Second Edition

INTRODUCTION TO INTERNATIONAL DEVELOPMENT

APPROACHES, ACTORS, AND ISSUES

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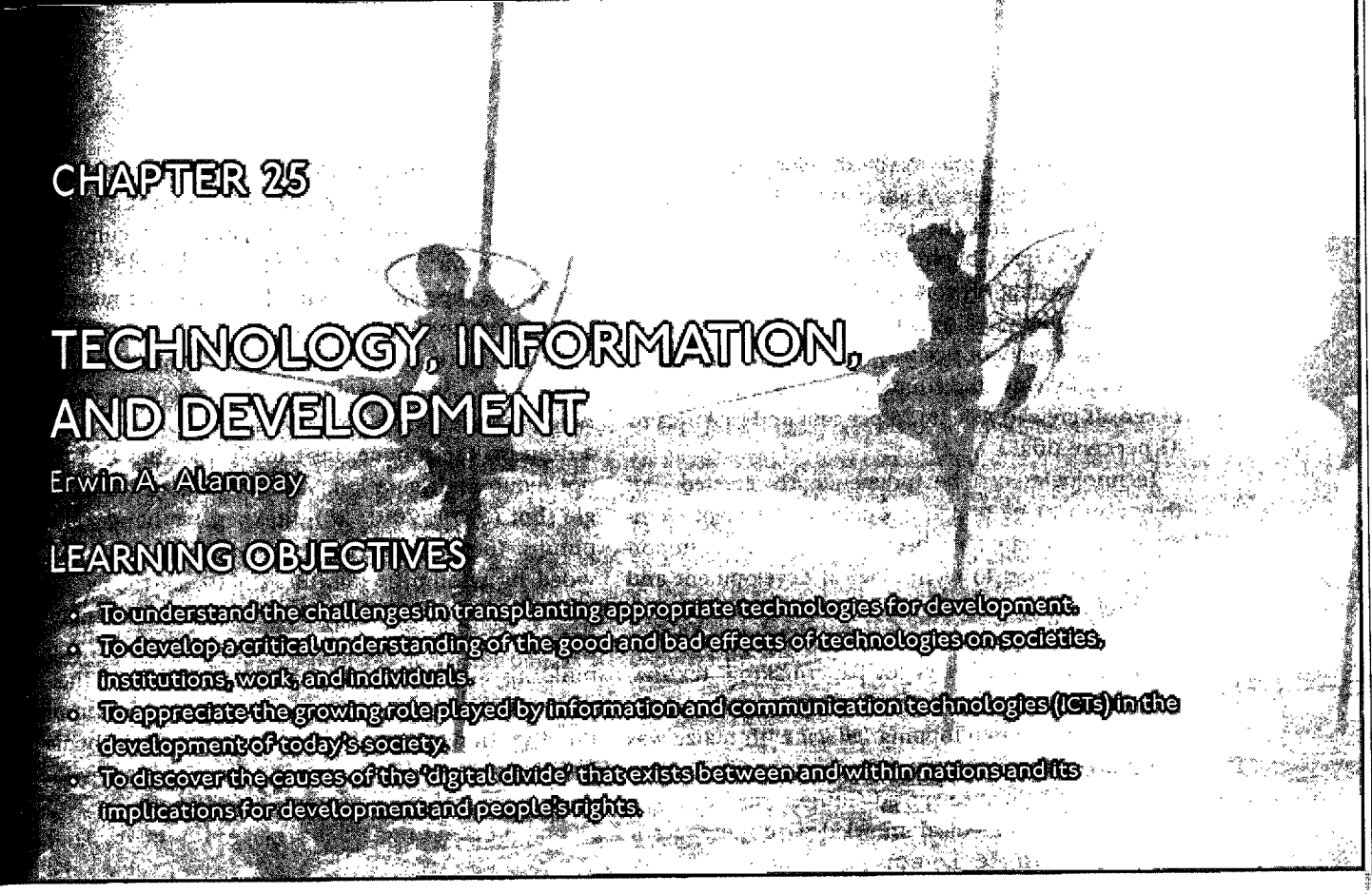

CHAPTER 25

TECHNOLOGY, INFORMATION, AND DEVELOPMENT

Erwin A. Alampay

LEARNING OBJECTIVES

- To understand the challenges in transplanting appropriate technologies for development.
- To develop a critical understanding of the good and bad effects of technologies on societies, institutions, work, and individuals.
- To appreciate the growing role played by information and communication technologies (ICTs) in the development of today's society.
- To discover the causes of the 'digital divide' that exists between and within nations and its implications for development and people's rights.

Information is central to the things people do every day. Access to information is crucial to learning and to the development of communities. People need information to meet their needs—to access basic services like water and health care and to look for opportunities. This chapter explains how information and systems for sending and receiving it can be used for development and governance. We begin with a brief discussion of the relationship between technology and development, then focus on **information and communication technologies** (ICTs).

In discussing the role of ICTs in development, the chapter is not limited to computers and the Internet. We also consider such ICTs as radio, television, telephone, and indigenous information systems that may be available and more appropriate for some situations in the real world. ICTs today have an enormous impact on economies, on how we organize and work, and the chapter examines some of these impacts and looks at important policy issues, such as open access, intellectual property rights, censorship, and freedom of expression.

TECHNOLOGY AND SOCIETY

Every technology is both a burden and a blessing; not either-or, but this-and-that.

Postman *(1992: 4–5)*

Defining Technology

Technology is considered 'the science and art of getting things done through the application of skills and knowledge' (Smillie, 2000: 69). The non-governmental organization Practical Action defines it as the capacity to organize and use physical infrastructure, machinery and equipment, knowledge, and skills. In this respect, benefiting from technology is not simply a matter of getting new equipment, tools, and infrastructure but also putting people's knowledge and skills to use and applying them to their problems. In brief, then, technology is the practical application of science to solve real-world problems.

Technology Creation and Diffusion

Technology can be developed and transferred in a number of ways. Resource abundance and shortages

play an important role in the development and diffusion of technologies. A good example of this is the need for grain and the resulting Green Revolution in the 1970s (see Chapter 18). The Green Revolution was a by-product of work conducted in the 1960s to develop higher-yielding strains of rice and wheat. A cross-bred variety of rice was developed that doubled traditional yields, and from 1982 to 1992 production of cereals grew in Asia by 25 per cent and in Africa by 41 per cent (ibid.).

Technologies can be independently created, but they also can be bought, copied, and stolen. Commerce and warfare have been among the most important contributors to technological development and diffusion. Early trading between China and other Asian countries, for instance, brought with it the diffusion of technologies for papermaking, textiles, gunpowder, and porcelain. Aztec, Maya, and Inca technology for intercropping *ipil-ipil* with maize was transferred to Asia by the galleon trade (ibid.). Arabian traders helped to spread Chinese steel technology and Arabian medical knowledge. In more recent times, the Japanese, Koreans, and Taiwanese developed their automobile and electronics industries from products that originated in the West.

The contribution of warfare to technological innovation has included the use of crossbows, guns and gunpowder, and mathematics to optimize distribution systems and decode messages. Space travel, for instance, traces its roots to the development of land-based missiles that can carry bombs across vast distances. Similarly, the Internet had its origins in the need to secure communications in the event of a nuclear attack. Moreover, technological disparities between civilizations have led to the conquest of nations. A good example of this is how that the greatly outnumbered Spaniards were able to defeat the Incas in the 1500s because of their guns, steel weapons, armour, and horses (Diamond, 1999).

