Chapter 2

# Crafting the Environment for Networked Readiness

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In the aftermath of the bursting of the technology bubble, one thing remains constant: information and communication technologies (ICT) have been and continue to be a powerful engine for economic and social development. ICT provide tools that accelerate growth and enhance productivity. The benefits of ICT must thus be harnessed to improve living standards worldwide, for only then can there be a feasible chance for achieving extreme poverty eradication and the other goals of the United Nations Millennium Declaration.

For ICT to serve as an engine for development, it is absolutely critical that an effective policy framework is in place; such a framework will enable an economy to fully capture the benefits of the technologies. The environment—market conditions, regulatory framework, and the network infrastructure—forms the foundation of a country's Networked Readiness. Setting the "right" environment is difficult, however, for it requires policy coherence among various areas, ranging from labor and education policies to telecommunications and capital market reforms. The task also entails flexibility in adapting to rapidly-changing technologies and shifting global capital and trade patterns. In addition, there is no simple blueprint that can be followed—a particular policy mix that is suitable for one country may not be applicable to another because of any one of a myriad of complex variables, ranging from varying geographic terrain to differing and dynamically evolving economic, political, and institutional contexts. The onus is, therefore, on national policymakers and business leaders to tailor and craft their respective policies to create an environment that best facilitates their country's Networked Readiness.

This chapter is intended to serve as a guide to policymakers and business leaders who are seeking to establish a solid foundation for promoting Networked Readiness. Existing national strategies are assessed and lessons gleaned from the varying policy experiences of countries in the course of their attempts at fostering the most appropriate and effective foundation for promoting Networked Readiness. This chapter, which covers in its analysis eighty-two of the world's leading economies, also seeks to highlight best practices, where available, and provide an indication of the range of policy options and initiatives.[1] Building on the findings of the Networked Readiness Index (2002–2003), this chapter applies the analytical framework outlined in the *Report* for assessing the readiness of a country's environment. Accordingly, the chapter is divided into three parts, corresponding to the three components of the environment subindex: market conditions, regulatory framework, and infrastructure.[2]

The first part addresses the following question: what needs to be in place, in terms of the market environment, to enable individuals, businesses, and governments to participate and benefit more fully in the networked economy? The conditions of the three key resource factors in a networked economy—human resources, capital markets, and technology—are also assessed.

Box 1. **The Framework**

**PART I: MARKET ENVIRONMENT**

**HUMAN RESOURCES**

- Education
  - Infrastructure-related: computerization and networking of schools and libraries
  - Content-related: training of educators and integration of ICT in the curriculum
  - Government expenditures in education
- Labor
  - Certification
  - Skills development
  - Skills matching
  - Reversing brain drain

**CAPITAL**

- Early-stage financing: access to venture capital
- Later-stage financing: access to capital markets

**TECHNOLOGY**

- Technological Diffusion
  - Role of trade in technology transfer
  - Role of foreign direct investment in technology transfer
- Technological Innovation
  - Financing: grants, subsidies, tax concessions, loans
  - Academia-business collaboration
  - Industry clusters
  - Ease of patent registration

**PART II: LEGAL AND REGULATORY FRAMEWORK**

**LEGAL FRAMEWORK**

- Basic legal framework: property rights, contract law
- Revising and creating relevant legislation: e-commerce
- Harmonization with international law

**REGULATORY FRAMEWORK**

- Regulatory capacity
- Degree of regulation
- Regulatory process
  - Licensing/auctions
  - Standards setting
  - Dispute resolution: interconnection

**PART III: INFRASTRUCTURE**

- Market Structure: Privatization, Liberalization
- Pricing
  - International: cost of connecting to international gateways, accounting rates, Internet telephony
  - Domestic: choice or regulatory pricing regime, metered vs. non-metered, issue of subsidies
- Universal Service/Access
- Content: local content, content regulation, taxation, privacy, and consumer data protection
- Network Quality: network service and support, quality of service monitoring, security
- Supporting Infrastructure: electricity, postal systems, customs, transport logistics
- Financial Infrastructure: payment gateway, identification, authentication

In the second part a similar question is posed, but this question pertains to the type of legal and regulatory environment that needs to be in place. After first assessing the legal framework, both basic as well as technology-specific legislation, the regulatory framework is examined, including the institutional capacity and structure as well as specific regulatory issues that have a direct impact on the development and use of the network infrastructure.

In the third and final part, the state of the infrastructure is analyzed and the range of policies needed to facilitate the development of efficient networks discussed. The access, availability, and quality of telecommunications and Internet communications networks, as well as supporting infrastructure such as transport, postal, and energy, is also examined.

Despite the seemingly discrete schematic divisions, it is worth noting that the underlying factors are interconnected, with implications that overlap the three components. It is thus important to have a comprehensive overview as well as a detailed analysis of each of these three components.

Combined, these three components depict a country's environment and whether that environment enables it to capture fully the benefits of participating in the networked world. Using these three components, the five countries with the best environments are (in descending order) the United States, Finland, Iceland, Canada, and Israel. At the opposite extreme, countries that require the most improvement in their network environments are (in descending order) Honduras, Nicaragua, and Haiti.

## Part I: The Market Environment

There are three resource factors that a country needs most to participate and benefit fully in a networked world: human resources, capital, and technology. Without human resource development, a country's citizens would be unable to use and adapt technologies and create new ones. Similarly, the ability of governments, businesses, and individuals to engage in activities and projects involving technological creation and innovation would be impaired without the breadth and depth of financial markets that allow for access to capital with reasonable costs and conditions. Moreover, countries also need environments that are conducive to technological diffusion, which is the process of adopting and adapting technologies developed abroad, and to innovation, the process of creating new technologies.

The succeeding discussion delves deeper into the factors that define a country's market environment. It also examines the performance of successful countries in this regard, particularly countries that have scored well in the market subindex. These countries include the United States, Finland, the United Kingdom, Sweden, and Israel.

## Box 2. **On Visions and National Strategies**

The revolutionary gains ushered in by information and communications technologies (ICT) have compelled the highest levels of governments to craft a national ICT strategy. As early as 1991, Singapore, among the front-runners, launched a national ICT strategy, outlined in *IT2000 Plan: A Vision of an Intelligent Island*. The United States announced its national information initiative two years later, in 1993, with the publication of *The National Information Infrastructure: Agenda for Action*. Later that same year, the European Union (EU) published a *White Paper on Competitiveness*, which highlighted that there is a close link between the sophistication of a country's information infrastructure and its economic prosperity. Within a span of five years, Canada, Japan, and most of the European countries followed suit with respective national initiatives.

The last five years have also witnessed the unveiling of national ICT strategies in many developing countries. Policies outlined in Malaysia's *Vision 2020*, of which *Multimedia Super Corridor Project* is a component, have fortified the country's position as one of the leading exporters of electronic products. India's *1998 Action Plan* has catalyzed the Internet expansion in the country. Moreover, Jordan's *REACH Initiative*, launched on March 2000, has jumpstarted the country's strategy of focusing on software and related ICT service industries.

That the vision of a country's national ICT strategy stems from the highest office of the land is a concrete depiction of the country's commitment to making a successful transition to the new economy. It reflects a leadership that is forward-looking and ready to steer the country into an accelerated path of development. The most visible national ICT strategies tend to have a key visionary, a chief architect. In Singapore, former Prime Minister and now Senior Minister Lee Kuan Yew played that role; in Malaysia, it was Prime Minister Mahathir Mohammed; and in Jordan, King Abdullah II. For a national ICT strategy to achieve international visibility and a competitive level of success, the strategy is indeed best initiated from no less than the office of the head of state.

Beyond a powerful articulation of a compelling vision, crafting a national ICT strategy entails an accurate and comprehensive assessment of a country's readiness to participate in the global networked economy. A careful and thorough analysis must be made of the country's strengths, and of target areas for policy intervention. The challenge is to enhance core competencies and maximize existing resources, all within the context of the country's development goals.

Crafting a national ICT strategy is a complex process that requires extraordinary policy coordination. A truly concerted national ICT strategy requires the cooperative efforts of several ministries, including education, finance, labor, communications, trade and industry, and information technology. The strategy entails the establishment of national priorities as reflected in policies and regulatory measures that create the conditions which will enable the country to reap more fully the rewards of the global networked economy.

Since information and communications technologies continue to evolve and revolutionary applications continue to be created in the process, the national ICT strategy must be sufficiently flexible to adapt appropriately. Flexibility entails that the national ICT strategy is not dependent on any particular technology, particularly in view of the odds against identifying winning technologies.

