

2.3 National Approaches to ICT

From the early 1980s, developing countries began adopting national ICT policies. This process was propelled to a large extent by the advent of the personal computer and increasing demand for related hardware and software applications. The emergence of the global network economy in the 1990s, fueled by the digitalization of telecommunications and later by the rapid expansion of the Internet, created additional impetus for a wider variety and number of developing countries to adopt national ICT policy frameworks. For many countries, these policies and strategies are not clearly differentiated from ICT sector and telecommunications policies and, in most cases, have no explicit connection with national development goals.

Developing countries' diverse ICT policies and strategies vary substantially in terms of their objectives, design and approach to implementation. Nevertheless, while the strategies pursued by each country have unique features, the role assigned to ICT can be broadly characterized in one of two ways:

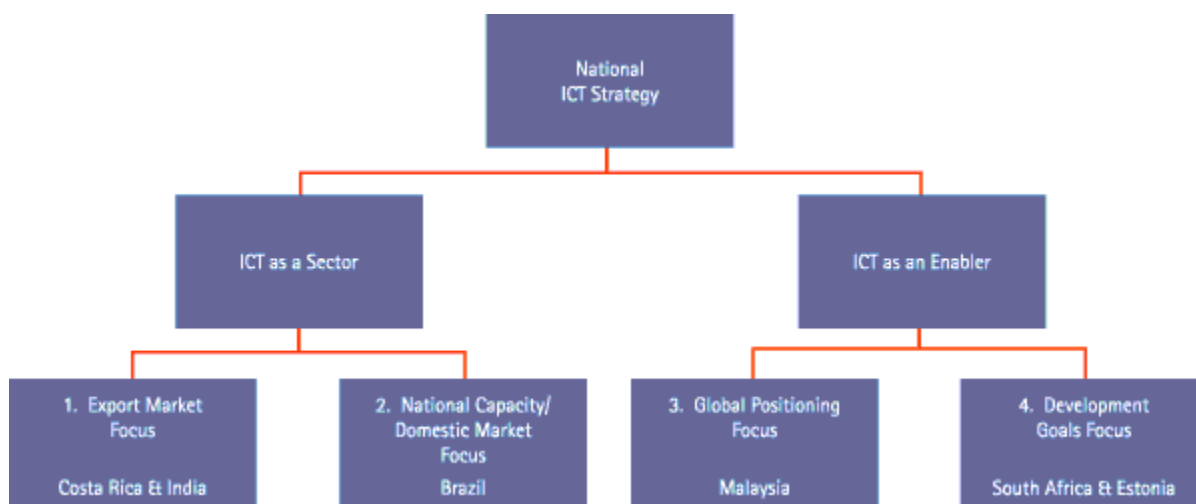
- **ICT as a Production Sector.** This involves policies which focus on the development and/or strengthening of ICT-related industries such as computer hardware, software, telecommunications equipment and ICT-enabled services.
- **ICT as an Enabler of Socio-Economic Development.** This involves the adoption of holistic, cross-sector strategies which aim to harness the uniqueness of ICT to accelerate a wider development process.

Within these two overall approaches, it is possible to discern a second tier of strategic choices, which in turn influence the particular policies and strategies adopted by developing countries (see [figure 2.1](#)).

These four types of interventions—export market focus, national capacity/domestic market focus, global positioning focus and development goals focus—are neither mutually exclusive nor necessarily complementary. But this typology is useful in helping to understand the development impact of different approaches and contributes to building a framework which can guide future efforts.

Representative country examples are presented in the following section to illustrate each of these basic types of policy and strategy interventions and to highlight the similarities, as well as differences, in terms of implementation and outcomes. The purpose of this typology is not to comprehensively describe any specific country's ICT policies, but to highlight the main focus of their approach, at a point in time, for the purposes of analysis.

Figure 2.1 The role of ICT in National Strategies: A Typology



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2.3.1 ICT as a Production Sector

The global networked economy offers opportunities for developing countries not only to respond to market opportunities in developed economies, but also to develop national capacity and create domestic spillover effects and niche opportunities for nationally-located enterprises, including small and medium enterprises (SMEs).

The following case studies illustrate these two different approaches to the development of ICT: leveraging ICT for export opportunities (Costa Rica) and as a sector—building national capacity for domestic market development (Brazil).

1. Costa Rica: Focusing on ICT as an Engine of Export Growth

Like many other Central and South American countries, Costa Rica has focused on developing its export sector and on increasing foreign direct investment (FDI) as a means of generating employment and foreign exchange. However, instead of concentrating in labor-intensive industries like some of its neighbors, Costa Rica focused its attention on the high-tech sector.

In 1996, faced with declining prices of its primary source of exports and growth, Costa Rica saw the need to develop alternatives to coffee production. The government recognized the potential of the emerging ICT sector and the importance of attracting a global corporation such as Intel to locate in the country.³⁰ Today, the Costa Rican factory is Intel's second largest for final assembly and testing of computer microprocessor chips. One-third of all Intel microprocessors used in computers around the world come from the Intel plant in Costa Rica.

Costa Rica's location vis-à-vis North and South American markets, its peaceful and stable political environment, the business-friendly policies it adopted in the 1980s,³¹ its excellent infrastructure,³² and its educated and skilled workforce have all made it an attractive location for high-tech, export-oriented firms and other IT-enabled industries. Once the success of Intel in Costa Rica was demonstrated, other major US companies followed, including consumer products maker Procter and Gamble, medical devices manufacturer Abbott Laboratories and money transmitter Western Union.

Costa Rica's export focus is being broadened to include software and IT services exports. Over one hundred software development companies currently operate in Costa Rica, employing more than 1,000 professionals and exporting to countries in Latin America, the Caribbean, North America, South East Asia, Europe and even Africa. The total exports of the six largest software development companies in 1997 surpassed US\$25 million. The target for 2001 is to export over US\$200 million. According to the Costa Rican government, "software is destined to become in the coming century what coffee represented for the Central American country for over two centuries."

A critical element of Costa Rica's approach has been a focus on education. Not only does Costa Rica have high national standards of education, it has also worked on ensuring that education institutions produce appropriately skilled workers and professionals. Given the limited number of engineers and technicians, the government has embarked on an aggressive campaign to transform the knowledge base of the country in alignment with the requirements of the high-tech sector. The *Instituto Nacional de Aprendizaje* (INA), an autonomous institution financed with public resources and private contributions, and the private *Instituto Tecnológico de Costa Rica* (ITCR) are the main providers of engineering professionals. Costa Rica has been supported in its efforts to upgrade its education system by the Inter-American Development Bank and private investor funding.

To encourage demand, computer duties were removed in the 1980s. The falling computer prices stimulated usage and Costa Rica now has one of the highest rates of usage in Latin America.

Achievements and Limitations. Intel's impact on the Costa Rican economy is indisputable. The balance of trade turned positive due to the dramatic increase in exports (20 percent annual increase). Traditional exports, such as bananas and coffee, could not create such a boost in exports and in any case were declining. The gross national product (GNP) also grew by approximately 6.4 percent and 8 percent in 1998 and 1999, respectively. In 2000, computer products accounted for 37 percent of Costa Rica's exports. This is higher than bananas at 10 percent and coffee at 5 percent, making the technology free trade zone regime the most important foreign exchange earner for the country.

This kind of export focus requires developing countries to compete with each other for limited foreign capital. Offering financial incentives can have

a costly impact on the budgets of small countries, particularly when foreign companies' operations do not create many linkages with the rest of the economy. Countries such as Ireland have experienced growth in local satellite industries around large foreign investment such as that of Intel. Although this has not yet happened in Costa Rica, the government is trying to use foreign companies' presence to spur development of domestic-owned suppliers and other satellite businesses such as software development firms.

The Costa Rican Government has launched several separate initiatives to use ICT to address developmental goals (for example, schoolnets and public access sites), but these are not integrated with the wider export promotion approach.

2. Brazil: Building National IT Capacity for Domestic Market Development

Brazil's ICT policy has been consistently focused on the development of a domestic ICT sector and market, although the mechanisms to secure this have changed. In the early phase (1980-90s), the focus was on the creation of a diversified industrial structure and the development of the technical capabilities of national firms. In more recent years, with greater liberalization of the economy, the strategy to support domestic capacity has shifted from protection to promotion. Development of the sector is taking place with a greater presence of, and collaboration with, external partners. Brazil is now poised to become a major production center for export as well as domestic demand. Brazil offers a large market, manufacturing capabilities, installed industrial base and access to other South American markets. Having encouraged the growth of the IT sector, the Brazilian Government is now moving to extend the benefits of ICT to a broader base in society.

Brazil was among the first developing countries to put in place policies promoting the development of a national ICT industry. The Brazilian ICT (principally computer) sector drew on a skilled population base, strong research and development (R&D) networks, a relatively extensive telecommunications infrastructure³³ (put in place by the end of the 1970s) and a strong level of government commitment.

Brazil's IT policy in the early 1980s came in the wake of the debt crisis, the attendant need to reduce imports and the desire to avail the country of the opportunity to expand and diversify its industrial base. Its so-called "market reserve" policy was established to create a "greenhouse" environment that could nurture locally-owned companies (for micro and mini-computers) and protect them from direct imports and competition with world industry leaders for Brazil's relatively large and fast growing national market. Domestic R&D grew because technology transfer agreements were difficult to obtain. Local firms developed their own products based on reverse engineering or in-house design. By the end of the 1980s, Brazil had attracted a set of IT corporations that brought significant local market presence and job creation benefits. Among the 50 main ICT firms involved

in hardware production, total employment increased from 43,000 in 1984 to over 74,000 in 1989. The output of local computer hardware producers grew from less than US\$200 million in 1979, to more than US\$4 billion in 1990.