Appropriate Technology

The transfer of technology, however, is not that easy to accomplish. In developing countries and marginalized communities, it is necessary to consider the socio-economic and environmental context into which a technology will be transplanted. The term **appropriate technology** has its origin in the work of Dr Fritz Schumacher on the kinds of technology that fit small-scale, grassroots, and community-centred organizations. These technologies are appropriate to the environmental, cultural, and economic context to which they are transferred. An appropriate technology does not mean it is a 'lesser' kind of technology. What is important is that it works, is suitable for the context, and is sustainable. Some examples of appropriate technologies include a polio vaccine that only requires a drop on the tongue, heat-stable vaccines that do not require refrigeration, vaccine cocktails in a single shot (UNDP, 2001: 28), inexpensive hand water pumps, fuel-efficient stoves, cheap electricity provided by windmills (Smillie, 2000), earthbags for building houses, water rollers that ease the transport of clean water (see www.hipporoller.org), and building simple latrines that help reduce the incidence of blindness by reducing the population of flies that transmit the bacteria that causes trachoma (see www.cartercenter.org). Appropriate technologies typically require fewer resources, cost less, and have a minimal impact on the environment. They also tap the existing knowledge of local people and use local natural resources (see Box 25.1).

Technological Determinism versus Social Determinism

Social scientists have looked at the interaction between technology and society in two ways: either through technological determinism or through social determinism.

Technological determinism suggests that technology drives the evolution of society. The idea is that technology begets technology and that society is continually reformed in the wake of this process (Ling, 2007). An example of this is the way the printing press contributed to the Protestant Reformation by giving more people access to the Bible and permitting individual interpretations of God's word.

Social determinism, on the other hand, considers social interaction as having primacy in terms of the development and use of tools. Thus, tools, while originally intended to function in one particular way, can be reinterpreted and used in other ways. From this viewpoint, technology is not inherently good or bad, since the outcome depends largely on how it is used. For example, nuclear technology has been used

IMPORTANT CONCEPTS BOX 25.1

APPROPRIATE HOUSING TECHNOLOGY: EARTHBAGS

An example of a technology that has been adopted in some developing countries is the earthbag (see www.earthbagbuilding.com). This natural building alternative, evolved from military bunker construction techniques, uses bags filled with local, natural materials, hence the term 'earthbags'. Such construction is cheaper because it lowers the production and transportation costs of building materials. After being filled, the bags are stacked like bricks, and the house often is domed, much like igloos. The method is durable, non-toxic, and can provide good insulation. Because of the ease and simplicity of building with earthbags it is being promoted as a feasible option for low-cost housing, especially for remote areas where many common building skills are not available. However, the transfer of technologies is not always easily achieved. In one site where an earthbag building was constructed, the final layer of plaster was not placed correctly and did not adhere to the mud fill that was applied over the earthbag structure. Hence, plants ended up growing naturally in the earthen medium because seeds or roots were present in the bags at the time they were used (see www.earthbagbuilding.com/projects/clinic.htm).

PHOTO 25.1 The Asháninka, an indigenous tribe in the village of Marankiari Bajo, Peru, view the Internet.
Source: Luis Barnola/IRDC

constructively to support industries and communities but also has been used destructively for war. A hand tractor originally intended for plowing and farm use has been reinvented as a means of public transportation in some rural villages in the Philippines. In the context of development, this interpretation highlights the importance of focusing on people, on what they can do with technology, and on building their capacities.

Some technologies, however, are particularly closed. They are difficult to reinterpret and use in ways other than originally intended, while others are particularly open. Information and communication technologies are particularly open. Hence, while the telephone was originally intended for use by business, people soon found other, more social and personal applications for it. The same goes for the Internet, which is used not only by scientists, researchers, and the military (as originally intended) but also by ordinary people looking for recipes, life partners, or entertainment. In India, engineers conducted an experiment to test whether people in slum areas can independently learn to use an Internet-connected computer without instruction. Among the findings was how quickly children embraced the technology and were able to develop their own vocabulary for teaching each other about it.[1]

In the context of development studies, however, the issue of whether technology shapes organizations or whether society defines how technologies are used

may not be as important as the effects that result from the interaction between society and technology.

Technology and Development

According to the United Nations Development Programme (UNDP, 2001: 27), many technologies can be used for human development to increase people's incomes, improve their health, allow them to live longer and enjoy better lives, and permit them to participate more fully in their communities. However, as Postman (1992) suggests, technology is both a burden and a blessing.

Fire, gunpowder, steam engines, electricity and nuclear energy, trains, airplanes, the telegraph, telephones—history is full of examples of technologies that have changed the course of human development, and not all of them necessarily for the better. Thus, while technologies are often seen as indicators of modernization and material progress, they also have created new social conflicts. During the Industrial Revolution, for instance, technology created tensions not only between man and nature but also among men with different relationships to technology. Owners of capital were pitted against owners of land, progress against tradition, and capital against labour (Briggs, 1963). As Jared Diamond aptly puts it, 'technology, in the form of weapons and transport, has provided the direct means by which some peoples have expanded their realms and conquered other people' (1999: 241).

Technologies also are identifiable with historical eras. For instance, some would consider that what mechanization did for the Industrial Revolution, computer technology is doing for the Information Age (Naisbitt, 1984, cited in Webster, 2000: 8). The discovery of the steam engine and later electrical production spurred the Industrial Revolution and resulted in the transformation of major social institutions such as the family, the church, cities, and working life. In Western societies, the family moved from being a more multigenerational unit of production and reproduction to become more nuclear, with mom, dad, and kids, and with economic production shifted to other work sites than the family unit. The church lost much of its power, cities grew larger, and organizations became bureaucratized (Ling, 2007). Similarly, an important question today is how information and communication technologies are changing society and these same institutions (see Table 25.1).

TABLE 25.1 Comparison between the Industrial Age and the Information Age

	Industrial Age	Information Age
Productive input	Energy (steam, electricity); machines	Information; ICTs
Output	Products	Services
Organizations	Large factories	Networked organizations
Workers	Organized labour	Individualization

Source: Adapted from Castells (2000); Rubery and Grimshaw (2001); Ling (2007); Winter and Taylor (2001).

THE INFORMATION SOCIETY

Information and communication technologies are arguably the defining technologies of contemporary life. ICTs encompass both the equipment and the services that facilitate the electronic capture, processing, and display of information (Torrero and Braun, 2006: 3). They include computer technologies (computers, the Internet), telecommunications (cellular and land-line phones), audiovisual technologies (DVDs, cameras, MP3s), broadcasting (radio, television), and newer technologies that combine these functions (e.g., iPhone, iPad, BlackBerry devices, etc.).

Convergence and Interactivity

New ICTs are the product of technological convergence between old and new networks of technologies. Older technologies, such as radio and television, were characterized by one-way provision of communication. People were passive recipients of information. Newer ICTs are characterized by 'interactivity' whereby communication is two-way and people not only have a choice in selecting the information they want but can also create content that others may use.

