

## Chapter 1

### Overview

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**I**nformation and Communications for Development (IC4D) is a regular publication of the World Bank Group on the diffusion and impact of information and communication technology (ICT), available at <http://www.worldbank.org/ic4d>. The first report, *IC4D 2006: Global Trends and Policies*, analyzed lessons on developing access to ICT, examined the roles of the public and private sectors in this process, and identified the benefits and challenges of adopting and expanding ICT use in businesses.

This second report, *IC4D 2009: Extending Reach and Increasing Impact*, takes a close look at mobile and broadband connectivity. It analyzes the development impact of high-speed Internet access in developing countries and provides policy options for rolling out broadband networks and addressing the opportunities and challenges of convergence between telecommunications, media, and computing. The report also presents a framework of e-government applications and discusses various country experiences with the institutional and policy arrangements for e-government and for the development of the local information technology (IT) and IT-enabled services (ITES) industries. The common thread running through these topics is the development impact of ICT. Finally, the report presents summary tables on ICT sector indicators in 150 economies and introduces new performance measures in terms of access, affordability, and ICT adoption in government and business.

### Impact of ICT in an Increasingly Knowledge-Based World

Knowledge-based activities have become increasingly important and pervasive worldwide. ICT is the foundation of this knowledge-based world. It allows economies to acquire and share ideas, expertise, services, and technologies locally, regionally, and across the world. It also contributes to making the global economy more integrated than ever before.

ICT can help create and sustain new opportunities for economic development. Accelerated knowledge transfer and technological diffusion amplify the competitive advantages of fast-learning economies. As the information requirements for innovation in economic and social activities increase, the importance of ICT for the development agenda will continue to expand.

### Mobile Networks Now Constitute the World's Largest Distribution Platform and Create a Major Development Opportunity

The past 15 years have brought an unprecedented increase in access to telephone services. This growth has been driven primarily by wireless technologies and liberalization of telecommunications markets, which enabled faster and less costly network rollout. The total number of mobile phones in the world surpassed the number of fixed telephones in

2002; by the end of 2008, there were an estimated 4 billion mobile phones globally (Wireless Intelligence 2008).<sup>1</sup> No technology has ever spread faster around the world (*The Economist* 2008a). Mobile phones now represent the world's largest distribution platform.

The mobile phone market is especially important for developing countries, where it is growing most rapidly and where it is seen as a "leapfrogging" tool. New telephone connections in low- and lower-middle-income countries have outnumbered those in upper-middle- and high-income countries since 1998 (World Bank 2008c). Virtually all new mobile customers in the coming years will be in developing countries (GSMA 2008).

Mobile communications have a particularly important impact in rural areas, which are home to nearly one-half of the world's population and 75 percent of the world's poor (World Bank 2007). The mobility, ease of use, flexible deployment, and relatively low and declining rollout costs of wireless technologies enable them to reach rural populations with low levels of income and literacy. The next billion mobile subscribers will consist mainly of the rural poor. Mobile operators are thus taking innovative approaches to reach rural customers, such as offering village phone programs in Bangladesh, low-denomination recharges for prepaid phones in East Africa, and combined voice and agricultural information services in China (*The Economist* 2008a).

An important use of mobile phones in rural areas is to access market information. TradeNet, a Ghana-based trading platform, allows users to sign up for short message service (SMS) alerts for commodities and markets of their choice and receive instant alerts for offers to buy or sell when anyone else on the network has submitted an offer by mobile phone. Users can also request and receive real-time prices for more than 80 commodities from 400 markets across West Africa. The Ghana Agricultural Producers and Traders Organization<sup>2</sup> is a major beneficiary: in 2006 it concluded trade deals worth \$60,000 with other producer and trader organizations in Burkina Faso, Mali, and Nigeria. These deals involved purchasing tomatoes, onions, and potatoes without middlemen, thereby substantially reducing transaction costs between buyers and sellers (World Bank 2007). In India, access to market information through mobile phones has allowed fishermen to respond faster to market demand and has increased their profits (Jensen 2007); in Niger, it has reduced price disparities in grain markets (Aker 2008).

Once legal frameworks are in place, banking and payment services provided through mobile phones can bring many more people into the formal financial system (World Bank 2007). Mobile banking services offered by Wizzit in South Africa, Safaricom (M-PESA) in Kenya, and Globe Telecom and Smart in the Philippines are such examples. These services allow mobile phone users to pay for purchases in stores and transfer funds, significantly reducing transaction costs. In Sierra Leone, workers in the cities have cut out intermediaries and now transfer money almost instantly to relatives in remote villages (World Bank 2008b).

Mobile phones can improve the effectiveness and reach of health programs. In many countries, health care is one of the largest public budgetary expenses. Improved information systems that track service delivery, establish accountability, and manage patients for better health outcomes can result in major efficiency gains. For example, using the mobile phone as an interface, Voxiva's HealthNet system allows drug inventory management, while its HealthWatch supports monitoring programs. These systems have been deployed in India, Peru, and Rwanda.<sup>3</sup> SIMpill, deployed in South Africa, uses mobile phone technology to ensure patients take medications on time, notifying health professionals if a patient does not appear to be taking his or her medication as prescribed.<sup>4</sup>

The development potential of the wireless platform is enormous. Mobile communications are evolving from simply voice services and text messaging to more broadband intelligent systems that enable a diverse range of applications in locations where conventional services are not available in developing countries. "Smart" wireless phones now allow users to also browse the Internet, download music, and access information services. This opportunity is especially exciting given that the developing world missed out on much of the initial Web revolution because it did not have adequate Internet infrastructure (*The Economist* 2008b).

