essential medium that supports other forms of production, participation, and social development. Whether in developed or developing countries, urban areas or rural, for economic purposes or sociopolitical ones, access to ICT is a necessary and key condition for overcoming social exclusion in the information society. It is certainly not the only condition that matters; good schools, decent government, and adequate health care are other critical factors for social inclusion. But ICT, if deployed well, can contribute toward improved education, government, and health care, too, and thus can be a multiplying factor for social inclusion.

2

Models of Access: Devices, Conduits, and Literacy

If access to information and communication technology (ICT) is critical for social inclusion in the information era, what does such access entail? The two most common models of access to new technologies are those based on *devices* and *conduits*. The insufficiency of these two models forces us to consider a third model, based on *literacy*.

Devices

The simplest, but perhaps the most limited way, to think about ICT access is as ownership of a device. In this sense, *access* is defined in terms of physical access to a computer or any other ICT device. Ownership of a computing device is clearly part of ICT access; however, device ownership does not in itself constitute complete access because full ICT access in current times also requires connection to the Internet as well as the skills and understanding to use the computer and the Internet in socially valued ways.

The device model is appealing to some people because diffusion of devices is comparatively easy and quick, compared to diffusion of conduits, content, and practices. Devices require a one-time purchase rather than a monthly fee—let alone the development of a skill—and the purchase price is often reduced through the availability of a variety of first- and second-hand models. In the United States, for example, television and radio both reached 95% saturation points within twenty years of their introduction, and their penetration rate in low-income communities and high-income communities is about the same (currently at 97+%).

The device model has several major flaws, however. First, though the price of computers is falling, the actual purchase price is only a small part of what can be considered the total cost of ownership. This includes the price of software, maintenance, peripherals, and in institutional settings, training, planning, and administration (see comments by Kling in Patterson and Wilson 2000) as well as the price of replacement hardware and software that is necessary because of corporate-planned product obsolescence. In addition, beyond the affordability of computers (or the broader computing package), other barriers will continue to play a major role in fostering digital inequality. These barriers include differential access to broadband telecommunications; differences in knowledge and skill in using computers or in attitudes toward using them; inadequate online content for the needs of low-income citizens, especially in diverse languages; and governmental controls or limitations on unrestricted use of the Internet in many parts of the world (DiMaggio and Hargittai 2001).

In other words, the presence or absence of the computing device is only a small part of the broader context that shapes how people can actually use ICT in their lives. Although a personal computer will soon be affordable to most families in developed countries, this will not in itself overcome inequality in access to ICT for social inclusion. In developing countries, the price of a computer is of course still a major obstacle toward getting online, but the other factors just mentioned are also of great importance. For example, it accomplishes little to have a computer if you don't know how to use it.

In summary, in both wealthy and poor countries, the singular concentration on the computing device itself, to the exclusion of other factors, is a shortcoming of many well-intentioned social programs involving technology. This is particularly the case, for example, in the field of education, where too often insufficient planning regarding teacher training or curriculum reform has undermined the value of investments in costly computer equipment (see chapter 5). What is at stake is not access to ICT in the narrow sense of having a computer on the premises but rather access in a much wider sense of being able to use ICT for personally or socially meaningful ends.

Conduits

Whereas a device can be acquired through a one-time purchase, access to a conduit necessitates connection to a supply line that provides something on a regular basis. In one sense, television and radio are also conduit services in that the devices are worthless without the accompanying airwaves. However, since much television and radio programming is provided free over public airways, the device model for those technologies still holds.

Examples of conduits that require ongoing payments are electricity, telephone service, and cable television. Diffusion of conduits is slower than that of devices, either because a delivery infrastructure must be established first (such as the installation of telephone lines or fiber optic cables) or because the cost of a regular monthly fee is a disincentive to access. An illustration of the slower diffusion of conduits vis-à-vis devices is seen in figure 2.1, which shows the relatively slow diffusion