Developed countries tend to be more interested in the newer technologies, largely because they have achieved widespread penetration and have superseded the older ones (Sciadas, 2003). However, in developing countries, where access to older ICTs has remained problematic, it is necessary to consider alternative ways of gaining access to needed information, including the use of appropriate ICTs, whether old, new, or a combination of these technologies. In the near future, this issue may no longer be salient, since *convergence*

has resulted in the 'old' media of TV, radio, and telephones becoming digital. But developed countries also can learn from the innovation occurring in less developed countries. For example, text messaging, which has been popular in less developed countries, has been applied in some development projects. Projects like Frontline SMS, which allows anyone to text-message with a large group of people, now are applied even among communities in developed countries in the West (see www.frontlinesms.com).

Theories of the Information Society

Five arguments can be made for considering the world today as an 'information society': technological, economic, occupational, spatial, and cultural (Webster, 2000).

The *technological* argument emphasizes the impressive technological innovations in information processing, storage, and transmission. It touches on the issue of 'convergence' of telecommunications, broadcasting, and computing and the creation of networks of terminals among organizations, offices, schools, homes, and so on. These technologies, in turn, have provided people with new ways of working—flexible specialization and greater customization of products and services.

The *economic* perspective on the information society derives from the work of Fritz Machlup (Machlup, 1984, cited in Webster, 2000), who developed a framework for measuring the information society in economic terms by classifying technologies according to five broad primary industry groups: education (e.g., schools, libraries, universities), media (radio, television, advertising), information machines (computer equipment, musical instruments), information services (law, insurance, medicine), and other information activities (research and development, non-profit work). He also identified secondary-level organizations, such as research and development (R&D) within companies, information produced by institutions, and the library resources of organizations. By quantifying the economic contributions of these industries, one can calculate the growing economic significance of information and knowledge in today's society.

The *occupational* argument focuses on occupational change and the apparent predominance of occupations based on informational work (more teachers, lawyers, and entertainers than builders and coal miners, for example). This perspective is often combined with the economic approach. In this view, the distribution of occupations has shifted towards a 'white-collar society' and away from industrial labour. A simplification of this dichotomy argues that in the industrial sector, workers create, process, and handle physical goods, while in the information sector, workers create, process, and handle information.

The *spatial* perspective is based on the informational networks that now connect locations and affect how society organizes around time and space, thereby leading to a 'flat world' (Friedman, 2005). For example, multinational organizations today can operate 24 hours a day, with offices, factories, suppliers, and employees located all over the world, as a result of the ICT infrastructure that links them together. This perspective sees ICTs as crucial drivers of globalization.

The *cultural* argument recognizes the extraordinary increase in information in social circulation because of television, the Internet, cell phones, and other devices. As a result, the behaviour and values of people in cities as diverse as Tokyo, London, New York, Manila, and Kuala Lumpur may be more similar than they are to those of people within the same country who are less connected to the network of information technologies. Furthermore, given the role that technology plays in people's lives, it affects the way that homes, workplaces, and even clothes are designed. Homes and offices are equipped with ports for plugging into the Internet; clothing comes with special pockets for iPods; and cars contain cordless phone jacks.

This five-pronged argument supporting the idea of a global information society remains problematic, however. Identifying the types of economic activity that constitute the information society is somewhat subjective. It can be argued that just about every profession deals with information and that many of these professions have existed for a long time. Furthermore, at what point (in terms of percentage of GNP or types of employment) can we say that a nation already constitutes an information society?

India, for example, is often cited as one of the beneficiaries of the information revolution, yet Indian society exemplifies a wide divide between the haves and have-nots, and its employment profile barely changed over the 1990–2004 period (see Table 25.2). Over the same time span, Kazakhstan's economy

TABLE 25.2 Labour and Employment by Economic Activity, Selected Asian Countries

Year	Country	% Employment					
		1990			2007		
		Agriculture	Industry	Services	Agriculture	Industry	Services
2004	Afghanistan	70	15	15	70	5	26
2003	Bangladesh	64	15	21	52	10	38
2004	Cambodia	81	2	17	60	10	30
2004	Hong Kong	1	28	72	0	7	93
2004	India	5	28	67	5	27	69
2005	Korea	18	28	55	8	19	73
1997	Myanmar	66	8	27	63	10	28
2005	Philippines	45	10	44	37	10	53
2005	Thailand	64	10	26	43	15	43
2005	Kazakhstan	19	21	60	32	12	56

Source: Asian Development Bank statistical database, at: sdbs.adb.org:8030/sdbs/index.jsp.

actually became more agricultural. According to the same table, which countries could be described as information societies? The stark differences among these countries clearly suggest that some societies are more reliant on information as a commodity than others are, and that the world cannot collectively be described as an information society.

Finally, networks among people in the same occupation or profession have been around since long before the creation of the Internet. Examples include machine technicians, salespersons, lawyers, academics, and doctors, who meet regularly to discuss their respective professions. Taking such phenomena into account, how does one identify the point at which the information society came to be? From a pragmatic viewpoint, however, it does not really matter whether we are an information society or not. Even though the concept of an information society may be debatable, what matters (and is not debatable) is that ICTs are here to stay and that they are affecting society economically, socially, and culturally. Societies are confronted with the growing importance of information products, an increase in information itself, the essential role of ICTs in many services and activities, and the need for information processing in trading and finance. It is important to understand what is happening in the interaction between society and ICT. These interactions have technological, cultural, sociopolitical, and economic dimensions. For that reason, just about every field in the social sciences has begun investigating the implications of ICTs.

Development Theories and the Information Society

The idea of the 'information society' can be linked to the ideas of *modernization* and *globalization*. Modernization theory explains how societal development must go through a series of stages, with each phase having a different technological base of production (see Chapter 3). In an information society, that base would be information technology. Furthermore, economies of the world have become more integrated, aided by information technology, as a result of globalization (see Chapter 6). Only over the past few decades has a technological infrastructure developed to permit the global economy to function as a unit on a planetary scale. This technological infrastructure includes telecommunications, information systems, micro-electronic processing, air transportation, cargo systems, and international business services all over the world (Castells, 1999).

In both the modernization and the globalization perspectives, information technologies play a part in development. According to modernization theory, ICTs can be seen as a potential means of closing the gap between nations. In fact, ICTs even allow countries to leapfrog stages of economic growth by modernizing a country's

PHOTO 25.2 A media workshop with Afghan NGOs.
Source: © Dominic Morissette

production system and increasing competitiveness at a faster rate than in the past (ibid.). ICTs are viewed as an important aspect of a nation's ability to participate in global markets. Others argue that ICTs have helped level the playing field, as evidenced by the shift of knowledge and information-based work to less developed countries through outsourcing (Friedman, 2005).

However, these development perspectives have been questioned. The *dependency* paradigm, in particular, views development in one country as inevitably implying underdevelopment in another—a sort of global zero-sum game—and sees this as implicit in the nature of capitalism (see Chapter 3). This perspective is consistent with world systems theory, which views development as a dynamic link between core regions of development and peripheral areas. Core regions are characterized by high income, advanced technologies, and diversified products, while peripheral areas have lower wages, rudimentary technology, and simple production mixes (Taylor, 1989, cited in Malecki, 1997). For instance, call-centre work, which has been a growth industry in English-speaking developing countries such as India and the Philippines, is seen by some as just another modern-day sweatshop. For example, once a call-centre operator ends a conversation and drops the call, the system immediately and automatically diverts the next call in order to minimize idle time among workers. According to Hechanova (2007), the negative effects of call-centre work include lack of sleep, lack of exercise, increase in drinking and smoking, and less time for the family. Odd work schedules, coupled with the mentally and physically stressful nature of the work, are leading to high turnover rates in these kinds of jobs.