### **Broadband Increases Productivity and Contributes to Economic Growth, for Which It Deserves a Central Role in Development Strategies**

Broadband networks, both fixed and mobile, are necessary to deliver modern communication and information services that require high rates of data transmission. Enterprise file transfer, television, and high-speed Internet are examples of such services. High-speed Internet connections provide ready access to a wide range of services, such as voice, video,

music, film, radio, games, and publishing. Broadband networks enhance the efficiency and reach of existing services and provide spare capacity for unknown future applications. Indeed, broadband networks are key to the ongoing transformation of the ICT sector through the convergence of telecommunications, media, and computing. The convergence process comprises service convergence, which enables providers to use a single network to provide multiple services; network convergence, which allows a service to travel over any combination of networks; and corporate convergence, by means of which firms merge or collaborate across sectors. Driven by technology and demand, convergence is resulting in major changes in market structures and business models.

Broadband has considerable economic impact at all levels of individuals, firms, and communities. Individuals increasingly use broadband to acquire knowledge and skills to increase their employment opportunities. Where broadband has been introduced in rural areas of developing countries, villagers and farmers have gained better access to crop market prices, training, and job opportunities (Qiang and Rossotto 2009, chapter 3 in this volume). In developed countries and urban areas in developing countries, an increasing number of individuals build up social networks through broadband-enabled, peer-to-peer Web-based groups that facilitate economic integration and drive development. Blogs (Web logs, or online diaries), wikis (Web sites where users can contribute and edit content), video sharing sites, and the like allow new, decentralized, and dynamic approaches to capturing and disseminating information that allows individuals to become better prepared for the knowledge economy (Johnson, Manyika, and Yee 2005).

Access to broadband supports the growth of firms by lowering costs and raising productivity. Realizing these performance improvements, however, depends on firms' ability to integrate their technological, business, and organizational strategies. When fully absorbed, broadband drives intense, productive uses of online applications and services, making it possible to improve processes, introduce new business models, drive innovation, and extend business links. A study involving business and technology decision makers in 1,200 companies in six Latin American countries—Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico—showed that broadband deployment was associated with considerable improvements in business

organization, including speed and timing of business and process reengineering, process automation, data processing, and diffusion of information within organizations (Momentum Research Group 2005).

Firms in the media, export, and other information-intensive sectors have benefited most from integrating broadband into their business processes. Clarke and Wallsten (2006), in a study of 27 developed and 66 developing countries, found that a 1-percentage-point increase in the number of Internet users is correlated with a boost in exports of 4.3 percentage points. Increases of 25 percent or more in the efficiency of claims processed per day have been documented by U.S. insurance companies that have adopted wireless broadband (Sprint 2006). Other industries that have benefited significantly include consulting, accounting, marketing, real estate, tourism, and advertising.

Local communities around the world have realized considerable economic gains and new opportunities from broadband services. Studies from Canada, the United Kingdom, and the United States find that broadband connectivity has a positive economic impact on job creation, community retention, retail sales, and tax revenues (Ford and Koutsky 2005; Kelly 2004; Strategic Networks Group 2003; Zilber, Schneier, and Djwa 2005). In rural areas of developing countries, communities have recently begun to launch broadband services and applications that give local populations access to new markets and services. Facilitating information exchange and value creation between buyers and sellers of agricultural products, which has improved income and livelihoods in rural areas (box 1.1), is a prime example of this. Previously, such opportunities were available only in the largest or wealthiest localities.

According to a recent World Bank econometrics analysis of 120 countries, for every 10-percentage-point increase in the penetration of broadband services, there is an increase in economic growth of 1.3 percentage points (Qiang 2009). This growth effect of broadband is significant and stronger in developing countries than in developed economies, and it is higher than that of telephony and Internet (figure 1.1). The impact can be even more robust once the penetration reaches a critical mass.

Because broadband networks have the potential to contribute so much to economic development, they should be widely available at affordable prices and should become an integral part of national development strategies.

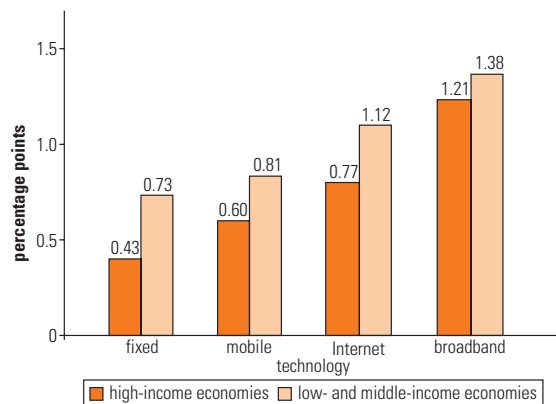
### Box 1.1 Broadband Raises Rural Incomes in Developing Countries

Experience shows that access to broadband networks has had a positive impact on rural incomes in developing countries. In India, the E-Choupal program was started by ITC, one of India's largest agricultural exporters, in 2000. The program operates in traditional community gathering venues (*choupals*) in farming villages, using a common portal that links multimedia personal computers by satellite. Training is provided to the hosts, who are typically literate farmers with a respected role in their communities. The computers give farmers better access to information such as local weather forecasts, crop price lists in nearby markets, and the latest sowing techniques. Collectively, these improvements have resulted in productivity gains for the farmers. E-Choupal also enables close interaction between ITC and its rural suppliers, which increases the efficiency of the company's agricultural supply chains, eliminates intermediaries, and improves terms of business. The fact that ITC pays a higher price than its competitors for exportable products has encouraged farmers to sell their increased output to the company. By 2008, E-Choupal had reached millions of small farmers in more than 40,000 villages, bringing economic and other benefits. It aims to reach 100,000 villages by 2010.

Another program, launched by the Songtaaba Association, has allowed female agricultural producers in Burkina Faso to become economically empowered through broadband. Songtaaba, an organization manufacturing skin care products, provides jobs to more than 3,100 women in 11 villages. In order to provide its members with regular access to useful information and improve the marketing and sales of their products, the association set up telecenters in two villages equipped with cell phones, Global Positioning System (GPS), and computers with high-speed Internet connections. The telecenters, managed by trained rural women, help the association run its businesses more efficiently. The organization also maintains a Web site that offers its members timely information about events where they can promote or sell their products. In the two years following the establishment of the telecenters and the launch of the Web site in 2005, orders have increased by about 70 percent, and members have more than doubled their profits.