Along with flexibility, however, it is critical that the national ICT strategy has a clear focus. At its most basic, the strategy must be founded on two prerequisites: infrastructure and education. The strategy must then build upon this foundation by formulating an industrial policy designed to attract private investment in strategic segments of the ICT sector.

Indeed, vision, leadership commitment, and planning are all important in crafting a successful national ICT strategy. The presence of a clear vision provides guidance to the policy-making process, while the commitment of leadership encourages investment and ensures continuity in the deployment of various information infrastructure projects. Long-range planning is also important, particularly for large countries, as is evident by China and India's five-year plans. To ensure effective development of the country's information infrastructure, a distinct and dedicated Ministry or Department, as in the case of India's Ministry of Information Technology, or the United Kingdom's e-Envoy, would also be useful.

## Human resources

To have a human resource base that is ready and capable of participating in and benefiting from the networked economy, the attention of policymakers and business leaders must be placed on two major areas: education and labor policies. In the area of education, the task is to create a set of structures and policies that provide and deliver relevant knowledge and skills to individuals. Meanwhile, in the area of labor, the task is to upgrade the knowledge and skills base of the workforce and to craft policies that attract and retain talent in the country.

Results of education and labor policies are partly reflected in selected indicators of the Market Environment subindex. One of the variables related to education policies, for example, is the survey question (in the Executive Opinion Survey)[3] asking if scientists and engineers are common in the country. Answers to this question reveal that many developing countries are among the top-ranked in this category. Such countries include Israel, India, Slovakia, and Romania, ranked 1st, 2nd, 3rd, and 5th, respectively. Among the developed countries, France ranked 4th, and Canada placed 6th.

In contrast, responses to the question asking if talented people leave the country show a different scenario. The United States ranked 1st in this regard, with Netherlands and Finland in 2nd and 3rd place, respectively, indicating that talented people tend to stay in these countries. Interestingly, of the four developing countries that scored among the top five places on the question of availability of scientists and engineers, only Israel remains among the top five countries that is able to successfully retain talented people in the country; Slovakia, India, and Romania are ranked 52nd, 54th and 80th, respectively, indicating that although these countries have a considerable pool of scientists and engineers, a considerable proportion of talented people leave the country.

### *Education*

There are two sets of education policies that are required to develop the requisite skill base for the networked economy. The first set is infrastructure-related, and this entails computerization of schools and libraries and the networking of these computers. The second set is content-related, and involves the training of educators and the integration of ICT into the curriculum and pedagogy. A prerequisite for both sets of policies is the allocation to the education sector of sufficient resources from the government, supplemented by support from the private sector and nongovernmental organizations.

Canada and Estonia are among the countries with best practice in infrastructure-related education initiatives. The case of Canada, the first country in the world to connect its schools and public libraries to the Internet, demonstrates the importance of a government-led but collaborative initiative to meet the task of computerizing and networking the educational system. Canada achieved the latter through its Schoolnet initiative; and the former, through initiatives such as the Computer for Schools program that collects, refurbishes, and delivers surplus computers donated from the public and private sectors. Similarly, Estonia's Tiger Leap initiative has enabled the country to be one of the first developing countries to connect all its schools to the Internet.

A government-led approach to infrastructure-related education initiatives is only one of the many approaches to the task. In many countries, the private sector and nongovernmental organizations (NGOs) play a critical role. In the United States, a volunteer-driven initiative, Netday, has been instrumental in wiring more than 75,000 classrooms.[4] Another example comes from Brazil, which has an NGO-led initiative, launched by the Committee for Democracy in Information Technology, that provides free computer equipment and software—all of which have been collected in donation campaigns. Mexico has a similar project coordinated by a civic organization, the Union of Industrialists for Educational Technology, with participation from the state and federal governments. The aim of the project is to provide equipment for computer workshops in schools. In addition to providing computers and networking schools and libraries, it is also important for a country to have a network infrastructure that provides the necessary bandwidth at a very low cost (ideally free or subsidized for the education sector), so as to enable the sector to use ICT as solutions to many of the obstacles that typically face education systems in developing countries. Computer-aided instruction can facilitate distance learning, as well as the overcoming of teacher shortages and upgrading teacher skills. It also allows the creation of repositories of study materials that can be accessed at a very low cost. Mexico, for instance, has Educational Television of Satellital Net, in which more than 29,000 establishments participate and benefit from equipment installation, and which has ten channels to receive the Edusat signal. Edusat offers production services, programming, and transmission of educational material to institutions that require television in support of their education and training activities. The government of South Korea is also promoting distance education, offering ICT-related courses with the use of cable TV, satellite broadcasting, and the Internet.

For content-related initiatives, the training of educators and teachers is considered a must. While there is great variation in approach, the task is to incorporate ICT in the curriculum and the teaching process. Clearly, there are developing countries where the educational systems are barely able to provide basic education and literacy skills; for these countries, integrating ICT into the curriculum is, quite understandably, far from a priority. Yet there are also many examples of developing-country governments committed to promoting content-related initiatives. Costa Rica, for instance, has a program called Computers in Education, a public-private partnership spearheaded by Fundacion Omar Dengo and targeted at primary schools. Argentina and Chile have created respective education portals, educ.ar and educarchile, both equipped with an array of ICT-related learning resources for teachers and students.

Because they have fewer resource constraints, developed countries tend to have more advanced content-related initiatives. Canada has the GrassRoots Program, which has helped learners and educators become skilled users of ICT as well as creators of online collaborative classroom projects. Likewise, the United Kingdom has the National Grid for Learning, an Internet-based resource for education and lifelong learning that brings together an increasingly wide variety of institutions and content providers to provide access to high quality materials.

Indeed, a prerequisite for both infrastructure-related and content-related sets of policies is the allocation to the education sector of sufficient resources from the government. Given the funding constraints, government leaders often have to choose where to allocate most of the state's resources: should the focus be on higher education which is more specialized and may benefit only a few, or should it be on primary education, which is more general and would benefit a broader population? A similar funding dilemma is the choice between prioritizing formal graduate and postgraduate education, which is highly specialized but can also be availed by a few, or prioritizing more broad-based, though shorter-term, vocational training? While such policy choices are inevitable for developing countries, one of the ways to alleviate the constraint is to increase the pool of resources in the educational system by tapping the private sector and nongovernmental organizations. Another way for governments to increase education expenditures is by prioritizing it over expenditures for other sectors; in this regard, Costa Rica perhaps presents the most dramatic example of redirected priorities—the government has moved its defense funding to education. This commitment to education was further consolidated in Costa Rica by a 1998 constitutional reform, which mandated that 6 percent of the gross national product be invested in education.

### *Labor*

The task for policymakers and business leaders is to ensure that there is a sufficient supply of skilled labor. Whereas the task for policymakers in the past was primarily to maximize employment, the networked economy requires more sophistication because of the faster-than-ever creation and destruction of jobs caused by advances in technology. Moreover, globalization has facilitated companies' relocation to areas that can satisfy their labor requirements, thereby rendering a skilled workforce to be one of the most, if not the most, important assets in a knowledge-based economy. A skilled labor force is crucial to encouraging new investment and facilitating job creation; further, without a skilled labor force it would be very difficult to retain and sustain existing businesses.

To promote the upgrading of the workforce, initiatives can be pursued in two key areas: certification and skills development. In terms of certification, Finland is notable for its Computer Driving License, an ICT literacy examination that everyone takes, and that is designed to implement a nationwide ICT standard. A shared accreditation standard between countries is another area that needs to be pursued more vigorously. Japan has an information technology engineers' examination, for example, which other Association of Southeast Asian Nations (ASEAN) countries are interested in applying to facilitate mutual recognition of standards.

Skills development in the context of the networked economy entails preparing the workforce to meet the skill requirements of the labor market, and for this, a close coordination between academia and the business sector is required. Continuous learning is essential and takes various forms, including on-the-job training, distance learning, and other professional development opportunities. Many developed countries have launched various initiatives to promote skills development. Targeting increased participation of women in ICT skills development programs has been the thrust of initiatives in Belgium and Norway: Belgium has its Electronica project which aims to "demystify" ICT professions in the eyes of women; while Norway's Norwegian University of Science and Technology has introduced a special quota system for women in computer technology studies. Austria's tele.soft, a training program that introduces qualifications "on demand" for the ICT sector, targets the overall population. Similarly, the United Kingdom has Learndirect, and as many as 885 Learndirect centers offer more than 600 Learndirect courses, all aimed at adults—whether they are working, seeking work, considering returning to work, or retired. Canada is notable for addressing the issue of funding skills development by creating Registered Individual Learning Accounts; these accounts make it easier for Canadians to finance their learning and increase the loans available to part-time students.

