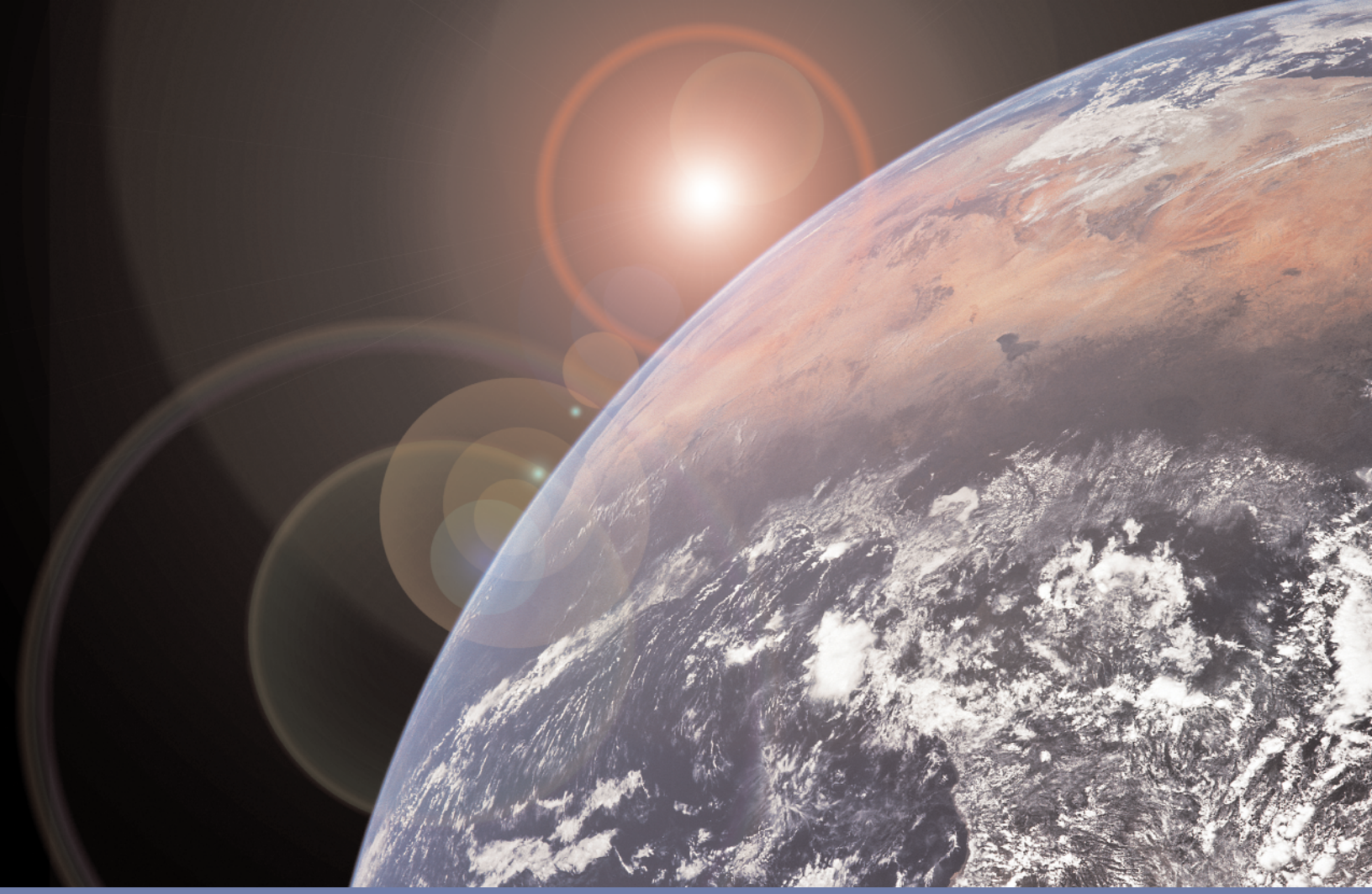

Creating a Development Dynamic

Final Report of the Digital Opportunity Initiative

July 2001

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Contents

Executive Summary

Despite many steps forward in social and economic conditions around the world in recent decades, there remain huge disparities in the quality of human existence. We are now at a critical juncture. Unprecedented global flows in information, products, people, capital and ideas offer great potential for radical improvements in human development, but left unabated, they may also serve to worsen and entrench the spiral of poverty which already exists in many communities and countries.

These flows are enabled by Information and Communications Technology (ICT): their sheer scale and pace would not be possible without the ability to connect vast networks of individuals across geographic boundaries at negligible marginal cost. This is why decisions about the use of ICT will be critical in determining which road we go down, to wider development or greater inequality. The old debate, about choosing between ICT and other development imperatives, has shifted from one of trade-offs to one of complementarity. The Digital Opportunity Initiative (DOI) aims to provide some fresh answers for this new reality. The uniquely diverse nature of this partnership has made it possible to combine for such a purpose the skills and expertise that each of its members—Accenture, the Markle Foundation and the United Nations Development Programme (UNDP)—enjoys in their respective fields.

Numerous factors influence the extent and speed of social and economic development—not least political stability, physical infrastructure, basic literacy and basic health care. There is no suggestion that ICT can eliminate the need for these or offer a panacea for all development problems. But detailed analysis of experience around the world reveals ample evidence that, used in the right way and for the right purposes, ICT can have a dramatic impact on achieving specific social and economic development goals as well as play a key role in broader national development strategies. The real benefits lie not in the provision of technology per se, but rather in its application to create powerful social and economic networks by dramatically improving communication and the exchange of information.

ICT is already being used highly effectively to directly address development goals. In Gambia, for example, it is being used to achieve better health outcomes. In Chile, it is starting to reap significant results in primary school education. In Bangladesh, it has led to the creation of direct employment for thousands of local women and men, while in parts of India new Internet-enabled centers mean better access to different government services for remote communities. In Indonesia, too, ICT is enabling local citizens' groups to monitor compliance with environmental standards.

What lessons can we draw from these success stories? The identification of, and continued focus on, both economic and social development goals is a key determinant of success. Solutions should also be realistic, flexible and sensitive to local conditions, and should be backed by strong public and private institutional support. Above all, there should be a strong commitment to local participation and the fulfillment of local needs, as well as political will at the highest level.

Additional analysis of the approach to ICT policy taken by developing countries shows that ICT can play a significant role as part of an overall national strategy for development. In this respect, countries have pursued diverse strategies: some have focused on developing ICT as an economic sector—either to boost exports (Costa Rica and Taiwan) or to build domestic capacity (Brazil, India and Korea)—while others are pursuing strategies which seek to use ICT as an enabler of a wider socio-economic development process. Countries which use ICT as an enabler may be further subdivided into those which have focused primarily on repositioning the country's economy to secure competitive advantage in the global economy (Malaysia, Trinidad and Tobago) and those which explicitly focus on ICT in pursuit of development goals such as those set forth in the UN Millennium Summit (Estonia and South Africa).

These varied experiences have revealed some important lessons about the role of ICT in development:

- An export focus can produce significant economic benefits, such as growth and foreign investment, but these gains do not automatically translate into progress on broader development goals.
- Building domestic ICT production capacity may address local needs and help strengthen domestic economic

linkages, but it can significantly restrict countries' ability to adopt new technologies and to gain competitive advantage in the global economy.

- It is imperative to use ICT to improve the competitive position of a developing country in the global economy, but this may fail to meet some development goals if it diverts attention from fostering local markets and businesses.
- An explicit focus on using ICT in pursuit of development goals allows countries to achieve a wide diffusion of benefits from ICT and contributes to both broad-based economic growth and specific development goals.
- A number of interrelated factors should be addressed to maximize the benefits of ICT for development. These include building human capacity, creating incentives for enterprise, developing appropriate content and increasing competition, especially among telecommunications and Internet-related businesses.
- Finally, the success of national ICT strategies is dependent upon the coordination and alignment of efforts undertaken by all actors involved, at global, local and national levels.

Based on these lessons, the DOI has developed a strategic framework to help guide stakeholders in investing in and implementing strategies which take advantage of the potential of ICT to accelerate social and economic development. The framework consists of five critically interrelated areas for strategic intervention:

Infrastructure – deploying a core ICT network infrastructure, achieving relative ubiquity of access, and investing in strategically-focused capacity to support high development priorities.

Human Capacity – building a critical mass of knowledge workers, increasing technical skills among users and strengthening local entrepreneurial and managerial capabilities.

Policy – supporting a transparent and inclusive policy process, promoting fair and open competition, and strengthening institutional capacity to implement and enforce policies.

Enterprise – improving access to financial capital, facilitating access to global and local markets, enforcing appropriate tax and property rights regimes, enabling efficient business processes and stimulating domestic demand for ICT.

Content and Applications – providing demand-driven information which is relevant to the needs and conditions experienced by local people.

This strategic framework does not assume that action in these five areas can be taken all at once. It is imperative to acknowledge the practical limitations faced by development efforts. Development gains can be achieved through interventions in any one area, but there are considerable benefits from a more holistic approach. This framework offers a tool which can be used at global, national and local levels to prioritize development initiatives so as to maximize their long-term impact. Providing such strategic interventions are properly conceived and implemented, interaction between them has the potential to create significant multiplier and network effects. These can ignite a virtuous circle of sustainable social and economic development—"a development dynamic."

For this to happen, there is a need not only to understand, in the context of local conditions, the critical relationships between strategic interventions, but also to secure the participation and commitment of all key stakeholders—local communities, NGOs, governments, the private sector and multilateral institutions. Heads of government should provide the necessary leadership to confront existing barriers and promote innovative solutions. National and international private industry should work closely together to adopt, adapt and develop technologies to meet the unique needs and challenges of the less fortunate. Civil society should be a critical player and help assure that ICT is used in a way that targets and addresses specific development goals and priorities. Through innovative vision and leadership, win-win situations can be created, thus aligning stakeholders' critical objectives and unleashing the potential of new collaborative alliances and strategic compacts to harness the power of ICT for development.

1 Introduction: A Global Call to Action

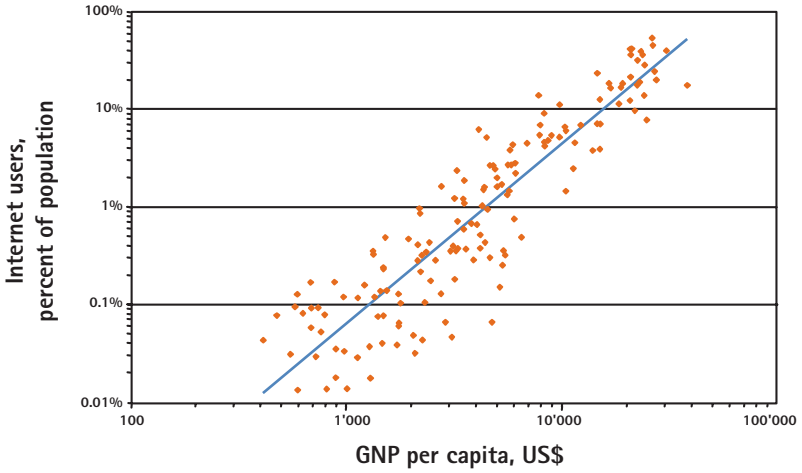
Despite real progress on some fronts, there remain dramatic disparities in levels of human development: one in five of the world's people lives on less than one dollar per day and one in seven suffers from chronic hunger.[1] The international community has responded to the pressing need to address this state of affairs at the recent United Nations Millennium Summit by agreeing on the key development goals for the next decade: reducing poverty, raising levels of education, improving standards of health, enhancing empowerment, and reversing the loss of environmental resources.[2]

This consensus reflects not only the necessity of addressing poverty and other human needs, but also an emerging sense that the international community is at a crossroads in the development process. The unprecedented pace and scale of global flows in information, products, capital, people and ideas, if properly harnessed, offers the potential to create new opportunities for those who have thus far been excluded from gains in human development. But the same forces could also actually widen the gap and trap developing countries, especially least-developed countries (LDCs), in a perpetual spiral of poverty and exclusion.

The current debate on the importance of access to ICT and its value in addressing global development disparities is part of this wider discussion on the potential benefits and risks of globalization. This is because ICT is itself a key enabler of globalization: the level and pace of global flows in physical and intangible assets have been dramatically boosted by the ability to connect vast networks of individuals across geographic boundaries, at negligible marginal cost. This relationship between ICT and globalization makes ICT interventions critical to development policy.

Industrialized nations that have a high degree of ICT penetration also experience high levels of wealth (see figure 1.1) and human development. However, there is still considerable uncertainty about the nature of the relationship between ICT and development. Recent efforts launched by the international community—including the G8's Digital

Figure 1.1 Internet Penetration and GNP Per Capita[3]



Source: International Telecommunication Union, 2000.

[1] IMF/ OECD/ UN/ WB, 2000, A Better World For All; www.paris21.org.
[2] See Appendix 1 for the United Nations Millennium goals, targets and measures.
[3] This demonstrates a correlation between ICT and income, but does not indicate a causal relationship.

Opportunity Taskforce (Dot Force) and the United Nations ICT Taskforce—directly recognize the urgent need to harness ICT to contribute to the achievement of development goals. These efforts are significant, not only because they seek to develop strategies and initiate innovative and effective action on the ground, but also because they represent and encourage new forms of collaborative interaction among government, private sector, multilateral, and non-profit organizations.

As a contribution to this global effort, at the G8 Okinawa Summit,[4] Accenture, the Markle Foundation, and the United Nations Development Programme formed a public-private partnership[5] to launch the Digital Opportunity Initiative (DOI). The DOI aims to help mobilize, focus and coordinate action by developing a strategic approach to harnessing the benefits of ICT for sustainable development. The present report will focus on lessons learned to date about the value of ICT for achieving development goals, and will offer an analytical framework that developing countries and the international community can use as a guide for designing and implementing a more strategic approach to the use of ICT for development.

[4] G8 Summit in Okinawa, July 2000.
[5] See Appendix 4 for DOI Partner Profiles.

2 ICT for Development: Making the Case

Debate regarding the effectiveness of using ICT to help achieve development goals arises not only around questions concerning the evidence in support of a relationship between ICT and development, but also more substantially from inherent doubts about the relevance of ICT to achieving sustainable development and fears that investment in ICT will draw resources away from traditional development goals.

2.1 ICT As An Enabler of Development

This report will seek to demonstrate that ICT can be a powerful tool for development, both because of ICT's inherent characteristics and the mounting empirical evidence that suggests it can in fact contribute a great deal to development goals. It can do so at both the micro and national level by increasing the effectiveness and reach of development interventions, enhancing good governance and lowering the costs of service delivery. Moreover, the right complement of targeted ICT interventions has the potential to play an even more substantial role in accelerating a sustainable dynamic of social and economic development in developing countries.

While the focus of the DOI is the role that ICT can play in the development process, it should be clear from the outset that ICT is not a panacea for the developing world's problems. Social and economic development is dependent on many factors, which should be addressed through an overall development strategy. Factors such as political stability, macroeconomic governance, transparency and accountability of national and local administrations, the rule of law, physical infrastructure (for example, clean water and energy), and basic literacy should also be addressed in an explicit manner—and ICT should not be seen as a substitute. However, the integration of ICT into overall national development strategies can help facilitate implementation, expand the scope and coverage, and increase the results for most of these factors. Moreover, development goals cannot be achieved by government efforts alone. The involvement of civil society and the private sector is crucial.