**Source:** Qiang and Rossotto 2009 (chapter 3 in this volume).

**Figure 1.1 Growth Effects of ICT**



**Source:** Qiang 2009.

**Note:** The y axis represents the percentage-point increase in economic growth per 10-percentage-point increase in telecommunications penetration. All results are statistically significant at the 1 percent level except for those for broadband in developing countries, which are significant at the 10 percent level.

Currently though, few people in developing economies have access to broadband networks. In 2007, an average of less than 5 percent of the population of low-income economies was connected to broadband networks, and that was mostly in urban centers. In this light, developing countries are missing a great development opportunity.

#### **The Global Market for IT and ITES Is Expanding, and Developing Countries Are Seizing the Opportunity to Build Local Industries**

The services sector is growing globally—it already accounts for 70 percent of employment and 73 percent of gross domestic product (GDP) in developed countries and for 35 percent of employment and 51 percent of GDP in developing countries (UNCTAD 2008). IT services, a component of the services sector, represents a \$325 billion annual potential market, according to McKinsey & Company estimates. IT

services include hardware and software maintenance, network administration and system integration, help desk services, application development, and consulting, as well as activities in engineering, such as mechanical design, production, and software engineering.

Another component of the services sector is ITES. ITES are services that can be delivered remotely using telecommunications networks. Estimates of the size of the ITES market vary.<sup>5</sup> While analysis by McKinsey & Company suggests the annual potential market for ITES was \$150 billion in 2007, Gartner Research (2008) expects the global market to grow from \$171 billion in 2008 to \$239 billion in 2012. Even more optimistic is an estimate from NASSCOM-Everest (2008), which suggests an ITES market of \$700 billion–\$800 billion by 2012. In the ITES market, services for industries such as banking, insurance, and telecommunications account for close to two-thirds of the potential market, while services for functions that exist across industries, such as human resources management, finance, administration, and marketing, account for about one-third.

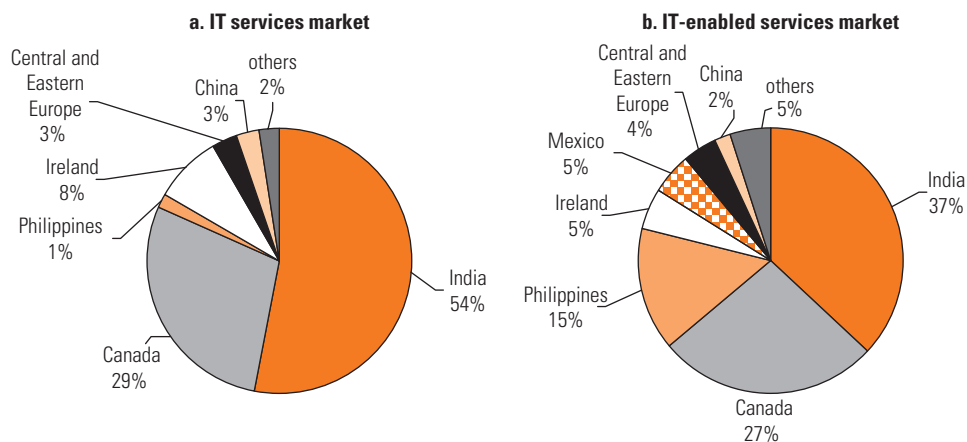
Developing countries have been very successful in IT services and ITES. Undoubtedly, India is the global leader in both industries. However, China, Mexico, and the Philippines are also emerging as potential players in this space. In addition, transition economies in Central and Eastern Europe (the Czech Republic, Hungary, Moldova, Poland, Romania, and the Russian Federation) have developed their capacity in IT services and ITES, though on a smaller scale (figure 1.2).

For these countries, the expansion of IT services and ITES creates significant economic and social benefits. India, for instance, exported more than \$40 billion worth of IT services and ITES in 2007, a figure that represents one-quarter of the country’s total exports and nearly half of its service exports. In the Philippines, IT services and ITES employed 345,000 people as of mid-2008 and are projected to directly employ close to 1 million people by the end of 2010. Employment of this scale means that the sector would account for 27 percent of all new jobs created in the Philippines by 2010 (BPAP 2007).

Another important positive impact of the growth of IT services and ITES is on the status of women. Women account for about 65 percent of the total professional and technical workers in IT services and ITES in the Philippines. In India, women make up 30 percent of the IT services and ITES workforce—a much higher rate of female participation than in the services sector in general—and this share is expected to grow to 45 percent by 2010. More than half of call center employees are women. In both countries, women fill a greater number of high-paying jobs in IT services and ITES than in most other sectors of the economy.

Given the large potential market for IT services and ITES, there is an important opportunity for more countries to participate and benefit.<sup>6</sup> The opportunity is especially attractive because only about 15 percent of the potential market, or about \$65 billion in 2007, has been exploited so far. There also remains significant room for growth from new entrants: estimates by McKinsey suggest that only about 27 percent of

**Figure 1.2 Global Distribution of Offshore IT Services and IT-Enabled Service Markets**



Sources: McKinsey & Company 2008; NASSCOM-Everest 2008; Tholons 2006.

the market potential will be realized by 2010. Countries that meet the requirements of the untapped IT and ITES market are likely to experience rapid growth in these industries.

An increasing number of countries are beginning to develop IT services and ITES into major potential sources of economic growth. South Africa, for example, is emerging as an attractive ITES location by leveraging its English-speaking workforce. Similarly, the Arab Republic of Egypt, Morocco, and Tunisia are developing a range of ITES operations, including call centers. Israel, Malta, and Mauritius are beginning to fill niche segments such as packaged application development (Israel), remote gaming (Malta), and higher-value-added activities such as advisory, design, and legal services (Mauritius).

