across countries

Country/criterion	Singapore	Finland	South Africa	Philippines
Integrating into development strategy	H	H	L	M
Coverage, coherence, synergy	H	H	L	M
Leading, institutionalizing, and engaging	H	H	L	L
Balancing central direction with local	M	H	M	L
Balancing long-term and short-term objectives	H	H	L	M
Innovating, adapting, and learning	M	H	L	L
Balancing ICT as enabler and sector	H	H	L	M
Emphasizing digital inclusion	H	M	L	M

Key: *H* high; *M* medium; *L* low rating for each criterion

account in proposing hypotheses or conclusions about how key parameters of e-strategies are contingent on a country's sociopolitical and economic development.

We now introduce the main criteria or dimensions along which our cross-country comparisons are made. These are "process" criteria of fundamental importance to e-strategy design and implementation. They include integration of e-transformation into each country's development strategy; comprehensiveness, synergy, and coherence of the ICT strategy; and attention to e-leadership, stakeholder engagement, and institutional mechanisms for implementation. They also capture the balance between top-down direction and bottom-up initiative, between pursuing long-term and short-term objectives, and between ICT as a cross-sector enabler and as an industry or sector on its own. The final set of issues or criteria for comparing e-strategies includes the extent of reliance on innovation and adaptation during implementation, stress on monitoring and evaluation or measuring outcomes, and attention given to the digital divide and social inclusion. We assign a tentative grade (overall characterization of e-strategy) for the four countries along these dimensions, based on both country policy and implementation for the period covered by the case study (Table 6.2).

Implicit in the eight criteria on which we seek to compare the e-transformation strategies of the four country cases is the hypothesis that the higher the rank on each of these criteria, the more likely the national strategy is to be successful in promoting comprehensive e-development as set forth in the model presented in Chap. 1, and to some extent reflected in the country rankings on the NRI. For example we expect that a country following a strategy that is supportive of and integral to overall development goals and programs, one with a high focus on digital inclusion, and a high degree of balance between top-down and bottom-up initiatives will, other things being equal, do better at advancing e-transformation than one with low ratings on these criteria. The same goes for high rankings on the other criteria.

It should be noted that there may not be a high correlation between the scores on the characteristics of the e-transformation strategy process (in Table 6.2), and e-readiness indicators (Table 6.1), since process criteria alone do not determine immediate e-readiness outcomes; e-readiness also depends on level of economic development, how long has the country been pursuing e-transformation, etc. Also, there is no close correlation between scores on e-transformation—as a process—and the level of development of the country, at least for the short to medium term, as

countries are starting their e-transformation journey at very different levels of incomes and initial conditions. However, we can conjecture that those countries that are pursuing e-transformation more effectively will move faster in terms of their development goals and competitive position compared to their (and to other countries with similar) initial conditions. Moreover, we conjecture that those countries that pursue e-transformation over the long term and through public-private partnership will be able to catch up in terms of their overall development, and perhaps surpass the slow adopters of the new technologies. Korea, Singapore, Finland, and to some extent, China and India, among others, support such a conjecture. This would be consistent with the "New Structural Economics" (Lin 2011).

The remaining part of this comparative analysis draws on the above two tables and is organized along these key criteria.

Integrating ICT into Development Strategy

This is perhaps the most important criterion for assessing e-strategy as an enabling and transforming tool for economic development. Some middle-to-higher income countries and advanced knowledge-based economies have adopted policies and strategies that put ICT at center stage of their competitiveness and innovation. Finland and Singapore are notable examples. Finland's high degree of ICT integration into its overall economic and social development was borne out of conscious political and social choice to transform the economy from crisis and heavy dependence on agro-forestry and related industries to an innovation-driven economy, where ICT is harnessed to transform forestry, health, education, services, government, and research. Four successive national information society strategies and action programs were developed since the early 1990s and a highly sophisticated innovation system created to harness new technologies to build a highly competitive economy with a strong ICT core. Likewise, over an even longer period beginning in the 1970s, Singapore developed a deliberate and well-phased set of six national strategies to build a highly developed and competitive economy with ICT again playing a central enabling role.

Linkages to development and competitiveness strategies proved to be easier to design and implement when such strategies were clearly articulated. Clear development strategies help design ICT strategies that can be supportive of and integral to overall development goals and programs. ICT can then be targeted to clear development priorities, and mainstreamed as enabler of all priority sectoral programs, rather than taken as a binding constraint to sustained growth and competitiveness. Defining the national ICT strategy in terms of development outcomes (such as sustainable growth and improved education) rather than ICT sector indicators (such as teledensity) helps policy makers to take a holistic view of the linkages between ICT and key user sectors. Openness, export-orientation, and competition from local and international sources can further build pressure to leverage ICT more strategically across the economy as in Finland and Singapore.

Integrating e-strategy into overall development policy and programs is difficult for large countries with regions at very different levels of development such as South Africa and the Philippines. In South Africa weaknesses in the state in general, and regulatory and policy-making bodies with digital inclusion and cross-sector mandates in particular, have contributed to poor performance on this criterion.

For poor countries, it is difficult to conceive of and communicate the linkages of ICT to growth and poverty reduction, particularly when ICT is viewed solely as an industrial sector rather than an enabler of all other development priorities. These countries face many daunting development challenges and ICT may be perceived as lower among and in competition with a long list of priorities. Moreover, ICT's role in poverty reduction is less understood and more uncertain than in improving productivity or promoting export and competitiveness. But the leadership of some poor countries has taken a visible and proactive posture in adopting e-transformation as central to their overall development strategy, as was in the case of Sri Lanka (Hanna 2007a, b). Singapore took such a proactive posture to promote ICT-enabled development as early in its development process as in the 1970s, when Singapore was a low-income country.

For successful countries, e-transformation strategy is not a mere vision; it operates within institutional and financial constraints. Thus it seeks to guide the allocation of resources, focusing scarce public resources on investments with the greatest development impact. Investments have to be sequenced and phased.

As implementation proceeds and awareness grows, the links become clearer to leaders and implementers alike. There is some evidence that this has been happening in the Philippines. The creation of the Commission on Information and Communi-cations Technology (CICT) in 2000 and the progressive strengthening of its coordinating function directly under the President's office increased the potential for a more holistic e-transformation approach. But in practice weak accountability for results, frequent changes in objectives, and both staffing and financial constraints seem to have limited effective integration.

The experience of leading corporations suggests that, through practice and institutional learning, business leaders begin to own the ICT function, and ICT becomes increasingly central to overall business competitiveness and transformation strategies—not just a facilitator or support function. Similarly, both Singapore and Finland revisited their national ICT strategies over time and redefined them in support of an evolving vision of Singapore as an innovation and services hub, and of Finland as a knowledge hub in the global economy.

These links to the development agenda cannot be taken for granted. Integration of ICT with development strategy is not a one-way street or a one-time exercise (Hanna 2007a, 2009a). Unless iteratively revisited, built and rebuilt within an e-transformation framework, the links may weaken over time and be displaced by narrower interest groups, or purely ICT sector agendas. This appears to have been the case in South Africa, Brazil and Canada (Hanna and Knight 2011).

Coverage, Coherence, Synergy

Our case studies suggest that most countries have progressively moved toward broader and more comprehensive coverage of e-transformation, along the proposed e-development framework (as outlined in Chap. 1). Small countries at more advanced stages of e-transformation have taken the most comprehensive coverage (Singapore, Finland). Social consensus on development strategy and stable political commitment and leadership can help pursue a broad mandate to ensure coherence and synergies across all elements of e-transformation.

Despite dramatic technological advances in telecommunications, liberalization remained a binding constraint for a long time for many countries. A dominant telecom provider or a protectionist ICT industry can narrow the perspective of policy makers and undermine the interests of other stakeholders in pursuing a comprehensive, coherent, and synergistic approach to e-transformation, as in South Africa and Canada. In South Africa the dominant telecom provider captured the regulatory regime and became an impediment to liberalization, downstream connectivity, and e-transformation for a long time. The successive national ICT strategies of the Philippines initially focused on opening the monopolized telecommunications industry, but did not make corresponding progress in shared access to Internet and ICT for the rural areas.

In Singapore, liberalization of the telecom market was phased and only fully realized in 2000; it was the government-led supply push that propelled the development of Singapore's physical infrastructure, including telecom. Yet, government intervention may have led to an initial slow uptake of broadband due to lack of competition. Once competition was enhanced, it led to greater demand and much higher penetration. Finland had an early start with a highly liberalized market.

While telecommunications remains a vital pillar of e-transformation, it would be misleading to limit attention to getting the "hard infrastructure" right. It is equally important to advance the "soft infrastructure": content, education, awareness, etc. Most countries tend to fall short on striking this balance, most notably South Africa and the Philippines in the cases covered. But even Singapore, which excelled in education and awareness-raising to spur penetration and adoption of broadband, was slow to develop content, due to the lack of economies of scale for local content providers and tight control over Internet content.

Pursuing a holistic approach is a dynamic process that often involves balancing the interests of diverse stakeholders, both ICT providers and users. Singapore and Finland achieved a high level of coherence and synergy by having one leading agency with broad mandate for e-development, and/or by having a shared vision and strong consensus among all stakeholders and e-leadership institutions.