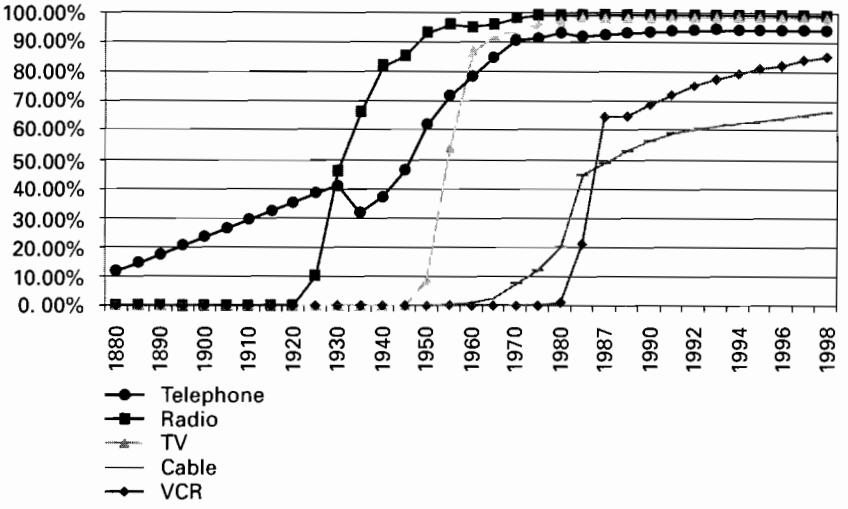

Figure 2.1
Household penetration of selected media, 1880–1998.
Source: Schement and Forbes (2000). Used with permission from *The Information Society*.

of telephones and cable television compared with television sets, radios, and video cassette recorders.

Among conduits, electricity is a useful example to consider in more detail because electricity, like ICT, has played a key role in at least one industrial revolution. Electrification has followed a variety of paths around the world based in large part on the constellation of class forces engaged in struggle over access to electric power in particular countries. In South Africa, for example, wealthy industrialists developed their electric system primarily to improve diamond, coal, and gold mining, but they did not electrify the nearby homes of their black workers (Renfrew 1984). In the Soviet Union, Lenin launched a massive national electrification effort soon after the Russian revolution under the slogan of "Communism = Soviet Power + Electrification of the Whole Country" (Abamedia 1999; Nye 1990). This campaign was largely successful, and the diffusion of electricity and power plants throughout the country was a prerequisite to the Soviet Union's rapid industrialization and eventual military success against Nazi Germany. At the same time, the highly centralized and forceful nature of the electrification campaign, as with other aspects of Soviet industrialization, took a heavy toll on the work force and citizenry.

Between these two extremes lie the experiences of Western Europe and the United States, which used different combinations of market forces and governmental action to extend universal access to electricity in the early 1900s. In the industrialized nations of Europe, strong workers' and farmers' parties pushed for electrification to be considered a social service rather than a private commodity. At the time, the state usually owned public utilities and subsequently developed electrification policies within the context of the welfare state. As a result, in Germany, Holland, and Scandinavia, 90% of all private homes and two-thirds of all farmers' homes had access to electricity by 1930 (Nye 1990). Moreover, services that grew up around the advent of electricity, such as electric trolleys, were operated by many European governments at a loss in order to provide people with affordable local transport. In the United States, however, with its weaker labor and farmer movements and its laissez-faire style of capitalism, electric utilities primarily were owned privately, with the government's role in electrification of regions reduced to regulation (Brown 1980). By 1932 public power produced only 5% of U.S.

electricity (Nye 1990). Unprofitable electric trolley systems in the United States collapsed and were replaced by privately owned automobiles. As a result of private ownership and the profit motive, American home electrification began "as a form of conspicuous consumption for the very rich, and only spread beyond the wealthiest classes at a slow pace" (Nye 1990, 140). By the end of the 1920s, 90% of U.S. farmers could not get electricity in their homes as service was not extended to their areas, and in those rural areas where service was available, farmers often had to pay twice the urban rate (Nye 1990). In the end, governmental intervention via Franklin Delano Roosevelt's 1935 Rural Electrification Act (REA) was necessary to complete the task of electrifying America. A component of Roosevelt's New Deal, the REA had its roots in decades of popular struggle for rural electrification (Brown 1980).

An interesting footnote to this background relates to the 2001 energy crisis in California. Although electric utilities are privately owned in most U.S. states, the city of Los Angeles has owned its own utilities since 1914, when a labor-backed referendum wrested the city's electric power system from private utilities. This served the city well in the energy crisis, with Los Angeles avoiding the blackouts and soaring rates experienced in the rest of California.