2.1.1 The Unique Characteristics of ICT

ICT can be a powerful enabler of development goals because its unique characteristics dramatically improve communication and the exchange of information to strengthen and create new economic and social networks:

- ICT is *pervasive and cross-cutting*. ICT can be applied to the full range of human activity from personal use to business and government. It is multifunctional and flexible, allowing for tailored solutions—based on personalization and localization—to meet diverse needs.
- ICT is a key enabler in the *creation of networks* and thus allows those with access to benefit from exponentially increasing returns as usage increases (i.e. network externalities).
- ICT fosters the *dissemination of information and knowledge* by separating content from its physical location. This flow of information is largely impervious to geographic boundaries—allowing remote communities to become integrated into global networks and making information, knowledge and culture accessible, in theory, to anyone.
- The "digital" and "virtual" nature of many ICT products and services allows for *zero or declining marginal costs*. Replication of content is virtually free regardless of its volume, and marginal costs for distribution and communication are near zero. As a result, ICT can radically reduce *transaction costs*.
- ICT's power to store, retrieve, sort, filter, distribute and share information seamlessly can lead to substantial *efficiency gains* in production, distribution and markets. ICT streamlines supply and production chains and makes many business processes and transactions leaner and more effective.
- The increase in efficiency and subsequent reduction of costs brought about by ICT is leading to the creation of new products, services and distribution channels within traditional industries, as well as *innovative business models and whole new industries*. Intangible assets like intellectual capital are increasingly becoming the key source of value. With the required initial investment being just a fraction of what was required in the more physical-asset intensive industrial economy, barriers to entry are significantly lowered, and competition increased.
- ICT facilitates *disintermediation*, as it makes it possible for users to acquire products and services directly from the original provider, reducing the need for intermediaries. This cannot only be a considerable source of

efficiency, but has in fact been one of the factors leading to the creation of so-called "markets of one," leveraging ICT's potential to cater to the needs or preferences of users and consumers on an individual basis.

- ICT is *global*. Through the creation and expansion of networks, ICT can transcend cultural and linguistic barriers by providing individuals and groups the ability to live and work anywhere, allowing local communities to become part of the global network economy without regard to nationality, and challenging current policy, legal and regulatory structures within and between nations.

These characteristics suggest that ICT has the potential, if conceived as a means and not an end in itself, to be a powerful enabler of development. However, the fact that ICT can, in theory, assist development efforts does not mean that it will necessarily do so. In order for ICT to positively foster development goals, it must be employed effectively.

2.1.2 From Promise to Action: Evidence and Potential

In fact, there is already ample evidence that a focused, micro-level application of ICT can contribute to individual development goals, including health, education, economic opportunity, empowerment and participation, and protection of the environment (this evidence is reviewed in Section 2.2).

Even more importantly, emerging evidence from country case studies suggests that ICT can play a more profound and far-reaching role in development than simply through interventions focused on specific development objectives. Five case studies are reviewed in Section 2.3, which draws on these and other case studies detailed in the appendices and leads, in Section 2.4, to some conclusions about how national ICT strategies can contribute to improved development outcomes.

These findings, at both the micro and national level, highlight the need for a framework that can help guide stakeholders in developing and implementing strategies which take advantage of the potential of ICT to accelerate social and economic development. The DOI provides such a framework, in Section 3, around which ICT initiatives can be implemented strategically to ignite, accelerate and sustain a network of positive effects—or a "sustainable development dynamic."

The two types of interventions discussed here—those aimed at development goals and those aimed more broadly at developing a national ICT strategy—are complementary and can both contribute to accelerating a "development dynamic."[6]

2.2 ICT For Specific Development Goals

This section reviews the experience of efforts to apply ICT in five key areas identified by the UN Millennium Summit as development imperatives:[7] health, education, economic opportunity, empowerment and participation, and environment.

2.2.1 ICT for Health

Some of the most promising and clearly demonstrated applications for ICT in development are in the improvement of health care delivery. Experience to date suggests there is a number of specific ways ICT can be applied to achieve better health outcomes.[8]

ICT is being used in many developing countries and communities to facilitate *remote consultation, diagnosis and treatment*. In Gambia, for example, nurses in remote villages use digital cameras to download images of symptoms onto a PC and transfer them to nearby towns for

[6] See case studies in Appendix 2 for illustration of how specific, micro-level interventions can impact, and are influenced by, the components of a wider "development dynamic."
[7] See Appendix 1 for details of the United Nations Millennium Summit development goals.
[8] See Appendix 2 for additional case evidence of ICT's impact on development goals.

SatelLife's HealthNet

Application Model:
HealthNet is a system of local telecommunications sites used to provide low cost access to healthcare information in developing countries through a link to basic email. Users—mainly physicians and medical workers—connect to the network through local telephone nodes to access services such as physician collaborations, medical databases, consultation and referral scheduling, epidemic alerts, medical libraries, email and shared research reporting databases. HealthNet is provided by a non-profit organization, SatelLife, with assistance from local and international donors.

Illustrative Impact:
HealthNet is used by 19,500 health care workers in more than 150 countries worldwide. The development impact of HealthNet has been most prevalent in Africa, where the model has contributed to increased rural and urban connectivity, capability building among the user community, increased demand for IT services, and in some cases, commercially viable IT service enterprises. For example:

- Surgeons from Mozambique, Tanzania and Uganda use HealthNet to consult on patient treatments and learn new reconstructive surgery techniques;
- In Zambia, healthcare workers who once traveled 700 kilometers each week to collect data for clinical trials now use HealthNet to send this information via email;
- Physicians in Ethiopia use HealthNet to schedule consultations, making it unnecessary for ill patients to travel long distances with no guarantee of seeing a physician;
- Health workers in Democratic Republic of Congo use HealthNet to report progress on treating trypanosomiasis to public health organizations in the north of the country; and
- In Gambia, malaria researchers use HealthNet to submit data to European medical schools for clinical trials.

Many physicians in developing countries rely on HealthNet as their sole source of information on the treatment of AIDS and tropical diseases, essential drugs, pediatrics and public health promotion.

Challenges:
Although HealthNet has made a real contribution, important challenges remain. Implementations in Africa have not always delivered the hoped-for level of success due to a number of factors, including: a lack of reliable and affordable telecommunications and power infrastructure; the failure and high cost of local Internet service providers (ISPs); unfavorable regulatory, licensing and taxation regimes; insufficient grant sustainability; poor organizational design; and user dissatisfaction with low band-width and delayed response.

Sources: www.healthnet.org; HealthNet management interviews and project reports (2000); ITU (1999).

examination by doctors. The same model is being applied to facilitate *collaboration among physicians* themselves. When an expert opinion is required, doctors in rural towns in Gambia send the images captured by the nurses to specialists in the United Kingdom for advice. The principle of ICT-facilitated collaboration extends to *medical research* also. This is illustrated in West Africa, where malaria researchers use a network of satellites and ground stations to submit data for clinical trials conducted at tropical disease research facilities in London and Geneva.

Health workers in developing countries are accessing relevant medical training through ICT-enabled delivery mechanisms. Several new malaria Internet sites for health professionals include innovative 'teach and test' self-assessment modules. In addition, centralized data repositories connected to ICT networks enable remote healthcare professionals to keep abreast of the rapidly evolving stock of *medical knowledge*. In Bangladesh, for example, the local MEDINET system provides access to hundreds of medical journals via email for less than US$1.50 per month.

When applied to *disease prevention* and *epidemic response efforts*, ICT can provide considerable benefits and capabilities. Public broadcast media such as radio and television have a long history of effectively facilitating the dissemination of *public health messages* and disease prevention techniques in developing countries. The Internet also can be utilized to improve disease prevention by enabling more effective monitoring and response mechanisms. For example, across Sub-Saharan Africa, the Internet is used to monitor daily cases of meningitis and to help coordinate mass vaccination programs when threshold levels are reached.

A number of countries, such as Estonia and Costa Rica, have invested in ICT to improve the administrative efficiency of their *public health systems* and ICT can also be applied to improving the efficiency of medical *facility administration* through, for example, the streamlining of medical procurement or the creation of patient record databases.

2.2.2 ICT for Education

Across a range of educational applications, ICT is being harnessed to improve the efficiency, accessibility and quality of the learning process in developing countries.[9]

One of the most clearly demonstrated applications is *distance education.* Distance education has been a particularly successful model in developing countries where affordability and geography have been real barriers to access. The six largest distance-learning universities in the world are located in developing countries: Turkey, Indonesia, China, India, Thailand and Korea—all of which offer expanding virtual campuses. To date, distance learning has mainly been applied to tertiary education where the motivation and commitment of students is high. In the case of primary and secondary education, ICT has been found to significantly enhance the learning process by enabling increased access to knowledge and more collaborative and interactive learning techniques, but is not an effective substitute for close personal supervision from teachers or parents. In Chile, for example, the *Enlaces* Project wired 50 percent of the primary schools, enabling teachers within the schools to improve the quality of the curriculum and allowing students from different schools to conduct collaborative projects.

The development of *scientific research networks* on a worldwide basis, usually over the Internet, is also helping to empower indigenous research and development programs in developing countries. Virtual research groups—composed of interconnected specialists in different parts of the world—allow databases to be shared, conferences to be organized, papers to be circulated and discussed, and collaborative research and reporting to be undertaken. A proliferation of such collaboration is occurring on both a North-South and South-South basis. The African Virtual University, for example, provides online communication tools such as chat rooms, email, bulletin boards and home pages to encourage shared research efforts among both academics and students.

University of South Africa (UNISA)

Application Model:
UNISA is the oldest and largest university in South Africa and one of the largest distance-learning institutions in the world. UNISA has internationally-recognized certificate, diploma and degree courses up to doctoral level across six faculties: Arts, Economics and Management Sciences, Law, Science, Education and Theology, and Religious Studies. In addition to on-campus instruction, UNISA provides educational programs via Internet and online classrooms, video and audio lectures and correspondence instruction. Students can also access UNISA's well-equipped library over the Internet.

Illustrative Impact:
- UNISA's distance learning programs provide education to over 120,000 students per annum, mostly from Africa and other developing countries.
- The distance education programs are less expensive (80 percent less) than those of residential universities.
- The programs allow students to obtain higher education at their own pace while they work to support their families.
- UNISA encourages gender equality by providing women with educational and employment opportunities: 56 percent of UNISA students and 51 percent of staff are women.
- The organization provides professional employment opportunities within South Africa: there are 3,000 staff members including academic, administration and support staff.

Challenges:
While UNISA has a key strength in the quality and relevance of its educational content, a number of key challenges must be overcome before it can achieve critical scale with its online offering. Chief among these is securing the skills and capabilities required to develop and maintain a rich and broad program of educational content. The development of applications to deliver content to a broader and more diverse audience is also a priority.

Source: www.unisa.co.za.

Another rapidly growing area of ICT-mediated learning is in the delivery of *technical and vocational training*. Because ICT can facilitate sophisticated and customized performance simulation at low marginal cost, many organizations and vocational training facilities are employing ICT to train workers in an array of functional areas—from healthcare to

[9] See Appendix 2 for additional case evidence on ICT and education.

IT services—even to train teachers themselves. For example, Cisco's Networking Academy Program provides a 280-hour technical training course over the Internet. This course trains workers in developing countries in designing, building, and maintaining computer networks, enabling students to obtain jobs in the local IT industry.

ICT-enabled solutions also present significant opportunities for enhancing the efficiency and effectiveness of *education administration*. Through the use of ICT data repositories and networks, curricula can be developed collaboratively, educational materials can be procured more cost effectively, staff and student time can be scheduled more efficiently, and individual student performance can be monitored more closely. In Southern Africa, Educor, a private conglomerate of education institutions, uses ICT networks to facilitate collaborative curriculum development among educators across its schools—improving the quality of the curriculum and avoiding duplication of effort.

2.2.3 ICT for Economic Opportunity

ICT can contribute to income generation and poverty reduction. It enables people and enterprises to capture economic opportunities by increasing process efficiency, promoting participation in expanded economic networks, and creating opportunities for employment.

There are a number of ways ICT is enhancing *rural productivity*. ICT enables *solution sharing* between local people and communities, providing access to practical information on small business accounting, weather trends and farming best practices, for example. Timely access to *market information* via communications networks also helps farmers make astute decisions about what crops to plant and where to sell their produce and buy inputs. In Chile, for example, an Internet network among farmer organizations has dramatically increased farmers' incomes by providing information about crop status, weather, global market prices and training.[11] ICT is also providing unprecedented access to *rural finance*. The financial and information service network provided by Pride Africa[12] offers micro-finance

Village Pay Phones, Bangladesh

Application Model:
Village Pay Phones is an initiative of the Grameen Bank aimed at reducing poverty through the economic empowerment of women in rural Bangladesh. The Grameen Group manages the entire phone system, operating the GSM network and loaning money to village women to purchase GSM cellular phones. Phone owners rent the phones out to village farmers and other community members for a fee and also provide messaging and incoming call services.

Illustrative Impact:
- Phones have been placed in 1,100 villages. The 6–7 year goal is to serve 500,000 subscribers, including 68,000 phones dedicated to serving rural areas.
- Village Phones have increased incomes and savings accumulation among phone owners, mostly women.
- Phone users, mainly local farmers, have increased their productivity through access to market information, weather reports and pest and disaster alerts.
- Farmers in phone villages receive up to 10 percent higher prices for farm products and improved security of supply for inputs.
- A significant portion of phone owners' profits have been spent on paying for improved education and health services for their families.
- The phone service has also contributed to improvements in disaster response, crime rates and livestock mortality through better access to public services.

Challenges:
While Village Pay Phones is a model for community development, the Grameen network is not integrated with the national fixed line network. This is due to telecommunications regulation in the country which, to a large extent, is being challenged by the rapid expansion of Grameen Phone. The wireless technology chosen by Grameen, based on well-known international standards, is expensive and not optimal for rural areas.[10] Service quality has been inconsistent among phone owners and may have a negative impact on customer satisfaction.

Sources: ZEF Bonn-Center for Development Research, Insights from a Grameen Bank Initiative in Bangladesh, June 1999; Iqbal Z. Quadir, Connecting Bangladeshi Villages (http://www.devmedia.org/documents/ACF1055.htm), February 2000; Allen Hammond, CIO and Senior Scientist at the World Resources Institute (see Appendix 2).

[10] See Section 2.2.6, lesson 6, for an example of an Indian initiative that uses more optimal technology for rural areas.
[11] In 1995, ninety farm organization representatives in Mexicali launched plans for an Internet-based communications system. By 1996, farmers were using email on a daily basis to submit reports on irrigation quotas and planting activities to the local irrigation boards. Farmers now use their web site to post farm newsletters, access market and weather information, and download agricultural journals. There is also a plan for the Department of Agriculture to deliver agricultural assistance services through the site.
[12] See Appendix 2 for more information on Pride Africa and other case studies demonstrating how ICT can contribute to economic opportunities.

opportunities for local people and small enterprises that previously had no access to flexible financing due to rigid banking regulations and the information monopolies of government and large businesses.