In common practice, potential synergies and interdependencies are often missed when designing national ICT strategies. South Africa pursued separate and parallel programs for various elements of e-development, but with little coherence, coordination, or synergy. The Philippines has articulated a more integrated approach and been effective in both liberalizing the ICT sector and supporting private sector-led ICT development, but seems to have been less effective in coordinating and

prioritizing public sector programs, many of which appear to be excessively top-down, donor-driven, and under-funded.

Most countries face major challenges in ensuring data sharing across government, and have continued to struggle to bring about data unification and a whole-of-government approach to their e-government efforts—South Africa and the Philippines in this volume, and Brazil, China, and Sri Lanka in the companion volume. Singapore presents an example of the competitive edge of starting with unified approach to e-government. As early as 1994, Singapore set up its main data hubs for people, land, and enterprises—setting data standards, unique identifiers (IDs), and the enabling data management, governance, and legal frameworks. It was tempting to short-cut these painful efforts and start with putting everything online agency by agency without unification. Taking an integrated perspective, however, gave Singapore a head-start on setting the building blocks for sustained government e-transformation.

Leading, Institutionalizing, and Engaging

Securing linkages to overall development and holistic coverage of e-development depend on e-leadership, e-institutions, and stakeholders engagement. Investing in leadership education, institutional development, and stakeholder participation can both strengthen the integration of ICT across the economy and the synergies among elements of e-transformation.

Commitment at the top of the political system was strong and critical in the success of Singapore and Finland, and relatively weak in South Africa and the Philippines. Singapore has the longest track record of sustained high-level political commitment and strategic thinking, favored by the stability of its ruling party that has retained control since the city-state gained independence. Finland had changes in leadership, but developed institutions to build continuity and social consensus on e-transformation strategy that persisted through multiple changes of government, supported by a strong ICT sector led by Nokia, a sophisticated innovation system, and a superb educational system.

A widely shared vision of ICT's strategic role in national development has simply not existed in South Africa, and has developed only incipiently in the Philippines. In South Africa, the political leadership did not lead the-transformation and change management process, but other stakeholders also have not pushed. A key constraint to building a leadership coalition for reform is that the labor unions—key players in the government—are resistant to change and indifferent to the interests of other stakeholders.[3] South Africa has only recently begun to develop a competitive telecommunications sector with the potential to lower prices for its services. The country is still relatively weak in the IT industry, ICT skills, and above all in ICT policies and institutions.

[3] An analysis of the political economy for such reform is attempted in the South Africa chapter, but much more in-depth understanding of why such coalition did not form for a long time is warranted.

Experience indicates that it is easier to engage stakeholders and create effective leaders and e-leadership institutions when countries are endowed with a civil service that is effective and ready to lead and partner with the private sector and civil society. It is also easier where populations are more homogenous, educated, and urbanized, and where national consensus on development is well established. These are the salient characteristics of Finland and Singapore. Not surprisingly, they score highest on NRI and their degree of attention to developing leadership, institutions, and stakeholder engagement for e-transformation.

However, even in these favorable environments, leadership and institutional development are continual challenges, demanding continual education and institutional innovation. With strong leadership coming from the top of the political system, Finland engaged in extensive leadership awareness and education, and in institutional innovation to govern and promote e-transformation. Extensive participation of stakeholders has benefited from innovative mechanisms for national consensus formation which have been institutionalized in parliamentary commissions including a unique Committee on the Future, and from a specialized organization, the Finnish Innovation Fund (Sitra). Sitra not only prepared many reports on e-development strategy but also over many years conducted broad-ranging national economic management courses for new members of parliament, together with leaders from the civil service, business, labor, academia, and NGOs.

Countries characterized by economic inequalities, polarized societies, and underdeveloped civil service systems face significant challenges in establishing the leadership and institutions necessary for e-transformation. This appears to have been the case in the Philippines and South Africa.

A recurrent theme of the case studies is the need for broad participation of stakeholders from government, private sector, and civil society and the leadership, institutional mechanisms, and processes involved in designing and implementing e-strategies. The pioneering countries have consistently engaged political and business leadership in managing e-transformation as in Finland and Singapore. Countries with long traditions of democracy and decentralized government have also given NGOs, academia, and media a stronger voice in these e-leadership institutions, thus keeping them agile, informed, and accountable. Countries with substantial inequalities have sought to engage their NGOs, academia, and the media, as in South Africa and the Philippines, albeit with mixed success. Political instability, civil strife, and inequalities have constrained balanced representation and inclusive engagement of stakeholders, as in the Philippines.

Weak leadership, institutionalization, and stakeholder engagement have led to slow progress and low rankings on many NRI indicators for South Africa. There was no strong leadership from the top of the political system to mobilize stakeholders, develop long-term national e-development strategy, and counterbalance the telecommunications industry which effectively captured its regulatory agency. No effective government institutions were created with a wider mandate to develop policy or learn from national experience. This also aggravated the digital and economic divide. Pressures for telecoms liberalization, greater competition, and lower prices did not come from government or the regulator, who seem to have held the view that

the disruptive effects of competition and innovation are not desirable. Rather they came through the legal system inspired by potential private sector competitors of Telkom, the dominant market player, and by market forces derived from the convergence of mobile computing and Internet provision propelled by an explosion of smartphone use encouraging investment by new market players.

Among the fast adopters, partnerships were nurtured across all components of e-transformation. For example, in the case of Finland and Singapore, the need to retain key constituencies as partners has influenced the evolving scope of the e-development investment program and the balance of funding among its components. This rationale also influenced the design of e-Sri Lanka (Hanna 2007a, b).

Contextual factors influence partnerships of all kinds, including public–private partnerships. Partnerships have been easier to form when societies were more equitable and inclusive as in Finland. By contrast, partnerships proved difficult to form in South Africa. Such partnerships inevitably demand trust and reconciliation of interests. Forums, pilots, and incentives had to be developed to build trust, align interests, and nurture cross-sectoral partnerships.

Balancing Central with Local

It is not easy to generalize about the optimal balance between top-down direction and bottom-up initiative that should be pursued in e-development. This balance is conditioned by the political and social culture of the country. So while Finland and Singapore have been frontrunners and enjoyed national consensus in e-transformation, Finland relied much more on bottom-up initiative and emergent strategies than Singapore. Put differently, while top leadership appears to have driven change in Singapore, the top-down direction was secured only by a push from other stakeholders in the case of Finland. This was possible for Finland through extensive and institutionalized participation of key stakeholders at all phases of strategy development and implementation.

Observing e-strategies over time indicates that countries at early stages of e-transformation tend to rely on top-down push for reforms, and central coordination in investing in shared infrastructures and capabilities. In such phases, they also often relied on the highest political authority of the country and a powerful central ICT agency to provide central policy guidance and an enabling environment. Singapore moved only slowly from a centrally driven program toward increased decentralization and shared responsibility within government and the private sector. Finland presented a more balanced approach from the beginning.

Striking the right balance is particularly hard for large countries with high inequality and/or regional diversity such as South Africa and the Philippines. South Africa illustrates that it is often necessary for pressures to build up gradually from outside the government, by NGOs, academia, the courts, and users of ICT—essentially bottom-up—to advance the process of e-transformation. Local initiatives in the most developed provinces and municipalities existed with little

encouragement by national policy. Despite major efforts aimed at decentralization and regional development, these efforts did not incorporate many ICT measures to redress inequality, and those adopted in planning documents were not matched with implementation capacity at the local level.

It is at the local level that many of the links between elements of e-development must be sought and built—such as those between telecenter development, content development, e-literacy, and the delivery of e-government services. Accordingly, an ecosystem can be created at the local level whereby telecenters[4] are used as platforms to deliver diverse services, connect local enterprises to global supply chains, and engage local communities with the knowledge economy (Hanna 2010). The Philippines has made some progress in this regard, but South Africa's attempts do not seem to have been effective. Poor connectivity, deficient organizational and entrepreneurial capacities, slow development of e-government and e-education applications, and lack of small-scale business applications resulted in low adoption and sustainability.

Balancing Long- and Short-Term Objectives

Country cases indicate that political and economic stability have been essential to set and sustain commitment for long-term aspirations. The main examples are Singapore and Finland. Finland, with institutions devoted to foresight and national consensus on long-term objectives, has educated its policy makers and parliamentarians to support sustained ICT-enabled transformation. Conversely, Canada shifted its emphasis from long- to short-term objectives as the government changed to one with a conservative economic philosophy, leaving much of goal and target setting to market forces and local initiatives.

Despite grandiose visions, South Africa and the Philippines did not commit to programs to realize their long-term aspirations. Their experience is similar to Brazil's and many others. For example, in 1999–2000, Brazil articulated early-on a long-term vision of its information society, led from the Ministry of Science and Technology, a relatively weak ministry with a rather small budget. This vision and most corresponding programs were not articulated and executed in a coordinated fashion. Sustained commitment and cooperation among many different ministries in the federal bureaucracy would have required strong support from the President's office and Ministry of Finance. Short on resources and also subject to changing political leadership, many state and municipal initiatives have focused on the short term. In e-government, for example, the temptation was to pursue window-dressing websites and front-end e-service delivery, as quick and visible wins, but to lag far behind in attempts to secure interoperability, information sharing, back-end process transformation, and fully integrated transactions.