Skills development initiatives in developing countries are particularly constrained by lack of government funding resources and the lack of know-how in the education system. In this regard, collaborating with the private sector is an effective way to address and overcome these constraints. The Philippines is particularly notable for tapping multinational information technology companies for training programs, among them Oracle (Oracle Academic Initiative), Cisco (Cisco Networking Academy Program), IBM (Advanced Career Education), Sun Microsystems, and Hewlett-Packard. These private-sector initiatives not only help to overcome resource constraints but, more important, ensure that the skills of the workforce are better matched to the requirements of the marketplace.

Skills matching is indeed critical and it is important that a country has job-matching tools and centers. Canada, for example, has SkillNet, an Industry Canada initiative that helps Canadian employers locate and recruit skilled workers. Without job-matching tools and centers, a skills gap may go undetected for a considerable period. In Europe, a skills gap became particularly apparent at the height of the technology boom, when there were an estimated one million information technology vacancies despite a fairly high youth unemployment rate in the region. While education and training action plans provide longer-term solutions to the skills gap, labor markets in countries facing this challenge must have sufficient flexibility in labor and immigration regulations as well as policies designed to attract skilled workers. The United States has also been successful in attracting highly skilled workers with policies that allow for the favorable tax treatment of income and stock options.

In addition to the task of accrediting, developing, and attracting a skilled labor force, one of the most critical challenges for policymakers is to retain talented people in the country. Brain drain is a challenging problem, particularly for developing countries. To prevent brain drain, two countries, Taiwan and South Korea, have launched programs specifically designed to reverse it: Taiwan has set up the National Youth Commission, an information clearing house for potential employers and for returning scholars seeking employment, while South Korea has focused on upgrading its research institutions, such as the Korea Institute for Science and Technology, as a way to attract returnees (UNDP 2001).

## Capital

Capital is a key resource factor in the development of a networked economy. The availability of and access to low-cost capital at favorable terms is particularly critical for startup ventures. To foster an environment conducive to the development of innovative, high-growth technology companies, policies must be designed to ensure that capital markets have the requisite breadth and depth to allow for efficient financial intermediation and capital allocation towards activities and projects involving technological creation, diffusion, and innovation. To this end, policymakers can pursue initiatives at two levels: early-stage financing (especially government-funded venture capital), and later-stage financing (to facilitate access to equity and bond markets).

### *Early-stage financing*

For a local ICT industry to emerge, capital, ranging from grants, government bank funding, or more typically, venture capital, must be available for startups. While the private sector provides most of the venture capital in the world, in some countries governments play a substantial role in providing early-stage financing. Australia, for instance, has the Innovation Investment Fund, which provides venture capital to small, high-tech companies at the seed, startup, or early expansion stages; the country also has Build On IT Strengths, an incubator program. Likewise, Austria has implemented the Austrian Industrial Research Promotion Fund, a seed financing program that supports technology-oriented startups with capital and know-how. In Mexico, the National Bank for Foreign Trade has invested in different risk capital investment funds, which are directed at supporting small- and medium-sized Mexican enterprises. The government of Greece is the single shareholder of the New Economy Development Fund, which was created to co-finance the formation of venture capital funds. In Israel, the government has set up a venture capital company, Yozma, with an initial budget of US$100 million, designed to attract foreign capital for investment in local companies (UNDP 2001:84). In Singapore, the state agency, Economic Development Board, serves as, among other functions, a venture capital entity with US$7.7 billion in funds under its management; in addition, the Singaporean government has added a US$1 billion fund, the Technopreneurship Investment Fund. Meanwhile, in addition to providing about KRW 500 billion in early-stage financing and research and development (R&D), the Korean government also operates an IT Venture Investment Mart to match promising information and communications businesses and venture capital.

While government initiatives in this area are noteworthy, most venture capital comes from the private sector. The bulk of this type of capital is also concentrated in a handful of countries, with the United States serving as the base for most venture capital companies. In 2001 for instance, the United States had US$103 billion of venture capital invested, thirty-five times more than the United Kingdom, the country with the next largest amount of venture capital invested at US$2.9 billion (UNDP 2001:84). Indeed, of the eighty-two countries ranked in the *Global Competitiveness Report 2002–2003*, the United States ranks 1st in terms of ease of access to venture capital.

### *Later-stage financing*

As ventures expand and mature, it becomes necessary to tap stock and bond markets for further financing. Policymakers seeking to facilitate access to stock markets may, for instance, encourage the creation of a secondary board that has less stringent listing requirements, such as shorter operating history requirements. Greece, for instance, has launched the New Stock Market for trading shares of innovative and dynamic "new economy" small- and medium-sized enterprises (SMEs).

In terms of access to funding, stock and bond markets provide, in addition to bank credit, the bulk of financing for technology-related investments. While developed countries have the benefit of mature stock and bond markets in addition to highly competitive banking sectors, developing countries are still in the process of building their banking and financial markets. In this regard, governments need to pursue banking-sector reforms, as well as capital-market reforms. Care must be taken to avoid undue taxation of transactions, because this could inhibit capital market and banking activities. Governments can also pave the way for local companies to tap international markets by seeking sovereign credit ratings and launching sovereign bonds in international markets.

## Technology

Technology is the third resource factor that is critical to the creation of a foundation for Networked Readiness. To enable an economy to capture more fully the benefits of ICT, policies designed to promote technological transfer and diffusion, as well as technological innovation, are critical. The former involves trade liberalization and investment promotion, while the latter entails the creation of clusters, promotion of corporate R&D, and facilitation of patent registration.

### Box 3. Special Technology Zones

If the prospect of laying out a nationwide network infrastructure is daunting for developing countries given resource constraints, special technology zones provide an option of focusing infrastructure efforts in a geographically prescribed area. Special technology zones, often referred to as technology parks, can range from a single building development to a several-thousand-hectare master-planned development.

To be successful, a technology park must be carefully designed in order to maximize fully the economic benefits and synergies of clustering. In addition to ensuring that state of the art infrastructure, such as power and high bandwidth communications twenty-four hours a day seven days a week, are in place, an ICT park must also be adjacent to centers of innovation and talent pools such as research and development centers and universities. Typical facilities of technology parks include: research and testing laboratories, intelligent buildings, on-site teleport earth station, technology incubator, wide area network, recreational facilities, shared business services, training and consultancy center, and exhibition areas. To be more attractive, other technology parks include housing developments for expatriate and other employees as well as schools, hospitals, and religious establishments.

However technology parks are designed, it is important to have highly competitive facilities and incentives. Formulating policy incentives for investing in a technology park is just as critical as deploying infrastructure. Incentives typically include income tax holidays, import duty and indirect tax exemptions, subsidies, foreign investment privileges, one-stop-shop investment and business registration processing, and simplified export and import procedures. United Arab Emirates is host to the leading examples in technology parks: Dubai Internet City, Dubai Ideas Oasis, and Dubai Media City. It is notable, for instance, that Dubai Internet City offers a whole host of benefits, including 100 percent foreign ownership and zero tax on sales, profits, and personal income. Dubai has also positioned itself as a leading leisure destination, with a wide variety of sporting and leisure facilities. Dubai offers world-class medical and education facilities, in addition to a modern housing infrastructure.

The importance of telecommunications infrastructure cannot be understated. Malaysia's Multimedia Super Corridor, for example, has a fiber-optic backbone with a 2.5 to 10 gigabits per second capacity, direct high-capacity fiber links to international centers, a 100 percent digital open multimedia network, as well as open standards, high-speed switching, and multiple protocols. Performance guarantees include installation of telephone services within twenty-four hours, ATM circuits within five days, and 99.9 percent service availability.

The role that governments play in the creation of technology parks can vary. From one end, it can be government-led and funded, as in the cases of Singapore, Malaysia, and the United Arab Emirates; on the opposite end, it can be purely private sector–driven. In many cases, however, it can be both, resulting in a private sector-initiated but government-supported technology park. With regards to the latter, Hong Kong's Cyberport is a case in point, whereby the government has contributed the land for the project but the financial risk and other requirements of the project have been borne by the private sector.