However, the debt crisis also led to a decline in telecommunication services.³⁴ Partly in response, the government introduced liberalization measures in the telecommunications sector. The first step was a constitutional amendment abolishing the telecommunications monopoly. This was later followed by legislation allowing private enterprise to bid for cellular licenses. Lower prices resulted and telecommunication services were not only restored, but grew, making the expansion of the domestic computer industry more viable.

Following an initial decline in the production of hardware with liberalization, production expanded again in the 1990s on the basis of local production led by Compaq, Itautec (a national company) and IBM. Liberalization thus resulted in the computer industry being rebuilt on new terms, although based on the legacy of previously created technological capabilities. In 1997, the Brazilian PC industry produced over 1.2 million systems worth US\$2.5 billion, or 37 percent of the Latin American market. Opening up the market has also led to rapid growth of contract manufacturing in Brazil. Compaq and Epson are outsourcing their production of integrated circuit boards to Brazil. Hewlett Packard does the same for its printers.

Another development is that software has risen as a proportion of the IT industry, going from 15.7 percent in 1991 to 21.3 percent in 1997, and it is currently growing at 25 percent a year. Software production accounts for over 10,000 firms in Brazil, and for more than 200,000 jobs. Brazil is the largest "packaged software" market in Latin America. The growth of the Brazil IT market has encouraged a number of foreign software and information services firms to set up local subsidiaries for customization and various service functions, but national firms, given their previous experience and well-established user-producer relationships, were also able to find profitable niches in banking automation and R&D.

Achievements and Limitations. Thanks to the IT policy pursued over two decades, Brazil is poised today to become a major production center. Brazil offers a large market, manufacturing capabilities, installed industrial base and access to other South American markets with which it has trade agreements. Several major computer hardware firms have located regional production centers in Brazil, and this has slowly begun to attract component suppliers as well as major parts distributors and specialized contract manufacturers. Brazil has a tradition of excellence in IT-related research and a large university trained workforce that, taken together with the size of its domestic market, provide good opportunities to create both demand for and production of software and services aimed at local users.

With the current income distribution, growth of the internal market is limited and skill shortages are emerging. In addition, the focus on

developing ICT as a sector has resulted in limited impact on development goals. Aware of these issues, the government launched the "Information Society Program" in December 1999. The Program's scope includes: promoting business competitiveness, universal access for citizens, education, e-government, research and development in key technologies, local content development, and basic infrastructure deployment.

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2.3.2 ICT as Enabler of Development

Recently some developing countries have begun to stress the role of ICT as an enabler of broad-based social and economic development. Two non-mutually exclusive approaches can be pursued to carry out this strategy. The first is deploying ICT to improve positioning in the global economy. The second is using ICT to directly target the full range of development objectives.

In more detail, the following case studies illustrate these two different approaches to using ICT as an enabler of development—focusing on improving global positioning (Malaysia) and leveraging ICT to directly address social and economic development goals (South Africa and Estonia).

3. Malaysia: Positioning as a Competitive Economy

The intent behind Malaysia's Multimedia Super Corridor (MSC) has been to create a high-tech environment and infrastructure that can attract national and international investors and create spillover effects in the rest of the Malaysian economy—allowing it to leapfrog its neighbors to become Southeast Asia's leader in information technology. Its aim has been to replicate the conditions that underpinned the economic success of Silicon Valley, and also to use this as a starting point to develop spin-off applications intended to transform major sectors of the society through the use of ICT: education (smart schools, distant university), healthcare (telemedicine), government (paperless administration), commerce (electronic commerce) and manufacturing (electronic processes).

The Malaysian government was one of the first to attempt to replicate the Silicon Valley model in a developing country. In its attempt to move to the technology sector to attract domestic and foreign private investment, the Malaysian government invested in creating what was expected to be a world class physical and information infrastructure. This US\$40 billion initiative, called the Multimedia Super Corridor, serves as the backbone for the country's information superhighway. The network is supported by a high-speed link (10Gb/s network), which connects the MSC to Japan, ASEAN, the US and Europe. The network is also capable of supporting extensive public, education and business applications.

A strong emphasis has been put on the expansion of telecommunications infrastructure and the telephone penetration rate as a measurement of the

ICT readiness of the country. The telephone penetration rate rose from 16.6 percent to 23.2 percent between 1995 and 1999, while fixed lines in the rural areas rose from 5.2 percent in 1994 to 11 percent in 1999. The country aims to establish an infrastructure with 25 Internet access points, 25 mobile phones and 50 fixed lines for every 100 people within the next 5 years. In addition, other supporting infrastructure such as power, transportation, airports, office buildings and extended business areas are being developed to enhance the primary infrastructure of the country.

Beyond infrastructure, the Malaysian government provides attractive tax incentives for world-class technology-led companies to participate in the MSC initiative. And most importantly, it has launched actions to provide a well-educated work force with relevant skill levels ranging from technical to research—since the MSC implies an enormous demand for IT skills that the Malaysian society is currently unable to provide.

To address skilled labor shortages in all industries, education institutions such as the National Institute of Public Administration (NIPA) and the Multimedia University are developing curricula to better prepare the Malaysian workforce for the e-economy. In addition, to meet demands for knowledge workers, Malaysia offers unrestricted and user-friendly work permit policies for foreign knowledge workers. At the same time, the country has made several efforts to increase ICT literacy because widespread computer illiteracy among the general population is viewed as inhibiting the diffusion of ICT.

Achievements and Limitations. Malaysia has provided attractive inducements to global and local capital through the creation of strong ICT infrastructure in major enterprise zones, by improving business processes, and by providing business incentives. Its development strategy has already stimulated growth in investment and trade. In 1999, GNP rose by 5.4 percent, much faster than initially forecasted. This increase was led by manufacturing, particularly the export of ICT-related electronics—positioning the ICT sector as the economic driver of Malaysia. ICT's contribution to GNP was approximately 36.5 percent primarily from semiconductor and electronic equipment.

Nevertheless, it is too early to draw definitive lessons from the implementation of the MSC and other related programs. Observers already point to some issues that need to be faced with regard to achieving the ambitious goal of transforming the Malaysian society from a developing third-world economy into a knowledge/informational economy. The first relates to doubts about the shortage of skilled labor and ability to generate sufficient numbers of knowledge workers. Second, it is not clear that the goal of entering the knowledge society is best served by a capital intensive focus on multimedia applications, as opposed to a strategy which is more focused on extending infrastructure, increasing ICT and general literacy, and focusing on SME and government usage of ICT so as to improve Malaysia's positioning through more widespread productivity gains and deeper access to global markets for local businesses. Another concern is the

possibility of an emerging gap between the information-rich and those who do not have access to technology, notably because of the high cost of computers compared to average incomes.

Despite real determination to make Malaysia an ICT-centric economy, with the MSC being the catalyst for ICT development, there is still much opportunity for progress in bringing the real benefits of this policy to 22.7 million Malaysians.

4. South Africa: Using ICT for Economic and Social Development

South Africa's challenge after the first democratic transition was to balance sustainable economic growth with social empowerment. This is the challenge addressed by several related ICT initiatives including the South Africa IT strategy Project—how to make South Africa regionally and globally competitive and, at the same time, use ICT as an enabler of social equity.

The South Africa IT Strategy Project (SAITIS) was developed by the Department of Trade and Industry and the Department of Communication, in consultation with the private sector and other stakeholders. SAITIS has four fundamental objectives: (1) to create a robust, growing and sustainable ICT sector; (2) to increase use of ICT as an enabler for socio-economic development; (3) to create a knowledgeable and growing ICT workforce; and (4) to create a world-class culture of ICT innovation. Specific initiatives sponsored by SAITIS include: providing Internet access in schools; creating an academy for software development training; providing community Internet access points; and installing public information terminals for access to government services.

In the design of the SAITIS strategy, it was recognized that the development of the local market could act as a powerful stimulus to the ICT sector and, at the same time, could have substantial socio-economic benefits for other sectors. To achieve this, the extension of ICT usage is viewed as needing to take place in four areas—local market development, applications development, information infrastructure development, and achieving ubiquity of access.

Until now, access has been heavily concentrated in the urban commercial areas and among higher socio-economic groups. While some rich suburbs have 70 phones per 100 people, in parts of the country this statistic falls as low as 0.1 per 1,000 people—the same is true for access to PCs. An important objective of the 1996 Telecommunications Act was the promotion of universal service and affordable provision of telecommunication services.

To leverage the cross-sector benefits of ICT, the government has organized a number of ministerial clusters: Efficient Governance, Investment and Employment, Human Resource Development, Poverty Eradication and International Affairs. Each of these areas is to be addressed at the national level through the development of prioritized policies. The aim is to try to reduce the potential waste of resources and to create reinforcing strategies through coordinated deployment of resources, visible sponsorship and wider

stakeholder involvement. In addition, the government has created International and National Task Forces for ICT, as well as a Local Content and Production National Task Force within the media and broadcasting industry which will focus on the implementation of the ICT strategies generated by the taskforces.

Private and public sector firms have been involved in training and development of IT skills. For example, Telkom, has been awarded funds to build ICT skills at its training centers across the country and the Howteq training center has had funds earmarked to build capacity in software development skills. The department of education has also started emphasizing ICT in secondary schools where connectivity is available. Education curricula are being reworked to include ICT courses from early stages of learning.