Hence, the core–periphery dichotomy that was evident during colonial times and the industrial era continues in the information age, with the idea of *divides* continuing to persist. As Castells explains, a network society has the 'simultaneous capacity to include and exclude people, territories and activities', and this is characteristic of 'the new global economy as constituted in the information age' (1999: 5).

Just as nations have to clarify their position with respect to these development perspectives, they also

CRITICAL ISSUES BOX 25.2 THREE SEPARATE WORLDS

As Table 25.2 shows, no country is purely based on services or information. Verzola (1998) argues that one of three sectors will dominate: agricultural (primary sector), industrial (secondary sector), or informational (tertiary or service sector). This creates three disparate worlds and could lead to a widening gap between rich and poor societies.

The agricultural sector produces and consumes living matter. The industrial sector produces non-living finished goods from natural resources, and the information sector produces non-material goods based on high information content. In trade terms, this equates producing 160 pounds of coffee (if coffee costs $1 per pound) with producing one television set at $160 or selling one copy of the latest Microsoft Office Professional for the same price.

The unique characteristic of information—never wearing out, never being used up, and easily copied with minimal input of labour and materials—gives a significant advantage to societies with economies based more on information over those based more on agriculture or industry.

have to clarify the role of ICTs in their development policies, since ICT use is also value-laden, cultural, and contextual. For instance, as a tool for governance, ICTs can be used to increase control, just as they can be used to empower. They can be used to develop national identity, just as they can be used to better understand other cultures. In the end, ICT is a tool, and it is up to the owners or users of the technology to decide how it will be used for development—whether in commerce, education, health, or governance.

ICTS AND SOCIETY

There are a number of ways in which access to ICTs can help communities. Most important are the efficiency gains they provide. Access to telephones, for example, helps to reduce travel time and transportation costs because people do not have to physically commute to communicate with each other. It also provides more security, especially for those who are isolated in remote areas or in dangerous locations, since access to ICTs enables them to communicate more quickly with police, hospitals, and emergency response services. Examples include the 911 emergency phone line and tsunami warning systems.

Furthermore, with an increasingly mobile population, ICTs are useful in maintaining family ties and in some cases have stemmed migration because businesses have outsourced various processes to developing countries. However, the primary function of ICTs has been social in nature, allowing people to stay in touch, rather than in the economic sphere for which they may have originally been intended (Alampay, 2006).

There are various views on how ICTs affect society and development. Some are optimistic, and focus on the potential benefits that ICTs can bring, including access to economic opportunities, more efficient work, and instantaneous access to better and more relevant information. In a 'networked economy', those included in the network have the opportunity to share and increase their life chances, while those who are excluded have fewer opportunities and roles (Castells, 1999). Hence, to keep pace with other countries, every nation must be able to participate in the information economy. This creates skepticism among some observers, who caution that ICTs simply support existing social divides. For them, the information society widens the gap between the rich and the poor because of differences in their access to ICTs, their capabilities for using them, and the ways that they can apply them. Some also view ICTs as irrelevant to the majority of the poor and a possible negative influence on people's culture and lives (see Box 25.2).

More pragmatic observers, however, see ICTs as having varied effects on different groups and regions across the world. Consequently, they see the challenge is in making ICTs more relevant to different groups.

Optimistic View

The optimists see the use of ICTs as a necessity that helps to encourage the sustainable development of individuals, communities, and nations. At the World

Summit on the Information Society (WSIS) in 2003, ICTs were considered crucial to development because they can be used in public administration, business, education, health, and environmental protection. They are seen as useful in alleviating poverty by expanding people's opportunities for economic development. They also are seen as tools that provide people with access to information that can be used to undertake production, participate in the labour market, and conduct reciprocal exchanges with other people.

The growing share of ICTs in world economic output is cited as evidence of their importance. The most optimistic see ICTs as providing developing countries with an opportunity to 'leapfrog' stages of development and achieve the level of development of the West (see Box 25.3). In fact, a recent study has found a beneficial relationship between access to mobile phones and economic growth, with the impact being more significant in developing than in developed countries (Waverman, Mesch, and Foss, cited in *The Economist*, 2005b).

Pessimistic View

An opposing view about ICTs is that they only will increase existing inequalities and social divides. Evidence for this perspective is taken from cases demonstrating that areas that have long benefited from excellent physical access and have been dominant politically and economically are the ones benefiting from greater access to information technologies (Niles and Hanson, 2003). Historically, the introduction of new telecommunications has generally increased inequality, benefited mostly the wealthy, and had little impact on quality of life for the poor (Forestier et al., 2003). The idea that development results from linking poor nations to ICTs—the Internet in particular—is also considered a myth (*The Economist*, 2005a). Indeed, there are legitimate questions regarding the real effects of ICTs on national development, considering the limited evidence of any correlation (Heeks, 1999). Thus, while ICTs have been instrumental in the development of India's information technology industry, this has not helped to reduce inequality between the rich and poor in Indian society (UNDP, 2001; Warschauer, 2004). To understand why the gap continues to increase, one simply needs to visualize the price and cost differential between commodities. Original software on a disk may cost $100 and can be duplicated at almost zero cost with minimal expenditure of time. Contrast that to the situation of a farmer, who would need vast inputs in resources and time to produce the same value in agricultural produce. Finally, for some countries, the utopian ideal of an information society requiring investment in ICTs is overshadowed by the more pressing basic needs of shelter, food, and health care.

Pragmatic View

The pragmatic point of view sees ICTs as playing a role in a country's development if applied appropriately. Anecdotal evidence shows that access to a telephone, for instance, can have a dramatic effect on the quality of life of the rural poor. For example, the Grameen Village phone ladies in Bangladesh have been celebrated as a good model for areas where there is no

CRITICAL ISSUES BOX 25.3 GLOBAL CARE CHAINS

An interesting example of the balance between positive and negative views of ICTs is the concept of 'global care chains', which are a 'series of personal links between people across the globe based on paid or unpaid work of caring' (Hochschild, 2001: 131, cited in Munk, 2005). These chains emerged as a result of greater numbers of women obtaining employment in 'post-industrial' occupations created by the growing economic reliance on information as a commodity. The need for non-manual skills has particularly benefited women, in terms of new jobs it has created for them. However, the increase in the proportion of women in the labour force has had an impact on the nuclear family in developped countries. It has fuelled a desire for migrant domestic workers from the South to serve families in the North (Thomas and Ling, 2011). Similarly, those who stay in their countries of origin but serve the needs of the North through outsourced services do so at odd hours. Thus, traditional family arrangements in developing countries also are affected.

widespread access to telephones. These women used a micro-loan to start a mobile phone business, in which they would buy a phone and then charge other villagers per call. At one point, village phone ladies were earning three times the national average income. However, as access to mobile phones in Bangladesh increased, the income from this 'shared-access model' has declined. Nonetheless, the model would still seem viable in places like Uganda, Rwanda, and Indonesia, where telephone access remains limited.[2]

Hence, whether ICTs are useful for development or not still depends on overcoming the same socio-economic barriers that contribute to underdevelopment in the first place. Strategies for using ICTs should consider their fit in the local context. In addition, innovative public policies are required to make sure that technologies are not only tools for progress but also socially inclusive.