In terms of actual application, the phenomenal development of India's software industry is perhaps one of the best examples of a successful technology park strategy. In 1990, India's Department of Electronics established seven software technology parks, which granted export-oriented software firms a zero-tariff regime, competitive telecommunications facilities, and low taxes. Aware of the problems of infrastructure in the country, the government has designated certain geographic areas in which the necessary infrastructure, such as power and communications twenty-four hours a day seven days a week, are in place. In addition, an export promotion council was also created for electronics and computer software, with representatives from the Ministry of Commerce, Ministry of Finance, and Department of Electronics. Today, India has more than forty software technology parks, and the entire sector's exports exceed US$1.7 billion.

### *Technology diffusion*

International trade and foreign direct investment are the two mechanisms by which countries can acquire, adopt, and adapt existing technologies. Policymakers must focus on both mechanisms to facilitate technology transfer. The transfer of technology is of particular benefit to emerging market countries seeking to harness global technologies for local use. Significantly, it is the absorption of advanced technologies and capital from core economies that has allowed certain non-core economies to achieve the highest economic growth rates in the world,[5] and enabling economies such as Taiwan, Ireland, Hong Kong, Singapore, and Korea—which were non-core economies in the 1980s—to become core innovators by the year 2000.

International trade is vital to Networked Readiness because it allows domestic producers and consumers to have access to a greater variety of ICT products and services at prices lower than they would otherwise. Equally essential is the role of international trade in facilitating technological diffusion. To create an environment conducive to technological diffusion, policymakers must liberalize trade by lowering tariff and nontariff barriers that are applied to ICT.

Foreign direct investment contributes to Networked Readiness through the facilitation of technology transfer. To acquire relevant technologies and gain employment and other positive spillovers, governments seek foreign direct investment. As competition for foreign direct investment has intensified, governments have become increasingly aggressive in investment promotion, offering fiscal and nonfiscal incentives, which, if availed, come at a cost, either in terms of taxpayer burden or foregone revenues for the government. More often than not, however, calculus of costs and benefits of incentives to promote foreign direct investment tend to be positive, leading policymakers to offer targeted incentives in selected strategic sectors.

The importance of trade and investment as mechanisms to facilitate technology transfer and diffusion is best illustrated by China's experience in liberalizing the telecommunications equipment sector. As early as 1978, China allowed direct importation of foreign telecommunications equipment. In addition to facilitating the importation of technologies, the government also encouraged the establishment of joint ventures with foreign companies that are leading the world in specific areas. Domestic producers now control at least 15 percent of China's telecommunications equipment market, excluding handsets and office equipment. In terms of phone sets, China now seeks export opportunities; it manufactures around 100 million home phone sets, exceeding domestic demand. In terms of wireless products, China has more than 100 telecommunications plants producing parts and equipment for mobile telephones. Most of these ventures are foreign-funded companies with names such as Tianjin Motorola, Beijing Nokia, Beijing Ericsson, Beijing Matsushita, Wuhan NEC, Shanghai Siemens, and Shenzhen Philips (Paua et al 2001). More important, China's ability to produce telecommunications equipment at low prices has enabled the country to post the highest telecommunications diffusion rates in the world.

### *Technological innovation*

Technological innovation, or the creation of new technologies, is a widely acknowledged engine of growth. A country that is seeking to promote Networked Readiness must create an environment that fosters innovation. To this end, policies can be directed towards encouraging research and development in academia or corporations, or through industry-academia collaborations.

Apart from state-owned research institutions, policymakers have four basic tools with which to promote R&D: grants, subsidies, tax concessions, and concession loans. Most developed countries have pursued a mixture of all four tools. Australia for instance, has an R&D tax concession program, R&D grants and loans program, as well as concession loans. Likewise, Canada has Technology Partnerships Canada (TPC), which has an annual base budget of CAD 300 million; TPC invests in high-risk, near-market development and demonstration projects across Canada. Indeed, Canada ranks 4th in direct R&D subsidies and tax credits to companies based on the Executive Opinion Survey. Other countries in the top five places are Israel at 1st place, Singapore at 2nd, Taiwan at 3rd, and Ireland at 5th.

Outside of Israel, Singapore, Taiwan, and Ireland, best practice cases studies of R&D promotion in developing countries tend to be rare. R&D initiatives are cost-intensive, risky, and have long-term time horizons; for many developing countries, many other resource priorities, such as education and health, take precedence over R&D. In this context, Mexico's initiatives to promote R&D are particularly noteworthy. Mexico has created the National Council of Science and Technology, which serves as the vehicle for the promotion and sponsoring of specific projects concerning research and the dissemination of scientific and technological information. Mexico also has the Integrated System for Information on Scientific and Technological Research, an information and registration system of activities and institutions involved in science and technology that also serves as a mechanism for R&D institutions to obtain support from the federal government. The country also has the Technological Services Information System, which seeks to foster a technological culture in small and medium enterprises by offering a database with information provided by more than 225 development research institutes and centers.

Another way to promote R&D is to encourage academia-business collaboration. Canada, for example, operates the

Industrial Research Assistance Program, which assists SMEs across Canada in R&D leading to new products and processes. Likewise, Austria's Kplus Competence Center Programs stimulate the long-term cooperation between innovative enterprises and top-quality research organizations. And in Australia, the government is funding twenty-eight projects involving university and industry partnerships over three years under its Science Lectureship Initiative. Significantly, academia-business collaboration also facilitates the exploitation of the commercial potential of research outputs.

For many countries, industry cluster strategies embody both policies directed toward encouraging R&D and policies designed to foster industry-academia collaboration. The notion of industry clustering, a variant of industrial policy theories that assert that competitive advantages can be created, seems paradoxical when taken in the context of the much-heralded "death of distance" ushered by ICT. Yet clustering as a strategy makes sense, as it lends positive network externalities generated by the density of interactions within areas where there is a concentration of technology companies, financing sources, and pool of talent from adjacent university centers.

Successful clusters contain, in close proximity to the businesses, sources of intellectual capital, usually a major university. Universities are sources of potential employees, but seedbeds of entrepreneurial ideas as well. Also present in every cluster are incubators and other sources of risk capital for funding of startups. The presence of major locators is also one of the strongest indicators of the success of a cluster.

The United States is home to the best known and perhaps the most successful industry cluster, Silicon Valley (California), which includes Stanford University and the University of California, and has among its major locators Hewlett-Packard, Sun Microsystems, and Cisco. Also in the United States is Route 128 (Massachusetts), anchored to Harvard University and Massachusetts Institute of Technology and that has, among its major locators, Lotus and EMC. Outside the United States, Finland has a Helsinki cluster with Nokia as an anchor company, and the Helsinki University of Technology; Ireland has the Dublin-National Digital Park with the University of Dublin and the major locators Dell and Intel; while Sweden's Stockholm-Kista cluster has Ericsson as an anchor locator together with the Royal Institute of Technology.

In addition to clusters, policymakers can promote innovation by facilitating the ease of patent registration. Two countries that have recent initiatives in this regard are Belgium and Mexico. The Belgian Office for Industrial Property has asked the European Patent Office to integrate the electronic filing of Belgian national applications into the epoline communication environment, the electronic filing of European patent applications. In Mexico, the Mexican Institute of Intellectual Property has set up the National Bank of Patents, an Internet-based database that provides information about registered patents, utility models, industrial models, and patent applications.

## Part II: Legal and Regulatory Framework

An environment conducive to promoting Networked Readiness requires clear and up-to-date legal frameworks. In addition, it also requires a regulatory regime marked by an independent regulator that is empowered and equipped to craft and implement regulatory policy, allocate scarce resources, adjudicate disputes, and balance goals of efficiency, equity and innovation.

Among the eighty-two countries covered in this *Report*, Singapore is number one with respect to the legal and regulatory environment. The other leading countries, in descending order, are: Israel at 2nd place, Finland at 3rd, the United States at 4th, and Canada at 5th.

### Legal Framework

An effective legal framework for promoting Networked Readiness has three prerequisites: first, a clear legal framework; second, an up-to-date, ICT-relevant legislation with a degree of built-in flexibility; and third, relevant legislation must be harmonized with international law. In terms of the quality of the supporting legal framework for ICT, Singapore, the United States, and the United Kingdom achieved the highest ranks (in descending order); while Haiti and Argentina received the worst, and second-to-the-worst ranks, respectively.

First, a clear basic legal framework must be in place. The basic legal framework must include provisions for property rights (including intellectual property), and legal certainty of contracts—both of which are essential to encouraging long-term and large-scale investments.