### E-Government Can Lead the Way to Mainstream ICT Applications

E-government is the most cited and high-profile of all ICT applications, given its importance in underpinning development efforts. In many countries, developed and developing alike, there has been significant government expenditure on IT. In Europe, IT spending in government is growing faster than in most other sectors (figure 1.3). Since 1999, China has embarked on major initiatives in this area. Total e-government spending is expected to increase to more than \$10 billion in 2008, from \$7 billion in 2006. China's investment in the State Economic Management Information Systems program alone amounts to about \$2.5 billion (Zhou 2007). India is also planning large investments; its National

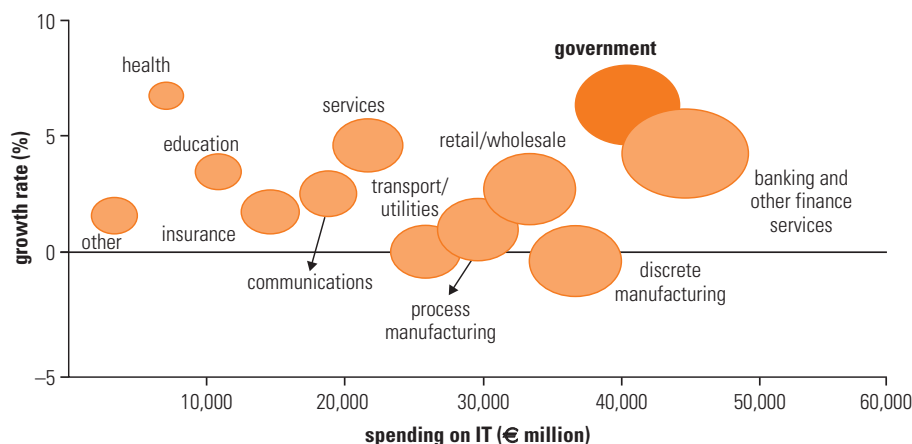
e-Government Program will receive \$5.5 billion in funding between 2007 and 2012.

Such significant funding for e-government reflects growing recognition of its benefits for the delivery of public services. Users rank improved transactional efficiency (as reflected in a reduced number of visits and less waiting time), reduced corruption, and better quality of service (such as reduced error rates and increased convenience) as most important in their dealings with public services. Nondiscriminatory treatment and an effective complaint handling system are also desired features (Bhatia, Bhatnagar, and Tominaga 2009, chapter 5 in this volume).

Successful e-government projects have reduced transaction costs and processing time and increased government revenues. For instance, the e-Customs System in Ghana (GCNet) increased customs revenues by 49 percent in its first 18 months of operation and reduced clearance times from three weeks to two days (De Wulf and Sokol 2004). An e-procurement system in Brazil cost only \$1.6 million, yet it enabled savings of \$107 million for the state in 2004 alone as a result of improved process efficiency and lower prices for goods and services procured. The fully automated tendering process launched as part of the same system in Brazil saved suppliers an estimated \$35 million (Crescia 2006).

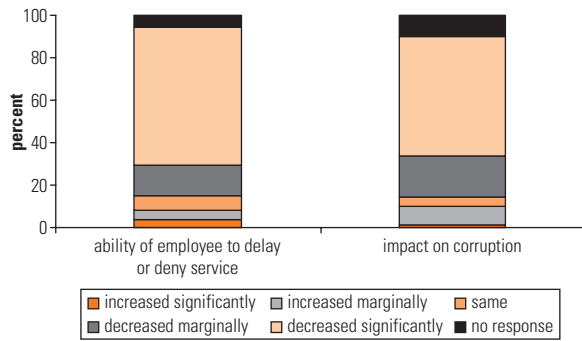
Some e-government projects have also improved governance by reducing corruption and abuse of discretion, thereby making vital contributions to development. In India, a survey found that fewer users were required to pay bribes to accelerate service delivery under e-government

**Figure 1.3 ICT Expenditure in Europe by Sector, 2006**



Source: Information Society Technologies Advisory Group 2006.

**Figure 1.4 Impact of ICT on Corruption and Service Denial in E-Government Projects in India**



Source: Bhatia, Bhatnagar, and Tominaga 2009 (chapter 5 in this volume).

projects than under manual systems, and that the frequency of paying bribes to service officials has fallen. For example, the land registration system in the state of Karnataka in India is estimated to have cut bribes by about \$18 million annually. Furthermore, an overwhelming proportion of supervisors sense that abuse of discretionary power through means such as denying services to citizens has narrowed (figure 1.4). They are also more aware of the need to comply with service standards specified in citizen charters.

The potential to access public services at home or at a local center also empowers women and minorities. For example, among the users of e-government services, women are usually in charge of dealing with public administrations at the household level. The delivery of e-government services translates to easier access and less time than traveling to or queuing up at government departments. For minorities, ICT facilitates access to relevant public information on rights and benefits, inheritance and family laws, health care, and housing, allowing the public to make informed decisions on issues of importance.

### Some Policy Directions

The agenda of ICT for development is rather new and still in flux. A good case can be made for ICT as a factor of economic development. But how to use ICT cost-effectively to meet private and public objectives is less clear. There are examples of failures as well as successes. The technology and its products continue to change at a fast pace. The market responses are hard to predict. The jury is still out on the extent to which the evolving ICT sector should be regulated. Both developing and developed economies are struggling to

understand the difficulties, constraints, and uncertainties and how best to handle them. The following are some of the most challenging issues faced by developing countries:

- Convergence does not fit easily into established sector frameworks. Translating a broad vision into specific policies and regulations is likely to be difficult. Although a proactive response could yield the greatest development benefits, some countries adopt a “wait and watch” strategy while policy options become clearer or until the issues gain urgency.
- Broadband networks are developing mainly in the potentially profitable cities and intercity corridors. People living in commercially less-attractive provincial and rural areas, as well as low-income groups in urban areas, tend to be left behind.
- Although there are a number of success stories, a high rate of failure has been reported in the adoption of e-government by developing countries. Ensuring robust performance from new large-scale information systems has proven to be a challenge even for countries with sophisticated technical skills.
- Many countries have major gaps in their ability to compete in the IT services and ITES markets, most notably in relation to scarcity of skilled labor.