THE DIGITAL DIVIDE

At the World Summit on the Information Society, representatives of governments and civil society organizations from 175 countries declared their common desire and commitment to building a fairer society:

> a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize, and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life. (WSIS, 2003: 1)

The challenge of making a more inclusive information society means overcoming the so-called **digital divide**. The digital divide is generally defined as the difference between groups in their access to and use of ICTs. Manifestations of this divide are commonly seen between the North and the South, rich and poor, genders, urban and rural areas, young and old, and the educated and uneducated. The divide is usually measured in terms of number of phone lines per inhabitant and the number of Internet users or mobile phones in a population (see Figure 25.1).

The digital divide, however, is a relative concept. For instance, between 2000 and 2009 the number of Internet users grew by almost 400 per cent. While most people in North America, Australia, and Europe have Internet access, a larger percentage of the world's population in 2010 (71.3 per cent) remained offline. More than 40 per cent of the Internet users are in Asia, but then, most of the world's population also resides there. In fact, only 21.5 per cent of the population of Asia are considered to be Internet users. In Africa, although Internet use increased by 1,800 per cent over the 2000–9 period, Africans comprised only 4.8 per cent of global users.[3]

Optimists would argue that access is always on the upswing, given that the technology is rapidly developing (see Box 25.4) and its capacity exponentially increases at the same time that the cost decreases. Pragmatists, however, would point out that any progress towards access among the marginalized should be examined against the progress made by developed countries. For others, the idea of a digital divide may be passé or irrelevant, because those who need ICTs in the more developed countries already have them and those who do not have access do not really need them. Anecdotal evidence, however, suggests that access to ICTs can make a difference to people who have been deprived of it, even as there is clear evidence that such a divide exists between and within countries (see Box 25.5).

In the end, the issue of whether the divide is increasing or not is less important than the question of how to bridge it. Bridging the digital divide is important for a number of reasons. The primary reasons are to provide access to basic services and to promote social equality.

Access to Basic Services

Access to ICTs is a basic component of civic life that some developed countries aim to guarantee for their citizens. The primary argument for universal access to ICTs, in fact, is security-related, not economic. Telephone service is often considered important for the security and reduced isolation of remote areas. Health, crime, disaster, and other emergencies can be handled better if people have access to telecommunication systems. Also important is how more information for education, career, civic life, and safety purposes is made available on the Internet, especially on websites. Even social welfare services can be administered and offered electronically.

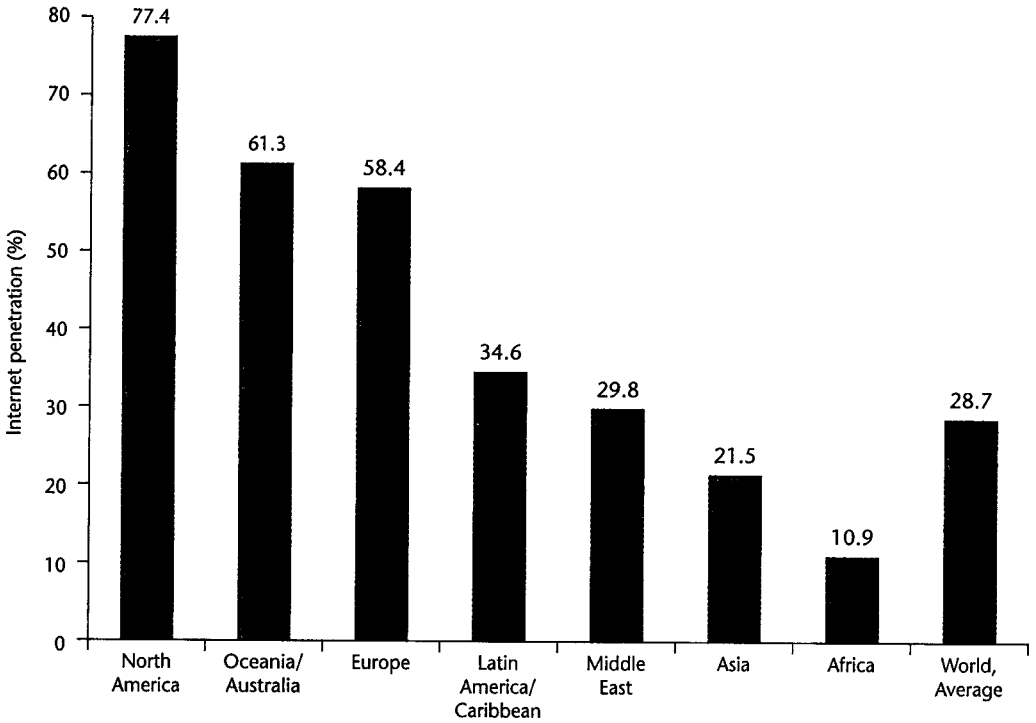

FIGURE 25.1 Internet Penetration by World Region, 2010

Note: Percentages are of Internet users within the total population of each global region; numbers in parentheses are the number of Internet users in each region. Penetration rates are based on a world population of 6,845,609,960 and 1,966,514,816 estimated Internet users as of 30 June 2010.

Source: Adapted from Internet World Stats, 'World Internet Penetration Rates by Geographic Regions—2010' and 'Internet Users in the World by Geographic Regions—2010', at: www.internetworldstats.com/stats.htm.

Social Equality

For people in developing countries without Internet access, bridging the digital divide is a means of sharing the wide range of opportunities already available to those who are connected (i.e., the rich, people in urban areas, the educated). It gives them a means not only of making better decisions but also of participating in decisions (see Sen, 1999: chs 1 and 13). This is especially important in the exercise of good governance (see Chapters 9 and 16, this volume). It varies from the simple ability to search and access government information to more ambitious visions of increased public participation in elections and decision-making processes. Direct participation through ICTs would only be possible if access to these technologies were available to all strata of the population.

From an economic standpoint, the development and use of ICTs is widely believed to be a source of competitive advantage. Hence, the ability to harness its potential is important so that no one is left behind.

If ICTs play an increasingly important role in continued learning and career advancement, then meaningful education in ICT use is necessary. Unless such education is widely available, the existing digital divide discriminates against children of lower socioeconomic status. However, offering long-distance education through ICTs can potentially reduce the cost of education, especially at the post-secondary level, since the cost of relocation and travel can be a disincentive to continuing in school. In fact, this was the prime motivation behind Mahabir Pun's quest to provide Internet service to his high school in Nepal (Box 25.5). Students in the villages can now not only access more information but also listen to guest teachers from distant places through the Internet.

CURRENT EVENTS BOX 25.4

LEAPFROGGING STAGES OF ICT DEVELOPMENT

Given how rapidly ICTs are developing today, many are optimistic that developing societies and communities are likely to catch up quickly. Part of this optimism has to do with the fact that ICTs are not only becoming more powerful, they are also becoming more affordable. This is attributable to Moore's law, which states that the number of transistors on a chip doubles about every two years. This leads to a rapid and continuing advance in computing power per unit cost because the increase in transistor count is also a rough measure of computer processing power. On this basis, the power of computers per unit cost doubles every 24 months. A similar law has held for hard disk storage cost per unit of information, as well as for RAM (random access memory). Hence, not only is the technology getting better, it is also becoming more affordable and therefore more accessible to poorer segments of the population. In turn, this fuels the worldwide ICT revolution. In January 2005, the MIT Media Lab launched a new research initiative to develop a $100 laptop (see laptop.org). By 2010, the Indian Institute of Technology and the Indian Institute of Science had already come up with a $35 touchscreen laptop. The tablet gadget, which can be run on solar power, is an example of how Moore's law, along with the declining cost of ICTs, is levelling access to the technology. This product has effectively superseded the $100 target, with a technology appropriately developed from a developing-country context.