Achievements and Limitations. The South African ICT sector has been able to build on a relatively good infrastructure and a small, but highly skilled, IT professional base. Software development production grew by approximately 20 percent in 1999–2000. However, most of the development has been limited to small scale local projects or within foreign-owned companies. Packaged software is 100 percent imported. R&D spending has thus far been low and there is scope for expansion, both in terms of the range of products available and the number of domestic markets which are served.

South Africa has been able to extend its base of ICT usage with the development of infrastructure and applications made available through government community initiatives, as well as by the private sector, which extended both usage as well as training to its employees. South Africa has the largest GSM market outside Europe and is ranked in the top 20 globally in terms of Internet users (despite the uneven access). The government has also increased the degree of computerization of its own operations: it has become the standard for every government official to have access to a computer and to use email to communicate with other departments. However, not every citizen is enabled to use ICT because access and technology are only available in primary and secondary towns and not in remote and rural areas. ICT education is improving in some instances but not all schools have infrastructure and computers, and even when they do, they fall into disrepair without maintenance. There is a shortage of IT-literate staff to use and maintain them.

It is not clear whether the development focus of the South African strategy has been fully translated into action on the ground. Slow progress may be due to skills, access and regulatory constraints. Approximately 25 percent of ICT-skilled workers leave the country each year; meanwhile demand is growing at 40 percent per annum. The cost of access is still high by international standards and many areas are without access at all. There is not yet a transparent regulatory regime which could facilitate the development of the telecommunications sector.

Potentially differing priorities among stakeholders also present a challenge. The multi-stakeholder taskforces are an important step in this regard, but consultation also needs to be extended to the implementation stage to ensure that initiatives are demand-driven and sustainable.

5. Estonia: Using ICT for Economic and Social Development

Estonia's focus on ICT goes beyond an attempt to position itself to take advantage of the global information economy, although that too appears to be a major determinant of its policy.³⁵ Given its limited natural resources and the declining competitiveness of labor-intensive exports, Estonia is attempting to leverage people and knowledge capital as key assets in its pursuit of economic development. Estonia also has a strong focus on using ICT to address equity—equity in access to opportunities to acquire ICT related skills, equity in addressing the needs and challenges faced by people in rural areas, and equity in terms of ensuring the right to access information.³⁶

An important element of Estonia's approach has been the heavy emphasis on building infrastructure. Connectivity was extended throughout the nation, including the remote island Hiiumaa, starting in the early 1990s. In addition, 300 public Internet access points providing free email and Internet access are expected to be in place by 2002. These will also provide places where citizens can conduct most of their transactions with the public administration. A concession agreement between foreign telecommunications suppliers and the Estonian Telephone Company³⁷ helped to ensure that connectivity in rural and scarcely-populated areas was addressed. Compared with just 7 percent in 1997, 36 percent of the population now has Internet access, either at home or at work.

The telecommunications market in Estonia was fully liberalized from January 1 2001. Increased competition in the telecommunications market since 1991 has resulted in a 50–80 percent reduction in the price of international long-distance calls, lower prices on national long-distance calls and price reductions of 50 percent for Internet connections.

Connectivity and net access have helped to contribute to economic development. Rural telecottages³⁸ supported by local and state governments help to promote economic development, education and scientific research in rural areas. Farmers from the remote island of Hiiumaa are expanding their access to markets by offering their produce on local versions of eBay. Web design firms, some in remote locations, work for clients all over the world and other national technology firms fulfill orders outsourced by Estonia's neighboring hi-tech giants in Finland, Norway and Sweden.

Estonia has become a country where mobile phones are manufactured, not just used. Local entrepreneurship has produced some major new companies including Microlink, the largest IT company in the Baltic states. To gain access to relevant regional and global markets, Estonia has leveraged its location at the crossroads of Eastern and Western Europe and its strong

historical ties to the Nordic countries, which are leaders in the use and manufacture of ICT products.³⁹

To meet the growing demand for ICT workers, university curricula are being adapted to adequately prepare students with relevant and practical skills. A new IT college was established in September 2000. Two universities, a number of polytechnics and many training companies also provide basic and specialized education in information technology. The Estonian government has also initiated a number of programs, including the innovative Tiger Leap Program,⁴⁰ to increase computer literacy in schools. As a result of Tiger Leap, the generation of Estonians currently in school is 100 percent computer literate—every school in Estonia is now connected to the Internet. The Tiger Leap Program also trained school teachers in computer skills and sponsored the design of special educational software packages, especially in the sciences. Associated with Tiger Leap is the annual "Tiger Roadshow" which is aimed at spreading the reach of Internet access and computer literacy, especially among people who have not had a chance to use computers in school or at work and older Estonians.⁴¹

ICT has also been used to make government more transparent and efficient.⁴² From late 2000, cabinet ministers were able to read proposed laws, make comments and suggestions, and carry out votes online. Real audio broadcasts and full-text transcripts of parliament sessions are posted instantly and almost all government documents can be accessed online by ordinary citizens. In May 2000, the government approved the "Estonian Healthcare Project 2015," a key component of which is the use of ICT to achieve efficiency gains.

Achievements and Limitations. When Estonia started its ICT program in the early 1990s, the infrastructure was old and inadequate. Ten years later, Estonia boasts a modern telecommunications network and a computer literacy rate higher than many of its Western European neighbors. Toomas Hendrik Ilves, the Estonian Minister of Foreign Affairs, points to "a combination of well-designed concession agreements with foreign telecommunications operators, clear government support for a broad e-readiness program, aggressive public awareness-raising, and governmental commitment to the digital revolution (particularly in education and e-government) as being the factors making for Estonia's successful adoption of ICT to both position the economy, but also to address selected development goals."

Estonia's approach is not without its constraints. Despite the investment in human capability, educated Estonians are continuing to leave the country to pursue employment abroad. Until this is reversed, skilled labor shortages threaten to become a bottleneck in the development process. In addition, there has been some discord between Estonia's emphasis on both global positioning and addressing specific development goals. The focus on competitiveness and the associated adoption of liberalization policies is having a social cost (reflected in a declining human development index) that ICT alone has not been able to abate. Additional attention should be given

to using ICT to ensure vulnerable and disadvantaged communities are not further marginalized by liberalization policies.

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2.3.3 Lessons Learned from National ICT Approaches

Having reviewed five case studies illustrating the different types of focus for national ICT strategies—export, national capacity, global positioning and development goals—as well as the experiences of other countries (see Appendix 3), the following section assesses each approach and derives some general lessons about how ICT can best address development goals.

Key Lessons About Strategic Focus

1. An export focus can produce economic growth, improve balance of payments and reduce dependence on traditional commodity exports. An ICT-related export focus has had a positive impact on the balance of payments and GNP of some developing countries. In Costa Rica, ICT accounts for 38 percent of exports (mostly Intel) and contributed to a major increase in GNP. Costa Rica also leveraged the high profile investment from Intel to entice other ICT firms, such as Acer and Microsoft, to invest. In India, the focus on software exports has also borne fruit—software exports have been increasing by over 50 percent per annum since the early 1990s. A 1999 Nasscom-McKinsey report estimates that by 2008, there will be 2.2 million additional jobs created, that foreign investment will rise to US\$5 billion and that software will account for 7.5 percent of India's gross domestic product.

2. An export focus tends to have a limited impact on the development of national infrastructure and capacity. Since the focus is on the lucrative, already developed external markets, there is no immediate incentive to focus on the infrastructure needs of the domestic market, despite its being limited by market failure or under-development. For example, India's concentration on the export-oriented software industry meant that the primary focus was on ensuring good external connectivity and incentives for enterprise (secured through the software park scheme). Improvement of domestic infrastructure and reduction in access charges, which would have helped to expand the domestic market for ICT, was not a priority.

3. Gains from an export focus do not automatically translate into broader development gains. In Costa Rica, most of the inputs used are imported and there are few backward and forward linkages with the rest of the economy. This is often the case with assembly operations, although it is

not inevitable. Under the export focus approach, developing countries are forced to compete with each other for the same limited supply of capital. The pressure to offer competitive financial incentives to draw in such investments can take a toll on the public budget of smaller countries if not offset by rising growth and revenues.

4. A national capacity focus may fail to achieve the full potential benefits from the use of ICT. If a national ICT sector develops without being subject to competitive pressures, incentives for the adoption of cutting edge technologies can be lost. In addition, lower costs typically associated with ICT may not be passed on to users, inhibiting the expansion of ICT demand and deployment. This was the case in both Brazil and India in the first phase of their ICT sector development.

5. A national capacity focus creates diversified producer capabilities. Unlike the case of an ICT export sector, a national ICT capacity focus is more likely to lead to the development of local technical capabilities, spare parts production, component supplier networks and other linkages. As Brazil's experience shows, these developments can help to facilitate the diffusion and deployment of ICT more broadly.

6. A national capacity focus has the potential to be more adapted to local needs. A national capacity focus leads to research and development into and domestic production of ICT goods and services that are more likely to be tailored to local needs, and also to result in better user support and after sales service. Moreover, if already competitively priced, there is the added benefit that equipment prices will be buffered from adverse changes in the exchange rate. Brazil's real devaluation in 1999 increased prices of imported computers by 40 percent, but prices of local products remained relatively stable.