To address these challenges, elements of good practice are emerging for policy, regulatory, and investment frameworks to extend the reach and increase the impact of ICT on development.

### Policy Responses to Convergence Facilitate ICT Development

The technological drivers for convergence are in place or are quickly diffusing. Fundamental to convergence are the digitization of communication and the rapidly falling cost of computing. More recently, expanding use of Internet protocol (IP)-based networking has made interconnection among diverse networks, devices, and applications possible. These developments have led to the deployment of broadband next-generation networks that deliver a wide range of services interactively over any combination of communication networks anytime and anywhere.

As these technical factors fall into place, convergence finds market traction with service providers seeking to diversify their businesses, increase revenues, and cut costs.

Globally, service providers are embracing convergence by investing in broadband networks. They are entering new markets and improving business prospects by consolidating content and services and by adopting new business models. An evolving set of providers offers innovative services with high quality and maximum choice at low prices.

As users adopt new ICT services and applications, demand for greater access and content is growing with previously unmatched breadth and speed in both developing and mature economies. Since its first release in 2003, the Internet telephony service provider Skype has attracted more than 300 million subscribers in 225 countries and territories (Skype 2008). In 2007 alone, Skype carried an estimated 27 billion minutes of computer-to-computer calls (TeleGeography 2007). By the end of 2008, there will be an estimated 40 million “triple play” subscribers worldwide—all of whom receive most of their telephony, video, and Internet services over broadband networks (Pyramid Research 2007). Further, consumers are now also participating in content creation. Growing access to a broader variety of services and applications through a range of new and constantly improving devices, including mobile phones that go well beyond voice services, has stimulated enormous social interaction and exchange. This has led to higher demand for advanced ICT networks and services that have the ability to support new applications.

As supply and demand align, the technical and market factors driving convergence are visible in markets at all stages of economic development, from Brazil to France and from India to Nigeria. While high-income countries have had these conditions in place for some time, there are clear indications that even low-income countries and population groups are now recognizing these forces and the resulting convergence as a reality (Singh and Raja 2009, chapter 2 in this volume).

The greatest benefits of convergence are realized in markets that enable it promptly. Convergence, though, typically does not fit easily into traditional policy frameworks. Attempting to stick to existing policies creates regulatory uncertainty and inconsistency—the economic costs of which will increase over time in a way that will hinder technological progress and market evolution. Consequently, countries that resist convergence or adopt a “wait and watch” approach will ultimately miss the benefits of improved ICT networks and services.

As understanding of convergence evolves, emerging trends point to three global good practice principles for

regulatory frameworks to enable convergence. First, regulatory frameworks must promote competition. Service providers can deploy converged networks and services only if regulatory frameworks lower entry barriers in order to increase competition, reduce prices, and drive growth. However, it is equally important that regulators intervene in cases of market failures and do not allow abuse of market dominance. Hence, regulatory frameworks that establish and effectively enforce competitive, level playing fields will result in the greatest benefits for users.

Second, policy makers should rely more on market forces and less on regulation. Maintaining legacy regulatory frameworks will likely stifle the growth of convergence. Instead, regulation can move toward allowing innovation and the entry of value-added service providers to promote the development of content and ICT-enabled businesses and social services.

Finally, policy and regulatory frameworks should allow new technologies to contribute everything they have to offer. Regulatory frameworks that are technology neutral and allow flexibility in service provision will encourage investments and innovation. When service providers are able to use their networks to the fullest extent, they can reduce costs, increase business viability, and ultimately encourage markets that are more efficient. Users of the networks will benefit from lower prices, more choices, and better quality.

Policy makers seeking to respond to and enable convergence will find that doing so enhances the effects of earlier sector liberalization efforts and supports innovation in services that benefit the ICT sector. Countries that begin these second-generation reforms in the ICT sector will find themselves better off for it.

### **Public-Private Partnerships Can Leverage the Private Sector to Meet Public Policy Objectives**

In market economies, responsibility for providing ICT infrastructure and services rests primarily with the private sector. This market-based approach has proven very successful in extending the reach of voice services. Competition is particularly effective among wireless mobile operators, resulting in the rapid rollout of networks across urban areas and, more recently, into rural areas at constantly declining cost.

The role of the public sector in achieving this outcome has been twofold: first, it has liberalized the market and regulated competition; and second, it has established mechanisms such as universal service funds and output-based aid that offer



incentives for operators to provide services in areas of the country that otherwise would not be commercially viable.

The role of the public sector in providing access to broadband networks in developing countries is also likely to be a combination of market reforms and targeted incentives. Establishing effective competition over time among broadband networks and service providers is often a central part of a successful policy approach. This will require removal of legal and regulatory barriers to investment, entry, and competition. It will also require that competing operators are able to interconnect with the incumbent operators' infrastructure, thereby avoiding economic and technical bottlenecks as well as inefficient duplicate investments. Such a policy approach has been successfully applied in countries such as Brazil and Nigeria, where multiple broadband network companies have developed in competition with each other (World Bank 2008a). Competition is also emerging among companies that install submarine fiber-optic cables providing international broadband connectivity to developing countries, such as off the east coast of Africa, where three submarine fiber-optic cables are currently under development (Technology Review 2007).