Second, the legal framework must be up-to-date, reflecting corporate changes in technological developments.
For many countries, existing legislation pertaining to telecommunications and communications are separate, and requires revision and updating in order to reflect the convergence of technologies. Moreover, most contract law is still paper-based in many countries; new legislation is required to recognize and accept electronic signatures. Care must be taken, however, that there is sufficient flexibility built into the legislation governing ICT given the dynamic nature of technological advances and the difficulty of crafting and passing legislation. For example, a standing law that was more than a hundred years old, the Indian Telegraph Act of 1885, had, until recently, handicapped India's telecommunications sector. At the opposite extreme, China had no direct legislation governing

the telecommunications sector until after 1999, although the lack of legal framework appeared to allow for a degree of experimentation prior to legislation. Ideally, the legal framework must have the clarity to encourage investment but the flexibility to accommodate changes in technology without being quickly rendered outdated and irrelevant.

Third, to the extent possible, relevant legislation must be harmonized with international law. The borderless nature of e-commerce lends to cross-border, territorial jurisdiction disputes. In this regard, it is useful when crafting e-commerce legislation to use as a basis the Model Law on Electronic Commerce created by the United Nations Commission on International Trade Law and designed to offer national legislators a set of internationally acceptable rules on how a number of legal obstacles may be removed, and how a more secure legal environment may be created for e-commerce (Townsend 1999:55). Further, in 1997 the International Chamber of Commerce adopted the General Usage for International Digitally Ensure Commerce, which was based on existing law and practices in different legal systems, to facilitate and promote the emerging global electronic trading system.

## Regulatory Framework

Attention to three aspects is most critical when establishing a regulatory framework that is most conducive to Networked Readiness: the first aspect is regulatory capacity; the second, degree of regulation; and third, the regulatory process. In analyses and discussions on regulation, it is best to remember that a regulatory regime appropriate to one country may not necessarily be suitable or enforceable in another. Regulatory regimes do not emerge from a vacuum; rather it emerges from, and is influenced by, a country's unique economic, political, social, and economic context.

### *Regulatory capacity*

The rise of the ICT-sector specific regulatory agency is a recent phenomenon, and it arose from the need to eliminate conflicts of interest that emerge from state-owned monopolies holding the overlapping roles of regulator, operator, and administrator—a situation typical in many developing countries. In some countries, the regulator also has broad oversight; that is, there is a "super-regulator" or a "multisector regulator" with responsibilities straddling telecommunications, broadcast, and Internet regulation. Indeed, among the many questions countries have to decide when designing the regulatory framework is: what services or industry segments should come under which regulatory authority? Should there be a single-sector or multisector regulator? If it is the latter, should telecommunications be combined with other utilities or with other communications sectors such as broadcasting?

Whatever regulatory structure emerges, one requirement is indisputable: the regulator must be independent, ensuring a level playing field. "Independence" means being independent of any operator or service provider, of any government department that is a shareholder in an operator, and of political interference with regard to individual reforms. Because they are a recent phenomenon, regulatory agencies in many countries lack not only the independence, but also the capacity to perform their functions; they often lack staff with the necessary expertise, and the legal clarity of their powers to enforce dispute resolution and other regulatory decisions.

Singapore presents a best-practice case study in ICT regulation. In 1992, Singapore became one of the first countries worldwide to create a sector-specific telecommunications regulatory body, Telecommunications Authority of Singapore, which later merged with the National Computer Board to become the Info-Communications Development Authority of Singapore (IDA). IDA has established the Code of Practice for Competition in the Provision of Telecommunications Services, based on principles of technological neutrality and asymmetric regulation between dominant and nondominant licensees. A complementary regulatory body is the Singapore Broadcasting Authority, responsible for regulating content.

### *Degree of regulation*

Distinctions must be made between the telecommunications sector, the Internet sector, and broadcasting sector when analyzing how much regulation is appropriate. Whereas self-regulation is the predominant regulatory regime for the Internet sector, and to a lesser extent, the broadcasting sector, the telecommunications sector tends to require, at the very least, a fair amount of regulation. The telecommunications sector is often misunderstood, and there are frequent calls for its "deregulation." As telecommunications sectors undergo reforms, such as liberalization, however, greater, rather than lesser, regulation is required. At least in the initial stages, regulation is needed for the licensing of new entrants, resolving interconnection issues, and choosing and implementing a pricing regime, among other concerns.

Although different countries are likely to have varying degrees of telecommunications regulation, one task remains the same for all countries: that of balancing the goals of efficiency, equity, and innovation. In choosing a pricing regime for instance, the regulator has to grapple with the competing objectives of ensuring just and reasonable rates for users, while recognizing investors' expectations regarding capital recovery and also ensuring that companies will have enough return on investment to encourage further innovation and the continued upgrading and maintenance of the network infrastructure. An overview of regulatory levers is depicted on the following page.

Figure 1. **Overview of Regulatory Levers**

| Regulatory levers | Levers for fixed services | Levers for mobile services |
| --- | --- | --- |
| Industry structure | Number of competitors<br>Ownership and control rules, including restrictions on foreign investment<br>Networks and services open to competition<br>Licensing procedures and conditions | Number of network operators<br>Ownership and control rules<br>Licensing procedures and conditions |
| Pricing | Price caps<br>Tariff rebalancing<br>Access deficit compensation<br>Pricing regime for local calls | Controls against abusive retail pricing<br>Controls against abusive international roaming pricing<br>Access deficit compensation applied to mobile operators |
| Inter-connection | Rights and obligations to interconnect<br>Structure and level of charges<br>Collocation and infrastructure sharing<br>Conditions for unbundling network elements<br>Interconnection for ISPs | Rights and obligations to interconnect<br>Structure and level of charges<br>Collocation and infrastructure sharing<br>Requirements for national roaming<br>Access for Mobile Virtual Network Operators (MVNOs) |
| Customer access | Numbering plan<br>Number portability<br>Length and ease of carrier prefixes<br>Subscription mechanism for carrier preselection | Numbering plan<br>Number portability<br>Length and ease of carrier selection codes<br>Subscription mechanisms for indirect access |
| Universal service | Universal access and service obligation definitions<br>Universal service funding mechanism<br>Penetration targets | Universal access and service obligation definitions<br>Universal service funding mechanism<br>Network rollout and coverage requirements |
| Performance levels | Service quality targets | Service quality targets |

Source: Beardsley et al (McKinsey) in "The Elements of Successful Telecommunications Sector Reform" in *The Global Information Technology Report 2001–2002*

### *Regulatory process*

Whatever form the final regulatory structure takes, it is important that attention also be placed on the process by which regulation is undertaken. Transparency in the regulatory process, as well as in consultations with stakeholders such as consumers and service providers, is advisable, particularly when deciding on major issues such as rate rebalancing.

Other regulatory functions, such as licensing or setting standards, also require due attention to process. The choice, for instance, on the mode of licensing has significant implications for the outcome. One mode of licensing is to conduct comparative evaluations, often referred to as "beauty contests," but this can be criticized for a lack of transparency and objectivity. The other mode of licensing is through auctions, which bear the hazard of raising bids so high that winners are put in a disadvantageous financial position, at the very least, in the near-to-medium term.

Regarding the allocation of finite resources such as spectrum, Finland provides a best-practice example of a "light licensing" policy, which is one that involves no license fees and no extra burdens for investors. The case of Singapore illustrates the importance of flexibility. Singapore had initially planned to hold an auction for four third-generation (3G) licenses, but with only three bidders for three licenses, the government decided to simply award the incumbents the licenses for the price of SGD 100 million each (*The Economist* 2002). Meanwhile, Germany and the United Kingdom demonstrate the perils of auctions; from their auction of 3G mobile licenses, these governments earned only US$46 billion and US$36 billion, respectively (Isern and Ríos 2002).

Post-licensing rules also need to be clear; otherwise, companies can become mired in litigation. In the area of spectrum allocation, litigation could mean that the resource is left unused until the dispute is resolved. Legal uncertainty regarding license awards may prevent industry consolidation, given the implications of merger and acquisition activities, as well as bankruptcy proceedings.