7. A national capacity focus may facilitate the achievement of development goals in the long term, but the impact is indirect and limited in scope. A strategy that is focused on developing capabilities in the national ICT sector may lead to an increase in jobs and enterprises created both directly and indirectly. It may also facilitate a higher level of deployment of ICT in areas that have an impact on development imperatives. However, to the extent that the main focus is the ICT sector, the spillover effects may be limited and development goals addressed only indirectly or in the long run.

8. A global positioning focus is essential to the long-term economic success of developing countries in the global network economy. As opposed to a national capacity focus, a concentration on the deployment of ICT to improve global positioning allows countries to use ICT to make the overall investment climate more attractive and to facilitate increased competitiveness in sectors and products in which the country may already have, or can create, a competitive advantage. Malaysia and Singapore have deployed ICT-enabled strategies to increase their global and regional

positioning. They have seen dramatic increases in foreign investment as a result of adopting this strategy.

9. A global positioning focus may fail to meet certain specific development goals. While global positioning is essential for countries to realize opportunities in the global economy, it does not necessarily translate into gains for the population, particularly vulnerable and disadvantaged groups. Moreover, a focus on such positioning needs to be supplemented by the use of ICT to achieve specific development objectives, such as improving the competitiveness of SMEs producing for local or external markets. Malaysia's focus on global positioning has allowed the country to achieve substantial economic development gains. However, the level of social development has not progressed at an equivalent rate.

10. A development goal focus allows countries to achieve both broad-based economic growth and specific development goals. Strategies that focus on development goals typically involve the adoption of comprehensive approaches to integrate ICT into broader development strategies, thereby gaining from the synergies between different elements of a holistic approach to development. In the case of Estonia, the national ICT initiative, Tiger Leap, had a dramatic effect within a single sector—improving access and content in schools—and also a spillover effect in other sectors, such as health, banking and public administration, which have realized the importance of the role ICT can play.

Two overall conclusions can be drawn from the lessons about strategic focus: **First, although not all countries can benefit from a focus on developing ICT as a sector, all can benefit from using ICT as an enabler.** Countries that launched national policies to support ICT as a sector based their efforts on local comparative advantages that included relatively advanced technical and human capabilities, basic telecommunication infrastructure, and substantial R&D investment, in addition to which, they offered large incentives to national or foreign direct investors. In some cases, such as Brazil and India, it took over 10 years to create an internationally competitive ICT sector and the impact on development goals was not immediate or direct. This suggests that promoting ICT as a sector might not be the best or most viable option for all developing countries. However, by focusing on ICT as an enabler, all countries can, in principle, achieve a degree of success by directly incorporating ICT into their existing development strategies and goals—for example, to address poverty or health and education. If local conditions are suitable, within the context of an enabler strategy, countries can also try to develop a competitive ICT sector.

Second, a focus on development goals places development at the core of the strategy and ensures a more broad-based diffusion of the benefits of ICT. When ICT as a sector is taken as the focus of the ICT strategy, there are some development gains. Principally these take the form of an increase in jobs, gains to enterprise development, enhancement of domestic capabilities and some spillover to other sectors—such as demand

for the products of other sectors and supply of ICT goods. The development gains are potentially higher when the focus is on building domestic capacity as opposed to an export focus. When ICT is used as an enabler, the gains for development are potentially higher still. An ICT as enabler strategy focused on global positioning does not directly address development imperatives, but it is necessary for countries to position themselves to leverage the social and economic development opportunities associated with the global economy. Making development goals the primary focus has greater impact than any of the other three strategies in isolation because it ensures that the latter are aligned with meeting development goals.

Key Lessons About Implementation

This section outlines some lessons from national experience about how to implement ICT strategies to ensure development goals are met. These issues will be discussed in more detail in Section 3 where a more comprehensive framework for action is introduced.

1. A comprehensive and holistic approach is the most effective way to benefit from synergies and ensure the impact of ICT deployment is optimized. Even with India's explicit software sector export focus in place since the 1970s, it became clear that a number of related factors needed to be addressed if the strategy was to be successful. Despite the abundant supply of English-speaking, skilled IT professionals, it was only when competitive international connectivity and enterprise incentives were put in place that software production could really take off.

Adopting an ICT as enabler strategy often demands a more comprehensive approach because there is a need to go beyond the requirements of a single sector and to facilitate a more general deployment of ICT. In the case of South Africa, development-focused ICT deployment could not go beyond micro-level initiatives until the central and state governments recognized the need to address infrastructure, access, local language content, SME support and e-government.

The main components that are important for an ICT strategy to address—with some variation in range and scope depending upon the focus of the strategy⁴³—are:

- *Human capacity*—specifically the creation of knowledge or technical workers—is important for both the production and use of ICT.
- Creating a favorable environment for *enterprise* such as through tax and trade policies is instrumental in stimulating foreign and local investment in ICT.
- *Infrastructure* development, particularly global connectivity, is a prerequisite to leveraging the benefits of the global economy, improving domestic productivity, and attracting foreign investment.

- A transparent, inclusive and open stance on *policy*, especially in telecommunications, is associated with increased enterprise activity, additional foreign direct investment, and improved infrastructure deployment.
- *Content and applications* that specifically address the development needs of the population generate greater demand and positive multiplier effects from ICT adoption.

Although each of these components produces benefits, because they are interrelated, they work better if addressed together as part of a coordinated strategic approach.

2. There is a need to recognize the roles played by different stakeholders and to support strategic partnerships. The country studies indicate that success depends on the contributions of a number of different actors, especially in areas such as infrastructure and human capacity development. The ICT as enabler strategy requires coordination and involvement from a wide range of interested parties, a process facilitated by visionary leadership and mechanisms to promote broad-based participation. This can take the form of formal taskforces (South Africa) or public-private partnerships (Brazil), and should include the local level to ensure that initiatives are demand-driven and implementation incorporates bottom-up approaches.

3. Global, national and local linkages need to be leveraged. The country studies demonstrate that national strategies are critical to using ICT effectively for development goals, but there are significant limitations to what a single country can accomplish on its own, even when it takes advantage of all the opportunities within its control. There needs to be coordination and partnerships, not just at the national level, but also at the global level to bring together developed and developing countries, multilateral institutions, civil society and the private sector to assist developing countries—particularly the least developed—in leveraging the potential of ICT to address development goals.

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2.4 Making the Case: Conclusions

[Section 2.2](#) (ICT for Specific Development Goals) demonstrates that ICT is already having a powerful and direct impact on achieving specific development goals in diverse communities in five key areas: health, education, economic opportunity, empowerment and participation, and environment. [Section 2.3](#) (National Approaches to ICT) widened the lens to reveal how national ICT strategies are enabling developing countries to generate export-led economic growth, strengthen national capacity and

reposition themselves in the global economy—while simultaneously, in some cases, addressing broader social and human development goals. The case studies in this section strongly suggest that in order to maximize the impact of ICT on development goals, it is important that national strategies have an explicit development focus.

The initiatives profiled in this study—and the resulting lessons learned for development policy and implementation—suggest strong linkages between direct ICT interventions and national-level programs that deploy ICT as an enabler of development. In addition to the direct and powerful impact these initiatives can have on specific development needs, they have the potential to contribute to the success of, and should therefore be aligned with, a development goal-focused national strategy.

The decisions to be made by developing countries and communities are not easy or simple. A framework for deploying ICT for development is needed to prioritize ICT interventions, identify synergies, maximize development impact and coordinate the actions of stakeholders. The framework in [Section 3](#) draws on the empirical evidence available and from the analysis developed in this section. The objective of the framework is to assist developing countries and communities to embark upon bold strategies to harness the power of ICT for the benefit of all members of society.

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Appendix 3 National ICT Approaches: Selected Case Studies

Brazil

Building on a legacy of technological capabilities and an early emphasis on ICT infrastructure, Brazil is positioning itself to participate more fully in the global network economy. The Brazilian Government has emphasized controlled privatization and deregulation in order to provide the business sector with an environment in which it can grow and adapt quickly to the changing economic and business climate, while at the same time still be subject to competition. The recently-launched Information Society Program is a first step in making technology-based services and job creation available to every citizen. Public-private partnerships are helping to identify innovative solutions to overcome barriers to universal access, such as the high-cost of personal computers and lack of financing options for low-income citizens.

Policy: Brazil began its pioneering approach to leveraging ICT for development in the 1980s, when it began implementing policies to promote the development of national enterprises in selected segments of the

computer industry. By the end of the decade, a set of diversified IT corporations with significant presence in the local market had been built.

In the 1980s, a so-called market reserve policy was established to create a "greenhouse" environment to nurture locally-owned companies and protect them from import competition attracted to Brazil's relatively large and fast-growing market. This policy initially focused on mini-computers and was later expanded to include micro-computers. By restricting technology transfer agreements, the government encouraged companies to undertake R&D locally. The government also restricted the importation of technology when local capabilities were available, so local firms developed their own products based on reverse-engineering or in-house design.

As the country proceeded to building on this strong base of technological capabilities and infrastructure, the 1990s brought accelerated growth in the ICT sector. The government began abandoning protectionist policies and opening its economy. The first step was a constitutional amendment abolishing the telecommunications monopoly, followed by legislation to allow private enterprise to bid for cellular licenses. This process of privatization and deregulation resulted in dramatic improvements in the quality, service and price of phone services. In 1995, Brazil opened the telecommunications sector to private investment, and also announced a plan for achieving open Internet services in the country.