The lesson from these examples in terms of better understanding issues of access is not that the ICT industry needs to be government-owned; indeed, as is argued in chapter 3, privatization, done well, can be an important component of extending telecommunications access. The lesson is rather that the diffusion of any technology is a site of struggle, with access policy reflecting broader issues of political, social, and economic power.

Comparing ICT diffusion with electrification is of interest because electricity, like ICT, opened the door to a new stage of industrial capitalism. However, beyond that, the comparison no longer holds. At present, access to electricity is generally provided through a one-time infrastructure installation, with relatively small continual payments required by users and with differences of knowledge, skills, and content usually irrelevant to whether people can make use of electricity.

A closer illustrative comparison can perhaps be made between telephone service and ICT. Telephone service, like ICT, makes available an

important means of public communication. Access to telephone services involves issues concerning infrastructure (e.g., telephone lines, satellites, cellular antennae) and affordability of ongoing service costs. Governments have sought to promote mass access to telephony for a number of reasons. First, and again similar to government policy concerning ICT development and access, telephone access or lack of it has been viewed as something that can help overcome or compound other disadvantages related to poverty, unemployment, and access to goods and services (Graham, Cornford, and Simon 1996). In addition, in developed countries, where telephone access has reached over 90% of the population, lack of telephone access is regarded as a direct restriction on people's opportunity to participate in societally recognized civil and social discourse (Preston and Flynn 2000). Finally, it has been recognized that universal telephone service, like universal electrification, cannot be provided by market forces alone because it involves laying expensive lines to rural areas that might have a small number of users (at least before the advent of wireless telephony) and therefore should not be subject to strict supply and demand forces of private enterprise.

Beyond the individual benefits of telephone services, governments have also promoted telephone access for reasons of collective welfare. In today's world, telephony is a key component of development, and developing countries recognize that poor and limited telephone service restricts opportunities for foreign investment and economic modernization. In addition, even in countries where many people already are connected directly to telephone services, there is a network effect to telephony; a telephone network, like a fax network, or the Internet, gains value when more users are connected to it. (Think of the alternative; only one telephone or fax machine in all the world would be valueless because no other machine would be available to receive messages). Therefore, each added network connection is seen as benefiting not only that additional user but also the entire network and society.

Despite best intentions, no government has been able to completely achieve universal telephone service, although some countries such as Finland have come quite close. In the United States, 120 years after the telephone was first introduced, only 94.2% of households have direct telephone access. The percentage with telephone access is much lower

among the low-income households (78.3% for households with annual incomes below $5,000) and in households headed by African Americans (87.7%), Hispanics[1] (88.9%), or the unemployed (89.0%) (FCC 1999).

Of course, anything approaching these telephone penetration rates would be a dream in most of the developing world. Teledensity around the world, measured by number of main telephone lines per 1,000 people, ranges from 661 lines in the United States, to 364 lines in the Czech Republic, to 121 lines in Brazil, to 70 lines in China, to 22 lines in India, to 1 line in Chad (UNDP 2000). In most countries, telephone penetration trails behind television penetration, indicating the relative difficulty of achieving access to conduits versus access to devices (figure 2.2).

Chapter 3 further discusses telephone access and what kinds of policies seem to hinder or promote it. The key point to be made here is the comparatively slow and difficult diffusion of conduits, such as the Internet, as compared with devices.