ICT enables improved *business process efficiency and productivity*. Businesses can reduce operational costs by decreasing material, procurement and transaction costs, resulting in lower prices for intermediate and finished goods, and they can also use more and better information to improve the value of their output. *Utilities Afrique Exchange*, for example, provides an e-trading platform to utilities companies in Africa and helps both sellers and buyers simplify their procurement processes and reduce costs.[13] In another example, a number of companies in developing countries are using the Global Technology Network, provided by the US Agency for International Development (USAID), to find comparable small and medium-sized US companies to share business solutions that satisfy their existing technological needs.[14]

ICT facilitates *global connectivity*, resulting in new ways of creating and delivering products and services on a global scale. New business models and market configurations enabled by ICT, including business process outsourcing, value chain integration and disintermediation, provide developing countries with access to new markets and new sources of competitive advantage from which to drive income growth. Through PEOPLink's global artisans trading exchange, for example, local craftspeople in developing countries are increasing their incomes not only through access to new markets, but also because the wholesaling intermediaries for their produce have effectively been removed.[15] Local craftspeople can now receive up to 95 percent of the selling price for their produce where previously they received only 10 percent.[16] Viatru is a similar initiative offering indigenous peoples opportunities to globally market their traditional crafts and farm products.[17]

ICT can contribute to better employment opportunities in developing countries both through improved labor market facilitation and direct employment. Using electronic job marketplaces, employers and employees can match labor skills and availability to satisfy their demands. For example, TARAhaat,[18] a portal designed to serve villages in rural India, provides job opportunity information on local web sites in local languages. In addition, the establishment of local telecenters in countries such as Bangladesh, India and Senegal has created direct employment for thousands of local women and men.[19, 20]

[13] See Appendix 2 for more information on the *Utilities Afrique Exchange*.

[14] The Global Technology Network (GTN) is a program of the US Agency for International Development (USAID) aimed at matching the technological needs of companies in developing countries with solutions from small and medium-sized US companies. An online database links firms with compatible interests, facilitating communication and collaboration. GTN focuses on four industry sectors: agriculture, communications and information technology, environment and energy, and health.

[15] See Appendix 2 for more information about PEOPLink.

[16] In another example, Chincheros, a small village in Peru, increased its income five-fold to US$1,500 per month when the village leaders formed an Internet-enabled partnership with an export company in 1996. The village vegetables are now sold daily in New York.

[17] Viatru is a retail service company using the Internet to enable people in Mexico, Cost Rica, India and some African countries to globally market their traditional crafts and farm products. The company's concept of "visible commerce" allows retail customers to look beyond a product to see the positive impact their purchase can create in developing communities.

[18] TARAhaat (www.tarahaat.com) is a portal designed to meet village needs. It seeks to connect local users to information services, government agencies and markets. In addition to employment opportunities, the site provides access to information about health, education, community issues, women's issues and local markets. Information is displayed in Hindi and English, in pictures and symbols, and also in voice.

[19] According to the International Labour Organization, an estimated 250,000 jobs have been created for women in India over the last four years through mobile telephony centers.

[20] An NGO in El Salvador is creating local job opportunities by building a national chain of cybercafes. Local businesses create the relevant content provided in the cafes, which are franchised, owned and operated by local entrepreneurs, local branches of government, churches, hospitals and other local organizations (see Appendix 2 for more information on this initiative).

2.2.4 ICT for Empowerment and Participation

ICT can contribute to fostering empowerment and participation and making government processes more efficient and transparent by encouraging communication and information-sharing among people and organizations, and within government.[21]

Using ICT, governments can improve the *quality and responsiveness* of the services they provide to their citizens as well as expand the *reach and accessibility* of services and public infrastructure. This is facilitated by e-government applications that provide services and information to citizens over the Internet and other communication networks. In the Indian state of Madhya Pradesh, the government is introducing an experimental intranet computer network for government services and local information. This allows citizens to have faster and more transparent access to government services. For example, farmers can get copies of land titles for 10 cents that previously cost as much as US$100 from corrupt officials. Andhra Pradesh in India has also launched Internet-enabled integrated service centers providing access to different types of government services.[22]

ICT connects individuals and local communities with information and resources beyond their geographic boundaries, encouraging information dissemination, information exchange and communication. Citizens are encouraged to *participate in the democratic process* through ICT mechanisms such as electronic forums and bulletin boards, which enable participation in public discussions. This is especially relevant for marginalized communities and groups such as women, youth and ethnic minorities: they can share and exchange information of mutual interest, strengthen their collective power and shape their own development solutions. A women's group in Mexico City, for example, used email to ask sympathizers in California to do research on the textile factory where they worked. When the women's jobs were threatened, they came to management armed with information on the company, its profits and its ownership to negotiate better conditions and more secure tenure.[23, 24, 25]

SANGONet

Application Model:
SANGONet is an electronic information and communications network for development and human rights workers in Southern Africa. It provides relevant information to people working on development issues by allowing them to communicate with each other on its web site (www.sn.apc.org/sangonet), and by building capacity in electronic communications within non-governmental, community-based, government and private sector organizations. SANGONet's priorities include open government, ICT, education, health, economy, labor, women, human rights and the environment. SANGONet is a member of the non-profit Association for Progressive Communications (APC).

Illustrative Impact:
- SANGONet empowers people and organizations to make decisions based on relevant information.
- NGOs and other organizations can communicate more efficiently and effectively using email software and services provided by SANGONet.
- NGOs, especially small to medium-sized organizations which face a lack of ICT skills, are taking advantage of SANGONet's low cost support services and training programs to improve their internal capabilities and operations.

Challenges:
The lack of reliable and affordable telecommunications and power infrastructure is still a barrier to encouraging widespread utilization of SANGONet's functions. In addition, although people and organizations can effectively use ICT to improve their information exchange and communications, strong leadership and management capabilities are required to translate information into coordinated action.

Source: www.sn.apc.org/sangonet.

[21] See Appendix 2 for illustrative case evidence.
[22] Also, in Brazil, citizens have been able to file their tax statements online, and pay their tax bills by credit card or electronic payment over the Internet, since 1997.
[23] The Dalit and Tribal People Electronic Resource Site (DATPERS) is a non-profit organization providing electronic newsletters on the issues of "low" caste peoples in India. The site has exposed the exclusion of 250 million "low" caste people and is helping to mobilize the community around coordinated human rights campaigns. See Appendix 2 for additional examples of ICT for empowerment and participation.
[24] The Committee for Democracy and Information Society in Brazil created a bulletin board on the Internet to give young people from under-served communities the opportunity to debate social issues. This has evolved into a new program with community associations that run computer science and citizenship schools.
[25] ICT can also help provide people with a sense of pride and self-esteem through opportunities to give information and communicate with the rest of the world. See, for example, Charity@Incubator in Appendix 2.

Organizations in developing countries also find it increasingly feasible to participate in information-sharing that strengthens governance and collective power, allowing them to influence political and institutional decision-making processes. Trade unions, for example, have used the Internet as a campaigning tool to organize labor globally in the fight against exploitation. Global networks played a crucial role in helping unionized Guatemalan workers to join with other union groups and lobby governments and multilaterals to gain recognition and wage increases from Pepsi-Cola in the mid-1990s.

2.2.5 ICT for the Environment

ICT can make a valuable contribution to sustainable environmental management by improving monitoring and response systems, facilitating environmental activism and enabling more efficient resource use.

Scarcity of relevant and reliable information has always been a substantial obstacle to more effective environmental management. Used to collect, process and disseminate information, ICT enables a better understanding of issues such as climate change and biodiversity and helps to *monitor* ecological conditions so that *prevention and mitigation* measures can be activated. SIDSNet, for example, provides a medium for sharing information and good practices among the forty-three Small Island Developing States (SIDS) on common issues such as biodiversity, climate change, coastal and marine management and energy sources.[26] In Nepal, computer imaging has been used to build a land resource database for the Arun River basin. This has generated the first ever basin-wide map of land use indicating forest degradation hotspots. The database, together with simulation models, was crucial to designing and implementing the land management program for the area.

ICT is also being deployed extensively to *monitor and respond to environmental disasters* in developing countries. This is demonstrated in Mexico, where fire emergency services are using satellite images to direct response teams to critical areas—resulting in significant reductions in casualties and property loss.

The power of ICT as an information and networking medium can also enable citizens to act as *environmental*

Global Forest Watch (GFW)

Application Model:
Global Forest Watch is an international network of more than 90 local forest groups linked by the Internet. It aims to slow forest degradation around the world as well as infuse transparency and accountability into the industry. The initiative was started by the World Resources Institute in 1997 to give the general public a clearer picture of the threats to the world's forests. GFW uses a combination of satellite imagery, Geographic Information Systems (GIS), mapping software, the Internet and on-the-ground observation to record forest coverage and condition, including where and how forest product companies are cutting. GFW compares the activity to forest leases to identify illegal cutting. These maps are posted on the Internet, naming specific companies that fail to comply with environmental policies and agreements.

Illustrative Impact:
GFW is ensuring fair and objective scrutiny of the practices of forest product companies. The group is already operating in 8 countries, and plans to cover 25 countries within a few years. It has negotiated agreements with IKEA, Home Depot, Loews and other major forest product retailers that constitute 40 percent of the North American market. The retailers have pledged to source only from sustainably-managed forests and forest companies and have agreed to use GFW's expanding database to guide their buying. GFW also provides governments, local communities, consumers and activists with information about what is happening to the forests, enabling the promotion and establishment of successful forest management practices. Results in a few countries demonstrate that GFW can produce information that is not obtainable by satellite systems and exceeds that currently available to governments and United Nations agencies.

Challenges:
Key challenges for GFW are: limited Internet access among concerned groups who have information to contribute and are also target information recipients; and securing political support and sponsorship among governments, industry groups, and NGOs in new geographic markets. If success in the North American market is any indication, this challenge is not insurmountable.

Sources: www.igc.org; www.globalforestwatch.org.

[26] See Appendix 2 for more information about SIDSNet.

enforcement agents, alerting decision makers to compliance infringements[27] and leveraging the power of ICT to reach and influence public opinion. In Indonesia, officials discouraged by weak enforcement of water pollution standards created a public access database for rating the degree of factory compliance. Citizen groups have used the ratings to pressure under-performing factories. Within the first 15 months of activism, one-third of non-complying factories had met regulations.

ICT applications can be used to reduce the consumption of energy, water and other essential natural resources through *more efficient agriculture and industrial procedures*. For example, precision agriculture techniques[28] using GIS and GPS systems can facilitate weather and soil monitoring, crop forecasting and the ability to optimize farm return on investment ensuring more efficient use of scarce resources.[29]

In the future, ICT may also play an important role in *the fight against pollution*—not only by providing more useful metrics and information, but also by enabling population decentralization and large-scale telecommuting.

2.2.6 Lessons Learned from Specific Interventions

The analysis of ICT initiatives targeting key development imperatives suggests that, while individual ICT interventions can have a positive impact on social and economic development outcomes, many initiatives experience barriers to scalability and sustainability under current conditions. The following is a synthesis of the common lessons found among initiatives that have thus far exhibited a substantial and sustainable development impact.

1. Initiatives should be explicit about their development goals and how they will directly impact the target population. Initiatives that clearly identify development goals within the needs and context of the target population are more likely to develop effective operating models and deliver tangible results. For example, one of Grameen Phone's explicit goals is to have a significant impact on poverty through the economic empowerment of women in Bangladesh. PEOPLink has clearly determined its role of helping talented artisans in developing countries to market their products directly to buyers on the Internet, cutting out the middleman.

2. Initiatives should be driven by user demands, identified and realized through direct participation and ownership. Experience from many initiatives, such as Pride Africa in providing micro-finance, and the African Virtual University in meeting demands for skilled and knowledgeable workers, demonstrates the importance of designing initiatives to be demand-driven and locally-owned. Technology imposed on a community of users who have not independently identified a need for it is unlikely to flourish. SANGONet in Southern Africa experiences high rates of local use because local people and NGOs, who are interested in development and human rights, participate in shaping the service to meet their own needs.

3. ICT solutions should be "built to last." Initiatives that are planned and managed using a business model are likely to be more sustainable and have a more substantial impact. Initiatives need to include mechanisms for growth and replication into their operating models from the outset, so as to offer scalable and sustainable solutions. SatelLife established a business model for HealthNet to deliver email and electronic information resources for better health and medical services. The model provides for training both end

[27] For example, an organization of fishermen in Honduras learned to use video to document the destruction of their mangroves by politically powerful commercial farmers. These recordings are used to lobby politicians in the Honduran Congress.

[28] Precision Agriculture is an information-based initiative developed by the University of Ohio which uses sensors, digital application controllers, communication links, global positioning systems (GPS), computers and innovative software solutions to automatically match agricultural inputs and practices to variable local conditions within an agricultural field.

[29] The Weather/ Pest Information Network uses weather data to make pest forecasts and reduce pesticide use and the subsequent negative environmental impact of farming on land quality. The seven existing forecast models have already generated savings of US$7.1 million to the US fruit and vegetable industry.

users to effectively use the system and technical staff to manage and operate the system so that local operations can be sustainable. On the other hand, some Digital Villages in South Africa have not been successful because operations did not include components such as a solid business plan, a cost recovery system, a marketing strategy, or emphasis on local community services to make the initiatives sustainable.

4. Initiatives should be sensitive to local conditions and limitations. Technology employed should be affordable, physically accessible, easy to use and maintain, and flexible enough to accommodate user demands for new services. Similarly, initiatives demonstrating a capacity to embrace adaptive and flexible solutions are more likely to be sustainable. For example, PEOPLink provides CatGen software, which enables local artisans to easily capture and transmit digital images of products over the Internet with minimal training and in conditions of poor connectivity. The solution is feasible due to the existence of public access points such as cybercafes and telecenters.

5. The interests of key stakeholders must be broadly aligned with each other and with the goals of the intervention. Identifying or engineering "win-win" situations is critical to securing lasting commitment from all necessary parties, including participation from the local community, private enterprises, non-government organizations, multilateral organizations and governments. Strong public and private institutional support and leadership is required to maintain commitment and alignment from all parties. This requires clear vision and direction, defined roles and responsibilities for all partners, adequate funding, sufficient technical and administrative means, and integration with existing local institutions. As an example, in the Madhya Pradesh State Initiative in India, roles and interests among stakeholders are well coordinated: government is responsible for content, farmers own their computers, and educated local citizens operate the information services. In another example, NIIT, a leading software service and education provider in India, formed a partnership with state governments and private sector companies to provide student loans promoting the Internet and computer-based education. All partners have defined roles and well-aligned interests in the initiative.

6. Initiatives with the most impact have approached development problems in a holistic and coordinated way, not only through the provision of ICT. HealthNet, for example, has focused on infrastructure and connectivity by providing low cost access, and also on building human capacity through training of both users and technical operators, transferring enterprise capability including management and operation skills, and creating effective partnerships with both local organizations and medical institutions in developed countries. While the Grameen Phone initiative faces a scalability challenge because of its technology choice and the telecommunications policy environment, a similar initiative undertaken by the TeNet Group in India uses more adaptable technology and works within national telecommunications policy guidelines to overcome this challenge. The Indian initiative has chosen a multi-point wireless technology which is more functional for rural areas (with greater transmission range), integrates easily with the national system, and meets regulatory standards.

These examples suggest that ICT interventions focusing on development goals must address a variety of interrelated dimensions to secure an enduring impact. The limited scope and scale of many of the initiatives described through Section 2.2 has prevented them from achieving even greater impact since, as stand-alone initiatives, it is difficult for them to address the policy and infrastructure issues necessary to ensure their success. While grassroots entrepreneurial activity is to be universally encouraged, the potential impact of these ICT interventions would be far greater had they been conceived as part of a comprehensive national ICT strategy for development imperatives. Pursuing ICT interventions in this manner would enable the creation of synergies that standalone initiatives cannot achieve by themselves.

In fact, successful initiatives have not only effectively coordinated efforts in different areas, they have leveraged the synergies created by the complementarity of aligned ICT interventions. These successful initiatives can provide useful lessons on how to better coordinate national "ICT for development" strategies. The next section is devoted to the analysis of how ICT has been leveraged in different countries.