Infrastructure: Although the network infrastructure in Brazil has been developing rapidly in recent years, it is still very uneven in scale and scope. The relatively high levels of public sector investment in telecommunications undertaken by *Telebras*, a public holding company, during the 1960s and 1970s, had come to a standstill by the 1980s as the state reduced spending in order to meet payments associated with the debt crisis. This under-investment was reversed in the 1990s by privatization and deregulation policies that led to rapid development of the ICT infrastructure. However, access to this infrastructure was not advancing at the same pace. *Ehile*, the Brazilian business triangle—that includes São Paulo, Rio de Janeiro, and *Minas Gerais*—has high-capacity fiber, virtual private networks, and bandwidth on par with that of the United States and Europe. Much of the countryside, on the other hand, has no access at all.

Through its Universal Access Plan, the government is seeking to subsidize the provision of infrastructure to geographically complex and low-income areas. Last year, Brazil's postal service also launched *Porta Aberta*, or Open Door, a project that gives the public free access to Internet kiosks, but only in selected post offices in São Paulo and Rio de Janeiro.

Enterprise: The establishment of open and free-market policies has contributed to the creation of a business-friendly environment. FDI reached a record US\$30 billion in 1999 and was expected to climb by another US\$30 billion in 2000. Most of the investment has been channeled into telecommunications. The attempt to influence ICT development through tax breaks has resulted in a five-fold increase in R&D in just two years. In

addition, Brazil's participation in free trade agreements like MERCOSUR has opened up the country's access to other markets. Brazil is poised today to become a major production center. It offers a large market, manufacturing capabilities, installed industrial base and access to other South American markets. Several major computer hardware firms have located regional production centers in Brazil, and this has slowly begun to attract component suppliers as well as major parts distributors and specialized contract manufacturers.

Human Capacity: Due to low levels of general literacy and the prohibitive cost of computers, computer literacy skills are below target levels. As such, technology training and skills development are priority areas for the Brazilian government. The Information Society Program allocates funding for the expansion of Internet infrastructure, the interconnection of all public libraries, and the creation of thousands of community access centers throughout the country. It is expected that the availability of ICT, in conjunction with relevant IT training programs and the availability of new low-cost computers will inevitably promote more technology users among the general population. The shortage of IT knowledge workers also poses a challenge, and is an area on which Brazil will need to concentrate further in order to continue its development progress.

Content and Applications: The private sector has played an important role—providing affordable Internet access and relevant Portuguese content to meet local needs. Brazil's biggest online service, UOL, boasts 5.1 million registered users accessing its 19 million pages from more than 100 Brazilian cities. UOL is the most visited Portuguese language site and enjoys an audience that establishes it as one of the most frequently visited sites in the world—surpassing sites like Disney and CNN.

Recent collaborative efforts have produced innovative and successful applications in electronic commerce and e-government. In December 1999, the first online coffee auction was held for 10 high-quality Brazilian coffees. While Brazilian coffees are normally sold at prices below the New York benchmark price, the auctioned coffees commanded an average price of 73 percent higher than the benchmark. A similar joint venture between a maker of household cleaning products and the country's leading free email company is offering web access through computer kiosks in supermarkets. Government has promoted Internet-based applications as well; eight out of ten people received income tax forms through the Internet in 2000.

Strategic Compact: Strategic collaboration between public and private sector organizations has been instrumental in Brazil's Information Society Program and other specific initiatives. For example, international computer manufacturers such as IBM, Hewlett-Packard, Compaq and Acer stand to gain substantially from a government program to increase PC penetration with the development of a prototype for low cost PCs (US\$200-250 per PC). Indeed, the low-cost PC formula is a result of a study in which all the major computer companies participated on how to reduce the cost of PCs in Brazil.

To support the program, the government will provide loans to lower income households to purchase the computers.

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Costa Rica

Costa Rica is pursuing a strategy focused on using ICT as an export engine, and it attributes much of its current economic growth—8.3 percent of GNP in 1999, the highest in Latin America—to that strategy. The country's political stability, democratic tradition, and emphasis on the health and education of the population, have all contributed to relatively high standards of living. Costa Rica's experience demonstrates that when a country has the right mix of skills, infrastructure and enterprise, it can find attractive niches in the global economy. Costa Rica has developed itself into a viable location for high-tech industries by providing not only an educated population and prime geographical location, but also by demonstrating the success stories of Intel, Microsoft and others. To continue this ICT-led progress, the government is taking action to build technological skills in the population, develop strong partnerships between government and business, and further upgrade the already good telecommunications network.

Policy: Costa Rica's telecommunications policy has been to maintain a national regulated monopoly. The *Instituto Costarricense de Electricidad* (ICE) is responsible not only for electricity and basic phone services, but also for high-level Internet access. ICE has achieved great success in networking the whole country with telephone lines, converting Costa Rica into one of Latin America's most densely networked countries. The International Telecommunication Union reported that, in 1999, Costa Rica had the highest number of telephone lines per person in Latin America—with the exception of Uruguay—including the leader in market privatization, Chile. Costa Rica's telephone penetration rates are much higher than in neighboring Central American countries.

ICE has performed well in providing basic telecommunications infrastructure and services, but it may not be the ideal arrangement for Costa Rica moving forward. ICE has lagged behind in the provision of adequate remote telecommunication services. Some indicators suggest that the deficit is approximately 100,000 phones, representing 50 percent of the total demand.

Other ICT and trade policies have helped Costa Rica to position itself in the high-tech industry. Incentive policies and programs include Free Trade Zone law and duty free export of products to the US, Mexico and Central America, and reduced duties to the European Union.

Infrastructure: Costa Rica has invested in establishing one of the most advanced network infrastructure in the Caribbean Basin, enabling easy access to ICT for the general population. This infrastructure provides a highly reliable electricity supply and a modern telecommunications network. The latter includes direct dialing to any part of the world, cellular telephone systems, data transmission and facsimile facilities, using both satellite and microwave links. In 1997, 684,600 telephone lines—18 lines per 100 inhabitants—and 65,471 cellular lines—1.7 cellular lines per 100 inhabitants—were in place. Currently, one in five people has a telephone line, which means that virtually every household owns a telephone. This is radical progress when compared with neighboring Central American countries where, on average, one in 20 people has access to a phone line. Progress still needs to be made on Internet access—only approximately 100,000 Costa Ricans, or 2.8 percent of the overall population use the Internet—though this is still relatively high when compared to neighboring countries.

Enterprise: Costa Rica has managed to create one of the most attractive investment environments in Latin America for the development of high-tech industries. According to the Minister of Foreign Trade (COMEX), foreign direct investment in Costa Rica is currently US\$530 million per annum, or roughly 5 percent of GNP, as compared with US\$480 million in 1997. Success in attracting reputable enterprises and entering new global markets, particularly in high-tech, is the result of a concerted effort by Costa Rica to do so. Costa Rica's unique characteristics—its strategic location, political stability, business incentives (including free trade zones), supply of human capital—and its proactive promotion of these assets—have all contributed to investment by high-tech companies in the fields of power technologies, systems integration technologies and call centers. Since 1995, 32 foreign electronics firms have located plants in Costa Rica. These firms include Intel, Microsoft, Lucent Technologies and Siemens.

In 1999, computer microchips (mostly Intel) accounted for 37 percent of Costa Rica's exports, compared to bananas at 10 percent and coffee at 5 percent. The balance of trade turned positive due to the dramatic increase in exports (an increase of 20 percent per annum). In addition to the export revenues, Costa Rica has achieved generous pay and stock options for workers, and new standards of efficiency and safety that are being emulated by other local businesses.

There are also continuing opportunities for growth and expansion of franchising within Costa Rica. Entrepreneurs, both corporate and individual, appreciate the established business systems and proven track record that selective franchises offer. Franchising is viewed as a way of entering the free market without necessarily possessing extensive knowledge of an

industry. The Internet is the primary source of information for local franchisees about potential new franchise opportunities. Approximately 4,000 Costa Ricans are employed by various franchises.

Human Capacity: Costa Rica has built on its legacy of supporting an educated population by continuing to build the educational system and emphasize the presence of IT in the curriculum. A tremendous effort has gone into ensuring that education facilities produce appropriately skilled knowledge workers and professionals to contribute to the development of Costa Rica. As early as 1974, the Costa Rican government used Inter-American Development Bank financing to expand the Costa Rican Technological Institute (ITCR) into what has become one of Latin America's most advanced computer science and software engineering schools. The government's dedication to an educated population is also exemplified in the redistribution of expenditures from defense funding to education funding. The results of this effort are easily discernible. In 1999, the illiteracy rate was below 3.5 percent and 18.5 percent of the active population had completed university, technical and para-university studies.

Content and Applications: To expand ICT use, the Costa Rican government is creating and providing relevant and up-to-date content on the Internet. One of the best examples of this effort is costaricense.com, the recently launched national portal, which made Costa Rica the first country in the world to offer all of its citizens their own email account in a centralized system. The portal also offers access to a wide range of government services, general information and e-commerce applications, including promotion of the eco-tourism industry.

Strategic Compact: Costa Rica attributes much of its recent economic growth to the widespread adoption of ICT. Among the reasons this has occurred are strong political vision, leadership and determination to allocate part of national budget to the development of ICT. Through presidential leadership, the country also actively courted and secured large-scale investments from several multinational corporations.