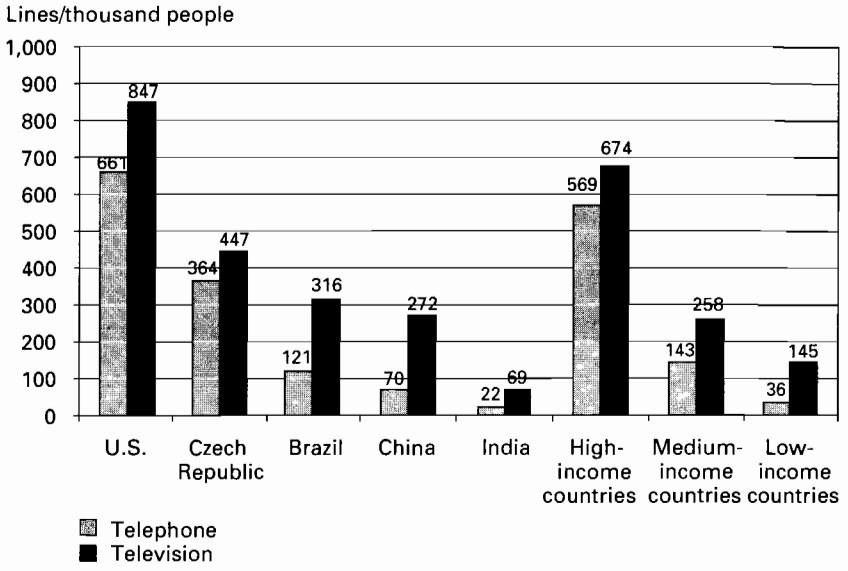

Figure 2.2
Telephone lines and television sets per 1,000 people, 2000.
Source: United Nations Development Programme (UNDP 2000).

Though conduits provide a better comparative model for ICT than devices do, neither category captures the essence of meaningful access to information and communication technologies. What is most important about ICT is not so much the availability of the computing device or the Internet line, but rather people's ability to *make use* of that device and line to engage in *meaningful social practices*. This is a crux of my argument concerning technology and social inclusion. For example, those people who cannot read, who have never learned to use a computer, and who do not know any of the major languages that dominate available software and Internet content will have difficulty even getting online, much less using the Internet productively, at least with the types of computers, Internet connections, and online content currently available.

Leah Lievrouw (2000) discusses this access issue and suggests the notion of content in contrast to conduit. Lievrouw argues that the concept of content encapsulates the physical access to a device *and* to an information channel, along with two additional elements: institutional sources of information and sufficient individual capacity to make use of that information to engage in social action and discourse. There is much of value in Lievrouw's conception of content because it moves beyond the device/conduit dichotomy. However, the usefulness of her concept is undermined by the popular, more common use of the term *content* to mean institutionally generated information. Instead, the concept of literacy more usefully provides a model because literacy, like ICT access, involves a combination of devices, content, skills, understanding, and social support in order to engage in meaningful social practices.

Literacy

There are many similarities between literacy and ICT access (table 2.1). First, both literacy and ICT access are closely connected to advances in human communication and the means of knowledge production. Second, just as ICT access is a prerequisite for full participation in the informational stage of capitalism, literacy was (and remains) a prerequisite for full participation in the earlier industrial stages of capitalism. Third, both literacy and ICT access necessitate a connection to a physical artifact (a book or a computer), to sources of information that get expressed

Table 2.1
Literacy and ICT Access

	Literacy	ICT Access
Communication stage	Writing, print	Computer-mediated communication
Main Economic Era	Industrial capitalism	Informational-capitalism
Physical artifacts	Books, magazines, newspapers, journals	Computer
Organization of content	Novels, short stories, essays, articles, reports, poems, forms	Web sites, e-mail, instant messages
Receptive skills	Reading	Reading and multimedia interpretation, searching, navigating
Productive skills	Writing	Writing and multimedia authoring and publishing
Divides	A great literacy divide?	A digital divide?

as content within or via that physical artifact, and to a skill level sufficient to process and make use of that information. Fourth, both involve not only receiving information but also producing it. Finally, they are both tied to somewhat controversial notions of societal divides: the great literacy divide and the digital divide.

To fully understand the relationship, it is worth exploring in more depth what literacy is, how it develops, and what research has shown regarding the existence of a literacy divide.

The Practice of Literacies

While the commonsense definition of *literacy* is the individual skill of being able to read and write, "new literacy" theorists prefer a broader definition that takes into account the social contexts of literacy *practice*.[2] They point out that what is considered skillful reading or writing varies widely across historical, political, and sociocultural contexts (Gee 1996). For example, in the pre-Gutenberg era, writing principally involved memorizing and transcribing oral speech or carefully and accurately

copying classical or religious manuscripts (McLuhan 1962). A skilled writer in those times usually had outstanding mnemonic and penmanship abilities. Reading was often done publicly, with an orator slowly reading a manuscript out loud to a gathered group. Whether done publicly or privately, however, the purpose of reading generally was to interpret a small number of classical and religious texts in order to achieve "a new consciousness of what a text *could have meant* or *could mean* to a putative reader" (Olson 1994, 157, emphasis in original).