[4] There are many definitions for telecenters, but a good one is "a facility that offers community members the ability to use ICTs in a publicly shared manner. Telecenters often provide the only connectivity available to many community members, and their services may be offered with or without a fee." See cyber.law.harvard.edu/readinessguide/glossary.html.

Innovating, Adapting, and Learning

Finland may present a best practice model in adopting an innovation- and learning-based approach to e-transformation. Learning and adaptation have been facilitated by a strong education system, highly skilled labor, technically literate and equitable society, open and learning culture, and a highly developed innovation system that links research, business incubation, and finance in interactive fashion. Nokia, the leader of ICT and ICT-enabled innovation, heavily invested in R&D to do its own business transformation. Learning and innovation have also been driven by future-oriented policy research institutions, linked to Parliament and top policy making, such as the Committee on the Future. These institutions did not yield blueprint plans, but a shared vision and an enabling environment to experiment, innovate, and transform with the power of ICT.

Singapore developed a sophisticated set of key performance indicators tailored to different stakeholders and levels of service maturity coupled with extensive feedback mechanisms and a flexible approach to planning to take advantage of such continuous feedback in developing its e-government program.

By contrast, South Africa and the Philippines have not adopted a systematic innovation, adaptation, and learning strategy to draw on the rich and varied innovation and experimentation that may be occurring at the local level, and to scale up the most promising programs. South Africa gave little attention to learning, adaptation, and evaluation at the federal level too. In fact it was the Guateng provincial government that was the first to formulate a monitoring and evaluation (M&E) framework, and this only in 2010.

Balancing ICT as Enabler and Sector

The ICT sector can play diverse and even contradictory roles, as a lobby for monopolistic and anticompetitive policies for telecom and protectionist policies for ICT producers, or as a promoter for ICT application and diffusion, that is, ICT as enabler and transformer of all economic sectors. Policy makers, broadly-mandated ICT agencies, producers of content, and intensive ICT users and NGOs can play counter roles and balance the interest of domestic beneficiaries of ICT use vis a vis dominant ICT producers and telecommunication operators. But reforms and liberalization to promote ICT diffusion are never easy when ICT users are too weak and disorganized to engage and bargain on a level playing field with dominant ICT suppliers and producers.

South Africa presents a classic case of an ICT sector, led by Telkom, looking after its own corporate interests, exploiting monopoly and oligopoly power, and constraining e-transformation. This imbalance was compounded by poor or little emphasis on raising public awareness, diffusing ICT as enabler, integrating ICT into development strategy, and synergizing ICT use with local ICT industrial competency development. Slowly pressures have built up in business and society, and that eventually led (2010) to erosion of Telkom's market power possibly paving the way for broad-based e-development.

A vibrant local ICT industry can be an powerful partner to innovation and learning across the economy, not just for the benefit of the ICT sector, but also for the benefit of all other sectors. In the Philippines, for example, the ICT industry succeeded in creating a globally competitive IT services for export. But both government and the private sector in the Philippines failed to create effective partnerships to promote innovation in the public, social, or small enterprise sectors in contrast, as the ICT industry in India matured, it became a powerful ally for e-transformation.

Finland and Singapore both rank high on the score of balancing the creation of a vibrant ICT industry ecosystem with effective programs to diffuse ICT in government and SMEs, and to build an inclusive information society, empowered by ICT. Singapore's emphasis on ICT as enabler was also driven by the need to achieve global competiveness for its exports, to diversify its economy, to become a global logistics hub, and to attract talent and innovation to its small, natural resources-poor island. Finland's programs were also proactive and organically embedded into its education, governance, innovation, and societal activities. In both countries, the interactions between the ICT sector and the user sectors (and all e-development components for that matter) were highly synergistic.

Emphasizing Digital Inclusion

Almost all countries in this review have emphasized digital inclusion, at least in terms of espoused policy, if not in practice. Finland and Singapore focused on building an inclusive information society early on in their e-strategies. It could be argued that for small and urbanized countries, with high income and relatively homogenous populations, it is easier to achieve digital inclusion. Singapore is a small, urbanized, multicultural society.[5] Yet, Singapore devised a broad range of general digital inclusion programs to promote e-awareness, e-literacy and the use of public and private e-services. In addition, specialized programs have been developed to cover the non-English speaking groups, the poor, senior citizens, and the disabled.

Providing Internet coverage for dispersed rural populations is relatively expensive, but Finland has consistently sought to expand this coverage and Internet use through government programs.[6] Much like Singapore, digital inclusion was a key objective of Finland's e-transformation journey from the outset, and remained so even as the country advanced to a developed economy status.

In countries with high levels of inequality and urban–rural divides, the rhetoric for digital inclusion and the information society was loud, but the record has been mixed. In South Africa, it is surprising that a government elected with the support

[5] Singapore, with a small and 100% urban population with a high per capita income, while heavily Chinese, has significant minorities of Malays and Indians, so it is a multicultural society where in addition to English, other languages such as Chinese, Malay, and Tamil are spoken.

[6] Finland's population is small, generally has high per capita income, and is quite homogenous, but over 30% is still rural and it has a large territory in relation to its population (like Canada).

of the black and largely poor majority of the population was so unresponsive in matters of social inclusion, use of ICT for education, and fostering broad-based ICT-enabled economic and social development. Since the digital divide is not merely about affordable access to Internet and telecom infrastructure, but also access to relevant content and capabilities, it is not surprising that not much progress was made in bridging the digital divide for rural, less educated, and relatively poor populations. But it is all the more surprising that national leadership did not develop the programs and investments necessary to overcome this vicious cycle for the disadvantaged majority, given the leadership role of South Africa in convening and hosting the Information Society and Development Conference back in 1996. The explanation in part appears to be that South Africa's ruling party, the ANC, not only inherited a weak state, but also continued to preside over a weak state, failing to increase its policy and implementation capabilities.

In the Philippines, there has been more emphasis on decentralization and rural development. The e-LGU for local governments, Community e-Center (CeC), and Cyber Education programs have the potential for helping bridge the urban–rural divide. But in remote municipalities, basic infrastructure, the presence of competent IT staff, competing local priorities, and development of local content are pressing concerns. Building capacity at the provinces and local levels to lead and practice inclusive e-transformation is an urgent and long-term effort, particularly for the poor and highly rural areas.

Capturing Fundamental Lessons

In reviewing the country cases, many lessons and hypotheses have been put forward as factors or practices that can facilitate e-transformation.[7] We focus here on four fundamentals:

- Committing to long-term objectives, coherence, and continuity
- Promoting leadership, institutions, shared vision, and human resources development
- Committing to experimentation, local initiative, learning, and evaluation
- Pursuing diffusion and inclusion

Committing to Long-Term Objectives, Coherence, and Continuity

Although ICT can accelerate the development process, economy-wide e-transformation is still a long-term process that takes decades to realize. The pressures to produce quick wins and tangible results for the short term are understandable and real. The expectation that each ICT tool or application is transformational and the

[7] We also draw on country cases in the companion volume (Hanna and Knight 2011) and on our experience in many other countries.

"irrational exuberance" generated by ICT industry innovations have often led to "hype cycles" and "bubbles."[8] Development practitioners and aid agencies are also prone to succumb to development "fads" in search of silver bullets and universal solutions to long-standing problems and pressing development challenges. Putting public services online without rethinking, simplifying, and transforming the underlying business processes has led to a one-time improvement or "window dressing" rather than broad, deep, and sustained government-wide transformation (Rubino-Hallman and Hanna 2006).

Sustained e-transformation, like sustained development in general, requires trading short-term pain for long-term gain. A strong future orientation is essential. But sustaining popular support for long-term objectives also requires gradual steps and demonstrable effects. Balancing a portfolio of quick wins to capture low-hanging fruits and to secure support for e-transformation programs, on the one hand, and of sustained change management efforts and long-gestating investments to create the enabling conditions, building blocks, and complementary institutions, on the other hand, is a key path to true transformation. This challenge is particularly felt in countries with fragile economies or democracies, as in the case of Philippines, South Africa, and Sri Lanka.[9] Making the necessary tradeoffs and balances both requires and facilitates social consensus and cohesion.

Adopting long-term perspective for e-transformation does not mean the adoption of centralized, rigid planning approaches. Even for a relatively small, planning-oriented nation like Singapore, the government evolved and revised its strategy over time, sequenced investments over successive strategies, relied on market forces wherever possible, adopted iterative innovation and process changes, experimented with new technologies, and remained alert to seize new opportunities as they arose. Successive strategies did not emerge full blown, but were rather built on earlier platforms and cumulative learning, and guided by a process of self-discovery.[10] To do so, the government had to engage various stakeholders and to partner with the private sector. Visions of e-transformation, and the broad ownership of these visions, were critical to the adoption of long-term investment programs, the coherent use of various policy instruments, and persistence with implementation and change management.

[8] Like the Internet bubble of 2000, and the emerging social media (e.g., Facebook) bubble in 2011.