Other than licensing, regulatory process issues requiring attention include rights of way issues, the allocation of universal service funds, and standard setting. The importance of setting standards is often underappreciated, but there is considerable lingering debate regarding the process and the extent of government/regulatory intervention. In some countries, the task of setting standards is solely in the domain of the private sector; in others, it is purely government-led, and in the remaining countries, both government and private sector take on the task or whatever international standards are in place are adopted. Significantly, the U.S. experience in setting standards for the wireless sector, which has been industry-led, compares much less favorably with government-led initiatives in Europe or Japan. Whereas a single wireless standard was adopted in Europe and Japan, the United States has several, illustrating how conflicting interests in the private sector can prevent the choosing of a single standard, which has the benefit of reducing the cost and complexity of the diffusion of a technology.

Another area in which regulatory process matters is the resolution of disputes. The most common dispute for telecommunications regulators involves interconnection, which entails correcting for the imbalance of negotiating power between incumbents and new entrants. The entry of numerous service providers means that regulators must ensure that the different networks are interoperable. Where possible, open access to networks must be promoted as it is essential to guarantee consumer choice; however, consumer choice must be balanced with the need to support innovation and provide incentives to innovate. A suggested principle in the area of convergence is technological neutrality; that is, equal terms and conditions in legislation for competition among different delivery channels (e.g., the same policies in broadcasting and telecommunication networks such as broadcast, cable, wire, wireless, and satellite). Indeed, open access and negotiation of interconnection costs are among the most contentious issues in ICT regulation.

## Part III: Infrastructure

Without network infrastructure, a country cannot avail itself of the benefits of ICT. Thus, the third component of the environment index addresses the question: what type of policies need to be in place to ensure that the network infrastructure is accessible and is of a quality that will enable individuals, businesses, and governments to participate and benefit more fully in the networked economy?

While there is considerable complexity in the range of policy options and considerations involved, there are essentially six infrastructure-relevant issues that policymakers need to address: market structure (extent of privatization and liberalization), pricing, universal service, content, network quality, and supporting infrastructure. These sets of policy issues bear the greatest impact on the availability, affordability, and quality of network infrastructure. Countries that have achieved the highest rankings in terms of infrastructure are Iceland, the United States, Luxembourg, Japan, and Sweden, in descending order. Meanwhile, countries with the most room for improvement in infrastructure are Nicaragua, Zimbabwe, Bangladesh, and Haiti, also in descending order.

### Market structure

The issue of market structure has perhaps the most direct and greatest impact on the rate of infrastructure deployment. Infrastructure deployment is a capital-intensive activity and, as such, the issue of market structure essentially has two aspects: what is the role of the government vis-à-vis the private sector, and how much competition is optimal? The former determines the government's privatization strategy, if any, while the latter defines the government's liberalization strategy.

It is important to note that the issue of market structure applies differently to telecommunications services, broadcasting, Internet services depending on the sector's scale of network economies and technology specifications. Even within the telecommunications sector, the optimal market structure can vary depending on the service: basic wireline, wireless, national long distance, international long distance, and Internet services.

What is the appropriate role of government in the provision of network infrastructure and services? The answer to this question varies not only among, but also within, countries. In the United States, more than 200 state and local governments are operating telecommunications businesses of one form or another, with more than 100 providing cable television service and others offering everything from Internet access to local telephony (Fidelman 1999). In some states, however, such as Texas and Missouri, local governments are banned from providing telecommunications services.[6]

In the international arena, remarkably, privatization of telecommunications has been the prevailing norm in recent years. The benefits of privatization in expanding network access and coverage, improving service quality, and increasing government revenues have been extolled in many countries by the private sector, governments, and multilateral organizations alike. In this context it is thus remarkable that China, the country that had the world's fastest rate of infrastructure deployment in the 1986 to 1999 period, accomplished such a feat without privatization and with the state firmly in control of management and ownership. China was also closed to direct foreign participation during this period; except for the last seven years of this period, the Chinese government was a monopoly.

That China liberalized its telecommunications sector underscores the importance of competition, although as its experience demonstrates, competition does not have to come from the private sector. The important thing is timing, as well as the design and execution of the liberalization process. In fact, if the regulatory capacity is in place, the earlier a sector is liberalized, the better. Finland is a case in point. From as early as the late 1980s, Finland began liberalizing its telecommunications sector, and today the country has one of the most extensive network diffusion and penetration rates in the world, with a wide availability of high-quality services at affordable prices.

It is also important to note that while privatization involves relinquishing government shares to private investors, the change in ownership does not guarantee effective introduction of competition; it may even still perpetuate a monopoly. But is a monopoly, or the absence of competition, necessarily disadvantageous? The case of Costa Rica demonstrates that it can be advantageous. The country has a national regulated monopoly, and also has one of the highest telephone penetration rates in the world. Indeed, the telecommunication sector lends to significant economies of scale and network economies present barriers to entry; often for developing countries, the sizes of the markets are too small to encourage competition.

## Pricing

The issue of pricing relates to the problem of affordability, which itself has several dimensions ranging from affordability of access devices such as computers, telecommunications, and Internet services to (a lesser degree) affordability of upkeep and maintenance.

In the area of affordability of access devices, which is a prevalent problem among developing countries, Brazil shows a promising way of dealing with the problem. In Brazil, the government taps international computer manufacturers to develop a prototype for low-cost personal computers (PCs)—priced at about US$200 to US$250 per PC—while providing loans to low-income households to purchase the computers.

In terms of affordability of telecommunications services, the issue is significantly more complicated. ICT-related services have two facets: domestic and international. In the international arena, pricing issues include accounting rates, treatment of Internet telephony, and international telephone service pricing. Internet affordability in developing countries is particularly affected by the cost of connecting to international gateways. The International Private Lease Circuit still comprises the bulk of ISP costs (up to 80 percent in some cases), and like the cost of routers and switching equipment, is denominated in U.S. dollars; this makes Internet affordability highly sensitive to fluctuations in exchange rates. It is also important to note that end-user prices for Internet access are also affected by the degree of competition. Embratel of Brazil for instance, is cited as charging up to nine times the U.S. price for leasing high-speed circuits to ISPs and other telecommunications service providers (Bastos 2002). It is notable that the high cost of Internet access and, in some countries, telecommunication services, has precipitated innovations such as pre-paid Internet cards and pre-paid telephone cards for wireline and wireless services.

In the domestic arena, policymakers face decisions regarding three issues: a pricing regulatory regime, metered or non-metered service, and subsidies. The choice of pricing regime is a decision usually undertaken by the regulatory agency when choosing between price-cap regulation or rate-of-return regulation, or a variant of either regime. Like other pricing decisions, the choice of pricing regimes has direct implications for user affordability and the propensity of the service provider to invest in infrastructure. With regard to infrastructure, governments have other measures in their toolkit, such as revising depreciation schedules and accounting treatment of property and other physical assets.

On the issue of the choice between metered and unmetered service, the empirical evidence is most helpful. An Organisation for Economic Co-operation and Development (OECD) report on local access pricing and e-commerce shows the difference in the penetration of Internet hosts between countries with unmetered local telecommunication charges for Internet access and those with metered service to be a multiple of 6:1; that is, in countries with unmetered Internet access, including all charges, the average price for 150 hours of use at peak rates is US$38.06, while the average price in countries with metered Internet access is US$235.67 (Bastos 2002).

The third domestic pricing issue is that of subsidies. The issue of subsidies arises because of market failure; market mechanisms alone are not sufficient to ensure widespread individual access, particularly in distant and sparsely-populated areas and in places with challenging geographic terrain. Historically, one of the ways policymakers have addressed this issue is through geographically-based cross-subsidies. More recently, many countries have sought to address this issue through universal access/service schemes.

## Universal access/service

In light of the market's failure to provide services in certain areas and problems of affordability in certain segments of society, most governments have universal service or universal access goals either covering basic telecommunications only or basic Internet access as well. In other countries, universal service goals have even been extended to broadband diffusion.

While a universal scheme, in which each household has access to the service, may be appealing, it may not be the most feasible course of action (particularly for developing countries) given the large amount of funding required for such an undertaking. A universal access scheme, which relies on community access points instead of individual household access, may be more appropriate. Interesting universal access initiatives have been launched in Brazil, Mexico, Canada, and United Kingdom. In Brazil, the postal service has launched Porta Aberta, or Open Door, a project that gives the public free access to Internet kiosks, but only in selected post offices in Sao Paolo and Rio de Janeiro.