These notions of reading and writing started to shift as early as the twelfth century (Olson 1994) but changed much more rapidly following the introduction of the printing press in the mid-fifteenth century. In this new typographic era, scholarly writing came to be viewed as authorship of original material, and scholarly reading came to mean the gathering, comprehending, and making use of information from a variety of sources (Eisenstein 1979).

Notions of literacy have continued to change in the past 100 years. For example, Suzanne de Castell and Allan Luke (1986) identify three distinct paradigms of school-based literacy in recent U.S. history, each highly dependent on the social, economic, and cultural norms of particular epochs. First, in the nineteenth-century classical period, literacy was viewed in terms of knowledge of literature and attention to rhetorical appropriateness. Literacy pedagogy involved rote learning, oral recitation, copying, and imitation of what was considered correct speech and writing. And the literacy curriculum was based on exemplary texts such as the Bible, a narrow selection from Greek and Roman literature, and handwriting primers. This public schooling paradigm corresponded to the needs of an aristocratic social structure, in which land, power, and knowledge was concentrated in few hands, and education involved obedience to tradition and power.

Following the mass industrialization of the early twentieth century, a Deweyan progressive paradigm of literacy emerged as a "self-conscious attempt . . . to provide the skills, knowledge, and social attitudes required for urbanized commercial and industrial society" (de Castell and Luke 1986, 103). In this paradigm, literacy was viewed as a form of self-expression. Literacy pedagogy involved teacher/pupil interaction and the "discovery method." The literacy curriculum included civics in order to produce good citizens, adventure stories in order to tap into students' interests, and self-generated written texts in order to foster creativity and imaginative thinking.

But the progressive model never fully took hold; instead, it was in constant struggle with a more technocratic paradigm that eventually won out (Cuban 1993). Within this technocratic paradigm, literacy was viewed in terms of the skills needed for functioning effectively in society. Literacy pedagogy involved programmed instruction, learning packages with teacher as facilitator, and mastery learning of a common set of objectives. And the literacy curriculum was based on decontextualized subskills of literacy competence.

From this brief historical sketch, we can conclude that literacy is not a context-free value-neutral skill; rather, being literate "has always referred to having mastery over the processes by means of which culturally significant information is coded" (de Castell and Luke 1986, 374). For this reason, the plural form *literacies* is often used by literacy theorists. In the same vein, scholars often prefer to use the term *literacy practices* rather than *literacy skills* because the former term emphasizes the application of literacy in a social context rather than as a decontextualized cognitive ability.

The Literacy Divide

One of the most important theoretical questions related to literacy, and one that corresponds closely to current debates over a digital divide, is whether there exists a great literacy divide. Literacy is distributed and practiced on a highly unequal basis. Adult literacy rates range from over 99% in some of the most developed countries (including Italy, Spain, Israel, Singapore, Greece, and South Korea), to the 50%–60% range in some developing countries (e.g., 55.7% in India, 53.7% in Egypt), to under 30% in some of the poorest countries (e.g., 22.2% in Burkina Faso, 14.7% in Niger) (UNDP 2000). Literacy is highly correlated with income and wealth at both the individual and societal levels. So, in one sense, the importance of literacy in social and individual development is broadly recognized.

What is disputed is the issue of causality, that is, whether literacy enables development, or whether unequal development (and corresponding

unequal distribution of political, economic, and social power) restricts people's access to literacy. Some advocates of the former notion posit the existence of a literacy divide. From this perspective, there are fundamental cognitive differences in individuals who are literate and who are not, resulting in a great literacy divide at both the individual and societal levels. Literacy has been said to separate prehistory from history (Goody and Watt 1963), primitive societies from civilized societies (Lévi-Strauss, in Charbonnier 1973), and modern societies from traditional societies (Lerner 1958; see discussion in Scribner and Cole 1981). At the individual level, literacy has been said to allow people to master the logical functions of language (Goody 1968; Olson 1977) and to think abstractly (Greenfield 1972; Luria 1976).