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:

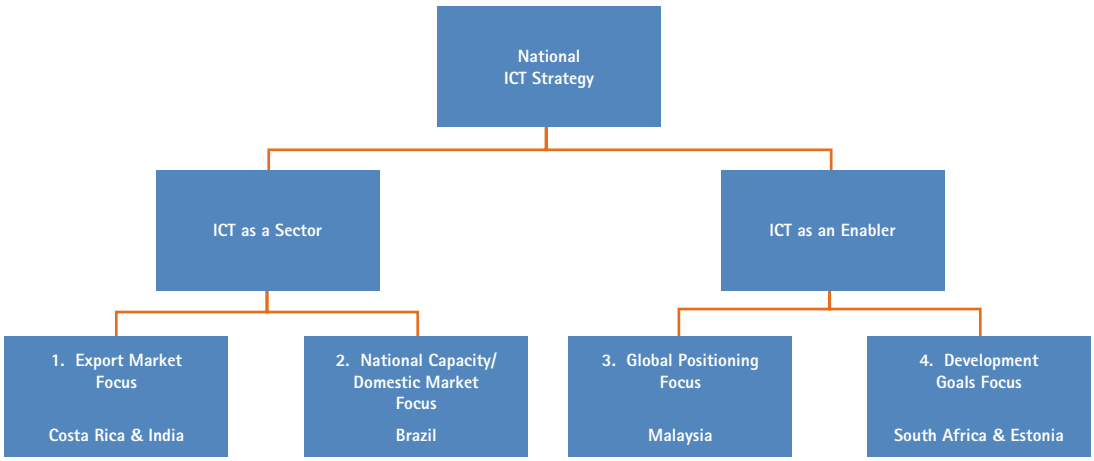
- **ICT as a Production Sector.** This involves policies which focus on the development and/or strengthening of ICT-related industries such as computer hardware, software, telecommunications equipment and ICT-enabled services.
- **ICT as an Enabler of Socio-Economic Development.** This involves the adoption 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



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

[30] Negotiations included offering the company 400,000 square feet of space in a tax-free industrial zone in San Jose, a commitment to improve the airport and flight schedule to better accommodate shipping requirements, low electricity charges, and the cooperation of area schools and the university to train and produce the required workers and engineers. Based on these contractual terms, Intel agreed to build its factory in Costa Rica.

[31] The initiatives adopted include: joining the Caribbean Basin Initiative (which allows it to export products duty-free to the United States); creating duty-free industrial parks and zones (infrastructure provision along with exemption from income and import taxes); and a general willingness to provide business incentives.

[32] ICE, a public monopoly telecommunications company, has networked the whole country with telephone lines, making Costa Rica one of the leading countries in Latin America for telephone density.

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 infrastructure[33] (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

[33] The *Telebras* infrastructure was constructed and implemented throughout Brazil. Integration of the new infrastructure included: a highly-modernized long-distance trunk network, direct distance dialing linking 200 Brazilian cities, installation of 50,000 long-distance circuits, and installation of 36,000 km of telephone cable throughout each state connecting 20,000 municipalities across the country.

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.

[34] The public utility was counted as part of the government budget and hence was affected by policies aimed at reducing government expenditures.

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]

[35] Estonia has a strong emphasis on reform that is resulting in a rapid transformation to a market economy and substantial inflows of foreign direct investment.

[36] Estonia's policy reflects a recognition that an effective knowledge-based economy can occur only in an open society. It has gone so far as to declare Internet access as a right.

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 Company[37] 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 telecottages[38] 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

[37] A partnership with Swedish and Finnish telecommunications operators modernized the Estonian telephone network, in exchange for which, these companies received a share of profits.

[38] A "telecottage" is used to refer to a "community-based" facility that provides distance learning, access to communications, and a range of other functions for a local community.

[39] Operating costs, including labor costs, are considerably lower than in the Western European countries. In 2000, the average monthly income of a software professional in Estonia was four times less than in the United States and three times less expensive than in Western Europe.

[40] Tiger Leap is a reference to the "Asian Tigers" and their fast-growing economies.

[41] The Open Society Foundation has also helped to train "model pensioners" in computer skills with the idea that they will be role models and encourage their contemporaries to take advantage of the public access centers.

[42] The system, designed by a coalition of local software developers, at the request of the government, was expected to pay for itself in savings on paper and printing costs in 14 months.

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.

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 buffeted 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 strategy[43]—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.

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

[43] These components are typically addressed in a country's ICT strategy. Brazil developed the Information Society Program in the late 1990s to guide its further development. Estonia has had a number of documents, including Principles of Estonian Information Policy and the Information Policy Action Plan. Malaysia's National Information Technology Council (NITC) developed Vision 2020 and an associated MSC plan. For India, see IT Action Plan formulated by the National Task Force on IT and Software Development. For South Africa, see SAITIS and Info.com 2025, and for Tanzania, see e-secretariat. These countries also had leaders with a strong vision for the role of ICT in development and who put in place national taskforces or councils to further develop the vision.

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.

3 Creating A Development Dynamic

The unique characteristics inherent in ICT and the evidence from both micro-level initiatives and national ICT approaches suggest that a development-focused ICT strategy that leverages the powerful synergies of ICT as an enabler of social and economic development can lead to the creation of a development dynamic. The lessons learned point to five important interrelated areas for strategic intervention: *policy, infrastructure, enterprise, human capacity, and content and applications* (these will be referred to as components of the dynamic).

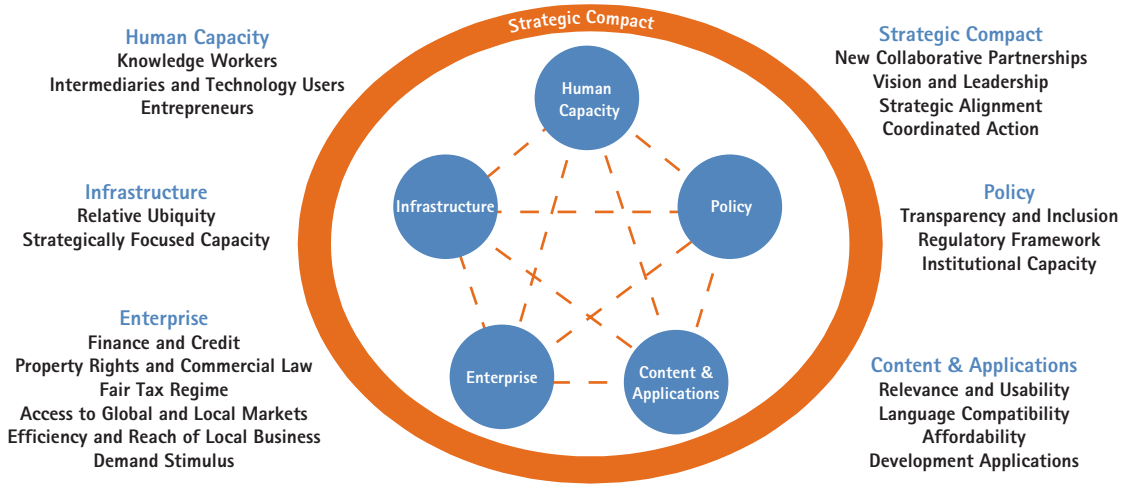
The development dynamic's distinctiveness arises from the fact that it draws on:

- ICT as an enabler to achieve selected development goals (and the integration of the ICT strategy into national development strategies);
- the unique characteristics of ICT (outlined in Section 2.1);[44] and
- the synergies and complementarities between the strategic components (which are mutually reinforcing).

Taken together, these factors suggest that an approach which addresses several components of the dynamic is likely to be more effective than one which focuses in just one area. However, the development dynamic framework does not call for an "all or nothing" approach, nor does it suggest that such a dynamic can only be ignited if action is taken in all five areas at once. While acting on any of the components of the dynamic can produce valuable results, interventions taken across several component areas can generate returns to scale much greater than those achieved by a concentrated focus in any single area. As critical mass and threshold levels are achieved, *feedback, multiplier*[45] and *network effects*[46] can ignite a virtuous cycle of sustainable development.

Consider the following example, which takes a change in infrastructure access as its starting point. Investments in ICT infrastructure can lead to improved access by reducing costs and extending coverage to additional areas. This can have a catalytic impact on enterprises and provide additional incentives for increased adoption of ICT. For

Figure 3.1 Components of a Development Dynamic



[44] Principally, ICT is multi-purpose and cross-cutting, it can enhance productivity and lower costs, and is subject to declining marginal costs in production and replication.

[45] Multiplier effects refer to effects on other components occurring with no additional intervention. Feedback effects are positive effects which come back to an initiating component from another.

[46] This is the tendency for the value of membership in a network to grow exponentially as the number of members increase.

example, it can help SMEs improve their competitiveness and expand market access. This in turn can create a feedback effect as demand for additional and faster access will entice additional investments in ICT infrastructure. The increase in both infrastructure and SMEs can lead, through spillover effects, to an increased demand for skilled labor and knowledge workers. This increased demand for labor can then trigger additional investments in human capital. Such a combination of effects illustrates the connection between the different components that characterize the dynamic. To the extent that these interconnections are foreseen and addressed through complementary interventions, multiplier and feedback effects are realized and the emergence of bottlenecks is avoided.

While the above example just looks at the generic case of a change in the conditions under which infrastructure is provided, the initiating effect could have started from any of the components of the dynamic—a change in IT policy, legislation favorable to enterprise creation, or a demand stimulus for increased deployment of ICT. In South Africa, the government requirement that all public procurement be done with electronic tenders led to a series of dynamic interactions between policy, enterprise and human capability development. Similar results have been achieved through infrastructure roll-out policies centered on development goals. Estonia's Tiger Leap Program has demonstrated how ICT deployed to improve education can have positive impacts in other sectors.

The complementarity between components of the "development dynamic" has substantial policy implications for national strategies focused on ICT as an enabler of development goals. Each of the five components has specific sub-components that allow policy makers and stakeholders to adopt and adapt them to reflect local priorities and conditions. This provides for a flexible policy tool that can be used in different contexts without tying countries to specific development paths.

3.1 Components of the Development Dynamic

The following section addresses, in more detail, each of the five dynamic components, or areas for action.

3.1.1 Infrastructure

Addressing infrastructure in the context of a strategy deploying ICT *as an enabler* to enhance the a*chievement of development goals* would involve the adoption of the following broad principles, adapted for the particular national context:

Strategically Focused Capacity. The strategy should focus on developing strategically focused network infrastructure capacity for key sectors to take advantage of leading edge technologies. To take advantage of *global positioning* possibilities, such focused capacity should also include a reasonable level of global connectivity.

Relative Ubiquity. Unlike policies focused on export expansion or only on global positioning, the above should be complemented by interventions to promote ubiquitous access through universal access funds and support of community networks and public access points.

Until recently, the financial situation of a country's public telecommunications company defined its ability to build and maintain core network infrastructure, as well as to provide universal access. However, with privatization, liberalization and policies aimed at increasing competition in the sector, there is a greater involvement of the private sector in infrastructure provision.[47]

Ubiquity and the move toward universal access[48] is becoming more and more feasible due to rapidly declining costs for networking and telecommunication technologies. These declining costs allow developing countries to leapfrog

[47] See, for example, the Brazil and Estonia case studies. In the latter, a partnership between the national public telecommunications companies and two Nordic telecommunications giants—*Telia* and *Sonera*—led to a rapid increase of telecommunications access and global connectivity.

[48] This varies by country: in Singapore, it is a nation-wide information infrastructure that interconnects computers in nearly every home, school and workplace; in India, in the short term, it means at least one phone in every village.

ahead through the use of cutting-edge technologies. In Botswana, for example, the information network is composed of an all-digital microwave and fiber-optic system with digital exchanges at the main centers. The involvement of the private sector has hastened the adoption of these technologies, particularly in the case of wireless and mobile.

Thus, the framework associated with the development dynamic suggests a move away from either a "build it and they will come" infrastructure policy or one that does not see ICT infrastructure as a development priority. Instead it focuses on the complementarities and synergies between the five strategic areas for action, and on coordinating the work of multiple actors. Infrastructure is rolled out as part of an overall program that includes simultaneous actions in other areas. These could include: the introduction of a supportive regulatory framework, partnerships with NGOs, private enterprise and non-profit community initiatives to expand ICT access and services, support for SMEs and strengthening demand as a beneficial side effect of addressing development imperatives through a public infrastructure strategy (for example, through schoolnets or e-government).[49]

Such initiatives can also help to enhance the financial sustainability of the infrastructure created. Human capacity and skill development would not appear as a bottleneck limiting effective deployment and use of infrastructure. An overall strategy which focuses on strengthening human capacity will result in much more effective spending on infrastructure because insufficient skills will not create a bottleneck to its effective deployment and use.

3.1.2 Human Capacity

Basic literacy is of crucial importance for development and, as such, is one of the development imperatives adopted by the UN Millennium Summit. However, for the purposes of adopting a strategy that deploys ICT as an enabler, it is not an absolute requirement that a country begin with a high literacy rate. In order to deploy ICT for development, it is important for countries to develop a critical mass of knowledge workers, technology users, and motivated entrepreneurs.

Knowledge Workers. Countries should focus on educating and retaining a core of professionals with the technical capabilities to provide and maintain ICT infrastructure and related ICT services, and to adapt new technologies for local requirements. Both tertiary education and corporate training are important components of ICT skill development.[50] Progress in these areas requires an increase in the number of tertiary institutions, the promotion of relevant educational curricula, and the creation of new educational facilities with specific emphasis on ICT skill development. Skill development and retraining of the existing workforce is key. Policies encouraging businesses to allocate resources to employee development and training, as is happening in South Africa, can be an important mechanism for achieving this outcome.

Intermediaries and Technology Users. Also important for achieving development goals and sustainable growth are the institutions to link the technology to those who would benefit from its use. A number of different actors, including the national and global private sector,[51] as well as community networks (particularly for the development of ICT intermediaries and users) have been involved in skill development and the creation of ICT awareness. However, it is not just the creation of skills that is important, but also the

[49] See South Africa's SAITIS strategy and Estonia's wiring of the entire country to facilitate widespread use of ICT applications in education (Tiger Leap program), health, banking, transportation, public administration and e-government.

[50] See Estonia, Costa Rica and India case studies.

[51] While countries such as Estonia and Costa Rica have focused on adapting higher education curricula, India has seen the proliferation of vocational learning institutions and commercial software training companies (such as NIIT and Aptech) create 2000 institutes and produce over 70,000 trainees per annum. In Ghana and South Africa, telecommunication companies have established centers that train ICT network and application specialists.

development of incentives[52] to reduce "brain drain."[53] In South Africa, for instance, the 15-20 percent per annum exodus of skilled technical workers has hindered ICT deployment and the growth of the ICT sector. This process may be reversed if proper measures are taken by policymakers to improve market and social conditions through a development dynamic.

Motivated Entrepreneurs. The development dynamic is also accelerated by the creation of a critical mass of motivated entrepreneurs, people with business expertise to leverage new opportunities.[54] This is a function not just of entrepreneurial skills and financing, but also of a supportive policy environment and opportunities for development. In South Africa, for example, the transition to universal democracy in 1994 has led to a proactive approach by the government to the development of local entrepreneurs and managers. Its Black Economic Empowerment program creates incentives for black businesses. Currently, the number of black entrepreneurs and managers is growing, although beginning from a very low base.

3.1.3 Policy

The overall policy environment, the degree of transparency and inclusion, and, more specifically, the regulatory environment, can all have a major impact on the development dynamic.[55] In addition, key policies in each of the areas of strategic action—human capacity, infrastructure, enterprise—as well as policies supportive of fair competition and property rights, are important to harnessing the potential of ICT to achieve development goals.