[9] This tension between short- and long-term objectives and mechanisms to manage this tension are illustrated in detail in the case study of e-Sri Lanka (Hanna 2007a, 2008).

[10] Singapore's TradeNet is an example. It was launched first in the late 1980s using pre-Internet electronic data interchange (EDI) technology to connect all members of the Singapore trading community through the exchange of intercompany documents in format conforming to established public standards. This was later linked to the international trading community, and subsequently migrated to the Internet. The processes of collaboration and coordination across many institutions, and of encouraging adoption of ICT by SMEs and small traders provided the foundations for successive advances in using ICT in trade facilitation, and for the diffusion of ICT across the economy. Subsequently, TradeNet launched Singapore's full entry into deploying value-added networks throughout the Singaporean economy, and later, to sell the expertise of trade facilitation and networks to other countries. Meantime, building on its earlier learning from TradeNet, Singapore commissioned TradeXchange in 2007, to facilitate collaboration across many actors by providing a secure, multiparty collaborative platform to integrate trade and logistics processes.

The rapid technological change in ICT poses challenges to the slow-moving processes of policy formulation, program design, complex project implementation, and formal evaluation and feedback. Given the fast pace and seemingly endless change in ICT, should countries continuously revise their e-transformation strategies or even give up strategizing and just respond incrementally to continuous waves of disruptions? Or should countries find ways to persist with desired transformations that will require long-term strategic commitments, leadership, and change management?

Successful countries took advantage of new waves of technologies, but did not rush into investments in new technologies without strategy, prioritization, experimentation, capacity building, governance mechanisms, and continuous evaluation and learning. e-Transformation is not about constant chasing of the "next new thing," or the adoption of the latest technology as an end in itself. Country case studies suggest some fundamentals that should guide countries through the technological upheaval, toward desirable and sustainable change. Countries like Finland and Singapore have persistently built institutions and governance mechanisms to coordinate investments, mobilize change agents and support early technology adopters. They induced appropriate changes in the culture to support openness, collaboration across sectors, and tolerance of the risks associated with transformation and the innovation of new organizations and practices. They set "stretch" targets but managed expectations to match resources.

Coherence also matters a national e-transformation strategy should be directed and shaped by the broader goals of national development that are set in relation to the imperatives and opportunities of the technological and knowledge revolutions and the challenges facing society and the environment. It may leverage ICT to transform the delivery of public services, bridge economic and social divides, and improve governance and transparency throughout economic, social, and political institutions. It may deploy ICT to drastically cut transaction costs across the economy. It may seek to capture new sources of growth, employment, innovation, and competitiveness by promoting the ICT and ICT-enabled services industries and the use of ICT by small enterprises to network, create, and compete. Broad national goals should guide strategy coherence.

A good strategy is a coherent response to change and opportunities, addressing the binding constraints, and mobilizing and applying resources to areas where they will have maximum impact. When a strategy is applied to complex and interdependent processes like e-transformation, it requires maintaining policy coherence and program coordination across the whole ecosystem. This holistic approach involves promoting a competitive and innovative ICT ecosystem, covering four pillars: ICT infrastructure, ICT industry, ICT skills, and ICT policies and institutions. Singapore and Finland in this study—and to varying degrees, China, Brazil, and Sri Lanka, in the companion volume—pursued a balanced development among these pillars. Others like South Africa and the Philippines were highly constrained by neglecting key pillars: ICT infrastructure development in South Africa (due to regulatory capture), and ICT institutions (fragmented capacity and neglect of ICT as enabler) in the Philippines. Establishing such coherence across the key pillars of e-transformation is essential and requires continuous attention.

A long-term perspective facilitates the adoption of a holistic and coherent approach to national ICT strategies. A comprehensive view of ICT for development does not imply addressing all constraints, opportunities, and investment possibilities at once. Instead, designers and implementers would be asked to prioritize, select, sequence, and phase the most critical investments and interdependencies in view of overarching objectives and the availability of resources and evolution of capabilities. A long-term perspective means anticipating, recognizing, and managing systemic interdependencies that can lead to significant changes over time. Without taking account of key synergies and interactions in a timely manner, true transformation is unlikely to occur, to be sustainable, or to be diffused on a large scale.

Phasing or logical sequencing of e-transformation may be used to provide a focus on fewer objectives, and mutually reinforcing interventions to achieve them during each phase. For example, Singapore adopted a holistic and ambitious vision of e-development from the start, but it pursued this vision over successive e-strategies, with a focus on foundational and mutually reinforcing projects for infrastructure, e-literacy, e-government, and e-trade, then becoming more inclusive through phasing and upgrading. Phasing can also be guided by tradeoffs between focusing resources on quick wins, and pursuing broad ownership, inclusion, and sustainability.

Countries pursuing e-transformation have used various tools to prioritize, select, and sequence projects and programs. They used what may be called dynamic investment programming—pursuing selective activities for maximum impact and maintaining flexibility to reallocate resources among interdependent programs. Tough tradeoffs in managing and sequencing activities had to be taken all the time—between quick wins and long-gestating investments, between sectoral and cross-sectoral applications, between core and noncore activities.

Promoting Leadership, Institutions, Shared Vision, and Human Resources Development

Fast adopters of e-transformation attended first and foremost to the "soft infrastructure" of e-transformation: leadership, shared vision, enabling policies and institutions, upgraded human resources, and national consensus and culture. They co-invested in both technology and organizational change. They focused first and foremost on human resources, not technology per se. They invested in massive training for all citizens as ICT users. Governments and businesses constantly sought to understand the needs of their clients and to engage them in the design and implementation of the transformation process. The further these countries traveled toward transformation, the broader and deeper these building blocks and shared infrastructures had to be built. Government played diverse roles, and these roles changed over time, but they were decisive in transforming the public and private sectors.

Governments, in collaboration with business and civil society, can play a critical role in managing the interdependencies and exploiting the potential synergies among various elements of e-transformation. Leading nations built e-leadership

institutions to promote, govern, coordinate, monitor, and evaluate the e-development process. They experimented with institutional options to lead and coordinate the e-transformation process across all key economic sectors, and in the process pursued systematic institutional innovation and learning (Hanna 2007b, 2009a). e-Leadership institutions were able to progressively identify more and more synergies across e-government, e-learning, e-business, and e-society.[11] Guided by a holistic view of e-transformation, these institutions sought to capture opportunities to tap potential synergies, realize returns to scale, build cross-sectoral links, and leverage entry points.

The process of identifying, organizing, and engaging key stakeholders in e-transformation is by no means simple or straightforward. Who can talk on behalf of the constituencies of each element of e-transformation? Large and diverse countries and those involved in civil conflicts present special problems. In countries like South Africa and the Philippines for example, many divides can make the process difficult to manage. In these countries as well as Russia, there are no effective mechanisms in place for the government to engage with other stakeholders representing business, academia, and civil society. The case studies shed some light on such mechanisms, the quality of communication and engagement, and the consequences of their absence or the dominance of one stakeholder like the telecommunications industry.

Effective leaders of e-transformation sought to understand stakeholders and engage them as enablers, partners, and implementers. By shaping an integrated national program, an e-strategy clarifies the comparative advantages of all potential actors: government, private sector, civil society, and academia, and defines what roles each can best play in designing and implementing e-transformation programs. In doing so, it helps build partnerships and coordinate agendas among these stakeholders. By building these partnerships, it provides an enabling policy environment for implementation and a healthy ecosystem for the information society.

Effective leaders articulate an inclusive vision, linking interdependent actions to coproduce sectoral as well as cross-sectoral outcomes. Among effective adopters, leaders presented e-transformation programs as enablers of other sectors and programs, such as rural and inclusive development, to gain the support of key partners and ministries—political leaders, Ministers of Finance and Economy, etc.[12] As a vision, e-transformation—and its synonyms of information society and knowledge economy—appealed to broad and diverse groups of stakeholders, not just ICT champions and specialists, telecom operators, IT entrepreneurs and service providers, or owners of single issues or applications. Highly participatory national economic policy management seminars involving major stakeholders, such as those conducted by Sitra in Finland, can play an important role in building national consensus and preparing e-leaders with a shared vision.

[11] The benefits of tapping these synergies have to outweigh the cost of coordination.

[12] See Hanna (2007a, b).

Countries can "leapfrog" some technologies and approaches to adopt the latest advances in ICT—such as broadband, mobile access, cloud computing, open data, and social networking—but they cannot leapfrog leadership, institutional, and human resources development. Given the promise of the new technologies (and the overpromise of ICT suppliers), countries (and aid agencies) are tempted to bypass the demanding development of the soft infrastructure.[13] But no off-the-shelf or "plug and play" technical solutions can substitute for institutional learning and change management skills and in-house capacity to define institutional visions and requirements, manage for results, and hold vendors accountable for service-level agreements. New waves of information technologies are likely to accelerate the pace of e-transformation in the public, business, and civil society sectors. However, taking full advantage of these technologies and integrating and institutionalizing them on a large scale will require new leadership and institutional competencies, including capacity to motivate knowledge workers, engage with citizens, collaborate with partners, and manage "institutional openness" and complex social change. New technologies open up new opportunities, but they also demand more transformative leaders, not less.