The imputed cognitive benefits of literacy have proven difficult for researchers to investigate. The problem is that literacy is almost always confounded with other variables, particularly with schooling. For the most part, those who are completely illiterate tend to have had little or no schooling, whereas those with high levels of literacy tend to have had a good deal of schooling.[3] And amount of schooling usually correlates directly with income levels of a child's family or the work engaged in by the child's family. The covariance of literacy with other social factors such as schooling and family employment has made the cognitive impact of literacy a thorny focus of investigation.

Two educational psychologists, Sylvia Scribner and Michael Cole, developed a creative solution to this research problem. They identified a tribe in Liberia, the Vai, that had developed its own written script in the tribe's own local language. Literacy in the Vai script was passed on through informal tutoring, not through formal schooling. Vai writing was used in very limited ways, mostly for personal correspondence and business records. By carrying out a three-way study that compared illiterate tribal members, those literate only in the Vai language (through personal tutoring), and those with broader English or Arabic literacy skills gained through schooling, Scribner and Cole (1981) were able to separate which cognitive benefits could be most likely attributed to literacy and which others were most likely due to the broader environment of formal education.

Interestingly, Scribner and Cole found virtually no generalizable cognitive benefits from Vai literacy. Individual differences on a range of cognitive tasks, in areas such as abstraction classification, memory, and logic, were instead due to other factors, such as schooling or, in some cases, living in an urban (rather than a rural) area.

Vai literacy was found to be correlated with better meta-language understanding when compared to non-Vai literate people's meta-language understanding. For example, Vai literates were better able than nonliterates to provide grammatical explanations of an oral sentence, read pictures (decode graphics according to a preassigned code), and write with pictures. Similarly, the cognitive benefits of Arabic literacy seemed to be closely associated with the functions of its use. The main benefit of Arabic literacy was in the area of verbal recall, which is not surprising because Arabic literacy is developed in Liberia through memorization of the Koran. More complex and generalizable cognitive tasks, such as solving abstract logic problems, were correlated only with schooling and English literacy, which is, again, not surprising, given the types of abstraction and problem solving that are practiced in school. And on no single task in their entire study did every Vai literate outperform every nonliterate (in other words, individual variation trumped group variation according to literacy level).

Scribner and Cole's study helped settle the question of whether there is a great literacy divide, at least at the individual level. Their work showed that there is no single construct of literacy that divides people into two cognitive camps. Rather, there are gradations and types of literacies, with a range of benefits closely related to the specific functions of literacy practices. Literacy, in a general sense, cannot be said to cause cognitive or social development; rather literacy and social development are intertwined and co-constituted, as are technologies and society in general (see chapter 7).

Acquisition of Literacy

If literacy is understood as a set of social practices rather than as a narrow cognitive skill, this has several important consequences for thinking about the acquisition of literacy, and important parallels with the

acquisition of access to ICT. Literacy acquisition, like access to ICT, requires a variety of resources. These include physical artifacts (books, magazines, newspapers, journals, computers); relevant content transmitted via those artifacts; appropriate user skills, knowledge, and attitude; and the right kinds of community and social support. Let us examine these one at a time, in reference to literacy.

First, the physical artifacts available for reading and writing enable the acquisition and practice of literacy at both the individual and the societal levels. At an individual level, it has long been known that children have an easier path to reading in a text-rich environment, and the ready availability of books and other reading materials is a valued part of effective reading programs (Krashen 1989). At the societal level, the mass production of books—and eventually newspapers, magazines, and periodicals—following the development of the printing press was critical for the achievement of mass literacy (together with other factors; see chapter 7).

Equally important for acquisition of literacy is relevant content within or via these books and artifacts, in terms of language, level, topic, and genre. One of the major obstacles to literacy acquisition is the dearth of published material in many if not most of the 7,000 languages that are spoken around the world. In addition, Paolo Freire (1994) and others have shown that literacy instruction is most effective when it involves content that speaks to the needs and social conditions of the learners. And, as with ICT-related material (see chapter 4), this content is often best developed by the learners themselves. Content that is relevant to people's lives is critical not just for basic literacy but for all levels; graduate students could never learn to interpret scientific articles, much less to write them, without direct access to relevant scientific writing.