Transparency and Inclusion. Transparent and inclusive government processes are useful for both the expansion of ICT, and also an area that the use of ICT can facilitate. For example, the Internet can be used to ensure access to legislation, taxation codes and government services, and thereby facilitate consumer and citizen input into governance processes.

Regulatory Framework. If the regulatory framework is not sufficiently adaptable, it can slow the development of competition in the sector and expansion of ICT use and enterprise growth. There is evidence to indicate that deregulation has had a positive influence on the development of infrastructure[56] in almost all the developing countries where it has been attempted. The benefits of competitive privatization come not only in the form of improved infrastructure, but also through increased foreign investment: in Brazil, for every dollar raised through privatization, an additional US$2.42 are attracted through FDI.[57, 58]

Liberalization and creation of a competitive environment in ISP markets, in many instances, resulted in rapid market expansion.[59] At the same time, regulatory actions that

[52] The Fifth Framework Programme on Research Technology and Development, which grants up to Euro 15 billion in funding, has helped to stop the outflow of talented people from Eastern Europe, strengthening links between industry and research and between Eastern European and EU researchers (Reconnecting Europe, Accenture, 2000). The South African government has created a Human Development Fund to address the "brain drain" problem, especially in ICT areas.

[53] It is estimated that more than 50 percent of tertiary education students from developing countries that study abroad never return.

[54] It was recently estimated that there is an unfulfilled demand in Central and Eastern European Countries of at least 10,000 senior executives and 100,000 middle managers. However, company training is improving this situation (Reconnecting Europe, Accenture, 2000).

[55] See, for example, The New Global Economy and Developing Countries: Making Openness Work, Dani Rodrik, Policy Essay 24.

[56] Evidence from a set of Latin American countries points to the fact that open markets in the region saw basic line rollout growth that was approximately three times as fast as that of countries with state monopolies, and twice as fast as that of countries with private monopolies (ICT and Poverty, World Bank, 2000).

[57] Privatization of telecommunications in Peru resulted in a fixed-line increase of 165 percent in 5 years, a doubling of employment in the sector, and improved access among the poorest households—from zero to 20 percent.

[58] Cross country studies of Internet penetration show a negative correlation between diffusion of the Internet and the monopolization of the telecommunications industry (Hargittai, 1999).

[59] Liberalization of the ISP market in Egypt has driven its rapid expansion. There are over 60 ISPs offering a range of services including dedicated, dial-up, pre-paid and premium services (ITU, Internet Country Case Studies, Egypt, 2000). Similarly, Brazil's managed deregulation of the ISP market resulted in the emergence of a large number of providers (World Bank, ICT and Poverty, 2000).

restricted competition significantly inhibited the growth of Internet services.[60]

Liberalization can also have side effects on developing country government budgets. Many developing countries depend upon interconnection and telecommunication charges to finance social welfare expenditures. Reductions in government collections resulting from liberalization may lead to a need for transitional mechanisms so that social programs are not adversely impacted.

Institutional Capacity. For an ICT as enabler strategy and synergies among the components to be achieved, a basic level of institutional capacity is required. For example, the benefits of a good regulatory framework can be undercut if regulators lack the training, resources, or motivation to implement it.

Even though policy formulation is typically the responsibility of national governments, other stakeholders assist through the sharing of good practices and expertise. Increasingly, the development of institutional capacity and related expertise can be facilitated by leveraging external policy support—for example, regulator-to-regulator programs, virtual policy centers and foreign expertise.

3.1.4 Enterprise

Given the important role played by the private sector in developing ICT infrastructure, creating jobs, and fueling growth (highlighted in Section 2.2.3), supportive conditions and prospects for endogenous and sustainable wealth creation are central to the working of the dynamic. The following appear to be critical factors for enterprise development:

Finance and Credit. Access to credit and financing is fundamental for the smooth functioning of the development dynamic. One of the major reasons for the lack of dynamic enterprise in developing countries is the shortage of affordable credit and investment to support new enterprises. This is often the result of adverse macroeconomic policies (including those aimed at bringing in foreign capital flows or preventing their outflow) and a lack of appropriate financing channels and mechanisms suited to developing market conditions. The development of the two key financial sectors—banking (including micro-finance) and venture capital—is crucial.

The banking sector is critical to channeling resources across geographic zones and economic sectors. It is also ICT-intensive and provides niche opportunities for local enterprises—Brazil is a case in point. As financial institutions proliferate deeper into the different areas of the country, they also help to expand opportunities for under-served communities and businesses.[61] At the same time, ICT can help to make financial services more cost-effective and affordable for poor communities and small enterprises.[62]

Although the venture capital sector is a key engine of enterprise growth in developed countries, this is not yet the case in most developing countries and transitional economies. Many factors account for this—in Hungary, for example, the lack of patent regulations can be held as partially responsible for the shortage of venture capital.[63] Business incubators and accelerators can play a crucial role in this regard.

Property Rights and Commercial Law. The establishment of a favorable business environment can increase foreign direct investment and trade. Although historically many developing countries appeared to benefit from reverse

[60] Restriction of the number of licenses for IAPs (Internet Access Providers serving ISPs), to three and the imposition of a fee of US$100,000 per license created a barrier to competitive Internet services in Tanzania (www.idrc.ca).

[61] Reforms introduced in 1995 in Costa Rica liberalized the state monopoly in checking and savings accounts. Private commercial banks are now able to compete with state-owned banks for demand deposits upon fulfillment of several requirements, one of which is opening four branches in rural areas (www.inforesint.com/profile/crinvest.htm).

[62] For example, Standard Bank of South Africa successfully operates a fast growing program (AutoBank E) that serves 2.5 million low-income customers using ATM and smart cards (www.btimes.co.za/99/1024/comp/comp09.htm).

[63] See Accenture, 2000, Reconnecting Europe.

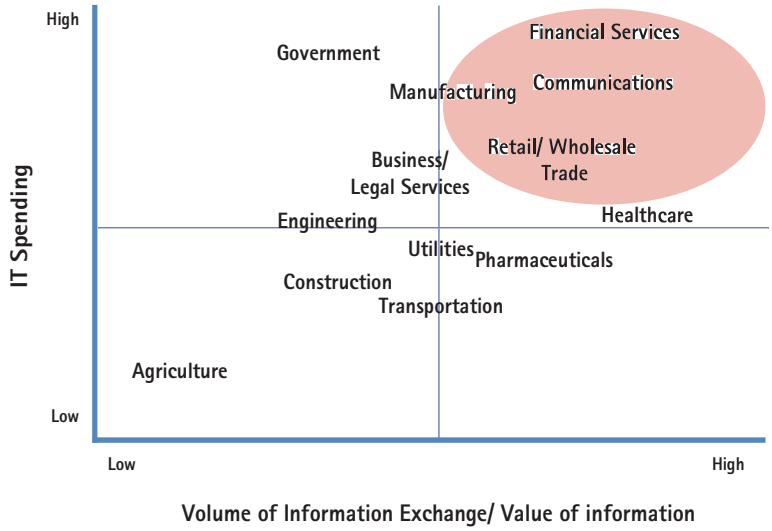
engineering and lax enforcement of intellectual property rights, in the long run the development of knowledge-intensive industries is unlikely to take place without appropriate property and commercial laws. These regimes should incorporate generally accepted principles of fairness, speed and dependability of execution, effective enforcement,[64] and compliance with international norms regarding intellectual property rights protection.[65]

Fair Tax Regime. Policymakers need to ensure that the tax regime is non-distorting and does not act as a disincentive to investment and entrepreneurial efforts.

Access to Relevant Global and Local Markets. Reducing a country's barriers on inward and outward trade flows is an important prerequisite to securing the full benefits of global positioning and gaining access to ICT at affordable prices.[66] ICT, in turn, can play a useful role in making shipping and trade-related rules and regulations transparent in order to facilitate more efficient trade.[67]

Increasing Efficiency and Reach of Local Business. The examples given in Section 2.2.3 suggest that it is crucial that ICT be used to improve the efficiency and reach of local businesses to make the entire local economy more productive, globally competitive, and better connected to local and global markets. This requires that businesses can use both newer trading platforms (such as business-to-business exchanges) and, where appropriate, more traditional business software supporting efficient logistics, good accounting practices and high levels of customer service. Local businesses need to acquire a strong awareness and

Figure 3.2 The Value of Information and ICT Spending in the US by Economic Sector



Source: Accenture analysis.

[64] Enforcement of copyright legislation in Thailand resulted in a reduction in illegal sales from 33 percent of total sales to 13 percent, and in the United Arab Emirates from 33 percent to 18 percent.

[65] In Central and Eastern Europe, lack of intellectual property protection has discouraged foreign investment in high-value activities. Patent laws in these countries often are not strong enough to protect new products.

[66] The elimination of almost all trade barriers in Estonia has been a key factor in the country's economic growth performance. See www.ecountry.com and Accenture, 2000, Reconnecting Europe.

[67] The Singaporean Government worked with a consortium of companies to develop software to speed customs and port operations (Kraemer et al., 1990; Wong, 1997).

understanding of the business opportunities these technologies make available. Artificial obstacles to the purchase and use of such software should be removed and steps taken to attract appropriate inward investment from providers of world-class software. It is important that providers take care to price appropriately for local marketplaces. Foreign direct investment specifically targeted at assisting local suppliers is critical.

Demand Stimulus. The different sectors of the economy differ in their demand for ICT infrastructure and services. High value-adding sectors tend to rely heavily on ICT. In developed countries, demand for ICT products and services comes predominantly from the financial services sector, manufacturing, government,[68] the telecommunications industry, and the retail/ wholesale sector (see Figure 3.2).

In many developing countries, the government is one of the major consumers of ICT products and services. Governments can therefore lead by way of example in the use of ICT and can also implement best organizational practices—some involving the use of ICT—to ensure that public funds are spent in the most optimal way.[69] Procurement of services by the government via ICT channels can generate a strong demand for ICT services. For example, in South Africa, the government currently spends US$1-2 billion a year on information technology systems for public use.

Governments can also encourage ICT deployment by enterprises to make them more competitive and efficient. The Chinese government, for example, believes the Internet can help to reform inefficient state-owned enterprises (SOEs) and is encouraging SOEs to adopt e-commerce. The "Enterprise On-line" initiative aims to put seven million Chinese businesses, including many SOEs, on the Internet by the end of 2002.[70]

3.1.5 Content and Applications

Relevance and Usability. ICT's capability to achieve development goals will not be effectively leveraged without content that is *responsive to user needs* and local conditions, in a language that is commonly understood, and with technical specifications that are sensitive to the actual use and working environment of users.[71] Partnerships between community networks and the private sector are key in this area, as are consultation mechanisms that facilitate bottom-up approaches and inclusiveness.

Language Compatibility. In many developing countries, problems also arise because standard fonts for local languages are unavailable.[72] External partners (public, private and citizens in diaspora) can play a key role in this area.[73]

Affordability. Unaffordable access is probably the single most important reason for low use of ICT in developing countries. National ICT strategies can facilitate mechanisms for subsidized use and can support reform measures that would lead to the reduction of costs and access charges.

[68] In the US, federal government demand stimulus was critical to the growth of the Internet and the development of related ICT infrastructure, the market for IT services and appropriate human capacity.

[69] The Hungarian government, which accounts for 30-33 percent of the total demand for ICT services in that country, centralizes procurement in order to leverage its buying power and to ensure transparency and efficient use of public funds (www. itfriend.mit.gov.in).

[70] The Internet provides various low-cost IT solutions for enterprises in developing countries. Travel companies in Namibia, for instance, have started to use Web marketing. Many online tourism solutions support reservation and confirmation processes through email for developing countries (www.bellanet.org).

[71] For example, Arabization is currently considered to be a critical factor in developing information systems for countries in the Gulf region. There is also an unsatisfied demand for Arabic language educational materials in electronic format (http://www.unesco.org/).

[72] In Russia, Internet use increased exponentially with the introduction of cyrillic character sets. There was rapid growth in local content with the result that 60 percent of all Internet traffic is now within the country.

[73] For examples and cases of support for multilingual publishing on the web, see http://www.heise.de/tp/english/inhalt/co/5199/1.html. India's Centre for Development of Advanced Computing also recently launched a multilingual webware scheme called the iLEAP-ISP scheme. A multilingual word processor with Internet and email support in Indian languages is made available free to all Internet subscribers through their respective ISPs. Also in India, the Tamil Nadu government launched a US$1.25 million Tamil local language initiative to promote online content and has given its backing to keyboard standardization drives for Tamil. See http://www.icimod.org.sg/focus/ict/ict_bang/online3.htm.

Development Applications. In addition, there is a need to build applications that are focused on achieving development goals. These range from those that enhance e-government and e-governance processes, to those that apply ICT to specific development goals, including health, education, empowerment, environmental sustainability and support of employment and enterprise creation.

3.2 Strategic Compacts

The emerging evidence from the various ICT for development strategies presented in Section 2 strongly suggests that, in order to reap the benefits of ICT for development, it is necessary to involve the full range of actors in the public and private sector in a process that is inclusive, open and participatory. In the case of an ICT as enabler strategy with a development focus, the relative success of Estonia and South Africa, for example, is positively correlated to the integration of multiple stakeholders and sector partnerships into the design process.

The key element here is the involvement of all sectors and stakeholders—not only in the design of strategies, but also, and perhaps more importantly, in their implementation—in such a way that each has specific roles and responsibilities. Strategic partnerships are required to aggregate the capabilities and resources to address the pervasive market failures in developing countries and to create win-win situations for the various sectors and stakeholders involved. Neither the government nor the private sector alone can achieve this objective—each is dependent on the cooperation of others to accomplish its goals.

A new form of collaboration and coordinated action between public, private, civil society and international organizations is needed—a strategic compact. There is an urgent need to build upon, and go beyond, existing partnerships to redefine roles and responsibilities at the global, national, and local level.

The required characteristics of these new strategic compacts are:

Vision and Leadership. This includes grasping the potential for ICT to link national economies to the new global network to accelerate the achievement of broad development goals, as well as the leadership to promote broad partnerships at the global, national and local levels to support bottom-up initiatives. Heads of government should provide the necessary leadership to confront existing barriers and promote innovative solutions. National and international private industry should work closely together to adopt, adapt and develop technologies to meet the unique needs and challenges of the less fortunate. Civil society should be a critical player and help assure that ICT is used in a way that targets and addresses specific development goals and priorities. As is highlighted by Estonia's experience, a strong vision which can be used to build consensus on national priorities and secure the commitment of all players involved is vital to the success of national ICT initiatives.

Strategic Alignment. A strategic compact can provide the space and pressure to address resistance, create ownership and devise incentives for change. A multi-stakeholder taskforce can thus work to align the goals, incentives, roles and responsibilities of diverse stakeholders and provide win-win opportunities. Without this sort of alignment, partnerships will not be sustainable and results will fall short of expectations for all involved.

Coordinated Action. Close coordination serves not only to prevent duplication of efforts, but also to achieve positive synergies. Cross-fertilization of ideas, multiple uses of ICT infrastructure and facilities, and a redirection of available resources to crucial and under-funded areas are examples of the gains to be realized from forming a strategic compact.

New Collaborative Partnerships. The successful design and implementation of a strategy focused on ICT as an enabler of development requires the formation of national compacts involving all stakeholders. South Africa's ICT taskforces and councils—and Tanzania's innovative eSecretariat which supports the work of the national eThink Tank—demonstrate the effectiveness of addressing ICT for development in a participatory and inclusive fashion. At the international level, both the G8 Digital Opportunity Task

Force (Dot Force) and the UN ICT Task Force have made substantial contributions to furthering the understanding of ICT's role in the development process. Through sharing best practices, promoting dialogue, highlighting success stories, and building consensus on the new agenda, national and international strategic compacts are crucial ingredients to help countries harness the benefits of ICT as a development enabler.