Leadership and institutions for e-transformation must be developed at several levels, including the grassroots. Many national ICT strategies have been driven by the desire of political leaders and central authorities to leapfrog to the knowledge economy and by their fear of being isolated from the global economy by a digital divide. Often designed by international consultants or the central staff of the ICT ministry, the strategies focused on large investments and complex projects that can be centrally funded and managed to achieve economies of scale. At times they have been intended to complement the many bottom-up but isolated pilots and fragmented investments. But these centrally driven programs often lacked mechanisms to promote bottom-up initiatives, build capacity at the grassroots, and induce innovative partnerships between central and local organizations—all critical to mobilizing local knowledge and capabilities and achieving scalability and sustainability.

Effective adopters of e-transformation built effective networks of leaders and leadership institutions across sectors, spanning government, business, civil society, and academia.[14] This is particularly evident in the case of Finland. Singapore progressively broadened its leadership network. Other country cases had a mixed record, but they succeeded in areas where this leadership networks and coalitions worked effectively, as in the case of cyber services in the Philippines.

In the context of high inequalities, inclusive e-transformation strategies must give special attention and resources to develop local capabilities, leadership, and institutions for e-transformation and to establish the incentives and authorizing

[13] The gap between the potential of ICT innovations and their widespread diffusion and economy-wide impact is significant, similar to earlier GPTs. The rapid diffusion of mobile phones may be the exception in view of the dramatic decline in costs and the low barriers and skill requirements for users. Yet, realizing the full potential of using mobiles for affordable Internet access and for development-oriented applications may take more time.

[14] An early study of this phenomenon is best illustrated in Wilson (2004).

environment for these institutions to function and become self-sustaining. Innovations in institutions and in participatory processes are often necessary under these conditions.

Effective adopters of e-transformation were primarily effective implementers. They did not stop at developing politically appealing visions of the knowledge economy and information society. The vast gap in transformational outcomes between Singapore and Philippines or South Africa was only secondarily due to vision, but primarily due to attention to institutions, implementation mechanisms, change management, and human resources development. While leadership at the top appears crucial in all cases, advanced adopters of e-transformation had to build a robust institutional infrastructure within and outside government to sustain and deepen the transformation.

The distinguishing features of effective implementation by successful adopters have been strong capacity and authorizing environments for e-leadership institutions, developing and nurturing champions and CIOs, training and meritocracy in the civil service, frequent calls for collaboration to bring various players in the industry to partner and innovate in government-funded pilots, evolving roles for both government and the private sectors, and continuity and adaptation of the core programs.

Committing to ICT Experimentation, Local Initiative, Learning, and Evaluation

Pursuing e-transformation as an inclusive shared vision and a holistic strategy—rather than a detailed blueprint—encourages learning from pilots and sharing experience from successes and failures. It also points to the need to discover complementarities and synergies over time, not just at the design stage. This cannot be done only from the center, top-down, or as a one-time event. Deliberate strategy, emphasizing focus and control, has to be complemented by emergent strategy, emphasizing continuous learning and venturing (Mintzberg et al. 1998). Experience shows that effective e-transformation processes required institutionalized learning, user-driven innovation, multiple feedback mechanisms, tools for managing and sharing knowledge, learning communities among stakeholders, and participatory M&E.

This is a key message from the fast transforming countries like Finland and Singapore: the central task of e-transformation (and development, in general) is learning at all levels, in government, business, and civil society sectors as well as academia. This is particularly essential for a new sector, for mastering a general-purpose technology and for broad-based ICT-enabled transformation. Singapore and Finland created a high-speed learning environment and made their economies test-beds for ICT innovation.

The Singapore government played a strategic role and made bold moves early on in the e-transformation process and continued to push Singapore's technology deployment capabilities close to the world frontier. But now at the frontiers, it faces limits to innovation and risk-taking imposed by rigid education, a tight regulatory

environment, and society's intolerance to failure. By contrast, Finland's innovation capabilities seem to be rooted in societal values, celebrating technological innovation and liberalism.

Many large countries—China, India, and Brazil, among others—created innovation hubs or zones to support such intensive local learning. They created ecosystems for experimentation and innovation. They decentralized innovation and learning resources to the city or state levels and engaged in systematic experimentation at these levels, and at the same time invested in ways to share and learn from these diverse laboratories of transformation.

To accelerate this learning process, they attracted leading ICT multinationals, invited the diaspora or international talent to participate in their learning, reviewed external experience and benchmarked themselves against the best, and built forums for sharing and blending external and local learning. In seeking foreign direct investment, Singapore selectively targeted its incentives and recruitment, emphasizing quality of investment, tapping global knowledge, attracting innovative and leading ICT firms and their research and learning arms, maximizing spillover effects, and building an expanding pool of highly skilled human resources.

This learning may focus on priority sectors where sector transformation is essential to accelerated development of the whole economy. Many countries—in the case studies covered in this volume and beyond—have targeted the education sector for such ICT-based innovation. This sector is viewed as a pillar of any dynamic knowledge economy and inclusive information society. Despite progress in using ICT in education, this is a sector where innovations are slow to emerge and diffuse. Transformation of this sector thus requires the highest commitment to socio-technical innovation, shared learning, and change management.

M&E are perhaps the weakest features of most e-strategies in developing countries. Setting M&E systems for learning and indicators for measuring progress for e-strategies present a dilemma. On the one hand, e-transformation is a novel and poorly understood change, with profound implications for all economies, and hence needs to be piloted and adapted in diverse local contexts, with much attention to innovation and learning. On the other hand, applying quantitative M&E systems and indicators to a new and poorly understood phenomenon runs the risk of measuring inputs rather than outcomes, emphasizing hard data over soft but more relevant and critical information, and at times even ignoring poorer regions and constituencies. Weak M&E systems have often led to heavy reliance on rigid and centralized plans for accountability, rather than local learning. Most developing countries have not developed monitoring, evaluation, and learning systems to match the challenging implementation and learning tasks for e-transformation. They have a long way to go on this score.

Decentralization and support to bottom-up initiatives can spur innovation, experimentation, and learning. Several mechanisms may be used to institutionalize and support bottom-up initiatives, such as innovation funds using matching grants. These mechanisms and the corresponding communities of practice can unleash a flood of ideas and energy. They encourage small enterprises, ICT associations, grassroots- and community-based organizations to engage with the national ICT agencies in creating and linking to various parts of the e-development program.

When appropriately targeted, they help the central agencies understand their most vulnerable clients—rural communities and the poor—and empower their clients to co-innovate appropriate ICT solutions.

Pull strategies mobilize participants into large ecosystems, energized by a passionate vision or "shaping view," encouraging them to invest in ways and platforms that amplify and scale up the investments and innovations of all participants (Hagel et al. 2010). By vividly and explicitly describing what the world would be like once it has been e-transformed, a pull strategy would set entrepreneurs and institutions in motion toward a common goal and direction. The digital infrastructure would be leveraged to give individuals, communities, and institutions new ways to make the most of their knowledge, learning, and other resources. It would strengthen the hands of leaders to reach out to, connect with, and coordinate investments by large numbers of actors, increasing the potential for rapid and sustained innovation and distributed learning.

e-Transformation involves a large number of participants, substantial opportunities and uncertainties, and potential for significant performance improvement, and thus could be ripe for new forms of pull platforms and innovation strategies. Examples of pull platforms or ecosystems may include incubators, telecenters, grassroots innovation funds, innovation networks, ICT diffusion programs, open source software, and open government data, among others. Connected cities and communities may act as pull platforms. A pull strategy would mobilize such large ecosystems of players. It would promote shared infrastructures to enable innovators and application providers to leverage shared infrastructures and resources and minimize the investment required to build products and offer services. Pull platforms may also include governance, interoperability, and policy frameworks that help coordinate complex investments and facilitate interactions.

A promising approach to spur innovation and transformation may come from enhanced transparency and demand for good governance and accountability, enabled by the use of ICT (Hanna 2011). Most e-government, e-education, and other ICT applications in the public sector in developing countries have been supply driven. Continuous improvements in services and innovation in government processes require demand for performance or demand for good governance. This demand can be strengthened by meaningful efforts to capture citizen feedback on services, and devising the right metrics to measure results and account for innovation and continual service improvement. Appropriately applied, accountability to citizens (social accountability) can also promote innovative public–private partnerships. Grassroots organizations and social intermediaries can play a key role in mobilizing public will, political capital, and champions of social innovation to demand community-defined results, support experimentation, push for creative solutions, and counter the incentives for risk aversion. Using metrics that focus on results and participatory processes that capture citizen feedback can be key drivers for innovation and accountability.

Fortunately, many ICT platforms and applications (social media, mobile apps, crowdsourcing, open government data) can be used to empower and mobilize citizens to support both social accountability and social innovation. Among the case studies, Singapore has been pioneering some of these innovative efforts. But all countries are still at early stages of leveraging these new ICT tools and platforms for social accountability, innovation and learning (Hanna 2011).