Thus, advancements in the development of ICTs contribute to the concept of *leapfrogging*, which is a theory of development in which developing countries skip inferior, less efficient, more expensive, or more polluting technologies and industries and move directly to more advanced ones. A frequent example is countries that move directly from having no telephones to having cellular phones, skipping the stage of land-line telephones altogether. Similarly, first-time computer users do not have to start with old 286 models but instead use the much faster and more powerful computer systems available in the market. The benefit of leapfrogging in information technologies is that it promotes greater access to information and ICTs that are at par with the developed world.

Factors Contributing to the Digital Divide

Several factors work against equal Internet access and use, especially for those in developing countries. These factors include distribution, affordability, skills, and motivation.

Unequal diffusion/distribution of technologies. The disparity among nations often begins with a lack of access to technological infrastructure. Access is often prioritized for urban centres and business areas. This explains the divide between urban and rural communities. The availability of technologies in a community, however, does not guarantee usage. Social barriers also need to be overcome in order for technologies to become useful. Foremost among these barriers are high costs, lack of education, and insufficient motivation.

Affordability. Even within urban enclaves where ICTs are commonplace, one barrier to usage is the cost of obtaining and using them. This contributes to disparities in the use of ICTs between the rich and the poor. The popularity of cell phones over land-line telephones in developing countries, for instance, was driven by the lower cost of short messaging systems (SMS) and the availability of prepaid cards that allowed customers to overcome barriers to ownership when credit histories were often a prerequisite.

Skills. In many countries, differences in the use of ICTs are related to educational attainment. The more educated tend to use ICTs more. A gender dimension is also apparent, especially in places where women have less access to education and are therefore less likely to have access to or use for ICTs.

Motivation. Another reason for the marked differences in usage within societies is motivation. This is especially true with regard to the young and the old. Older people tend to have a harder time adapting to new technologies, partly because they are quite used to life without them. Motivation also is related to the relevance of the technologies to a person's

CRITICAL ISSUES BOX 25.5

BRIDGING THE DIGITAL DIVIDE: THE CASE OF NEPAL WIRELESS

This is Mahibur Pun's story of how he brought the Internet to his village.

In 1997, I wished to get Internet in my village for the first time after Himanchal High School got four used computers as presents from the students of a school in Australia. Internet and e-mail were quite new terms then. Students from Billanook College in Melbourne collected the computers and raised money to ship them to Nepal. Our dream then was to have the students of the two schools communicate with each other through e-mail. That dream did not come true instantly because there was no phone line in the village to connect to the Internet.

I tried everything to get a telephone line. Initially we got a radio phone for the village, but it did not work well. I tried to find ways to get a satellite phone; however, the cost was beyond our means. I asked political leaders and officers of the Nepal telephone company for help, but nothing happened. I kept asking people for ideas. I wrote a short e-mail to the BBC in 2001, asking if they knew anyone who could suggest ideas for getting cheaper Internet connection to my village. They wrote articles about my school and the computers we had built in wooden boxes. That article changed everything: I got responses with ideas from people all over the world.

As a result of the BBC article, we received two volunteers in early 2002 who knew about wireless networking. We experimented with wireless cards to test the connection between two villages which were 1.5 kilometres apart across a river valley. We used ordinary TV dish antennas and home-built antennas for the testing. The test was successful. Later on, many people from around the world helped provide more ideas about the wireless technology. Others donated equipment for access points for the project. Additional tests were done to connect my village to Pokhara (the nearest city with an Internet Service Provider [ISP]) using an ordinary TV satellite antenna. We pointed the antenna towards the mountain range that was stretching between Pokhara and my village. These mountains were the main obstacle for us. To overcome it, we used a tall tree on the top of the mountain as a relay station.

We had partial success. We found that we could connect to Pokhara because we could connect to Pokhara from a relay station hill. However, we could not connect to Pokhara directly from the village that time even though we tried everything we could. I played with the access points for a few more weeks. I figured out that I could connect to Pokhara if I set the transfer rate of the radio at 2 Mbps, put the access points further apart, and put a screen made of aluminum foil in between them. It worked well but there was shortage of power to run the radios all day. We had connection only for a couple of hours every day.

It took seven years for my wish to be fulfilled. Eventually, we got a grant from a foundation, which was used to buy additional equipment. We have come a long way in the past three years, but we still have to go further to bring the full benefit of the Wi-fi technology to the villagers.

Source: Abridged from nepalwireless.net/story01.php.

occupation. People working in white-collar professions, for instance, may find more uses for ICTs than farmers and fishers.

USING ICTS FOR DEVELOPMENT

The use of ICTs in development requires an integrated approach that accounts for access to the ICT, the content and applications that can be used, and building the necessary skills among people to make use of them (see Figure 25.2). Universal service/universal access policies deal with bridging the ICT divide.

Universal service in telecommunications is defined as 'making affordable a defined minimum service of specified quality to all users at an affordable price' (Prosser, 1997: 80). The focus of universal service policies is to promote '"universal" availability of connections by individual households to public telecommunications networks' (Intven, 2000: 1).

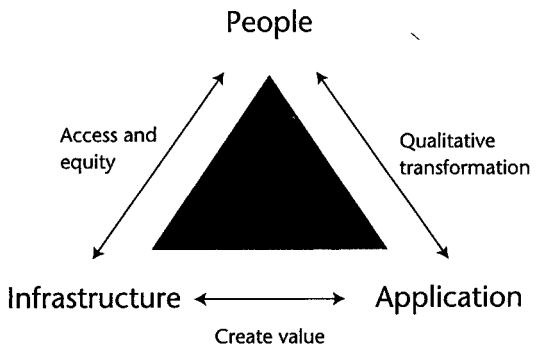

FIGURE 25.2 ICT for Development Framework
Source: Adapted from NITA of Malaysia.

This means that universal service is based on the availability of ICTs in homes (i.e., the percentage of households with a telephone).

Universal access, on the other hand, refers to 'a situation where every person has a reasonable means of access to a publicly available telephone . . . [which] may be provided through pay telephones, community telephone centers, teleboutiques, community Internet access terminals and similar means' (ibid.). It is often measured in terms of the proportion of people in the population with access (i.e., telephone lines per 100 inhabitants, percentage of people with cell phones, and so on). However, developing countries have varied definitions of access. Some define it in terms of distance, while others define it with respect to time. For instance, in Burkina Faso, access is defined as a pay phone within 20 kilometres of most people. In Bangladesh, it is every villager's having access to a telephone within a 10-minute walk (PANOS, 2004).

Both universal service and universal access are based on the *affordability*, *accessibility*, and *quality* of basic telecommunication services. The primary difference is that universal service is focused on the availability of services in all homes, whereas universal access aims to have basic telecommunication services available in all communities. Developed countries tend to aspire for universal service, whereas developing countries aim for the more modest goal of universal access, considering the limitations of their markets and resources. Policies are crucial in making this possible (see Box 25.6).