Investment in broadband networks by private operators has primarily focused on urban areas. If these networks are to be rolled out to smaller towns and into rural areas, some form of more direct public sector support is likely to be required. In many high-income countries, such support was initially provided through state ownership of the incumbent operator. However, state-owned operators have often proven to be ineffective in many developing countries (Williams 2009, chapter 4 in this volume). Alternative methods of channeling public support will therefore be required. The most effective means of doing this will be through public-private partnerships (PPPs), which are able to harness the investment resources and technical expertise of the private sector to meet policy objectives, such as ensuring that networks are developed in otherwise commercially unviable areas. Although public support or incentives may initially be required, the objective should continue to be the development of a sector that is in the long run, commercially viable on a stand-alone basis and preferably that is in a competitive environment as demand picks up.

There are many different models for PPPs. Competitive subsidy or cost-sharing mechanisms are one type of model that has traditionally been used to encourage the rollout of voice networks into underserved areas (*infoDev* and ITU

2008), and which has been recently applied in the rollout of broadband infrastructure. In France, for example, the government has launched a scheme to provide broadband infrastructure in Limousin, a rural region in central France with limited broadband services. The project is structured as a 20-year concession to build and operate a backbone network and to construct a broadband wireless network with the costs being shared between the public and private sectors (ICEA 2008). The Eastern African Submarine Cable System (EASSy), a project to build a submarine fiber-optic cable that will stretch from South Africa to Sudan with connections to all the countries along its route, is an example of a different type of PPP. EASSy is owned by a consortium of private operators but financed by development finance institutions with no subsidies or support from governments. The partnership has ensured that the cable will be operated on an open-access basis, allowing all operators and service providers in the region to obtain access to affordable capacity by having access to competing cables and providers of capacity.<sup>7</sup>

These PPPs in broadband networks are new, and governments are experimenting with different models. The key to the success of these projects will be ensuring that they are structured so that the private sector has sufficient incentives to invest and operate networks efficiently while also achieving the governments' policy objectives of broadband network rollout.

### **Cross-Sector Leadership and Institutions Are Essential to Realize the Benefits from Investing in E-Government**

E-government often entails institutional and political reform facilitated by technology. Competent leaders and institutions are essential to overcome resistance and inertia, to make timely policy choices, and to implement policy effectively. The cross-cutting nature of e-government makes it impossible to use traditional institutional arrangements that assign the entire agenda to a single ministry. Rather, e-government requires coordination among various government agencies. Public leadership needs to shift away from focusing on individual agencies and turf protection and toward management through collaboration across agencies. Moreover, e-government is a continuous process of policy development, investment planning, innovation, learning, and change management. This process must fit with and respond to a dynamic development strategy that supports

evolving national goals and creates sustained institutional reforms and public service improvements while providing frameworks and structures that ensure continuity and proper institutional coordination.

In order to realize development gains from e-government investments, a sufficiently influential institutional structure that attracts strong commitment and support is essential. Many countries have moved toward direct, institutionalized engagement of top public leaders to position the coordination of government transformation under the highest authority. Often the office of the prime minister or the head of state hosts a coordinating unit and chairs the interministerial e-government steering committee. Such an approach has three benefits. First, the head of this coordinating unit becomes a visible leader. Second, this leader can use e-government as a core component of a public management reform agenda and, more broadly, as a key to shifting to a knowledge-based, innovation-driven economy. Third, the coordination unit encourages work across ministries and levels of government to implement e-government programs.

A survey of 30 developing and developed countries found four basic models of a national institutional framework to lead their e-government agenda and fulfill the key functions of governance and coordination (table 1.1). In practice, though, these frameworks are more diverse and complex than

suggested by these basic models and may evolve over time, shifting from one model to another or becoming hybrids.

These four institutional models focus on the leading or central institution for e-government strategy and policy making, and on governance and coordination. But in terms of facilitating implementation, governments have increasingly experimented with new arrangements outside the ministerial structure to overcome sectoral fragmentation and civil service constraints and to expand e-government institutional capability. Countries such as Bulgaria, Ireland, and Singapore now have dedicated executive ICT agencies in their civil services. These agencies have special autonomy and salary structures to attract and motivate the best technical talent. Others, including India and Sri Lanka, are experimenting with ICT agencies that have a government-appointed board of directors and representatives of key stakeholders from the private sector and civil society.

Institutional innovation in these countries has a number of advantages. Apart from being shielded from the larger bureaucracy and having the flexibility to react swiftly to changing demands, agencies dedicated to e-government can hire personnel at competitive wages, provide shared services (such as network infrastructure) to the government, and outsource tasks to the private sector. Active private sector participation helps the agencies operate in an agile, businesslike way and accelerate e-government financing and

**Table 1.1 Models for E-Government Institutions in Various Countries**

Model	Countries	Benefits	Drawbacks
<i>Policy and investment coordination</i> (cross-cutting ministry such as finance, treasury, economy, budget, or planning)	Australia, Brazil, Canada, Chile, China, Finland, France, Ireland, Israel, Japan, Rwanda, Sri Lanka, United Kingdom, United States	Has direct control over funds required by other ministries to implement e-government. Helps integrate e-government with overall economic management.	May lack the focus and technical expertise needed to coordinate e-government and facilitate implementation.
<i>Administrative coordination</i> (ministry of public administration, services, affairs, interior, state, or administrative reform)	Bulgaria, Arab Republic of Egypt, Germany, Republic of Korea, Mexico, Slovenia, South Africa	Facilitates integration of administrative simplification and reforms into e-government.	May lack the technical expertise required to coordinate e-government or the financial and economic knowledge to set priorities.
<i>Technical coordination</i> (ministry of ICT, science and technology, or industry)	Ghana, India, Jordan, Kenya, Pakistan, Romania, Singapore, Thailand, Vietnam	Ensures that technical staff is available; eases access to nongovernmental stakeholders (firms, NGOs, and academia).	May be too focused on technology or industry and disconnected from administrative reform.
<i>Shared or no coordination</i>	Russian Federation, Sweden, Tunisia	Least demanding and with little political sensitivity (does not challenge the existing institutional framework and responsibilities of ministries).	May lead to rivalries among ministries. No cross-cutting perspective. Fails to exploit shared services and infrastructure and economies of scale.