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Estonia

When Estonia regained independence in 1991, the government embarked on an ambitious project to bring the nation into the digital age. Estonia premised its IT strategy on providing broad-based connectivity, providing

access to technology and information as a right, and on leveraging its human resources to expand economic growth. Today, Estonia boasts one of the most modern telecommunications networks in Europe, low connectivity costs and high rates of computer literacy, even by Western European standards. Twenty-eight percent of Estonia's population is connected to the Internet. Estonia's strategic investment in wiring the entire country has led to an explosion in ICT applications in banking, education, health, transport and public administration. Notwithstanding the recent economic slowdown, Estonia's period of independence has been characterized by significant improvements in living standards, in large measure because of its increased participation in the global network economy. Estonia also has been able to coordinate the efforts of dozens of associations dedicated to furthering the country as a whole, as well as its development as an information society.

Policy: Through a progressive de-monopolization of the telecommunications industry—mostly through the liberalization of the wireless sector—a more aggressive and diversified approach to the advancement of ICT-related solutions has emerged. These varied options—combining wireless, lease lines and fiber-optic networks—allow for a sustained roll out of infrastructure and improved rural connectivity. Cooperation among neighboring countries including Finland, Sweden, and Germany aims at establishing legal and regulatory frameworks for the development of long-distance telecommunications, postal services and broadcasting, consistent with free market economy principles and harmonized with the standards of the European Union.

Infrastructure: Estonia has one of the highest degrees of connectivity in Europe and ranks among the top 20 countries worldwide for teledensity as a result of the tremendous focus placed on the development of a core network infrastructure and provision of access to the general population. This was accomplished through a concession agreement with the Estonian Telephone Company. The company helped to ensure connectivity in rural and scarcely populated areas in return for lucrative urban contracts. The government is actively extending connectivity throughout the nation. By 2002, Estonia will have 300 public Internet access points providing free email and Internet access. These points will also serve as e-government access points where citizens can conduct the majority of their transactions with the public administration. Through another initiative, known as Tiger Leap, all of Estonia's schools have been connected to the Internet. Compared with just 7 percent in 1997, 36 percent of the population now has Internet access, either at home or at work. Estonia has demonstrated how leapfrog technologies can be employed effectively: 40 percent of the Estonian population is already utilizing GSM services. Estonian mobile operators were among the first in the world to introduce WAP services to their customers.

Enterprise: Estonia has placed strong emphasis on reform, embarking on an ambitious program of deregulation and privatization that has made it a highly attractive destination for foreign investors. This has resulted in a rapid transformation to a market economy and substantial inflows of foreign

direct investment. Currently, Estonia is one of the largest recipients of foreign direct investment in Central and Eastern Europe—ranking third in investment per capita behind Hungary and the Czech Republic.

Estonia has become a country where mobile phones are not only used, but manufactured. To gain access to both global and local markets, Estonia leveraged its location in the Nordic region (gateway between the East and West) and its historically close ties to its Nordic neighbors, who are the world's leaders in the use and manufacturing of new information technology products. This enabled the country to integrate itself into the supply chains of its Scandinavian counterparts as an initial step to gaining access to the international market. This coordinated effort has also helped Estonia to develop its national infrastructure. Local entrepreneurship, which is also helping to grow the Estonian economy, has already produced some major new companies, including Microlink, the largest IT company in the Baltic states. However, lack of capital is still a significant barrier to local enterprise and wealth creation.

Human Capacity: Emphasis on building a strong education system has been a critical success factor in Estonia's development. The country now boasts a highly educated and skilled workforce, with nearly 45 percent of all citizens pursuing tertiary education. To meet the demand of the growing ICT workforce and to provide an ample supply of knowledge workers, a strong emphasis has been placed on ensuring that university curricula adequately prepare students with relevant and practical skills. This has resulted in technology users who are highly adaptable to technology change. As a result of the Tiger Leap initiative, the generation of Estonians now in school will be 100 percent computer literate. Teachers are enthusiastically reporting that students are highly motivated to learn computing, both out of personal interest and because they know it will lead to better job opportunities.

Content and Applications: Estonia's high level of connectivity and ICT use are a direct consequence of the active efforts by players from multiple sectors to provide relevant content and applications. Telecottages, sponsored by regional governments and community groups, are providing rural areas with rich sources of information and opportunities to develop ICT skills and leverage new economic networks. Farmers from the remote island of Hiiumaa are expanding their access to markets by offering their produce on local versions of eBay. The government is introducing smart cards in 2001 to facilitate applications in public administration, hospitals, public transport and public telephones. The Internet is also being used extensively to deploy e-government and e-banking functions: over 280 public services are now available online, and 80 percent of commercial banking transactions are conducted via the Internet.

Strategic Compact: Estonia is a country with limited natural resources that depends heavily on its people and knowledge capital. Progress required coordination and commitment from a broad coalition of stakeholders including government, enterprise, and civil society. In this respect, four

strategic levers have been crucial: encouraging ICT providers to support rural development through concession incentives; forging strategic "win-win" agreements with Nordic telecommunications companies; de-politicizing the computerization issue by channeling government investments through an NGO; and a professional and aggressive marketing campaign waged by the government to encourage demand.

Strong presidential vision and leadership has been instrumental in encouraging and coordinating this broad-based commitment. ICT for development strategies are still fairly new, yet with the right leadership, Estonia has achieved significant progress through this approach. The country is effectively increasing use of ICT across a number of sectors, including government and education, rather than simply trying to position for ICT-related production or for outsourcing of ICT services.

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India

A spate of reforms—post-1991 economic crisis—have given impetus to the Indian economy, particularly to the ICT sector. As part of the reform agenda, the Indian Government has taken major steps to promote ICT including the creation in 1988 of a World Market Policy, with a focus on software development for export; telecommunications policy reform; privatization of the national long-distance and mobile phone markets; and development of a more comprehensive approach to ICT. Although India's success is commanding increasing attention and investment, it has yet to result in the distribution of social and economic benefits across a broader base of the population. Challenges—including the perception of an unfavorable regulatory climate, an overloaded judicial system, poor infrastructure and costly access, and limited use of ICT—remain. The emerging shift in government strategy, toward knowledge-intensive services, has created a climate more conducive to addressing enterprise, domestic infrastructure, education and the use of ICT to meet development needs.

Policy: India's focus on self-reliant industrialization in the 1970s and 1980s has been replaced with reforms aimed at positioning India in the world economy: the foreign direct investment process has been streamlined, new sectors have been opened up to foreign direct investment and ownership, and the government has exempted the ICT industry from corporate income tax for five years. These reforms have helped India to become increasingly

integrated into the global economy through growth in the export of software and skill-intensive software services, such as call-centers.

In 1986, the Indian government announced a new software policy designed to serve as a catalyst for the software industry. This was followed in 1988 with the World Market Policy and the establishment of the Software Technology Parks of India (STP) scheme. As a result, the Indian software industry grew from a mere US\$150 million in 1991-1992 to a staggering US\$5.7 billion (including over US\$4 billion worth of software exports) in 1999-2000—representing an annual growth rate of over 50 percent.

The establishment of the Telecommunications Regulatory Authority of India (TRAI) was a key step towards effective implementation of telecommunications reforms. In 1992, the mobile phone market was opened up to private operators, in 1994 the fixed services market followed, and finally in 1999, national long distance operations were opened to private competition. Prior to these reforms, the Department of Telecommunications had been the sole provider of telecommunications services.

In addition, to attract foreign direct investment, the government permitted foreign equity of up to 100 percent and duty free import on all inputs. Government-created technology parks also offered professional labor services to clients, a cost-effective program for India since ICT labour is so inexpensive by global standards.

Infrastructure: Teledensity in India has reached 3.5 percent of the population. Approximately 1 percent of households have fixed line connections, compared to 10 percent in China. The mobile sector has approximately 3 million users, growing at 100 percent per annum, and is expected to outstrip the fixed line market in the near future. The number of Internet accounts is around 1.5 million, growing at 50 percent per annum. India also has very high penetration rates of terrestrial TV, cable and radio. Voice and data wireless solutions, for both domestic and export markets, are increasingly produced and used locally.

Access to telephones in Indian villages has improved in the last five to six years through the introduction of the Public Call Office (PCO) run by local shopkeepers. More than 60 percent of the villages in India have at least one phone. This also includes over 800,000 Village Public Telephones (VPTs). Worldtel is undertaking a pilot in four states to secure financing to upgrade the Village Public Telephones so they will soon be Internet-accessible.

In some urban locations, India's Software Technology Parks (STPs) provide infrastructure, buildings, electricity, telecommunications facilities and high-speed satellite links to facilitate export processing of software.

India also has a number of progressive computerized networks in place, including a stock exchange, the Indian Railways Passenger Reservation

System, and the National Informatics Centre Network (NICNET), which connects government agencies at the central, state and district levels.

Enterprise: India's well-established framework for protecting intellectual property rights has been an important inducement to business investment: well-known international trademarks have been protected by Indian laws, even when they were not registered in India. In 1999, major legislation was passed to protect intellectual property rights in harmony with international practices and in compliance with India's obligations under TRIPS.⁸⁶

Much of the initial domestic demand stimulus for ICT and ICT services industries in India has come from government: 28 percent of total IT spending to date can be attributed to government and public sector expenditure. Major areas of government expenditure include: financial services, taxation, customs, telecommunications, education, defense and public infrastructure. As a result of the growth in ICT use in India, the ICT industry itself has also increased its domestic economic activity, for example, a number of ICT companies have developed accounting and word processing packages in Indian languages. The potential impact of this growth on the domestic economy is much broader than developing software for export only.