Historically, universal access and universal service have referred to land-line telephones. However, with the convergence of technologies and the development of wireless devices such as the cell phone and Wi-fi, 'universal access' and 'universal service' have evolved to refer to access to the types of services or functions a technology can deliver. Developing countries are now moving towards access to the Internet, in particular broadband Internet, as their primary universal access objective.

Creating Value: Developing Relevant Content

Using ICTs for development, first and foremost, requires understanding the information needs and rights of people (see Box 25.7). This understanding should come from the intended users in the community.

The community's information needs can be assessed in various ways, including observation, surveys, focus group discussions, and community consultations. Some of the basic information that can be collected may include

1. the different groups in the community;
2. the tasks these groups perform and the information they require to perform them;
3. the different media and ICTs that are used and can be used to access information;
4. the places where information can be obtained and how often it is needed.

Providing Qualitative Transformation: Making ICT Use Relevant to People

It cannot be assumed that ICTs alone can make a significant impact on an individual, an organization, or a government. Their impact also depends on the capacities and values of the people using the technology. Thus, investing in ICTs requires shaping people and developing the necessary skills to permit them to succeed.

In fact, even though newer ICTs are more 'user-friendly' than those of the past, they still require some degree of skill to operate. Being able to navigate the Internet to find useful information requires the ability to discriminate between what is useful and relevant and what is not. This is why more educated people have been better able to take advantage of the benefits offered by the Internet, such as surfing the World Wide Web, e-mailing, using social networks, and creating content.

ICTs and Organizations

Since ICTs are tools, their impact on organizations depends on the people who design what the system is supposed to do and on how people, in the end, use it. Thus, the impact also depends on what the user wants the technology to be rather than just on the technology itself. While the available technology defines to some extent the limits of what can and cannot be done in an organization, in the final analysis, how ICTs are used tends to be socially determined by their managers.

Internal versus External Focus

ICTs can be used to make internal processes within companies more efficient (e.g., automation). They can also be used to network different systems within organizations. Systems also can be designed to increase interaction between an organization and its clients. This can be done by offering feedback mechanisms through telephone hotlines, websites, or e-mail. Automated systems and business process outsourcing to other parts of the world also can enable an organization to offer services around the clock, seven days a week.

Flexibility versus Control

ICTs can be used to make work easier and empowering. This can be done by giving people greater access to different kinds of information within an organization (e.g., through local networks with access to internal databases) and outside the organization (e.g., providing Internet access during working hours). However, ICTs can also expand control over what employees are doing by increasing the managers' span of control—thanks to cell phones, for example, employees can be reached any time and anywhere.

ICTs and Work

The impact of ICTs on employment is mixed, just as it is in other facets of development. On the plus side, new kinds of jobs have been created. Some examples are call-centre operators, computer programmers, knowledge managers, systems administrators, web designers, on-line tutors, and medical transcribers. In addition, ICTs can provide flexibility in careers and work opportunities, since people are no longer limited by their location and the opportunities available there. They expand work opportunities available to people,

IMPORTANT CONCEPTS BOX 25.6

IMPLEMENTING UNIVERSALITY: REGULATORY MEASURES TO FUND IT

Several policy and regulatory measures are necessary to make universal access to ICTs possible.

1. *Market-based reforms.* In most countries, telecommunication services have historically been provided by a monopoly supplier, whether publicly or privately owned. In cases where the government had owned the telecommunication operations, evidence has shown that a marked improvement in access to services occurred following privatization. Other reform measures include opening the market to more competition and cost-based pricing.
2. *Mandatory service obligations.* Service obligations are imposed through licence conditions or other regulatory measures. This is often described in some countries as a provider's duty to serve all customers who are willing to pay the prescribed rates. The government may also prescribe geographic limits to areas where service is mandatory.
3. *Cross-subsidies.* Surplus revenue earned from profitable services should be used to cover losses from unprofitable areas or services (e.g., long-distance rates subsidizing local rates, business rates subsidizing residential rates).
4. *Universality funds.* This refers to independently administered funds that collect revenue from various sources and provide targeted subsidies to implement universality programs. These sources may include government-appropriated budgets, charges for interconnection services, levies on subscribers, or levies on service operators. Countries that have used this system include Chile and Peru (Intven, 2000).

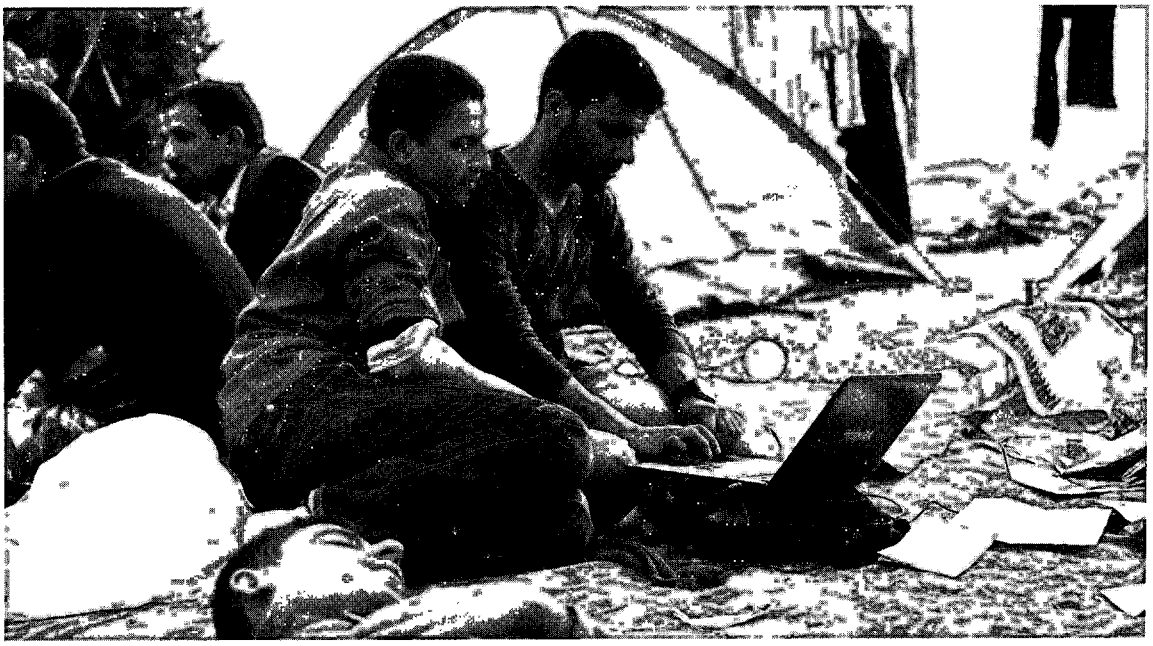

PHOTO 25.3 Technology helped protestors bring down the Mubarak regime in 2011: Tahrir Square, Egypt
Source: © iStockphoto.com/Joel Carillet

CRITICAL ISSUES BOX 25.7

COMMUNICATION RIGHTS ISSUES PERTAINING TO CONTENT

There are a number of pressing issues with respect to developing content for the information society. Among these are free access to useful and relevant information, freedom of expression, and the preservation of local cultures.