A key part of the learning agenda for e-transformation is learning to harness and exploit the continuous stream of new technologies, where appropriate. The Internet and particularly recent ICT advances—such as mobile devices, broadband, cloud computing, social networking, open source, and analytics—are challenging the old, hierarchical models of organization and innovation. These new tools can provide a new engine for innovation, and in particular, collaborative innovation. They open up new options to co-innovate solutions to match local, national, and global challenges, and to rebuild many industries and sectors of economy on a profoundly new, open, agile, networked model. They offer a new set of bottom-up institutions that are being built upon principles such as openness, collaboration, and the sharing of information (Tapscott and Williams 2010).

The recent trends in ICT suggest increasing reliance on collaborative, networked, and grassroots innovation as the driver for transformation. Even countries like Singapore, that traditionally had a more top-down driven strategy, have recently reoriented their strategies to rely on collaborative government and collaborative innovation. Government still steers the fundamentals such as developing an enabling policy environment, co-investing in broadband, and promoting partnerships for innovation and technological capabilities. But it is learning to listen to clients, to seek partners, and to collaborate with all segments of society. This means relearning skills and changing attitudes. The new collaborative technologies make the process easier, but changing attitudes, habits, and practices takes time, persistence, and leadership. Change management capabilities and strategic communication programs can play an important role in fostering such changes.

Pursuing Diffusion and Inclusion

As discussed in Chap. 1, and demonstrated in the case studies, the distributional implications of ICT revolution are likely to be profound in both developed and developing countries. ICT is an essential tool for countries to sustain or improve their competitiveness in a global economy. But its distributional effects must be explicitly addressed, however difficult and messy they may be. Development practitioners should at least avoid compounding the already high inequalities in income in developing countries, and more ambitiously, innovate new and more cost-effective solutions to persistent development problems of decent employment, social protection, education and health, and access to public services that work for the poor.

To ensure that transformation is both sustainable and equitable, effective adopters of ICT have strived to diffuse ICT and capture network externalities, and at the same time, addressed the digital divide in all its forms, and starting at early stages with affordable access and widespread e-literacy. Outsourcing of cyber services is a promising source of employment for some countries, but it cannot be sold as a primary channel to addressing the massive problems of unemployment and underemployment in developing countries. For the short to medium term, it may even

exacerbate the income distribution issues in both developed and developing countries.[15] So, tradeoffs may have to be made and the search for inclusion, employment, opportunity, and income for the poor must go beyond the ICT sector itself, and cover ICT applications across many public services, human development and livelihood strategies, and employment opportunities that would benefit both the poor and those disadvantaged by the technological revolution. Given the wide gap in productivity between large enterprises and small and micro enterprises (particularly those in the rural areas) in developing countries, ICT diffusion programs may target these small enterprises to enhance their productivity, access to information, and opportunities for growth.

Countries will have to experiment their way forward. Such distributional issues are difficult to solve (Spence 2011). Developing countries may need to develop mechanisms to promote social and "frugal" innovation, and affordable solutions that are co-innovated with the poor and their social intermediaries to address their pressing needs. They should also seek ways to integrate ICT in pro-poor policies and programs to enhance their effectiveness and reach, and their accountability to the beneficiaries. ICT is likely to do the most good for the poor when it is systematically integrated into sectors of major consequences to them such as rural development, social protection, and public works programs.

The four fundamentals discussed above—future orientation and continuity, leadership and institutions, experimentation and learning, and diffusion and inclusion—interact with each other and can be mutually reinforcing in support of sustained e-transformation. Good leadership envisions the road ahead and build consensus for the long term. Commitment to experimentation and learning helps maintain policy flexibility and avoid ideological lock-ins, while securing future orientation and sustained commitment to the long-term objectives of e-transformation. Digital inclusion enhances social cohesion and human resources development, and such inclusion can be achieved only through national consensus, institutional innovation, experimentation, and learning. In turn, widespread diffusion of ICT and its tangible benefits lends support to visionary leaders, robust institutions, and social consensus for effective e-transformation. These are some of the many possibilities for a virtuous cycle.

Implications for Development Assistance

The imperatives of the ICT revolution and the lessons arising from case studies of e-transformation present special challenges to development assistance. To sum up, e-transformation is a process that requires sustained commitment to profound

[15] Some micro-tasking solutions are being piloted to outsource IT-enabled services to micro enterprises in the rural areas in India, among others, with great promise for growth and employment opportunities in rural India.

changes over a long time horizon. This process involves building an enabling policy environment for the digital economy, leadership capacity and institutions to induce and govern the transformation process across the economy, and appropriate skills and attitudes to manage technological change and innovation. It calls for collaboration and coordination across sectors within governments and aid agencies to build the cross-sector information infrastructures and skills for sectoral and economy-wide e-transformation. It requires a holistic view of the ICT ecosystem, covering all elements or complementary requirements of e-transformation (Chap. 1). It also demands continual and institutionalized learning, to take account of the local context and the necessary adaptation and experimentation needed to match a fast-changing general-purpose technology.

Take the World Bank example. A recent evaluation of Bank activities in ICT (IEG 2011) highlighted the need to better leverage and integrate ICT as a tool to expand the benefits of ICT investments across sectors, called for more collaboration and coordination of joint approaches across different units within the Bank, and adopting a holistic approach that takes into account local context and capability, the need to incorporate change management, and complementary requirements such as ICT skills and supporting infrastructure. Other recommendations included strengthening M&E capabilities, a shift in emphasis in access and reform toward broadband and Internet (and the relevant regulatory and policy capacities), and a continuing focus on securing competition given changing market conditions including consolidation and convergence in the ICT sector. The cases presented in this book as well as the earlier companion volume (Hanna and Knight 2011) strongly reinforce these recommendations—but go further to secure sustainable transformation, by emphasizing development assistance over long time horizons, at sector- and economy-wide levels.

Can development assistance agencies rise up to these demands?

The primary engagement of the World Bank in e-transformation has been to incorporate ICT components into sectoral projects, typically on ad-hoc basis and bounded by the short time horizon of the project cycle. Bank engagement in the ICT sector has been narrowly focused on telecommunications, and here it recorded significant successes, mainly because this engagement was bounded and controlled by a specialized central unit, often focused on the single event of corporatization and privatization of the telecom incumbent, riding on the privatization wave of the 1990s, and the attractiveness of this sector to foreign direct investment. Bank engagement in the rest of the ICT ecosystem (ICT industry, ICT skills development, etc.) has been negligible. By contrast, the Bank's engagement in e-transformation through ICT components or applications remained diffused and under the radar of senior management attention. Thus, almost all the deficiencies pointed out in the latest IEG report were identified and commonly felt by task team leaders as early as 1993 (Hanna and Boyson 1993). Frequent reviews and self-evaluations have since confirmed and elaborated on these findings, suggesting that ICT is playing a growing role in Bank projects. But the use of ICT in these projects remains poorly designed and implemented, with high failure rates.

To meet the imperatives of e-transformation, development assistance should:

- Support e-transformation at the national level
- Take a long-term perspective
- Adopt a holistic, cross-sector approach
- Emphasize diffusion and inclusion
- Take evaluation seriously

Support e-Transformation at National Level

It is a striking fact that of the eight countries covered in this and companion book, only in one (Sri Lanka) did the Bank engage at a national strategic level. In the pioneering case of Sri Lanka, it then (2002) required support from the President of the Bank (James Wolfensohn at the time) to overcome internal resistance to engage in a holistic way at the national level (Hanna 2007a, b). Similar early requests for strategic assistance from India (1991),[16] Sri Lanka (1993), and the Philippines (1994) were declined by the Bank. Since, the Bank has received many such requests from the highest levels of government, including some from countries included in our case studies, but these proposals were declined on various grounds—from low priority to irrelevance to the Bank's country assistance strategy. In fact, the Bank's reluctance to give ICT a central place in its assistance has been only a reflection of the low awareness among development practitioners regarding the ICT revolution and its strategic implications.

The UN agencies (particularly UNDP and the Regional Commissions) have taken an early lead in assisting many countries to formulate their first national ICT strategies. Some of these strategies provided the basis for World Bank's follow-up entry at the national level, as in e-Rwanda and e-Ghana. But in most cases, these strategies were not followed with financing by other aid agencies, as these agencies remained preoccupied by interventions at the pilot, component, application, or sector levels. Most of these strategies have not been objectively evaluated, sustained, or institutionalized.

Absence of development assistance at the national level in the new field of e-transformation has serious consequences. First, missing this entry level has been a major contributing factor to taking a short time horizon, a fragmented (sectoral, ad-hoc, etc.) approach to ICT applications, and a reductionist view of ICT role in development (as industry and infrastructure, but not enabler). Most of the longer-term, cross-sectoral, and holistic issues cannot be tackled on the basis of one sector or one application at a time. They call for economy-wide perspectives.

Second, without engaging in dialogue on national policies and strategies to harness ICT for development, practitioners concerned with e-transformation lack

[16] See Hanna (1994).

access to the core ministries that must drive ICT integration into development and the strategic thinking of governments.[17] This situation confines ICT development assistance and aid engagement to specialized ICT agencies that focus on the technology. It reinforces the common misperception that ICT in development is an isolated activity to be relegated and confined to those specialists.