Human Capacity: In spite of relatively low literacy rates among the general population, India has several key advantages in human capital: a large English-speaking population and world-class education, research and management institutions—a direct result of investment in self-reliance in science and technology. In addition to establishing Indian Institutes of Technology in various cities around India to create a large pool of technical skills, the government has a computer policy to encourage R&D in personal computers. The IT training sector continues to grow at a rapid rate: total training revenues in 1998 were estimated at US\$225 million, 30 percent up on the previous year. However, one of the biggest challenges to the Indian software industry remains the difficulty in attracting and retaining talented professionals.

Content and Applications: India has a large population with great linguistic diversity. Creating and maintaining locally relevant content for a country with 418 languages is a challenge. Nevertheless, local language content is slowly making ICT more relevant and accessible to a broader cross-section of the population. For example, India's Center for Development of Advanced Computing has recently launched a scheme called iLEAP-ISP to create a free multilingual word processor to be made available to all Internet subscribers. On other fronts, some states such as Tamil Nadu have launched their own initiatives to support the standardization of local language software through interface programs that can be adapted to word processors, dictionaries, and commercial keyboards for use in schools, colleges, government offices and homes.

An emphasis has also been placed on the development of relevant e-government applications in India. Some states such as Madhya Pradesh and

Andhra Pradesh have started to introduce applications which allow citizens to have faster and more transparent access to government services—for example, the provision of information on laws and regulations, and the procuring of licenses and official documents online.

Strategic Compact: Public-private partnerships, catalyzed by the IT Ministry, have played a key role in India's ICT-related development. One of the positive results of this effort has been the IT Act of 2000, which was based on the recommendation of the National IT Task Force, and aims to set the overall strategy for the IT sector. In addition, the government and the private sector are starting to come together to foster ICT development. For example, a joint effort by the Computer Science Automation Department at the Indian Institute of Science and a Bangalore-based private company have developed Simputer—a cheap micro-computer that enables illiterate users to browse the Internet.

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Malaysia

In an environment characterized by rapid advance in ICT, globalization, liberalization, and greater reliance on knowledge for value creation, Malaysia plans to leapfrog into the post-industrial age by leveraging ICT as a strategic lever for national development and global positioning. In 1996, Malaysia launched a program called "Vision 2020," which laid out a plan to build a fully developed, knowledge-rich Malaysian society by the year 2020 through the development of the ICT sector and the use of ICT to increase global competitiveness. The intent behind Malaysia's Multimedia Super Corridor (MSC) has been to create a high-tech environment and infrastructure that can attract national and international investors and create spillover effects in the rest of the Malaysian economy. Specific sectors of focus include education, healthcare, government, commerce and manufacturing.

Policy: Comprehensive policies are being developed to encourage ICT use in various sectors of the economy, as well as to accelerate the growth of the ICT sector. Trade and investment policies, such as financial and non-financial incentives, a fair trade system, and import and export duties, promote local and foreign investment. The Malaysian government has also defined attractive policies for foreign investment, such as streamlining the investment approval process, unrestricted employment of foreign knowledge workers, and freedom to obtain capital globally.

With the inception of the New Economic Plan in the 1970s, the government made a concerted effort to deregulate the telecommunications industry. With the privatization of the government telecommunications department in 1987, and the formation of the National Telecommunications Policy (NTP) in 1994, the market has now been fully liberalized. The Malaysian Government's Master Plan for the telecommunications industry provides guidelines for competition, interconnection charges, tariff rates and network development. At the end of 1995, all operators signed interconnection agreements with Telekom Malaysia to provide seamless communication regardless of carrier, though most carriers have not signed agreements among themselves.

The computer and software markets have also been fully deregulated, though restrictions exist on participation in government bids, and there are equity requirements for setting up manufacturing facilities. These barriers do not pose an insurmountable barrier to competition, but encourage the establishment of joint ventures and local distributorships with Malaysian companies.

Infrastructure: The Malaysian Government has invested heavily in world-class infrastructure. Malaysia's Multimedia Super Corridor (MSC) is designed to create an ideal environment for ICT-related production as well as provide the backbone for an information superhighway. The network contains a high-speed link (10Gb/s network) that connects the MSC to Japan, ASEAN, the US and Europe, and is capable of supporting extensive public administration, education and business applications. The intent of the superhighway is to provide quality access to global information as quickly and easily as possible. Simultaneously, the Demonstrator Application Grand Scheme (DAGS) is intended to facilitate social and economic progress through the innovative use of ICT. It provides funds for citizens to access the opportunities associated with the MSC and to be involved in multimedia development.

The telephone penetration rate—as a measurement of the ICT readiness of the country—rose from 16.6 percent to 23.2 percent between 1995 and 1999, while fixed lines in the rural areas rose from 5.2 percent in 1994 to 11 percent in 1999. Malaysia is aiming to continue the establishment of basic telecommunications infrastructure, with plans for 250 Internet access points, 250 mobile phones and 500 fixed lines for every 1,000 people within the next 5 years. This is in addition to the development of other primary physical infrastructure, such as power supply, transportation, airports, office buildings and extended business areas.

Enterprise: As a result of fair trade and investment policies, foreign direct investment in Malaysia reached US\$6 billion in 1997, but then dropped to US\$3.8 billion in 1998 due to the Asian economic crisis. In 1999, flows of foreign direct investment again increased by 31 percent and GNP rose 5.4 percent—much faster than initially forecasted. This increase was led by manufacturing, particularly in ICT-related electronics (for export), and this

sector is now the key driver of growth in the economy. In 1999, the contribution of the ICT sector to GNP was approximately 36.5 percent.⁸⁷

A number of incentives and projects are underway to foster entrepreneurship and business efficiency. The government provides both financial and non-financial incentives to Malaysian businesses. Financial incentives include zero income tax for a period of 10 years, R&D grants, and a 100 percent investment tax allowance on new investment in the MSC. Non-financial incentives include unrestricted employment of foreign knowledge workers, no restrictions on global capital, and limited restrictions on ownership.

Human Capacity: The growing economy has created a demand for skilled knowledge workers and professionals. Skilled labor is still in short supply, especially in the ICT sector and manufacturing industries. To address this issue, the Malaysian government is investing in a high-quality, comprehensive education system designed to meet the demands of the evolving workplace. At the Multimedia University, for example, new skills such as information and knowledge management, as well as programming applications, will be incorporated into the education and training curriculum. Several additional efforts have been made to increase ICT literacy. The Computer In Education (CIE) Program has provided computer laboratories to 90 secondary schools and 20 primary schools. Between 1996 and 1998, about 1,230 teachers were trained to conduct the CIE course. Computer Aided Design and Computer Aided Manufacturing (CAD and CAM) courses were also taught in secondary technical schools.

Content and Applications: Malaysia has made a concerted effort to provide relevant content to technology users through a number of specific initiatives: for example, Agritani is developing a portal that serves agriculture communities, including farmers, agriculture agencies, consultants, and agriculture service providers; and Cybercare enables orphanage communities in Malaysia to share news, barter goods, train volunteers and increase administrative efficiency.

E-commerce initiatives are helping to provide Malaysian businesses with more efficient access to input and product markets, both locally and globally. For example, MyBiz, an e-commerce platform designed for small and medium enterprises helps facilitate collaborative marketing by linking 300 companies including 26,000 employees in a business community network. The same platform can be used to make procurement processes more efficient and effective.

Strategic Compact: Malaysia's leadership recognized the need for a cooperative partnership to achieve its development objectives and its ambitious vision. To leverage and coordinate public, private and community sectors, the National Information Technology Agenda (NITA) was developed as a major strategy for national development. The National IT Agenda (NITA), launched in December 1996 by the National IT Council (NITC), provides the foundation and framework for the utilization of ICT to

transform Malaysia into a developed nation. The NITA vision is to use ICT to transform Malaysia, across all sectors, into an information society, then a knowledge society, and finally a “values-based” knowledge society.

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Appendix 3 National ICT Approaches: Selected Case Studies

South Africa

South Africa's government has placed a strong emphasis on ICT sector development through the implementation of a National ICT strategy. This plan proactively addresses ICT penetration, particularly for disadvantaged segments of the society. The ICT sector is growing vibrantly, with ICT spending at US\$9.6 billion, 6.9 percent of GNP. This reflects a comparative advantage in high-level professional skills over blue-collar manufacturing skills. The government has implemented a number of frameworks for policies, infrastructure, partnerships and task forces that will help South African communities play a role in the global economy. The ICT sector will not be directly responsible for a significant number of new jobs, but rather is positioned as an enabler of increasing competitiveness in other sectors, as a source of future export earnings, and as a key enabler to achieve development goals.

Policy: During the 1990s, the South African government separated the post, telecommunications and broadcasting functions to promote efficiency in the provision of services to rural areas, townships, squatter camps and remote parts of the country. At the recent telecommunications colloquium, an agreement was reached to end the monopoly of the current wire line operator in May 2002, and to introduce competition through a controlled and staged approach. As a result of the debate, government approved a second wire line operator to begin service in May 2002. The government is also investigating whether it could allow more operators without eroding the telecommunications market and affecting the cost of services in remote and rural areas.

The government has created the State Information Technology Agency to encourage the provision of information technology, information systems and related services in a managed secure environment. In addition, the government has launched Info.com 2025, which serves as a collective program of ICT projects designed to establish a networked information community and make South Africa globally competitive. Info.com 2025 addresses issues of policy, infrastructure, human capacity and local content within ICT industries.