Similarly, Mexico has established TELECENTROS, which at present is comprised of sixty public service centers that provide informatic and communications services, such as Internet access in twenty-eight cities of the Mexican Republic. More important, the Mexican government is planning the Mexican Telecommunications Program, which will develop a network of 2,000 informatic and communication centers and integrate 1,400 telegraphic offices and 600 post offices in the next two years. Despite one of the highest household Internet penetration rates, Canada has the Community Access Program, a federal government initiative administered by Industry Canada with 8,800 public Internet access sites. Likewise, the United Kingdom has set up UK Online centers to enable anyone who wants it to have access to the Internet and e-mail near home. A UK Online center could be in an Internet café, a public library, college, community center, village hall—anywhere that is accessible to the public. The U.K. government has allocated GBP 252 million of over a three-year period to set up a network of UK Online centers.

For developing countries, funding options for universal access strategies are noteworthy, given resource constraints. In several Latin American countries such as Peru, Brazil, and Chile, the governments have set up specific funds for this purpose. Peru has a rural telecommunications fund, while Brazil requires telecommunications operators to contribute one percent of total revenues to a universalization fund. Chile is particularly remarkable—it has launched a program that provides one-time subsidies for the installation of public telephones. Subsidies are paid out from a Telecommunications Development Fund (Fondo de Desarollo de las Telecomunicaciones), which is funded from the Chilean national government budget. Private operators are selected through a competitive bidding process, and it is remarkable that in the 1995 to 1999 period, US$21 million subsidies were granted to 183 projects covering 5,916 localities and 2.2 million inhabitants (Intven 2000:6–31).

Instead of creating a pool of funds for universal access, Estonia and the Philippines used another mechanism, concession agreements. Estonia awarded a concession agreement to Estonian Telephone Company that ensured connectivity in rural and scarcely-populated areas in return for lucrative urban contracts. However, a similar scheme had disappointing results in the Philippines. The Philippines' service access scheme required recipients of licenses to install 300,000 to 400,000 lines in designated areas in exchange for obtaining their licenses. Several carriers failed to comply with the requirements for various reasons, including the peso devaluation and difficulty in securing right of way permits. Of greater concern, however, is the fact that many of the lines installed under the scheme had no subscribers; for the carrier, these lines represent nonrevenue generating investments. From the perspective of the entire economy, the service area scheme has resulted in an inefficient allocation of resources.

Several countries have extended the definition of service goals beyond the traditional universal service to include broadband; the amount of bandwidth required, the funding mechanism, and the role of government vary among these countries. In the United States, the 1996 Telecommunications Act established a benchmark of 200 kbps—both upstream and downstream—for broadband access, but it did not stipulate universal access; rather, in Section 706 it urged the Federal Communications Commission and the state public utility commissions to encourage the deployment of "advanced telecommunications capabilities." Canada went further than the United States when it announced the goal of ensuring that broadband access is available to all communities in Canada by 2004. Japan is also ahead, and has already set up a special financing system for the deployment of fiber-optic and broadband networks.

The three countries that are among the furthest ahead in broadband rollout are South Korea, Singapore, and Sweden. South Korea has the highest per capita broadband penetration in the world, with 9.2 million broadband connections, or nearly two out of three of the country's 14 million households (Williams 2002). This penetration was made possible by the fact that South Korea has one of the lowest price levels of broadband in the world—partly because of liberalization in the telecommunications sector, and partly because years ago the government allowed the electric utility company, Kepco, to lease its unutilized fiber optic cables for its own use.

In contrast to South Korea, Singapore and Sweden represent more active and interventionist approaches by their respective governments.[7] In Singapore, the Government has launched a national initiative to provide access to information and communications infrastructure to all its citizens. The definition of infrastructure includes not only broadband access but also the delivery of advanced applications and services. The initiative, Singapore ONE, involves private sector partners, but the government has pledged full commitment, partly manifested in its US$300 million investment in infrastructure, as well as in fiscal and financial programs for the initiative. While Singapore may have the world's first nationwide broadband network, increasing demand for, and usage of, broadband applications is a lingering issue.

In Sweden, the legislature has passed a bill to provide high-speed Internet access to every household. To implement the "broadband everywhere" legislation, the government has planned to invest about US$20 billion to create an infrastructure that will be open to everyone. While the funding pool is considerable, each municipality is responsible for creating an infrastructure plan for developing local solutions through a system of state tax incentives. Although the planned network may compete with the infrastructure of Telia and other telecommunications companies, the state's role in the provision of infrastructure is well defined; the provision of services is clearly left to market forces.

Box 4. **Regional Initiatives**

Regional initiatives, such as e-Europe and e-ASEAN, provide excellent opportunities for concerted efforts at an intergovernmental level to create an environment supportive of Networked Readiness. Regional initiatives can be particularly relevant for developing countries in the areas of infrastructure, coordinating research and development efforts and harmonization of legal frameworks. A case in point is the Southern African Development Community which has produced, in collaboration with the World Economic Forum, a consultation report on e-readiness. One of the areas where a regional effort would be beneficial is in physical infrastructure. The need for interoperability is a compelling rationale. Moreover, benefits from economies of scale can be derived from joint procurement of equipment and other products and services. Other activities that benefit from being done on a regional scale include the creation of a regional backbone as well as establishing hubs and peering arrangements.

Regional organizations like ASEAN are also excellent platforms for gaining leverage when negotiating and settling disputes with countries such as the United States. For instance, several telecommunications operators in the Asia-Pacific region have issued a statement urging U.S. operators and ISPs to share the cost of the international Internet backbone between the United States and the Asia-Pacific region. Unlike other networks, such as in telecommunications, where the cost is shared between two parties, ISPs in developing countries currently shoulder the full cost of leased lines to Internet backbones in the United States. In the past, such an arrangement may have been justified since most of the content flowing on the Internet originated from the United States. Presently however, and looking ahead, traffic flow will increasingly come from the developing countries to the United States, and as regional Internet infrastructures improve, the amount of transit routed through the United States will also decrease. Given that the cost of international leased lines accounts for the bulk of ISP costs in developing countries, no other measure that will improve affordability of Internet access other than the successful negotiation of this petition. Developing countries can avail themselves of regional organizations and multilateral settings to successfully negotiate a cost-sharing arrangement of international Internet circuits.

Outside of physical infrastructure, there are benefits from the harmonization of laws, regulations, and technical standards in regional settings. Given the increasing amount of intraregional trade that has been spurred by regional free-trade areas, harmonization of regulations would facilitate seamless e-commerce transactions and logistics between member states.

In addition, regional organizations allow developing countries to share policy experiences and research and development efforts. Currently, developing countries do not have enough expertise to guide policymakers in using new technologies to accelerate economic development. Since many countries are in a similar catch-up mode, there is great value in learning from other countries' strategies and experiences. Formalizing this learning process by conducting it in a regional setting also has cost advantages in terms of producing benchmark studies and readiness assessments. Equally important, developing countries should combine research and development efforts, rather than rely on developed countries. Developed countries, for example, cannot be expected to expend significant effort developing affordable access devices that are less powerful, since demand in their markets is oriented towards technical enhancements rather than cost reductions.

In delineating the optimal scope of regional initiatives in the digital arena, developing countries must be careful to avoid redundancies. Given the urgency of the task and scarcity of resources, it is not optimal for regional initiatives to supplant national initiatives or duplicate other activities that are taking place in a broader, multilateral setting. Neither should regional initiatives in the digital arena venture into the realm of the private sector. Commercial projects such as profit-seeking portals and industry exchanges are better left to the private sector barring a clear case of market failure.

## Content

In terms of promoting the use of networks by businesses, Canada, Norway, and the United Kingdom have notable initiatives. Canada's Ministry of Industry has ebiz.enable, which is a comprehensive online resource for guiding commercial organizations through the issues and options encountered in implementing e-business strategies. Likewise, Norway has the BIT Program, which includes twenty-two sectors and about 200 pilot companies, particularly targeting SMEs and their use of general ICT solutions. In the United Kingdom, the government has launched UK Online for Business, a major program within UK Online to help businesses succeed in new ways of working online.

Of the various ways to encourage use, promoting local content is one of the most direct and effective. South Korea, Austria, Costa Rica, Italy, and Portugal are among the countries offering the most remarkable array of initiatives designed to promote Internet use by individuals. South

Korea, for example, has launched its Ten Million People Informatization Education Program, targeting the part of the population that has not yet tapped into ICT. Austria has Circus Internet, a mobile training unit for Internet and ICT access, which started touring in June 2001 and will continue touring Austria for two years. The project is sponsored by the Federal Ministry of Science, Research, and Culture as well as by private companies. Austria also has eContent Austria, a program that consists of promotional activities for the content industry. Likewise, Costa Rica has become the first country in the world to offer all of its citizens their own e-mail account through its national portal costaricense.com. In Italy, the government provides 50 percent co-financing of libraries and multimedia centers that provide access and training to the public and are open at times other than standard office hours, such as late evening and weekends. In Portugal, the Ministry of Science and Technology has set up Access Unite to encourage access to, and inclusion of, citizens with special needs (physical or learning) in the networked economy.