3.3 A Framework for Action

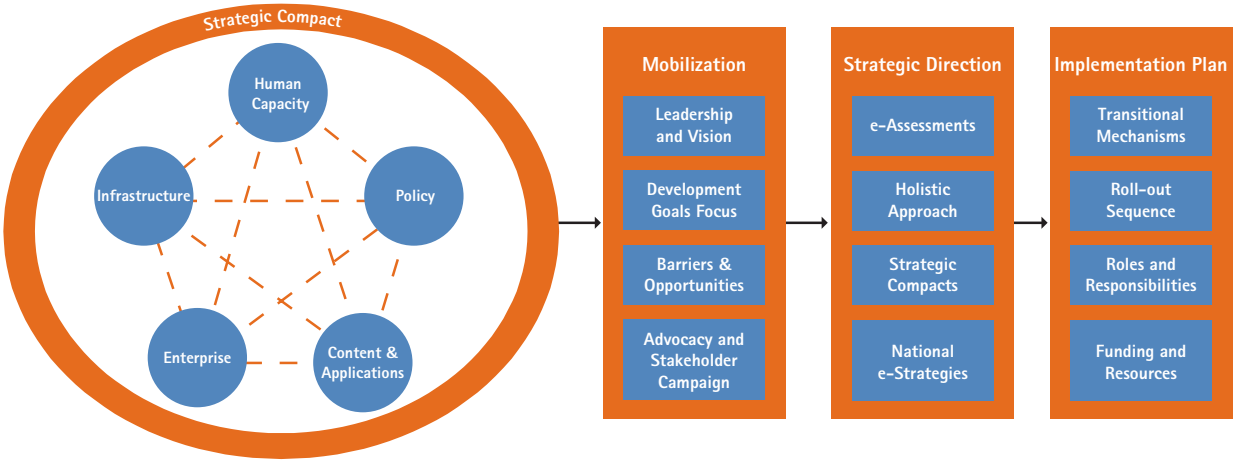
As developing countries face the new opportunities and challenges of the global network economy, there is increasing debate about how ICT can more effectively enable socioeconomic development. Although several countries have in fact created national ICT task forces and developed national ICT strategies (as seen in Section 2.3), the lack of comprehensive frameworks to illustrate how to use and deploy ICT development leaves nations struggling to identify effective strategies; sometimes even pursuing detrimental and costly approaches. The development dynamic suggested by the case studies and the inherent characteristics of ICT, and presented here by the DOI, is a framework that can assist countries in the effective and prompt design and implementation of ICT interventions.

Strategies for the use of ICT are not universal. Countries face different circumstances, priorities and financial means, and should therefore adopt different strategies accordingly. The framework offered by the DOI can be of help in determining a strategy regardless of what goals have been established, since coordinated action along the five areas identified in the framework is always likely to yield more effective results. However, the evidence and analysis presented suggest that a strategy that focuses its ICT interventions towards the achievement of development goals is more likely to achieve marked socioeconomic development. An ICT as development enabler strategy would have the following characteristics:

1. Adoption of a holistic and multi-dimensional approach. To strengthen synergies between the components of the development dynamic, leverage spillover effects, and directly address development imperatives, it is useful to undertake aligned interventions in a number of strategic areas.

2. Coordinated actions, strong partnerships and local implementation. The ICT as enabler focus, by its nature, involves actions taken by a number of different stakeholders. Enhancing the enabling impact of ICT—creating a development dynamic—will require not only a greater focus on the interplay of complementary components, but also coordinated action among diverse stakeholders and an inclusive policy to benefit from the synergies created by harmonizing bottom-up approaches. That is to say, the

Figure 3.3 Translating Framework into Action



process by which the approach is arrived at and coordination undertaken is equally important for success. The process needs to address potential barriers and resistance, put in place transitional mechanisms to address trade-offs and create positive incentives for change that leverage the creative potential of the different actors, allowing them to work on the basis of both established as well as new roles and responsibilities. This process will vary from country to country as each attempts to translate the strategic framework into action leading to tangible results on the ground (see Figure 3.3).

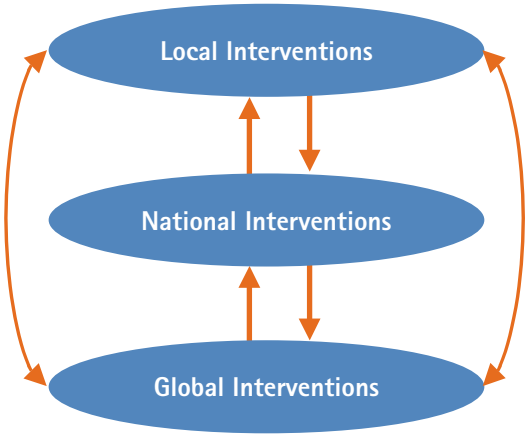
3. Global, national and local linkages. The development dynamic framework also acknowledges that the global network economy creates new opportunities for nations and communities. National ICT strategies can no longer be pursued in isolation but must be positioned within the global context, while simultaneously addressing the needs and opportunities emerging from the local context. Just as the value of a network expands with each additional member, the opportunities provided by the global network economy and society increase as nations and communities across the globe participate more fully.

There are important linkages between the national and local contexts as well. At the national level, developing country governments have a crucial role to play in creating the enabling environment for achieving virtuous cycles of sustainable development. National level policies can help or hinder ICT initiatives for development, with important consequences for the scalability and sustainability of local initiatives. And local initiatives can help create the critical mass that is needed for threshold levels, scale effects and networks effects to be realized at the national level. The local can also be integrated with the global, bypassing the national and allowing for bottom-up approaches (see Figure 3.4).

To summarize, implementing a framework for action involves bringing new ideas to the table, creating processes to build consensus about national priorities and addressing barriers in the different areas through some combination of advocacy, consultation, incentives, reforms, transitional mechanisms and the formation of strategic compacts.

The framework creates the foundation for diagnosing what needs to be addressed by national ICT strategies, policies and partnerships, based on an assessment of the level of preparedness (readiness) relative to the desired goals. It provides a tool to devise the strategies necessary for the creation of an enabling environment to achieve development goals and to outline measures for the type and levels of investment required to address gaps in infrastructure, policy, enterprise, human capacity and content and applications.

Figure 3.4 Global, National and Local Linkages



4 Conclusions

Two of the most powerful forces in the world today are the spread of ICT and the global effort to achieve more widespread social and economic development. It has long been suggested by some that these forces are in opposition: the development agenda aims to help developing countries make great strides forward and to close the gap between rich and poor countries, while ICT, according to this line of thought, reinforces the advantages of the developed countries and perpetuates the disadvantages of the less developed.

This study has found that this need not be the case. It is far from inevitable that ICT will have a negative impact on developing economies; in fact, with the right policies and practical actions, ICT can be a powerful enabler of development.

This is not mere theory—it is already starting to happen in practice. Section 2.2 of this study highlights a range of ICT initiatives, directly targeted at specific development goals, where ICT is producing tangible benefits for different communities. Across the developing world, ICT is helping women and men improve their lives, take advantage of new opportunities and realize their full potential. From the provision of low cost healthcare services to skill-building through long-distance education, from unearthing the entrepreneurial skills of Bangladeshi women to empowering development workers in Southern Africa with information and communication tools, ICT is undoubtedly making a difference in developing communities.

Initiatives that are properly conceived and implemented can have an impact that extends beyond the individual communities they are designed to serve. Model initiatives can be scaled nationally or even regionally, contributing to the critical mass and the threshold levels needed to ignite a virtuous cycle of development. In such circumstances, the increasing use and pervasive impact of ICT can substantially enhance the ability of developing countries to address the full range of development goals.

Of course, ICT is just one of the many resources that must be deployed as part of an overall development strategy. But the analysis in Section 2.3 of this study suggests that those countries that have employed ICT as an enabler of development goals, rather than just to position their economies in the global market, increase exports or build national capacity—can indeed achieve higher levels of development. In contrast, those countries that have had a single-minded focus on economic growth, and as such failed to integrate development imperatives into their national ICT visions, have ended up with narrowly defined ICT initiatives that do not fully address development goals.

Drawing on the analysis in this study, the DOI has developed a framework to assist policymakers and stakeholders in choosing strategically aligned ICT initiatives that can be implemented to achieve a "development dynamic." Well-targeted ICT interventions in five key interrelated areas can play a crucial role in igniting and sustaining this development dynamic by creating the necessary conditions to achieve critical mass and to reach the thresholds required for significant multiplier effects and increasing returns to scale.

The framework also emphasizes the importance of a new "strategic compact" for development, one that aligns government, civil society and business strategy and creates powerful linkages among organizations and communities across global, regional, national and local levels.

The need for a common framework and a shared vision in the effort to harness ICT for development does not mean that there is just one way of using ICT to achieve development objectives. Countries and communities are experimenting with very different initiatives and approaches, that take account of diverse conditions and resources, with great effect. Similarly, the holistic approach put forward does not imply that action must necessarily be taken in all five areas at once or that only large-scale efforts will do. Rather, it offers a strategic framework with which to design and prioritize development initiatives with a view to maximizing their long-term impact.

No matter what priorities a particular country chooses to adopt, all can benefit from greater coordination and broad

inclusion of all stakeholders in the creation and implementation of an ICT strategy for development. The development dynamic framework aims to help in this effort. It provides a focused yet flexible basis on which ICT can be used to achieve real change for people living in developing economies—even those that have yet to reap the benefits of the ICT revolution. It is not too late for all countries and communities to take advantage of digital opportunities, but it will take strong leadership, vision and a commitment by all stakeholders to work together, now, to achieve this goal.

Appendix 1 Millennium Summit Development Goals[74]

The following goals and targets were adopted in the Millennium Declaration at the General Assembly of the United Nations in September 2000. The Digital Opportunity Initiative (DOI) categorizes applications for ICT in development against five critical development imperatives that map to the Millennium Goals.

Table A1.1 Millennium Summit Development Goals

Millennium Goal	Target	Performance Indicators	DOI Opportunity Area
Income Poverty	To decrease by 50 percent the proportion of people in extreme poverty by 2015 (1990 baseline)	• Poverty headcount ratio (percent of population below national poverty line) • Poverty headcount ratio (percent of population below US$1 a day)	Economic Opportunity
Food Security and Nutrition	To decrease by 50 percent the proportion of people who suffer from hunger by 2015	• Percent of population below minimum level of dietary energy consumption (caloric intake in context of food balance sheet) • Percent of underweight under-5s	Health
Health and Mortality	Reduce the spread of HIV/AIDS by 2015 (2000 baseline)	Estimated HIV adult prevalence rate	
	Reduce the under 5 mortality rate by two-thirds by 2015 (1990 baseline)	Under 5 mortality rate	
Reproductive Health	Reduce the maternal mortality rate by three-quarters by 2015 (1990 baseline)	Maternal mortality rate	
	Achieve universal access to safe/reliable contraceptive methods by 2015 (baseline 1993)	Contraceptive prevalence rate	
Housing and basic household amenities and facilities	To decrease by 50 percent the proportion of people unable to reach or afford safe drinking water by 2015 (baseline 1990)	Percent of population with access to safe drinking water	
Education	Achieve universal access and completion of primary education by 2015 (baseline 1990)	Net enrollment in primary education	Education
Gender Equality and Women's Empowerment	Eliminate gender disparity in primary and secondary education by 2005 (baseline 1990)	• Ratio of girls to boys in primary education • Ratio of girls to boys in secondary education	Participation and Empowerment
Environment	All countries to be implementing a current national strategy for sustainable development by 2005	Percent of countries with environmental strategies	Environment

[74] United Nations, 2000, United Nations Millennium Declaration, www.un.org/millennium/declaration.

Appendix 2 Specific Interventions: Evidence of Impact

The following initiative profiles and case studies provide more detailed evidence of the impact ICT-enabled initiatives can have on social and economic development. The initiative profiles are organized into five development application areas: health, education, economic opportunity, empowerment and participation, and environment (see also Section 2.2). The case studies, contributed by the World Resources Institute (WRI), demonstrate how micro-level interventions can impact and are influenced by the components of a wider "development dynamic" (see also Section 3).

Table A2.1 ICT Initiative Profiles: Health

Initiative and Application Model	Impact
ITU Telemedicine Pilot Projects The International Telecommunication Union (ITU) is conducting telemedicine pilot projects in developing countries. Network connectivity is used for access to medical services and databases, teleconsultation, tele-education, vital sign monitoring, image transfer and video conferencing applications.	• A telemedicine system in Uganda based on ISDN point-to-point data link facilitates information exchange between hospitals. • An Internet link in Georgia allows online medical consultations. • A telemedicine link based on ISDN enables video-conferencing between hospitals on the islands of Malta and Gozo. • An information and telecommunications system in Myanmar improves medical services delivery.
Texas Technology University Health Science Centers Originally designed to connect the four campuses of the university, links were extended from the main campus to distant rural sites for the purpose of live medical consultations. In the early 1990s, the university invented TeleDoc, a single portable integrated package of software and hardware to provide live interactive video consultations.	• The telemedicine system provides a high standard of medical services at low cost. • The university conducts more than 2,000 telemedicine consultations a year for 33,000 inmates housed in 26 prisons in Texas. • TeleDoc is available to 92 percent of the inmates in the area and has reduced transportation costs by between US$200 and US$1,000, depending on location.
Telemedicine in Ginnack In Ginnack, a remote island village on the Gambia River, nurses use a digital camera to take pictures of symptoms for examination by a doctor in a nearby town. The physician can send the pictures over the Internet to a medical institute in the UK for further evaluation. X-ray images can also be compressed and sent through existing telecommunications networks.	• Physicians in remote locations can take advantage of the professional skills and experiences of colleagues and collaborating institutions. • People in Ginnack have better healthcare and medical services.
Disease Response in Sub-Saharan Africa Across Sub-Saharan Africa, the Internet is used to report daily cases of meningitis to monitor emerging epidemics. When threshold levels are reached, mass vaccination is required and the Internet is used to rapidly mobilize medical personnel and effectively coordinate laboratories and specialist services.	• Information exchange via the Internet allows monitoring of disease evolution and provides essential communication support to disseminate reliable information to public health officers and professional vaccination teams in the field. • Both of these applications help reduce loss of life from tropical diseases and epidemics.

Table A2.2 ICT Initiative Profiles: Education

Initiative and Application Model	Impact
African Virtual University (AVU) The AVU is a continent-wide network of universities that have joined with the World Bank to bring courses in computer science and business management to African students and professionals.	• AVU results in improved accessibility to high quality education. • Travel and overhead expenses for students in remote locations are reduced. • AVU generates employment opportunities as a result of higher education.
Cisco/ UNDP Networking Academy Program The Program is an e-learning initiative that delivers web-based educational content, on-line testing, student performance tracking, hands-on labs, and instructor training and support. It is offered at high schools, technical schools, colleges and universities, community-based organizations and educational institutions around the world. In partnership with Cisco, the UNDP is running a sister program in 24 least-developed countries.	• The Program has served more than 155,000 students and 12,000 instructors around the world. • 5,700 Networking Academies are located in all 50 US states and more than 100 countries.
Intel Teach to the Future Teach to the Future is a training program created for teachers to help them learn how to utilize computer technology as a teaching tool to captivate students and ultimately move them toward greater learning.	• Intel has trained 400,000 classroom teachers in 20 countries around the world including 100,000 in India alone. • The Program has increased the effectiveness of computers in classrooms and enhanced student learning.
The World Links for Development (WorLD) The Program's mission is to establish global on-line communities for secondary school students and teachers around the world.	• WorLD is currently active in 15 developing countries. • It promotes greater collaboration within schools and across different countries. • WorLD encourages equitable gender involvement and participation.
NIIT's Education Program A leading Indian software services and education provider in India is promoting education by setting up computer labs across the country, establishing scholarships for economically weak students and launching programs (such as the Hole-in-the-Wall) aimed at underprivileged children.	• Two hundred computer labs have already been established. • IT training will allow students to participate in the burgeoning IT sector of the economy. • The 'Hole-in-the-Wall' program will educate underprivileged children and increase their chances of enrolling in the formal education system. • Web-enabling IT courses will further extend the reach of IT education in the country.
StarMedia This initiative intends to provide a better future for millions of underprivileged youth in Latin America and the Caribbean by providing training in information technology skills, counseling and job placement.	• More than 60,000 students who participated in the programs have graduated from 190 schools in Brazil. • More than 30,000 young people per year have been given improved education opportunities in Latin America.