Third, literacy acquisition requires the development of a variety of skills, knowledge, and attitude. Cognitive processing skills are required at both the bottom-up level (e.g., word recognition) and top-down level (e.g., guessing words and their meaning from context). And while we often focus on the skill of reading, knowledge and attitude are equally important. Reading is a transitive verb; learning to read inevitably means learning to read *something* (see discussion in Gee 1996). And to read and understand that something involves bringing to bear a vast amount

of background knowledge, or schemata. Understanding a simple article about a basketball game involves a wealth of background knowledge about the way the game is played, who the teams and players are, how sports are typically reported in newspapers, and even how a newspaper is laid out. Attitudes involve the motivation and desire to read, the level of confidence in reading, and the general disposition to read various kinds of texts in different ways.

Finally, and most important, learning to read is a social act that intersects with social structure, social organization, and social practices. As Gee (1996, 41) explains, "A way of reading a certain type of text is *only* acquired . . . by one's being embedded (apprenticed) as a member of a social practice wherein people not only read texts of this type in this way, but also talk about such texts in certain ways, hold certain attitudes and values about them, and socially interact over them in certain ways."

This can be illustrated by referring to two very different types of literacy practices: those of a Pakistani *madrassa* (religious school) and those of an American university. The literacies valued in a *madrassa* involve, among other things, memorizing texts of a certain length to be repeated or referred to in certain ways in very particular contexts, and reciting appropriate passages in proper ways in the appropriate context. Is there any doubt that these can only be acquired through interaction, discussion, learning, and religious practice in social context with other Muslims in very particular settings? Similarly, consider the amount and types of social engagement that enable American students to learn to read and write in ways that their professors value, a process described nicely by Bartholomae (1986, 4): "Every time a student sits down to write for us, he has to invent the university for the occasion. . . . He has to learn to speak our language, to speak as we do, to try on the peculiar ways of knowing, selecting, evaluating, reporting, concluding, and arguing that define the discourse of our community."

Finally, the multifaceted nature of literacy, the range of resources it requires, and the social nature of its practice and mastery all point to one inevitable conclusion: the acquisition of literacy is a matter not only of cognition, or even of culture, but also of power and politics (Freire 1970, 1994; Freire and Macedo 1987; Gee 1996; Street 1984, 1993, 1995). From South Africa to Brazil to the impoverished ghettos of the

United States, access to literacy intersects with unequal opportunities to attend school, inequitable distribution of resources within the educational system, and curricula and pedagogy that meet the needs of certain social groups more than others. Perhaps the most obvious evidence of this phenomenon is the appallingly low rate of women's literacy in many countries in the world today, such as Burkina Faso (13.3% for females; 33% for males), Nepal (22.8% for females; 58% for males), or Morocco (35.1% for females; 61% for males).[4] Because of the politicized nature of literacy, campaigns that focus exclusively on individual skill while ignoring broader social systems that support or restrict extended literacy are not always the most effective. In many cases literacy is not so much granted from above as seized from below through the social mobilization and collective action of the poor and dispossessed.

Literacy and ICT Access

A synthesis of the previous discussion yields six principal conclusions about literacy:

- There is not just one type of literacy, but many types.
- The meaning and value of literacy varies in particular social contexts.
- Literacy capabilities exist in gradations rather than in a bipolar opposition of literate versus illiterate.
- Literacy alone brings no automatic benefit outside of its particular functions.
- Literacy is a social practice, involving access to physical artifacts, content, skills, and social support.
- Acquisition of literacy is a matter not only of education but also of power.

These points serve well as the basis for a model of ICT access: There is not just one type of ICT access, but many types. The meaning and value of access varies in particular social contexts. Access exists in gradations rather than in a bipolar opposition. Computer and Internet use brings no automatic benefit outside of its particular functions. ICT use is a social practice, involving access to physical artifacts, content, skills, and social support. And acquisition of ICT access is a matter not only of education but also of power.