Content regulation is a sensitive issue because it includes censorship and has an adverse effect on usage and consumer interest. Singapore and China are among the countries that exercise content regulation. While banning certain content is a matter of principle for government, as in the case of Singapore's ban on pornography, effective enforcement of content regulation is questionable.

Taxation of electronic commerce is also an important factor in encouraging network use by businesses and individuals, particularly for electronic commerce. A "technology-neutral" approach to electronic commerce avoids levying taxes on Internet-based electronic transactions. Thus far, the World Trade Organization has imposed a moratorium on customs duties for e-commerce transactions. It is notable, however, that this moratorium has a negative effect for developing countries that derive considerable customs duties for products, such as software, music, and movies, that lend themselves to electronic delivery.

Privacy and consumer data protection are important issues in promoting trust in the system, and trust encourages use. The OECD has launched several initiatives in this area, and of the OECD countries, Canada is particularly notable for its Personal Information Protection and Electronic Documents Act, which sets the rules for the protection of personal information and consumer data; moreover, industry and consumer representatives have also jointly developed a set of principles and guidelines for the protection of consumers conducting transactions online.

Significantly, not only do privacy and consumer data protection standards vary among countries, so does the implementation of these standards. In the United States, for instance, the government relies on industry self-regulation in the area of consumer data protection. Indeed, variations in standards and implementation cause frictions in cross-border electronic commerce and give rise to the question of whether harmonization would result in a ratcheting up or ratcheting down of standards.

### Network quality

Networked Readiness requires that the information infrastructure and associated services operate within certain quality standards to ensure the optimal functioning of the networks. Ensuring network quality requires network service and support, monitoring of quality standards, and ensuring network security.

With regard to network service and support, Australia is particularly notable for its Internet Assistance Program, a three-year joint venture between the government and Telstra. Under the program, residential users have access to a range of help services to solve Internet problems, and are provided with an Internet speed of at least 19.2 kbps per second no matter where they live. In the area of software, Australia also has a Software Engineering Quality Centers Program, which was established to improve the quality and reliability of software produced in Australia.

In terms of monitoring standards of service, Singapore offers an example of vigorous implementation. The Singapore regulatory agency requires operators to publish data each year indicating their track record in meeting standards such as speed in supplying an ordered service and in responding to repair requests and billing inquiries, and other indicators of service quality, such as the percentage of calls dropped or terminated abnormally and calls lost due to busy channels (ITU 2001:28).

In addition to promoting trust through privacy and consumer data protection policies, a country's network infrastructure must also be secure from threats such as terrorism or fraudulent activities. One of the ways to address security concerns is by using cryptography, but governments have to balance law enforcement with security of transactions. The United States is notable for its stringent cryptography policies; because of the threat of terrorism, network security for this country is, more than ever before, a top priority.

### Supporting infrastructure

Without the necessary supporting infrastructure, countries will be unable to fully capture the benefits of participating in the networked economy. The need for policies in this area is particularly relevant for developing countries with a deficient infrastructure in any or all of the four areas: electricity, postal system, customs and transport logistics, and financial payment infrastructure.

Most ICT devices, particularly computers, require electricity. As such, an electricity supply is a basic requirement for a country to be ready for the networked economy. Electrification alone, however, is not enough. It is important to ensure a stable supply in order to prevent power fluctuations that may otherwise adversely affect the functioning of ICT devices. Moreover, electricity costs have to be low or affordable enough to encourage continued use of ICT devices.

Improvements in postal systems, as well as in customs and transport logistics, are also particularly important if countries are to reap the full benefits of electronic commerce. Any gains of electronic commerce in the form of speed of transaction or costs of transaction have the potential to be nullified if the delivery of the product is impeded by problems in the postal system, such as slow delivery, theft, and difficulties returning goods through international parcel delivery. Problems in transport logistics, due to poor road, railroad, airport, and container port infrastructure, are all partly manifest in delays in parcel delivery. In addition, customs offices in most developing countries are bogged down with delays and high transaction costs due to cumbersome procedures. In the Philippines for instance, the Tariffs and Customs Code requires the following paper-based documentation for imports: sixty-nine copies of eighteen documents (Lallana et al 1999).

The benefits of electronic commerce will likewise be negated if there are no means in countries to facilitate electronic payment. This problem is most apparent in developing countries, where transactions are still done mostly through cash and checks. Even if credit card, debit card, and other cashless transactions gain popularity, countries must still address the challenge of setting up a payment gateway that facilitates the automated processing of settlements, whereby as soon as the pertinent information is sent to the bank or other settlement institutions, the payment is made to the merchant. In most developing countries, online merchants have to establish relationship with each bank separately, because the various banks are not yet able to smoothly interact with each other for online processing of settlements. This is partly because of conflicting banking systems.

Another area of the financial infrastructure that policymakers need to address is the need for identification and authentication. Developed countries are much more advanced in this regard, but even in these countries the most basic issues are still debated; that is: should certification authorities be government or commercial entities? If the authorities are commercial, should they be licensed or accredited by the government? If they are licensed or accredited, based upon what criteria? It is also notable that even when developed countries have resolved these questions, they still face problems in implementation. Finland, for instance, instituted the government's Population Register Center as the certification authority and established FINEID, an electronic identification card. But after a year, only 11,000 electronic identification cards were issued and the associated electronic services did not become popular.

## Conclusion

In the context of a global economy that is increasingly integrated, technology-driven, and knowledge-based, policymakers must craft a national ICT strategy that ensures that a country has the requisite environment for promoting Networked Readiness. The task entails ensuring that the market conditions, regulatory framework, and network infrastructure are in place to enable individuals, businesses, and governments to participate and benefit more fully in the networked economy.

In terms of market conditions, areas of attention include human resource development, access to capital markets, and promoting technological diffusion and innovation. To create appropriate market conditions, the policy framework must incorporate coordinated education, labor, trade, investment, banking, capital markets, and industrial policies.

Similarly, the legal and regulatory framework requires that in addition to the basic legal provisions for property rights and contract law, existing legislation must be renewed and complemented with provisions that reflect changes in technology as well as institutional and economic contexts. Regulatory capacity must be enhanced and due attention given to regulatory processes and the strategic use of various regulatory levers.

In terms of network infrastructure, there is considerable complexity in the range of policy options and considerations involved. But most considerations can be distilled into six infrastructure-relevant issues that policymakers need to address: market structure (extent of privatization and liberalization), pricing, universal service, content, network quality, and supporting infrastructure. These sets of policy issues have the greatest impact on the availability, affordability, and quality of network infrastructure.

Crafting the "right" environment for Networked Readiness may appear daunting to policymakers, particularly in developing countries. However, with policy guidance, the task is attainable when combined with a well-defined vision, the political will to commit the necessary resources, and the initiative to collaborate with the private sector and other key stakeholders in the development process.

## Endnotes

1. Unless otherwise indicated, examples of initiatives are drawn from the country profiles of the Organisation for Economic Co-operation and Development *OECD Information Technology Outlook 2002* (2002), the Digital Opportunity *Initiative's Creating a Development Dynamic* (July 2001), and the World Economic Forum's *Annual Report of the Global Digital Divide Initiative* (January 2002).
2. A detailed discussion of the subindex components, corresponding weights, and the strengths and limitations of the methodology, has been included in a previous chapter of this *Report*.
3. Refer to the *Global Information Technology Report: Readiness for the Networked World 2001–2003* chapter that explains the Executive Opinion Survey.
4. For more information, visit http://www.netday.org.
5. Sachs and McArthur (2001) note that catch-up growth has its inherent limits. A non-core economy's ability to narrow the income gap between it and technology leaders further diminishes with the size of the remaining divide. In order to close the income gap fully, the non-core country must become a technology innovator; in other words, it must become part of the group of core countries.
6. See Moura (1999). A good source for understanding the legal underpinnings of the dispute is an article by James Baller and Sean Stokes entitled, *The Public Sector's Authority to Engage in Telecommunications Activities*. Online. http://munitelecom.org/v1i1/Baller.html.
7. For a detailed overview of broadband infrastructure deployment in OECD countries, read Umino (2002).

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