Third, without a strategic entry, donor assistance tends to neglect the "framework conditions" for economy-wide transformation: e-policies, e-leadership institutions, whole-of-government approaches, and e-governance and coordination mechanisms. Fourth, it neglects the impact of ICT on employment and income distribution issues, which can be understood and addressed most effectively at the economy-wide level.

Finally, without conceiving the national ecosystem for e-transformation, aid agencies miss on defining the roles of the key stakeholders (government, business, civil society), building coalitions and effective partnerships among them, and establishing the capacity for an appropriate role for government in coleading e-transformation. This also leads to fragmentation of donor assistance, with all the consequent waste, duplication, and unconnected applications. e-Transformation is a complex and multidimensional process that requires a major push on many fronts by all stakeholders to overcome resistance to change and sustain economy-wide experimentation and social innovation.

National-level entry points are critical for attaining large-scale and sustainable impact, and securing the necessary enabling environment for successful ICT interventions. It should be more effectively utilized by large aid agencies and development finance institutions like the World Bank. Policy work at the country level will be increasingly important in line with the centrality of ICT to development and national competitiveness. e-Transformation initiatives would thus take advantage of economies of scale and whole-of-government approaches to leverage ICT at the national level, and in transformative ways, perhaps in conjunction with development policy lending.

Take a Long-Term Perspective

Aid agencies have not taken a long-term perspective of e-transformation—thus setting unrealistic expectations for immediate and transformational outcomes, focusing on the "next best thing" technology, neglecting the patient work and capital required to build the soft infrastructure, and avoiding issues of scalability and

[17] In the case of the World Bank, for example, engaging at the national level would enable the global ICT unit to deal directly with core ministries like Finance, Planning, and Economy, not just telecommunications, industry or ICT ministries, or the technical staff in the sectoral ministries. This should help bridge the gap between World Bank country managers and the global ICT unit, and bridge similar gaps between the core ministries and specialized ICT agencies within the client countries. It is essential to bring e-transformation strategy development to the central institutions formulating the national development agenda.

sustainability. Take the example of ICT in education. Despite growing substantial investments in ICT components in education programs (including those financed by the World Bank), ICT-enabled innovations have not been consistently pursued, sustained, scaled up, or conceived within a long-term sector strategy for transforming educational institutions and learning processes. Such has been the fate of the One-Laptop-per-Child (OLPC) initiative.

The persistence of short-term orientation is in part due to the growing versatility and diffusion of ICT applications across all sectors of the economy, and poor ownership and commitment of ICT—as a key enabler—by the leaders of these sectors. It is due to the short-term, ad-hoc engagements of ICT specialists in sector applications, based on the common belief that ICT applications can lead to transformation in very short times (often reinforced by the hype of ICT vendors and management consultants). Alternatively, it is based on the belief that ICT components can only play a marginal role in sector transformation.[18]

A short-term perspective has serious consequences. It leads to neglect of the fundamentals for scaling up and sustainability: developing the policy environment, engendering government commitment, creating national consensus and shared vision, and developing institutions and human resources. No commitment for the long haul is engendered within the aid agency or client country. ICT specialists are called upon only when crises arise from procurement errors, substantial delays, or total project failures—and by then the options are narrowed and opportunities for realizing meaningful ICT-enabled transformation are lost. In an exclusive search of quick wins, ICT practitioners end up neglecting the "soft infrastructure" and change management, and instead focusing on ICT procurement, disbursement of funds, the latest fads, and the "next best thing" technology. ICT applications suffer from exclusively supply-driven interventions. This leads to the proliferation of isolated, unsustainable ICT applications, with little scale, synergy, and impact on transformation. A whole-of-government approach cannot be pursued. Sequencing and phasing options are not considered. Cumulative institutional learning is aborted.

Short-termism is a common problem in development assistance, and Bank staff are not immune to the pressures and incentives that perpetuate this perspective. The Bank has attempted to address this issue at times through new lending instruments such as adaptable program lending, programmatic lending, and development policy lending. But, given the diffusion of ICT across many sectors in any country and the lack of a strategic view of the sector as enabler, such funding instruments and time horizons have yet to be adapted and adopted in this area. Beyond adopting appropriate incentives and instruments of development assistance, aid agencies should give increasing attention to building foresight and adaptive capabilities within the countries.

[18] A short-term horizon also fits with the short horizons of election and budget cycles.

Adopt a Holistic, Cross-Sector Approach

An integrated approach to ICT poses a challenge for aid agencies and developing country governments alike. Both sides face incentives that militate against collaboration and integration across sectors (see Hanna and Picciotto 2002). Aid funding and public budgets follow sectoral lines, and it can be hard to get new money for cross-sectoral initiatives. Whatever the source of funding, ICT efforts—e-government investments, telecommunications reforms, connectivity programs, ICT industry promotion, human resource development, content development, sectoral applications—are typically pursued by various agencies in isolation. Even within an e-government program, ICT investments are typically pursued agency by agency or system by system (see Fountain 2001).

With very few exceptions, development assistance agencies, including the World Bank, like most client country governments, have taken an agency-centric or sector-centric approach to otherwise common ICT-enabled government processes.[19] This approach reflects the internal silos of the aid agencies and the organization of the governments they are assisting. But being a general-purpose technology, ICT can benefit almost any economic or social activity. It thus calls for common frameworks and cross-sectoral platforms on which ICT applications would rest. Taking a cross-sectoral approach requires strategic leadership and vision, a cross-cutting horizontal organization to coordinate policies and programs—both in the client countries and development assistance organizations—and an effort sustained over many years.

As a whole, aid agencies have not adopted a holistic view of ICT assistance and e-transformation—as advocated in this book and others (Hanna 2009a, b). Strong economies of scale in the provision of ICT infrastructure (both software and hardware) as well as synergies between its impact on diverse economic and social activities are potentially pervasive. Realizing these economies of scale and synergies greatly improves the return on resources invested.

Adopting a segmented approach to ICT applications and a narrow view of the ICT ecosystem are having serious consequences on development assistance. The risks for ICT applications are magnified, and the payoffs are much lowered.[20] ICT applications have less chances for payoff and sustainability when complementary capabilities and investments in ICT skills and local ICT industry are lacking. ICT applications suffer from failing to take a holistic view of the linkages between ICT components and the user sector. Missing on investing in shared infrastructures,

[19] There is a complete absence of an architectural or enterprise-wide view when it comes to using ICT in government. Each sector or government agency goes about constructing its own room, without any overarching architecture bringing coherence to the building.

[20] Some have argued that ICT applications inevitably have a high risk high reward profile, not that much different from the projects associated with venture capital. We think this is a misleading analogy as most ICT applications in developing countries are not creating new and untested technologies, and with adequate design and complementary investment in capabilities and change processes, failure rates could be significantly reduced, and benefits sustained and scaled up.

processes, applications, and databases leads to waste and duplication; high costs of acquisition, operations, and learning; and limited information sharing across sectors and agencies.

To develop and support this kind of integrated approaches within the ICT sector, holistic linkages between ICT applications and the user sector, and cross-sectoral coordination and collaboration for the whole government, there is a need for local e-leaders with scarce combination of technical, organizational, and political/diplomatic skills. Finding and supporting such e-leaders involves taking risks in challenging short-termism and breaking down the sectoral silos. Vested interests and ingrained habits of defending turfs and the status quo are difficult to overcome, and incentives and skills must be developed to adopt integrated and holistic approaches. This can be facilitated when there is a better understanding—among policy elites, civil servants, development practitioners, and the general public—of the rewards to be obtained.

The schism between ICT and user-sector specialists also exists within development assistance organizations. This constrains the strategic integration of ICT in the user sectors in support of innovative solutions and deep transformation. The prevailing orthodoxy is that user sector (domain) specialists need to first define the problem and the solution. Technology is considered only much later downstream to support a fully developed solution. Yet, in today's world, problems (or opportunities) and solutions cannot be defined independent of technology. Consequently, there has to be an ongoing dialogue and collaboration between domain specialists and their ICT counterparts, starting very early in the process of designing a development program. Moreover, sector (domain) specialists need to become more IT aware, while ICT specialists need to have a much better understanding of the context and user domains.

Emphasize Diffusion and Inclusion

Development strategists should give prominence to ICT as enabler, recognizing that it offers the broadest and highest payoffs by accelerating development and transforming the whole economy. Countries with large and highly competitive IT and telecom sectors can also opt for balancing competing priorities and even create a more virtuous cycle by promoting those segments of the ICT sector that are most critical to broad ICT diffusion in the economy, and, at the same time, giving most attention and resources to the cross-sector and transformative role of ICT.

Aid agencies may engage in mobilizing the constituencies for ICT diffusion and digital inclusion. These constituencies of users and beneficiaries tend to be diffused, disorganized, and weak in contrast to the organized lobbies of the telecom operators, ICT industry and large business users. Moreover, solutions to reduce the digital divide and speed diffusion are context specific, thus requiring local experimentation and social and institutional innovations. Diffusion and inclusion measures may also require more capacity building, institutional development, and social learning than lumpy investments in physical infrastructures.