Open access versus intellectual property rights. Open access is important, especially when considering the social and economic necessity of sharing the benefits of technological developments. It becomes a controversial issue, however, when pitted against commercial interests in terms of ownership and intellectual property rights. A good example of this is the battle between proprietary software like Microsoft Explorer and open-source software, such as Firefox, that does the same thing. This development is similar to the growth of non-profit organizations in the West as an offshoot of the backlash against corporate greed. Interestingly, in the World Wide Web, voluntarism and sense of community remain very much alive. This is evident in the numerous journals and websites that provide open access—i.e., free, immediate, permanent, full-text, on-line access—for any user, web-wide, to digital scientific and scholarly materials, and the growth of open-source software available on-line.

Censorship versus freedom of expression. On the negative side, people and states are concerned about the potentially harmful and dangerous content carried in ICTs, especially pornography and gambling sites on the Internet, as well as sites that encourage terrorism, foster hatred of identifiable groups, and teach how to improvise explosive devices and other weapons of warfare. Hence, states are concerned about regulating its use. On the other hand, some people worry that increased regulation, especially in the form of censorship, can be abused and curtail people's freedom to express themselves, communicate, and access useful information. A good example of this occurred in 2007 in Burma, when thousands of Buddhist monks

marched for freedom in the streets of Yangon. The state tried to curtail access to the Internet to prevent the story from coming out. Nonetheless, activists and journalists were still able to smuggle images and video captured on mobiles phones and broadcast them on the Internet via YouTube. Their action generated worldwide condemnation of and concern over the events occurring in Burma. Similar attempts to control the Internet occurred in 2011 in Egypt, when large protests against then President Mubarak were organized through Twitter and Facebook. That said, even governments in developed countries like the United States are not immune from wanting some regulation of on-line content because of 'national security'. This was the case, for instance, with WikiLeaks, a whistleblower website that posted classified and sensitive documents about the wars in Iraq and Afghanistan.

Security versus privacy. Along with censorship, another form of regulation is increasing surveillance and monitoring of on-line communications. This is because of the growing view among states that cyberspace is now a national security concern. Hence, some governments try to exert some control over companies who own and operate in cyberspace. This has become an issue among companies such as Google and Yahoo! and providers like BlackBerry that operate in relatively closed societies and non-democratic countries, including China and the United Arab Emirates, as it raises ethical issues regarding the privacy of users and possible harassment of human rights activists, regime opponents, and free-speech advocates.

Diversity of content. One important issue with ICTs is the dominance of content created in the West. For example, the predominant language on the Internet is English, which may not be the first language of choice in many countries of the world. That is why some countries fear that ICTs can endanger local cultures and heritage. Furthermore, news conglomerates, often owned by a few powerful people, may present biased perspectives on world events. Thus, an important challenge is to diversify the content, provide information that celebrates different cultures, acknowledge differences in viewpoints, and provide more information in local languages.

giving them easier access to information about work in different parts of the world. Such information can enable people in developing countries to earn higher pay than what the local market would normally provide. It also can help workers balance their work and family life.

On the negative side, however, jobs can be destroyed. Automated teller machines, for instance, take the place of bank tellers. Lawyers no longer rely heavily on secretaries to type their briefs. With e-mail, the need for messengers and telegraph operators declines. Services outsourced to developing countries take jobs away from other parts of the world. Hence, even though people may have more employment opportunities, they face more competition for those jobs.

There are other drawbacks to always being 'connected'. For some people, being accessible at all times opens the way to intrusion in their private space rather than helping them to balance work and family life. Moreover, ICTs can create an irresistible distraction that could lead to lower productivity—even abuse and addiction. Because the Internet is so content-rich, people sometimes venture to websites and activities that are not work-related while on the job. These activities include answering personal e-mail, instant messaging, reading news, playing games, listening to music, viewing movies and pornography, and gambling. In addition, it can be argued that as people become more reliant on ICTs and spend more of their waking hours connected, they become less in touch—or lose touch—with important facets of the natural world.

Thus, balancing the benefits and hazards of providing Internet access in the workplace has become a policy concern in organizations and in countries around the globe. Determining who should have access and restrictions in terms of time and content are pertinent issues in the workplace today, just as they are issues for states.

In the end, ICTs are not a panacea for making corrupt governments less corrupt, bad organizations good, or incompetent individuals competent. However, as with other technologies, ICTs in the hands of good people can make the people themselves and their society better. That is what ICT for development strives for.

SUMMARY

This chapter examined how new information and communication technologies (ICTs), such as computers, cell phones, and the Internet, may advance economic development in poor countries. Historically, technology has been both a burden and a blessing, and has the potential to significantly affect society. There are optimistic and pessimistic views on the impact of technology on developing societies. The optimistic view suggests these societies may use ICTs to expand individual opportunities and leapfrog stages of development. The pessimistic view suggests that new technologies may exacerbate the digital divide of unequal access to ICTs between the 'haves' and the 'have-nots'. A more pragmatic view suggests that ICTs can be beneficial, if used properly. Indeed, bridging the digital divide is essential to expanding opportunities for poor people. The digital divide exists because of unequal diffusion and distribution of technologies; low affordability; inappropriate skills; and levels of motivation to adapt new technologies. There are different approaches to providing access to ICTs, such as universal access, which may differ from the universal service approach common in developed countries but is often an effective way of expanding technology use. Other important issues for developing countries include expanding open access to intellectual property and ensuring that content is produced locally and reflects local, non-Western cultures.

QUESTIONS FOR CRITICAL THOUGHT

5. What factors initially contributed to the digital divide in the Nepalese case discussed in the chapter? How did the community overcome these problems? Could this solution to the digital divide be replicated in other developing communities? Can such technology transfer be sustained?
6. Consider the case of earthbags (see Box 25.1). Is this technology appropriate for any place? How can problems identified in the case be fixed or avoided in the future? What lessons does it offer about the transplanting of technologies from one context to another?
7. Think of a technology today and list the benefits and problems it brings to society. (For example, cars have helped communities become more mobile. However, they have contributed heavily to pollution and have been among the leading causes of deaths due to accidents.)
8. Which of the countries in Table 25.2 would you consider information societies? Explain your answer. Would you say that the concept of an information society is an inclusive one? When is a person part of the information society?
9. What are some of the policies and strategies that organizations can implement to balance the advantages and disadvantages of Internet access? What do you think are the pros and cons of applying these policies to an organization?

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RELATED WEBSITES

Technology and development

Practical Action
practicalaction.org/?id=home

The Carter Center
www.cartercenter.org/health/index.html

ICTs and development

Information Technologies and International Development
itidjournal.org/itid

Information for Development Program (InfoDev)
www.infodev.org/en/index.html

ICTs and development on-line resources
www.sed.man.ac.uk/idpm/research/is/ictdev.htm

Women and ICT-based enterprises
www.womenictenterprise.org/home.htm

ICT for development cases

The Hole in the Wall Project
www.hole-in-the-wall.com

Grameen Village phones
mobileactive.org/grameen-village-phone-ladies

One laptop per child project
laptop.org/en/vision/index.shtml

India's $35 tablet
www.wired.com/gadgetlab/2010/07/india-35-tablet

Communication rights

Handbook on Communication Rights
www.crisinfo.org

The Open Net Initiative
opennet.net

NOTES

1. See the Hole in the Wall Project, at: www.ncl.ac.uk/egwest/holeinthewall.html.
2. See mobileactive.org/grameen-village-phone-ladies.
3. See www.internetworldstats.com/stats.htm.

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