Table A2.3 ICT Initiative Profiles: Economic Opportunity

Initiative and Application Model	Impact
PEOPLink PEOPLink is a non-profit, fair trade organization helping talented artisans in developing countries market their products directly to buyers on the Internet, cutting out the middleman. The images of the products are placed on the PEOPLink site and marketed to retail and wholesale buyers all over the world. PEOPLink also helps local groups build their own web sites and post information.	• The site received 14,000 hits and traded US$30,000 by the end of 1998. • Daily sales range from US$50–500, with up to 90 percent going to artisans. • According to PEOPLink, it generally pays craftspeople about 20 percent more than the going rate for exported products.
Utilities Afrique Exchange Established by Omega Scientific Research (OSR) and Izodia (formerly known as InfoBank Africa), utilitiesafrique.com is Africa's first B2B electronic exchange. This portal offers comprehensive e-trading to African utilities in the power, water, gas and telecommunication organizations and to their several hundred suppliers. It also offers utilities access to rich, real-time information such as news, business opportunities and events in Africa.	• This initiative is expected to help African businesses become active participants in the new economy. • OSR expects that suppliers can reduce sales costs by 80 percent and purchasers can reduce the processing costs of procurement by a minimum of 50 percent. • The B2B exchange initially focused on South Africa before expanding into East and West Africa. It has received expressions of interest from other countries such as Ghana, Zimbabwe, Kenya and Tanzania.
Rural Trading Networks In Chincheros, a small rural village in Peru, village leaders formed an Internet-enabled partnership with a national export company to trade rural produce in overseas markets.	• Village income has increased five-fold to US$1,500 per month. • The village vegetables are now sold daily in New York.

Table A2.4 ICT Initiative Profiles: Empowerment and Participation

Initiative and Application Model	Impact
Madhya Pradesh State Initiative The Madhya State Initiative is an experimental Intranet computer network for remote farming districts in India. The State provides the content for the site, farmers buy their own computers, and the operation is franchised to an educated local person who charges small fees for access to information and services. Villagers can report broken pumps, lost pension checks or a sick teacher, and the state guarantees a reply within a week.	• For 10 cents, farmers can obtain copies of land titles that previously cost US$100 when purchased from corrupt officials. • Farmers now take advantage of higher prices in city markets (up to 40 percent higher) because the system has reduced their reliance on local traders imposing lower rates. • Farmers are learning computer skills and earning off-farm wages.
Andhra Pradesh Citizen Service Centers Andhra Pradesh, a state of India, has launched Internet-enabled Integrated Citizen Service Centers. Access to services including bill payments, issuance of certificates, permits and licenses, public information and administration procedures are provided.	• People in Andhra Pradesh can take advantage of more efficient, transparent government services.
Charity@Incubator This non-profit organization is using Internet technology and business incubator practices to help children in Arab countries. It deploys Accenture's expertise in technology, marketing, finance and idea generation to create world-class charities that are built, marketed and operated according to a business plan.	• The first project, Al Aydi, is creating an Internet-based children's portal to display the work of Arab children to a global audience. It has provided children with a sense of pride and self-esteem. • The project has generated revenue through referral fees and corporate sponsorships.
DATPERS The Dalit and Tribal People Electronic Resource Site (DATPERS) is a non-profit organization providing electronic newsletters on issues related to Dalit and Tribal People in India and helping to coordinate international human rights campaigns. DATPERS is dedicated to information dissemination, research, dialogue and projects to address the situation and the needs of people in South Asia.	• People in India, and others sympathetic to the issues, exchange information about what is happening in the Indian villages. • DATPERS has exposed the exclusion of 250 million low caste people, coordinating International Human Rights campaigns and keeping the community in touch.
APC Women's Networking Support Program This program promotes gender equity in the use of ICT technologies by providing IT training and research capabilities in the fields of ICT policy, skill-sharing and women's network-building. Various programs addressing inequities based on women's social or ethnic backgrounds are being launched worldwide.	• APC helps women to be more empowered by encouraging communications among women's organizations, providing training and support activities and building strategic alliances with media networks.

Table A2.5 ICT Initiative Profiles: Environment

Initiative and Application Model	Impact
Virtual Watershed The emerging generation of digital tools is making it possible to implement integrated, watershed-scale salmon recovery strategies in the Northwest United States. These same tools can be applied to issues of bio-diversity and sustainable resource management in other regions.	• Digital tools can integrate sustainable management of watersheds and fisheries to improve bio-diversity. • Digital tools can facilitate cooperative resource management across the political boundaries of communities, states, and nations.
Bio-diversity in Indonesia A national computer-based information initiative in Indonesia combines the databases of various agencies and contributes to a global bio-diversity network.	• Sharing information strengthens the capabilities of existing data providers. • Improved information access promotes public awareness. • Networking encourages interest and participation in bio-diversity issues.
Weather/Pest Information Network The Network provides weather data to forecast pest problems, reducing pesticide use and the subsequent impact on environmental quality and farming sustain-ability.	• Results from seven existing pest models indicate savings of US$7.1 million for the fruit and vegetable industry from using improved forecast data to guide pest management practices.
SIDSNet SIDSNet is a medium of communication for 43 Small Island Developing States (SIDS) on common issues such as biodiversity, climate change, coastal and marine man-agement, energy sources and trade. It is promoting the sharing of SIDS experiences and the development of the global SIDS agenda.	• The web site receives an average of 300,000 hits per month from over 100 countries including donors and SIDS. • The site contributes to the increasing level of awareness and under-standing of the link between the environment and human develop-ment among SIDS decision makers.
Precision Agriculture Precision Agriculture is an information-based initiative offering information products that benefit farmers by contributing to the protection and efficient use of envi-ronmental resources. It uses sensors, digital application controllers, communication links, global positioning sys-tems (GPS), computers and innovative software solutions to automatically match agricultural inputs and practices to variable local conditions.	• Better information inputs for land management decisions are provided. • Pesticides and seed varieties can be tested more efficiently. • Environmental stewardship is improved. • Agricultural yields can be significantly improved.

Case 1 Scaling Micro-finance: Pride Africa[75]

Hundreds of millions of people lack access to the formal financial sector. As a result, they cannot save, borrow, buy homes, or grow their businesses—a significant social and economic cost to the communities and countries in which they live. Pride Africa is the largest micro-finance institution in East Africa and is addressing this challenge in an innovative way. The organization has lending operations in five countries, a client base of 100,000, and reaches some of the poorest of the poor. Pride Africa's average loan size is US$125, and these loans finance everything from trading operations to production of foodstuffs to manufacturing of clothing.

Business Model. Pride Africa is designed as a franchise model built around proprietary software systems, uniform processes, and extensive training to achieve pan-regional economies of scale that allow for rapid, cost-effective expansion. The software provides loan tracking, financial projections, and branch office management information. Its use has significantly streamlined the organization's internal transactions, both reducing costs and demonstrating an approach to improving the fundamental inefficiencies of the micro-finance industry.

Software tools, telecommunications links, and other ICT technologies are even more central to Pride Africa's strategy for the future. Pride Africa is negotiating relationships with commercial banks and intends to link micro businesses to the formal financial sector by playing a crucial intermediary role—aggregating loans and savings, and providing consolidated loan tracking, accounting, credit referencing, and credit/ debit card processing. In effect, Pride Africa will serve as a buffer between large commercial banks and thousands of small clients, and offer a range of financial services currently not available to micro-enterprises, particularly in poor communities. The intended result is greatly increased capital for micro-lending and rapid expansion in the number of branches and clients served, multiplying the development effects of micro-finance. The software that will make this intermediary role possible is presently being piloted in Kenya.

Infrastructure. Most of Pride Africa branches are located where its clients are—in poor, semi-urban neighborhoods. Linking these branches through an ICT network to facilitate daily loan operations, software upgrades, and staff training is now possible only via satellite. Pride Africa's plans for ICT infrastructure to play a more important role in the future, since it will be essential to link its branch network to commercial banks, enable non-financial business services,[76] and make possible expansion into rural communities. At present, however, the lack of ICT infrastructure in East Africa is a significant barrier to these ambitions.

Human Capacity. Pride Africa's success to date has been the result of a meticulously trained staff. Attrition rates are very low and some franchises boast credit officer productivity rates among the highest in the micro-finance industry. Pride Africa has drawn on the depth of talent in its franchise network to staff expansion and new franchise creation. However, Pride Africa faces a significant human capacity bottleneck—a shortage of local professionals with ICT skills. Its current solution, outsourcing, has slowed development of the software critical to its expansion plans.

Policy. Pride Africa in particular, and micro-finance institutions (MFIs) in general, operate under a tenuous financial regulatory status. They are treated as NGOs rather than as financial entities, even though some manage millions of dollars for their clients. Since accepting deposits is illegal for non-bank institutions in East Africa, MFIs accept "compulsory" or "non-voluntary" monies labeled as loan insurance funds. These irregularities are overlooked by national governments, who are generally supportive of MFIs since they are virtually the only available means of meeting the financial needs of the majority of their populations. Telecommunications companies and Internet service providers, on the other hand, are still highly regulated in

[75] Excerpted from in-depth case study prepared by the World Resources Institute.
[76] Pride Africa plans an internal market and information exchange, known as Drumnet, to link its 100,000 clients.

most of East Africa, with the result that connectivity costs are high and access is limited. This is a significant barrier for Pride Africa and any other business wishing to link branches or customers via an ICT network.

Enterprise. Pride Africa's operations have been highly subsidized by soft funds and low-interest loans provided by international multilateral donors. Commercial or venture finance has not been available. This has limited expansion of the franchise network, since it is dependent on donor funding. Lack of more flexible funding has been a significant constraint on the technology development critical to Pride Africa's business strategy; some technology projects have been put on indefinite hold. Nonetheless, in the past year almost all country operations have reached financial sustainability and subsidized funds are being phased out of balance sheets.

Content and Applications. Pride Africa's plans to create local content are embodied in Drumnet, the information exchange and internal market that it hopes will eventually link its clients. Drumnet would permit clients to share experience, pool their buying power to seek lower costs, and eliminate middlemen in client-to-client business transactions. Development of Drumnet has been put on hold because of lack of flexible financing, shortages of local ICT talent, and infrastructure barriers.

Key Lessons. Micro-finance is a proven but under-utilized development tool. Pride Africa's case shows the potential for ICT-based strategies to bring micro-finance to scale by increasing efficiency, enabling access to commercial finance for rapid expansion, and mediating between banks and micro-enterprise to the benefit of both. Pride Africa's ability to realize its business goals will depend not only on clarification of the financial policy ambiguities surrounding micro-finance, but also on access to finance for technology development and elimination of the barriers facing East Africa's ICT sector in general—restrictive policy environment, critical shortage of local ICT talent, and inadequate infrastructure.

Case 2 Rural Connectivity: Grameen Village Pay Phones[77]

In Bangladesh, 97 percent of homes and virtually all rural villages lack a telephone, making the country one of the least wired in the world. This lack of connectivity has contributed to the underdevelopment of the country and the impoverishment of individual Bangladeshis. To address this problem, Grameen Bank, a micro-finance institution, formed two entities: 1) Grameen Telecommunications, a wholly-owned non-profit organization to provide phone services in rural areas as an income-generating activity for members of Grameen Bank, and 2) Grameen Phone Ltd., a for-profit entity that in 1996 bid on and won a national GSM cellular license. Grameen Phone has since become the country's dominant mobile carrier,[78] providing services in urban areas and along the major railway routes via a network of cellular towers linked by fiber-optic cable.

Business Model. Grameen Telecommunications has the explicit goal of helping Grameen Bank's members shift from relatively low-yield traditional ventures, like animal husbandry, into the technology sector by creating micro-enterprises that can both generate individual income and provide whole villages with connectivity. Grameen Telecommunications uses Grameen Phone's advanced GSM technology in stationary village phones owned and operated by local entrepreneurs. These entrepreneurs purchase the phones with money borrowed from Grameen Bank,[79] and sell phone services to customers by the call. Rates are generally twice the wholesale rate charged by Grameen Phone plus taxes and airtime fees. An average of 70 customers a month uses each phone. This shared-access business model concentrates demand and creates relatively high cash flow, even in poor villages, enabling operators to make regular loan payments and still turn a profit. Repayment rates to Grameen Bank are 90-95 percent.

Rural telephones are also very profitable for Grameen Phone, bringing in revenues per phone of US$93 a month in March 2001, twice as much as Grameen Phone's urban mobile phones. However, rural phones represent less than 2 percent of the phones used on Grameen Phone's network and bring in only 8 percent of the company's total revenue, the company's profitability still depending on its urban business.

Infrastructure. Grameen Telecom's original goal was to have a phone in every one of Bangladesh's 65,000 villages by 2000, but only 4,543 village phones were in service as of March 2001. The primary constraint has been a distorted telecommunications market controlled by a monopolistic government provider, BTTB. Because BTTB has been unwilling to increase its interconnect capacity, despite Grameen Phone's offer to pay for the upgrading, Grameen Phone and other mobile companies have been unable to connect additional phones to the national switched network and instead have had to offer primarily mobile-to-mobile phone services.[80] This infrastructure barrier has also limited expansion of the rural phone network.

A second constraint is Grameen Phone's use of cellular technology for fixed phone centers, a choice that is neither efficient nor probably competitive over the long term. GSM, used throughout much of Europe and Asia, is far more expensive than fixed wireless local loop (WLL) systems used by Grameen Telecom's competitors, Sheba and BRTA. While GSM towers can provide service within 5 kilometers, WLL towers provide coverage within 50 kilometers. Moreover, WLL provides better bandwidth for data transmission at a lower cost.

Human Capacity. The development of a cadre of entrepreneurs, nurtured by Grameen Bank, has been key to the success of the village phone. After the Bank approves financing of a phone, Grameen Telecommunications buys a cellular

[77] Excerpted from in-depth case study prepared by the World Resources Institute.
[78] As of September, 2000, Grameen Phone had 57 percent of the mobile telecommunications market in Bangladesh.
[79] Grameen Bank chooses the entrepreneurs, 95 percent of whom are women; phone loans are approximately US$420, more than average annual income.
[80] Roughly 88 percent of Grameen Phone's 243,000 urban phone subscriptions (as of March 2001) are for plans that restrict customers to calling other mobile phones.

phone subscription on behalf of the entrepreneur and provides the connection, necessary hardware, and training to operate it. Grameen Telecommunications also tracks trends in phone use and identifies operators who are having difficulty marketing or collecting payments for the service.

The village phone network also yields important secondary benefits to the women who live in the villages that they serve. Because 95 percent of operators are female and the phones are in their homes, women who might otherwise have had very limited access to a phone feel comfortable using one. There is also some evidence that, because the phones are so important for whole villages, having female operators has helped to enhance the status of women in the communities where they work.