It is not surprising that large aid agencies have shied away from experimenting with such context-specific innovations as required for shared access (such as telecenters or community access centers) and targeted approaches to reach the poor and rural areas. While not holding a magic bullet to remedy these barriers, aid agencies must take the necessary risks to overcome them and colearn with countries. Diffusion and inclusion are at the heart of equitable and sustainable e-transformation.

Take Evaluation Seriously

Continuous experimentation, adaptation, evaluation, and learning should become central to development assistance when it comes to e-transformation. These modalities tend to be challenging to the attitudes, "routines," and procedures that have evolved or been designed for established sectors. Current routines and attitudes applied to ICT interventions do not recognize the uncertainty and the fast pace of change that characterizes the technology and associated changes. Consequently, the approach is to insist that everything relating to ICT application and e-transformation should be planned upfront and in detail. Similarly, aid agencies often insist on having a suggested approach demonstrated elsewhere before embarking on applying ICT to a new context. Given the high degree of uncertainty associated with changes of leadership, priorities and technology options, and business models, such insistence almost inevitably results in rigid plans, suboptimal solutions, or future failures. The only way out is not to eliminate uncertainty or adopt rigid plans, but to recognize the need for continuous learning and evaluation throughout the e-transformation process. Risks must be acknowledged and become integral part of managing the process of e-transformation.[21]

Development practitioners in general and ICT professionals in particular have focused in the most easily observable, physical and measurable things: investment in ICT hardware and software, telecom investments and penetration, connectivity measures and indices, etc. This gives an incomplete picture of growth and development and the role of ICT in transformation, and is thus not conducive to holistic thinking and learning about the intangibles. There is a parallel process of acquiring learning assets and capabilities that are intangible, much harder to measure, but no less important. These intangible assets are the accumulation of knowledge embedded in people, institutions, processes, and their interactions. They are key outcomes of experimentation, learning by doing, and institutionalized evaluation.

[21] With the increasing integration of technology into both the public and private sectors, the level of complexity is increasing. This exponential increase in complexity is likely to pose grave risks in the future. For example, Bank projects with ICT components do not adequately deal with cyber security threats. This is likely to become a serious problem going forward. Similarly, open government initiatives involve change management and political risks that should not be ignored. Both governments and organizations like the World Bank need to develop new skills, competencies, and processes to address such threats.

In reviewing the country cases, we encountered difficulties in accessing reliable information on the quality of implementation and independent evaluation of results. National ICT strategy websites regularly post formal plans and boast about major successes, mainly in terms of ICT access, but scarcely share independent evaluation and measures of impact. Almost all reviews of national ICT strategies are self-reporting exercises, even when issued by international organizations (e.g., the ITU 2010). Pilots and plans are prematurely declared as successes. Inevitably, they reflect more national pride than results on the ground. This systemic bias is reinforced by ICT vendors and consultants, marketing the "next best thing" and over-promising on potential payoffs. On the other hand, mainstream economists have remained oblivious or skeptical of the transformative impact of ICT, the new world it is creating, and its relevance to development practice.[22] Objective evaluation and systematic learning about ICT practice are squeezed out by these two camps. Progress is hindered by a primary emphasis on physical ICT access measures and the lack of meaningful and comprehensive indicators of ICT usage and impact.

To break these vicious cycles and advance development thinking and practice about ICT, systematic learning and evaluation must be taken seriously. Country capacity for monitoring, evaluation, and learning in this emerging field must be built from the ground up. Such evaluation should be holistic and participatory. It should take account of local contexts—to capture local adaptations and innovations and the contingent nature of ICT benefits. Indicators of ICT usages and their transformative impacts should be developed; they should be conducive to learning and holistic thinking about e-transformation. Building demand for evaluation and learning will require measures to mobilize demand for good governance (DFGG) and social accountability, including accountability for e-services—through enhanced citizen access to information about resource management and service delivery (Hanna 2011). Finally, developing countries will have to build communities of practice within and across nations, to share experience and mutual support along the journey of e-transformation.

Final Thoughts

We conclude with final thoughts that we hope will stimulate further research and comparative analyses of country-level experience in pursuing e-transformation. It is not possible for any book that shares and compares country experiences in such a highly complex and intangible process as e-transformation to come up with an ideal e-transformation strategy. In fact, a search for such ideal would be counter-productive, in view of diverse contexts and sociopolitical conditions, and the need for innovation and learning along the way. This book simply aims to share the diverse experiences of different countries and to provide a framework for thinking

[22] Notable exceptions are a few Nobel Laureates in Economics such as Stiglitz and Spence.

about and informing policy options, investments, and actions. It aims to provide concrete examples of what has been done in different contexts and conditions, and thus enrich the set of tools and options available to policy makers and development practitioners. It shows that design and implementation of e-transformation strategies is contingent on contextual factors and local stakeholders—understanding these factors and actors will continue to challenge e-transformation leaders and strategists.

This book and its companion covered eight countries and provided an initial assessment of these cases of e-transformation along eight criteria. The relevance and effect of the eight criteria (and the emerging lessons and recommended practices) need to be tested through more systematic research and learning on a larger number of countries using more holistic measurements of outcome. Research is also needed to validate and refine the assessments and rankings for these countries. These country cases do not represent a close adherence to the idealized e-transformation framework as presented in the first chapter—countries are at different stages of a long e-transformation journey, with many failures as well as successes. We hope that this initial effort at cross-country comparisons will encourage realistic assessments of country experiences and of the policy instruments and institutional innovations deployed to implement e-transformation. Research, debate, and learning are keys to understanding and managing the complex process of e-transformation.

Most countries are still at early stages of their e-transformation journey, and have much to learn from within, from each other, and particularly from the pioneers. No framework or overarching theory can substitute for this process of experimentation and self-discovery, which is also an intrinsic part of e-transformation. Developed countries have created many regional forums (including OECD ones) and communities of practice to share knowledge and provide mutual support among policy makers and e-leaders. Developing countries must establish their own communities of practice at the regional and global levels. New development partners like India, China, Korea, and Singapore are also pioneering their own South–South partnerships. Aid agencies like the World Bank and UNDP can provide knowledge platforms and nurture communities of practice that cut across all levels of development. We hope this book can support and complement these forums, enrich the research and learning agenda, and help countries share the policy lessons and discoveries arising from their exciting journeys.

References

Dutta, Soumitra and Irene Mia. 2010. *Global Information Technology Report 2009-2010: ICT for Sustainability*. INSEAD and World Economic Forum, available online at http://www.networkedreadiness.com/gitr/.

Fountain, Jane E. 2001. *Building the Virtual State*. Washington D.C.: Brookings Institution.

Nagy K. Hanna, 1994. *Exploiting Information Technology for Development: the Case Study of India.* Washington, DC: World Bank.

2007a. *From Envisioning to Designing e-Development: The Experience of Sri Lanka.* Directions in Development Series. Washington, DC: World Bank.
2007b. *Leadership Institutions for the Knowledge Economy*. Washington, DC: World Bank.
2008. *Transforming Government and Empowering Communities: The Sri Lankan Experience with e-Development*. Washington, DC: World Bank.
2009a. *e-Transformation: Enabling New Development Strategies*. New York: Springer.
2009b. *Enabling Enterprise Transformation: Business and Grassroots Innovation for the Knowledge Economy.* New York: Springer.
2010. *Transforming Government and Building the Information Society: Challenges and Opportunities for the Developing World*. New York: Springer.
2011. *Information and Communication Technology for Governance*. Washington, DC: World Bank.
Hanna, Nagy K. and Boyson, Sandor. 1993. *Information Technology in World Bank Lending: Increasing the Developmental Impact.* Washington, DC: World Bank.
_____ and Picciotto, Robert (editors). 2002. *Making Development Work: Development Learning in a World of Poverty and Wealth.* New Brunswick, USA: Transaction Publishers.
_____ and Knight, Peter T. 2011. *Seeking Transformation through Information Technology: Strategies for Brazil, China, Canada and Sri Lanka*. New York: Springer.
Hagel John III, Brown, John Seely, and Davidson, Lang. 2010. *The Power of Pull*. New York: Basic Books.
Independent Evaluation Group (IEG). 2011. *Capturing Technology for Development: An Evaluation of World Bank Group Activities in Information and Communication Technologies*. Washington, DC: The World Bank.
ITU. 2010. *National e-Strategies for Development: Global Status and Prospects, 2010.*
Lin, Justin. 2011. "New Structural Economics: A Framework for Rethinking Development" in World Bank Research Observer. 26 (2): 193–221.
Mintzberg, Henry, Bruce Ahlstrand, and Joseph Lampel. 1998. *Strategy Safari.* New York: Free Press.
Rubino-Hallman, Silvana, and Nagy K. Hanna. 2006. "New Technologies for Public Sector Transformation: A Critical Analysis of e-Government Initiatives in Latin America and the Caribbean." *Journal for e-Government* 3 (3): 3–39.
Spence, Michael. 2011. *The Next Convergence*. New York: Farrar, Straus and Giroux.
Tapscott, Don, and Williams, Anthony. 2010 *Macro Wikinomics: Rebooting Business and the World.* New York: Portfolio/Penguin.
Wilson III, Ernest. 2004. *The Information Revolution and Developing Countries*. Cambridge, Mass.: MIT Press.

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