**Source:** Hanna and Qiang 2009 (chapter 6 in this volume).

implementation, making the best use of scarce public resources and relevant expertise.

One disadvantage, however, is the potential struggle to obtain political weight and financial resources if the new entity lacks institutional links to powerful ministries. On the other hand, if such links are too strong, the government bureaucracy might assert control over the agency and undermine the effectiveness or businesslike culture of agency staff. Hence, the viability of these agencies depends on political leaders giving the agency the autonomy needed to act in an agile manner and avoid interference in staffing and day-to-day management.

### **Public Sector Interventions to Promote IT Services and ITES Can Be Good Investments Irrespective of Success of the IT Initiatives**

In countries that have succeeded in IT services and ITES, governments have generally adopted a proactive role in promoting the sector. Such support can often be provided with low levels of public funding by leveraging private sector investments. Most of the public interventions to promote these industries—such as improving education, providing adequate infrastructure, or catalyzing regulatory reforms—contribute to the broader business environment and benefit many other sectors of the economy whether related to the IT industries or simply able to realize efficiencies as a result of IT applications. In this sense, government support for IT services and ITES is consistent with the argument that public interventions should create positive externalities.

Locations that have successfully developed IT services and ITES typically have empowered industry development institutions to identify approaches that adapt to the rapidly evolving needs of the local and global economies. They achieve this through ongoing engagement with IT services and ITES companies, as opposed to adopting a policy approach with a predetermined strategic blueprint. The private sector can provide governments with invaluable information and insights on available opportunities, market trends, and future skill requirements (Dongier and Sudan 2009, chapter 7 in this volume).

Ireland's government-sponsored Industrial Development Agency (IDA), for example, has achieved significant success in attracting IT services and ITES investments. The agency deals with a multitude of aspects of inward investment: marketing, managing investment proposals, providing

financial incentives and property solutions, helping investors get started, and working with investors to maximize their contribution to Ireland's economy (IDA 2006). Nine of IDA's 13 board members are from the private sector. IDA's investment program has been a major driving force behind the growth of IT services and ITES.

Given the importance of skills as a driver of growth of IT services and ITES, a focus on expanding the talent pool in close alignment with local and global industry needs is essential. Partnerships composed of leading companies, industry associations, and universities have successfully aligned education and skills competencies with the needs of the industries in several countries. Singapore has been one of the most proactive examples in this regard. Its Industrial Training Board (ITB) established an extensive system of training advisory committees with industry participation and introduced industry-based training schemes in partnership with companies. It also established arrangements for keeping training staff abreast of the latest technological developments (Lee and others 2008). In addition, the InfoComm Development Agency of Singapore has been active in forging global partnerships to improve ICT sector skills. It collaborated, for instance, with Carnegie Mellon University's Entertainment Technology Center and the National University of Singapore's School of Computing in 2006 to develop a degree program in interactive digital media (CMU 2006).

Developing globally benchmarked skills in partnership with leading standards organizations helps not only maintain a certain level of quality, but also align skills with industry requirements. Universities in the Philippines, for example, offer courses in finance and accounting modeled after the U.S. Generally Accepted Accounting Principles (GAAP). This has made the Philippines a natural choice for U.S. banks and financial institutions seeking to offshore portions of their operations. Similarly, the Chartered Institute of Management Accountants (CIMA), one of the world's largest professional accounting bodies, has its second-largest number of management accountants in Sri Lanka, after the United Kingdom, making Sri Lanka an attractive offshoring destination.

### **Structure of the Report**

*IC4D 2009* has two parts. Part I analyzes key aspects of extending access to ICT infrastructure and services (chapters 2, 3, and 4), mainstreaming ICT applications featuring

e-government (chapters 5 and 6), and developing IT services and ITES (chapter 7).

Chapter 2 sets the sector context for the report. It explains convergence and shows that convergence is already a widespread, market-driven reality. It also discusses some of the main opportunities and challenges convergence poses to businesses, users, and governments, while advocating for proactive government responses.

Chapters 3 and 4 cover two important aspects of broadband. Chapter 3 summarizes the findings from the literature on the economic impacts of broadband on individuals, firms, communities, and the overall economy. It also introduces a cross-country empirical model for analyzing the impact of broadband on economic growth. It concludes that broadband has a significant impact on growth and deserves a central role in country development and competitiveness strategies. Chapter 4 outlines a market-based approach to policy for developing backbone network infrastructure, an essential part of providing broadband services. Building on the model of infrastructure competition, this approach seeks to harness both the investment resources and the operational expertise of the private sector to help meet the public policy objective of extending affordable access, thereby minimizing the financial and operational burden on the public sector.

Chapters 5 and 6 focus on e-government. Chapter 5 proposes a framework for assessing ICT investment in public administrations and applies it to five e-government projects in India that shifted from manual to electronic service delivery. It analyzes positive and negative changes perceived by the users and implementing agencies in terms of cost and quality of accessing public services and improvements in governance. Chapter 6 highlights the importance of institutional development for e-government programs. It outlines key functions of effective e-government institutions and identifies basic models that countries have used to fulfill these functions.

Chapter 7 covers development impact and policy options related to the expanding IT services and ITES. It aims to help policy makers take advantage of the opportunities presented by increased cross-border IT services and ITES, demonstrating the benefits for countries that have seized the opportunities and examining the potential competitiveness of small economies and least developed countries. Factors crucial to the competitiveness of a country or location—skills, cost advantages, infra-

structure, and a hospitable business environment—are also analyzed.