Policy. Bangladesh's telecommunications regulatory regime is both antiquated and anti-competitive. One consequence has been BTTB's ability to maintain control over the switched network without expanding its capacity, even in the face of high demand. Scarcity forces Bangladeshis to pay large sums to BTTB officials in order to obtain phone service. BTTB's control of the network is likely to become an even more significant market disadvantage to Grameen Phone and other mobile operators when BTTB launches its own GSM mobile network this year.

Enterprise. Grameen Telecom's village phone venture, as structured in Bangladesh, would not be feasible without access to the credit and bill collection services provided by Grameen Bank and the infrastructure and urban network provided by Grameen Phone. Village phones would be far less successful if Grameen Phone were not able to discount by 50 percent the rate charged to Grameen Telecommunications for a phone call, an underlying subsidy made possible by a transfer of profits from the more profitable urban part of the business to the rural sector. This is a significant advantage unavailable to rural-only competitors BRTA and Sheba.

Content and Applications. Demand for telephone services in rural Bangladesh remains high despite relatively limited marketing and no overt content development by Grameen Telecommunications or Grameen Phone. In large measure, this is because the village phones offer tremendous economic value to the users, who would otherwise have to spend hours or days traveling to other towns to make a phone call. According to one study, the average consumer savings for a phone call from a village to Dhaka ranges from 2.6 percent to 9.8 percent of the user's mean monthly household income.

Bangladesh is also a labor-exporting country with many rural people working overseas. As a result, one of the most important functions of the village phone is to facilitate remittances from relatives.[81] Local business people and farmers also use the phone to reduce costs, get better prices for their products, and plan shipments to reduce spoilage of perishable products.

Key Lessons. Were it not for policy and infrastructure barriers, Grameen Telecom's village phones might already serve all of Bangladesh's 65,000 rural villages. The high revenues generated by the shared-access business model suggest the effectiveness of market drivers for such approaches. And as a development-centered ICT strategy, the village phone program promises broad benefits, including enhanced productivity and social welfare, and new sources of rural income.

Nonetheless, the Grameen Telecommunications business model relies on subsidies from urban cellular users, on financing and other support from Grameen Bank, and on GSM cellular technology that is less than optimal for sparsely-populated rural areas, fixed phone centers, and data transmission. The wireless local loop technologies used by Grameen Telecom's rural competitors or wireless multipoint distribution technologies—already being deployed by the TeNeT group and their partners in rural India—promise lower costs and higher data bandwidths. Under favorable policy environments, such rural networks, combined with shared access strategies that concentrate demand and generate efficient usage, may well enable profitable, market-driven approaches to providing connectivity and infrastructure in rural areas.

[81] Calls to initiate or track remittances account for 42 percent of all calls.

Case 3 Community-Based Content: *Infocentros* Telecenter Model[82]

Telephones are scarce in El Salvador. Individual computer ownership is even more scarce—fewer than 2 PCs per 100 inhabitants—and dial-up Internet costs are still relatively high. As a result, less than one percent of the population now uses the Internet. Changing this situation is the mission of the *Infocentros* Association (IA), a newly-created non-profit organized and run like a business.[83] Its goal is to provide 2 million Salvadorians—one third of the population—with access to the Internet within 2 years through a chain of 100 telecenters. But connectivity is just the infrastructure—the *Infocentros* strategy is to build an "infostructure" of local content as well, in order to transform El Salvador's culture into an information society.

Business Model. Although formally a non-profit, *Infocentros* is headed by a CEO and will build, operate, and franchise telecenters throughout El Salvador. The IA business strategy is built around franchising: of the 100 telecenters planned by the end of 2002, only 10 will be operated by IA itself as regional "mother" centers.[84] Franchises will cost about US$80,000 and are expected to be profitable within 27 months. IA will launch each center and set up operations properly before handing it over to the franchise partner. Franchise revenues will be re-invested in additional centers and new services. Telecenters will typically have 30 computers and include open access areas and training or on-line conferencing areas.

Infocentros will also provide or catalyze the creation of local content, computer training services, and e-commerce infrastructure, in order to make Internet access an effective development tool. It is this content, such as courseware or other businesses built around computers and Internet access, that is central to the IA business model. Relevant local content generates usage and additional revenue sources for telecenters, as well as significant social benefits for the country. Courseware generated in one telecenter, such as a currently popular course on how to rebuild earthquake-damaged houses, can be offered in all others as well; its value increasing as the *Infocentros* network expands. In addition, *Infocentros* is developing strategic alliances with groups that can benefit from information technology, such as hospitals and local governments.

Human Capacity. Because of the focus on local content and training, human capacity development is a major outcome of the Infocentros approach. At the telecenter level, Infocentros trains its own rapidly-growing staff and offers one-to-one assistance to customers unfamiliar with computers or the Internet. Through alliances with government and business, IA also seeks to teach a large segment of the population how to use information technology to increase skills, create jobs and raise incomes, and overcome social problems. For example, in partnership with the Education Ministry, *Infocentros* is negotiating an 8-hour Internet training course for all Salvadorian high school students. IA is also developing financial applications for small and micro-businesses and other applications for farmers, doctors, and government officials. IA plans to offer free web page hosting for the 470,000 small businesses that, in El Salvador, constitute 99 percent of private enterprises.

Infrastructure. A significant obstacle to Internet use in El Salvador is the high cost of bandwidth.[85] Although *Infocentros* has been able to negotiate discounted rates, connections remain expensive. If *Infocentros* can use its market power to lower the cost of Internet access, it could gain a strong competitive advantage over private cybercafes.

[82] Excerpted from in-depth case study prepared by the World Resources Institute.

[83] During a 1998 national consultation on the information society and the future of El Salvador, the governments agreed to use some of the revenue from privatizing its telecommunications system as a loan to civil society to help ensure widespread ICT access and facilitate rapid social and economic development. As a direct result, *Asociation Infocentros* was created in 1999 and received the loan in February 2000. The Association began operation with the first telecenters in October 2000.

[84] At the time of this study, five telecenters were operational. The Association business plan projected 18 months for these initial telecenters to become financially self-sufficient, but this was achieved in six months. Twenty-five additional telecenters are expected to open by July 2001.

[85] A dedicated 128 Kbps line costs approximately $600 per month in El Salvador

Policy. *Infocentros* has benefited from the government's 10-year, interest-free loan, and from alliances with specific government ministries. In addition, IA has benefited from a number of policy initiatives aimed at liberalizing the country's economy. El Salvador's deregulation of the telecommunications sector and resulting competition, for example, has helped to reduce Internet access costs. Banking deregulation and privatization have also strengthened the investment capacity of entrepreneurs, which is likely to help the financing of IA franchises. Still further legislative and regulatory action will be required if the *Infocentros* plan to make its telecenters function as e-commerce ordering and payment sites is to succeed.

Uncertainty about the legality of Internet telephony has kept *Infocentros* from offering this potentially valuable service. However, IA's telecenters do not prohibit the use of applications like Net2Phone, and during the January earthquake, they offered Salvadorians free Internet calls to notify relatives in the United States. But *Infocentros* has chosen not to publicize the technology or to challenge the telecommunications companies who provide its Internet connections by seeking legal authority to offer the service. In so doing, it is foregoing a potentially lucrative market, since many Salvadorians live overseas.

Enterprise. The *Infocentros* business model, with its rapid deployment of franchises to reach scale, enables the enterprise to negotiate favorable contracts for equipment and services from a wide range of vendors. IA has been very entrepreneurial, negotiating deals with private companies to offer discounted Internet access to groups of employees or clients, and forging agreements with several government agencies to create e-government portals. To increase telecenter usage during evenings and weekends, partnerships are being developed with schools and small businesses that wish to offer computer and Internet training to their students, faculty, and staff. To extend Internet access throughout El Salvador and reduce the need for physical plants, IA is planning to create virtual telecenters located within existing institutions, such as medical centers and central courthouses. And to help perpetuate its entrepreneurial spirit, IA maintains a 3-person new business development group charged with assessing new opportunities quickly. Nonetheless, long-term profitability is not assured. As many Internet startups have found, building market share and creating content can be costly. Currently, 90 percent of IA telecenter users are paying discounted student rates.

Infocentros assists its franchisees by supplying initial management support, training, technical assistance, network marketing, and other services to help ensure that telecenters remain profitable. It also uses an enterprise-wide Intranet to share new business ideas across the telecenter network and to compare the monthly performance of each telecenter, providing strong incentives for telecenter managers.

Content and Applications. Community-based content is what sets *Infocentros* apart. One of its founders believes this approach gives IA a competitive advantage over US-style Internet access providers in Latin America. IA is building a new digital production center to create audio-visual content for education and professional training courseware that can be broadcast over the Internet. It is also developing a B2B e-commerce portal for small and micro-entrepreneurs, and a suite of business applications designed to help these business owners manage their finances and investments, and provide billing-services only at telecenters.

Key Lessons. *Infocentros* is an example of a development-centered ICT strategy based on a unique partnership between government and civil society. It draws on 10 years of accumulated experience in telecenter operation and franchising, and substantial financial and other support from El Salvador's government.

Infocentros is a start-up enterprise, but it appears to be meeting or exceeding its targets. It's business model gains efficiencies by aggregating users in telecenters, providing shared access to computers and bandwidth, generating additional revenues from local content, and aggressive franchising. As a result, it seems capable of reaching scale and providing widespread Internet access and the related social benefits that its creators intend. The generation of valuable content and training of customers to use information technology—for their own education, to obtain government services, to grow their businesses, or to communicate more effectively—will be critical the initiative's social and business success.

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.

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.

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.

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.

[86] TRIPS refers to trade-related intellectual property rights. The agreement prescribes worldwide minimum standards for patent protection and first came into being in 1994.

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.

[87] This contribution is primarily from semi-conductors and electronic equipment.

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.

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.

Appendix 4 Digital Opportunity Initiative Partner Profiles

The Opportunity Initiative is a partnership between Accenture, the Markle Foundation and the United Nations Development Programme (UNDP).

Accenture

Accenture is a US$10 billion global management and technology consulting organization whose mission is to bring innovations to improve the way the world works and lives. Accenture's 70,000 people work in 48 countries with clients across all industries to bring far-reaching change by aligning strategy with people, processes and technology. Accenture meets a full range of client needs through a network of businesses that deliver specialized capabilities and solutions in consulting, technology, outsourcing alliances and venture capital. Globally, Accenture is involved in strategic forums and initiatives aimed at harnessing the opportunities offered by communications technologies to empower businesses, communities and governments to meet their development aspirations. For more information go to: www.accenture.com.

The Markle Foundation

The Markle Foundation is a not-for-profit philanthropy working to realize the potential of emerging communications media and information technology to improve people's lives and promote the development of communications industries that address public needs. Markle pursues its goals through a range of activities, including analysis, research, public information and the development of innovative media products and services. Markle is the largest US philanthropy devoted exclusively to promoting the development and use of communications technologies in the public interest and recently announced a US$100 million commitment to grants, strategic investments and projects focusing on health, children's welfare and policy. For more information go to: www.markle.org.

The United Nations Development Programme

UNDP, as part of the United Nations, is committed to the principle that development is inseparable from the quest for peace and human security and that the United Nations must be a strong force for development, as well as peace. With offices in 132 countries, UNDP's mission is to help countries in their efforts to achieve sustainable human development by assisting them to build their capacity to design and implement programs in poverty eradication, democratic governance, employment creation, the empowerment of women, and the protection and regeneration of the environment—giving first priority to poverty eradication. Within its areas of focus, the UNDP supports technology transfers, adaptation, and access to the most effective technology. For more information go to: www.undp.org.

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African Information Society Initiative (AISI): www.bellanet.org/partners/aisi

Africa Virtual University (AVU): www.avu.org

Asia Pacific Development Information Programme (APDIP): www.apdip.net

Asia Pacific Networking Group: www.apng.org

Asian Development Bank (ADB): www.adb.org

Bellanet: www.bellanet.org

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Canadian International Development Agency (CIDA): www.acdi-cida.gc.ca

Center for International Development at Harvard University (CID): www.cid.harvard.edu

Center for International Research on Communication (CIRCIT): www.circit.rmit.edu.au

Charity@Incubator: www.charityatincubator.org

Children's Partnership Online: www.childrenspartnership.org

Cisco Networking Academy: www.cisco.com/warp/public/779/edu/academy

Committee to Democratize Information Technology (CDI): www.globalpartnerships.org/brazil.asp

CyberEcoles: www.cyberecoles.org

Digital Bridges: www.digital-bridges.org

Digital Partners: www.digitaldividend.org

eCountries: www.ecountries.com

Educor: www.educor.co.za

European Survey of Information Society (ESIS): www.esis.ee

Food and Agriculture Organization of the United Nations: www.fao.org/sd/index_en.htm

French Institute of Research and Development: www.ird.fr

Global Forest Watch (GFW): www.globalforestwatch.org

Global Information Infrastructure Commission (GIIC): www.giic.org

Global Knowledge Partnership (GKP): www.globalknowledge.org

Grameen Phone: www.grameen.org

GreenNet: www.gn.apc.org

Greenstar: www.greenstar.org

HealthNet (SATELLIFE): www.healthnet.org

Hewlett-Packard World e-Inclusion Program: www.hp.com/e-inclusion

Info 21 at UNDP: www.undp.org/info21

Information for Development Program of the World Bank Group (*infoDev*): www.infodev.org

Inter-American Development Bank (IDB): www.iadb.org

International Campaign for Responsible Technology (ICRT): www.svtc.org/icrt

International Development Research Center (IDRC): www.idrc.ca

International Institute for Sustainable Development: www.iisd.ca

International Labour Organization (ILO): www.ilo.org

International Telecommunication Union (ITU): www.itu.int

Japanese International Cooperation Agency (JICA): www.jica.go.jp

Leland Initiative: www.usaid.gov/regions/afr/leland

LINCOS and Digital Nations: www.lincos.net

Madhya Pradesh State Initiative: www.madhyapradesh-india.org

Media for Development and Democracy (DevMedia): www.devmedia.org

Millennium Project of Japan (IT21): www.kantei.go.jp

National Information Technology Agenda (NITA): www.nitc.org.my/nita

National Information and Communications Infrastructure (NICI): www.bellanet.org/partners/aisi/nici

National Institutes for Information Technology (NIIT): www.niit.com

National Telecommunications and Information Administration (NTIA): www.ntia.doc.gov

Netherlands Institute for Communication and Development: www.iicd.org

Neighborhood Webworks: www.neighborhoodwebworks.org

Partnerships in Statistics for Development in the 21st Century (Paris 21): www.paris21.org

PEOPLink: www.peoplink.org

Presidential IED Initiative: www.usaid.gov_info_technology/ied

Pride Africa: www.prideafrica.com

SANGONeT Information & Technology: www.sn.apc.org/sangonet/technology

Small Island Developing States Network (SIDSNet): www.sidsnet.org

Softbank Emerging Markets: www.softbank.com

South African Industry Strategy Product (SAITIS): www.saitis.co.za

StarMedia's Initiative for Youth: www.starmedia.com

Sustainable Development Networking Programme: www.sdnp.undp.org

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United States Agency for International Development (USAID): www.usaid.gov

VIATRU: www.viatru.com

Virtual Souk: www.elsouk.com

Women's Networking Support Program: www.gn.apc.org/apc-women

World Economic Forum: www.weforum.org

World Information Technology and Services Alliance (WITSA): www.witsa.org

World Links for Development: www.worldbank.org/worldlinks

World Resources Institute (WRI): www.wri.org

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