Infrastructure: Infrastructure is poorly linked and spread unevenly across the country. The development in the commercial zones contrasts with very low penetration of services in rural and remote areas (22 lines per 1,000 people). The South African Information Technology Industry Strategy (SAITIS) and Info 2025 Vision include a focus on building infrastructure, especially within secondary towns designated as export zones for both ICT and non-ICT products and services. Through the establishment of the Universal Service Fund, both wire line and wireless service providers have extensive obligations to provide access to previously disadvantaged areas with low income and geographic complexity. South Africa has also been involved in the Southern African and Far East (SAFE) Initiative to promote the connectivity of all African countries through regional backbones that do not leave the continent. This will reduce the cost of calls that are currently routed through Europe.

Internet penetration in South Africa is by far the highest on the continent, with 1.8 million users (90 percent of the total in Africa). The proportion of households with Internet access is estimated to grow to 9.2 percent by 2002. This penetration is focused in urban areas close to major towns. Penetration is low or non-existent in rural and remote areas due to lack of infrastructure and the high cost of access and equipment. The number of commercial ISPs was 150 by 1999. There are two NGO ISPs which focus on the provision of Internet access within the NGO sector. All government departments and their ministries have established web sites to disseminate information regarding their activities and are working to ICT-enable their constituencies. For example, in education, the Gauteng province will be providing 300 schools with computers, giving students access and free email accounts.

Enterprise: Many South African businesses now have access to both international and local financial institutions. Black empowerment start-up organizations have access to financial means far beyond that available under the apartheid regime, and there is a vibrant and growing local venture capital market accompanied by inflow of foreign direct investment from ICT multinationals. A number of South African ICT-related businesses have obtained access to global markets through mergers and acquisitions with ICT companies in similar lines of business.

Free trade policies and tax incentives have allowed organizations such as Mecer, Acer and Compaq to start assembling ICT hardware and network equipment locally, creating a pool of ICT-skilled technicians and programmers. There are also ICT tariff programs applied to the shipping of small units or parts that encourage value-added assembly to take place in South Africa.

The financial sector has been at the forefront of adopting ICT, contributing 50 percent of all ICT expenditure. Major banks operate their own regional networks, offering some web sites with online banking services. Public enterprises are also being transformed and modernized in a widespread

restructuring program. This movement has facilitated the development of an active entrepreneurial scene.

Human Capacity: South Africa is facing a significant “brain drain” in technical and entrepreneurial ICT skills, with an estimated 200-300 ICT-skilled resources leaving the country each month. This is caused by the rapid growth in demand for ICT skills worldwide and little opportunity (jobs, remuneration, and innovation) in South Africa. Current unemployment rates are very high (30-35 percent), but it is also difficult to find a sufficient supply of skilled ICT workers to meet the rising demand.

Historically, the education infrastructure in South Africa has been segregated and unequal, and ICT provision in schools reflects this. Approximately 50 percent of schools have no infrastructure to support ICT use among students. In addition, the current education system has been slow to meet market needs. ICT courses are only available in the universities and in the *technikons* (technical colleges). It is only recently that an effort has been made by the Department of Education to revise the curricula to include ICT courses at the primary and secondary levels and to create ICT-specific learning centers.

To address the knowledge worker shortage, the government has created the Human Resources Development Fund. The fund is being used to provide grants and subsidies to promote the provision of adequately skilled human resources for ICT. The establishment of the Houwteq Learning Centre, which focuses on skill development for ICT, supports this. The Department of Education has responded by creating SchoolNet, a strategic partnership that coordinates the linking of schools to the Internet.

Content and Applications: The lack of relevant content and applications is still a significant problem in South Africa. The incorporation of ICT into education has been hampered by the lack of relevant information and infrastructure. Several locally-relevant programs were discontinued following a restructuring of the broadcasting industry. To address this, South Africa has created a local content taskforce that will focus on the provision of content for broadcasting through TV and radio in local languages. The taskforce will also ensure that there is wider participation of communities in the creation and maintenance of information and content services.

Strategic Compact: Three important taskforces have been introduced to address the deployment of ICT as an enabler of social and economic development. They include the Presidential International Task Force on Information Society and Development (to focus mainly on global ICT markets), the National IT Task Force (which will deal with the issue of “brain drain” and the deployment of ICT initiatives locally) and the IT Council (to handle local and provisional government IT functions). In addition, the government has announced the establishment of the Investment Council that will focus on positioning South Africa's imports and

exports globally and also on generating foreign direct investment through international collaborations.

The South African cabinet has gone through drastic changes to embrace efficient government by creating clusters to integrate the efforts of the cabinet across the current silo-based structure. These clusters focus on national priorities, namely efficient governance, investment and employment, human resource development, poverty eradication and international affairs—and consult broadly with community and private organizations.

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Tanzania

Despite having very low per capita income, Tanzania is preparing to reposition itself in the global network economy. Bold steps are being taken to leverage the benefits of ICT for its national priorities of growth and poverty reduction. Key actions include: the creation of an e-secretariat, including key stakeholders to create supportive leadership for ICT development; communications infrastructure improvements, both in the capital city and in secondary towns; and restructuring of the financial sector to sustain a more market-driven economy. As it prepares for the shocks associated with the transition from an agriculture-based economy to a knowledge-based economy, Tanzania hopes to illustrate that starting off on the right foot is the key to leapfrogging or "antelope-jumping" many stages of ICT development.

Policy: In 1995, Tanzania established an independent regulatory commission by separating the operations of the Tanzania Telecommunication Company from its regulatory functions. This led to the deregulation of the telecommunications market, and the government sale of 30 percent of its stake to international and local consortia companies. The government plans to sell more of its shares in the Tanzania Telecommunication Company, which is already a tax-paying, profit-seeking enterprise with over 70 percent market share.

In 1999, Tanzania started an e-think tank to bring together different Tanzanian stakeholders, including the government, for the purpose of discussing ICT benefits and formulating National ICT strategies. Recently, an e-secretariat was designated to coordinate the activities of the e-think tank. Its mission will be to offer ICT leadership by utilizing policy changes

and supporting related developments aimed at enabling Tanzanians to participate effectively in the modern Internet-based global economy. The initial priority area is the development of a policy roadmap. The government is also formulating an ICT strategy which will become a de facto ICT framework to help Tanzania's public, private and community organizations embrace the benefits of ICT use, while positioning businesses in the local and global economy.

Infrastructure: Undergoing rapid modernization, the capital city, Dar es Salaam, has seen dramatic improvements in the local core network infrastructure. Recent advances, which are increasing the opportunity for residents of Tanzania to obtain access to information, have been funded by local venture capitalists. Advances include: new digital exchanges; two cellular networks with nearly 40,000 subscribers; half a dozen new ISPs, and pay phones at post offices. While there has been rapid improvement in infrastructure, network access in areas outside Dar es Salaam is still very limited and teledensity remains extremely low.

The US\$250 million donor-funded Tanzanian Telecommunications Restructuring Programme (TRP), responsible for much of the improvement in Dar es Salaam, will also improve the links to many secondary towns and meet the increasing demand for reliable services in the urban and rural areas. A portion of these funds will be allocated to the replacement of outdated magneto telephone exchanges with automatic ones throughout the country.

Enterprise: Tanzania's development has been funded by donations rather than foreign direct investment. By deregulating its telecommunications market, Tanzania has been able to attract international operators by issuing licenses for a fee, but other industries have not yet seen much investment due to the need for both policy and procedural reforms.

Until recently, Tanzania had been solely reliant on exporting its agricultural products to Africa and Europe. A number of ISPs are now offering Internet trading to farmers and other businesses to sell their products around the world. The government has embarked on an effort to improve the business environment through the revision of the regulatory and tax regimes to stimulate private sector-led growth. As part of its effort to attract investment and promote small and medium-sized business development, Tanzania is helping with the development of entrepreneurial business management skills through training and technical assistance to small business associations. Tanzania has successfully restructured the financial sector, resulting in an increase in the number of private financial institutions and a more market-oriented business sector.

Human Capacity: A 20-year prohibition on importing computers has adversely impacted workers' development in ICT skills. Training centers that focus on the development of ICT knowledge workers are only now beginning to emerge. For example, Soft Tech Training Centre, established in 1993, is

committed to the development of local expertise through ICT skills enhancement.

Tanzania has placed a short-term emphasis on the urgent need to develop ICT skills, rather than enhance the primary education system. To this end, Tanzania has created different programs, with the help of international donors, to focus on the different segments of human development. The World Bank has donated up to US\$1.2 million to deliver distance-learning programs through satellite technology, helping to promote knowledge workers and technology users generally within Tanzania.

Content and Applications: The government has initiated plans to launch a campaign to encourage Tanzanians to develop and propagate content that is relevant to local interests and social values. Tanzania has also implemented several ICT applications relevant to its national objectives. Examples of such initiatives include an information system to strengthen the capacity of wildlife institutions and a computerized case flow management system that has facilitated an increase in transparency and professionalism in the judiciary system.

Strategic Compact: Tanzania's pioneering eSecretariat brings together a diverse set of stakeholders to contribute to ICT policy development. Compact members are also expected to play a critical role in the follow-up and implementation of the national e-strategy currently under design. At the global level, the international community fully endorses Tanzania's economic and institutional reform effort, as evidenced by an expanded level of support from donors, NGOs, and private investors. Private sector organizations, including international consultancies and leading technology firms, have joined the public-private partnership to advance national development goals.

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