The development of a more sophisticated understanding of literacy did not lead to downplaying its importance. Rather, by better understanding literacy, academics, educators, and policymakers could better promote it. Similarly, by better understanding the broad and complex nature of ICT access, we can also better promote it. Access to ICT for the promotion of social inclusion cannot rest on providing devices or conduits alone. Rather, it must engage a range of resources, all developed and promoted with an eye toward enhancing the social, economic, and political power of the targeted clients and communities. Any attempt to categorize these resources is by nature arbitrary, but an analysis based on four general categories serves the purposes of both analysis and policymaking. These categories have emerged from my ethnographic research in Hawai'i (Warschauer 1999) and Egypt (Warschauer 2001a) as well from my case study research in California, Brazil, and India. They have been identified in similar terms by other researchers and theorists who have examined issues of technology and social inclusion in various contexts (e.g., Aichholzer and Schmutzer 2001; Carvin 2000; Wilson 2000). They can be labeled physical resources, digital resources, human resources, and social resources (figure 2.3). Physical resources encompass

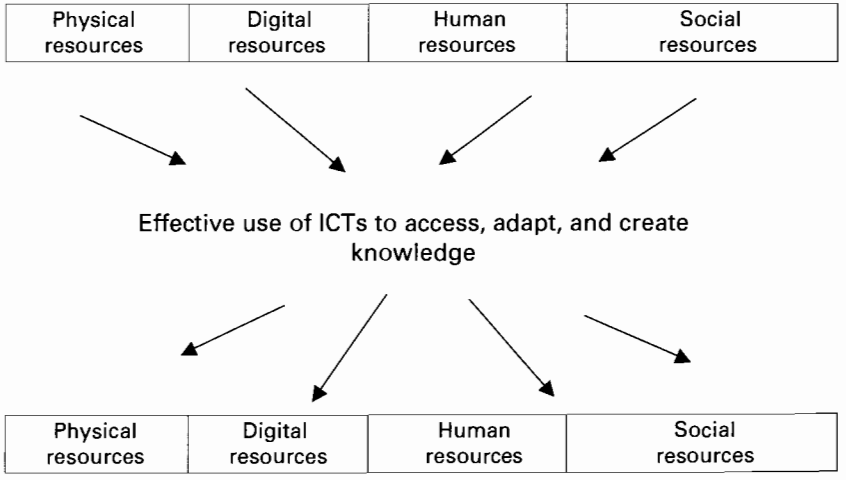

Figure 2.3
Resources contributing to ICT access.

access to computers and telecommunication connections. Digital resources refer to digital material that is made available online. Human resources concern issues such as literacy and education (including the particular types of literacy practices that are required for computer use and online communication). Social resources refer to the community, institutional, and societal structures that support access to ICT.

In considering these four sets of resources, it is important to realize their iterative relation with ICT use. On the one hand, each resource is a *contributor* to effective use of ICTs. In other words, the presence of these resources helps ensure that ICT can be well used and exploited. On the other hand, each resource is a *result* of effective use of ICTs. In other words, by using ICTs well, we can help extend and promote these resources. If handled well, these resources can thus serve as a virtual circle that promotes social development and inclusion. If handled poorly, these elements can serve as a vicious cycle of underdevelopment and exclusion.

3

Physical Resources: Computers and Connectivity

Although full access to information and communication technology (ICT) requires more than just the presence of devices and conduits, there still remain pressing issues concerning physical access to computers and the Internet. Examining data that indicate who does and does not have physical access reveals a number of interesting trends, as does an analysis of strategies and approaches put in place to enhance people's physical access through more affordable computers, Internet access, and public access centers.

Who Is Connected?

As of August 2001 an estimated 513 million people around the world had Internet access ("How Many Online?" 2001). That represents some 8.4% of the world's people.[1] Even though Internet access has been increasing rapidly in some developing countries, access remains highly stratified by region. The number of people with Internet access—defined as those who have been online in the last three to six months—ranges from 57.2% in North America to 0.5% in Africa (table 3.1 in "How Many Online?").

The reasons for disparity in Internet access rates are multiple and involve issues of economics, infrastructure, politics, education, and culture. Several studies have been conducted that analyze the principal factors that correlate with differential Internet access rates. One of the largest, conducted by Kristopher Robison and Edward Crenshaw (2000), examined the interrelationship between number of Internet host computers per capita and several economic, social, and political variables in