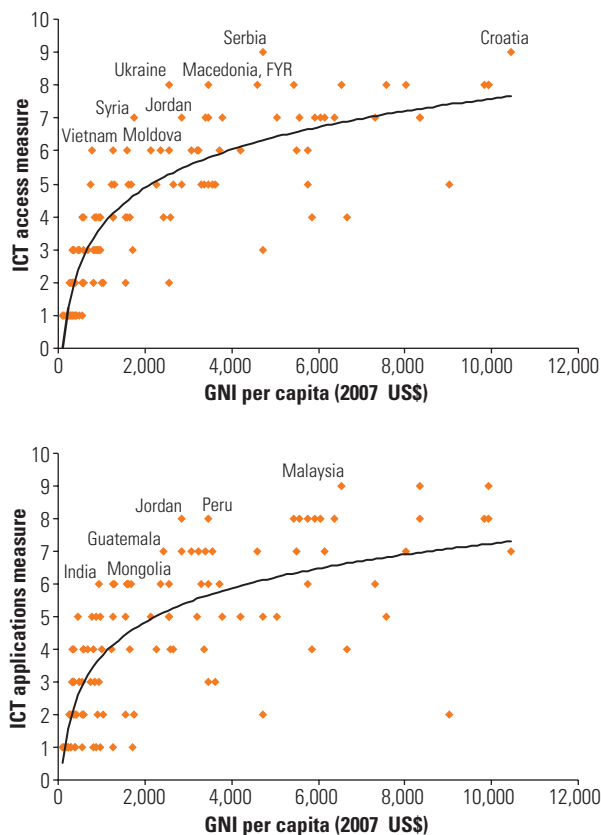
Part II of this report presents a trend analysis of ICT sector performance and the World Bank ICT at-a-glance (AAG) tables for 150 economies. The analysis uses data on nearly 30 ICT indicators from the AAG tables both to demonstrate the progress that many developing countries have made in recent years in improving ICT access, use, quality, affordability, trade, and applications and to show how that progress relates to enabling policies and regulations.

Country ICT performance measures are introduced in this report to provide a quick and effective way for policy makers to assess their countries' ICT capacities in comparison with other countries, as well as to benchmark their countries' progress along three key dimensions of ICT development over time. The economies have been evaluated and given a score on a scale from 1 to 10, corresponding to the performance deciles, for each of the dimensions of ICT sector performance: (1) access to ICT services, (2) affordability of ICT services, and (3) adoption of ICT applications in government and business.

Overall, as would be expected, there is a close relationship between the country ICT performance measures and income levels. The leading economies in ICT performance are mainly developed economies. Among developing countries, some stand out as better ICT performers than their incomes would suggest, such as Serbia, Croatia, Ukraine, Macedonia, Syria, Jordan, Vietnam, and Moldova in terms of access and Malaysia, Jordan, Peru, Guatemala, India, and Mongolia in terms of adoption of ICT applications (figure 1.5).

Recognizing that comparable ICT data provide a good basis for sound policy, a global Partnership on Measuring ICT for Development was launched in 2004. The members include the United Nations Conference on Trade and Development (UNCTAD), the International Telecommunication Union (ITU), the Organisation for Economic Co-operation and Development (OECD), the United Nations Educational, Scientific, and Cultural Organization [UNESCO] Institute for Statistics (UIS), the United Nations Regional Economic Commissions, Eurostat, and the World Bank. The partnership has been assisting statistical agencies in developing countries with their ICT data collection and dissemination efforts, and conducting workshops at the regional level to exchange national experiences and discuss definitions, methodologies, survey vehicles, and results analysis.

**Figure 1.5 Relation between the Country ICT Performance Measures (for Access and Applications) and Income per Capita, Developing Countries**



Source: World Bank staff.

One area that is receiving increasing attention in all countries, but that remains weak in most, is impact evaluation. Measuring the impact of ICT on development and evaluating the outputs of ICT interventions not only reveal the magnitude of the impact of ICT on development outcomes but are perhaps the most rigorous way to deal with the issue of attribution, or pointing to the effects of specific development interventions. Impact evaluation is essential to ensure that ICT strategies are relevant and to be able to hold governments accountable for their implementation.

More research is needed on the socioeconomic impact of ICT on development, the cost-effectiveness of ICT strategies and programs, and the economic justification of public sector intervention. Are these investments cost-effective in meeting social and development goals? How do they compare with alternative uses of public resources; for example, education and health? Rather than relying primarily on anecdotal evidence, there has been a clear call for rigorous and robust

impact evaluation as a basis for guiding policy development and public investment decisions.

## Notes

1. Nevertheless, it is important to note that the sale of 4 billion mobile phones worldwide implies far fewer than 4 billion individual users. The phenomenon of multiple mobile phone ownership is growing in many economies, including some in Africa. As evidence of this trend, penetration rates for mobile phones have risen to more than 100 percent in some markets. On the other hand, shared usage of mobile phones in rural areas of developing countries is also growing, suggesting that the footprint of mobile phone coverage is wider than for other ICT services.
2. See <http://www.tradenet.biz/gapto> for more information.
3. See <http://www.voxiva.com/solutionslist.php?catname=Health> for more information.
4. See <http://www.simpill.com/index.html> for more information.
5. Estimating the size of the IT services and ITES is difficult because of definitional issues and the relative novelty of the industries. Official statistics are often not available or not reliable, and calculations based on balance of payments and trade in services do not accurately isolate IT services and ITES. As a result, much of the data on the size of the current market comes from private surveys, consulting firms, and anecdotal evidence.
6. According to NASSCOM (National Association of Software and Services Companies, India), the global financial crisis is expected to result in reduced technology-related spending for the first two to three quarters of 2009, but it is expected to pick up in 2010; and “greater focus on cost and operational efficiencies in the recessionary environment is expected to enhance global sourcing” (NASSCOM 2009).
7. See <http://go.worldbank.org/GKHOFDJB0> for more information.

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