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Skills Access



❖ INTRODUCTION

After having acquired the motivation to use computers and some kind of physical access to them, one has to learn to manage the hardware and software. Often new users have observed others using them before. Perhaps some limited previous experience was gained by using someone else's computer or a publicly available one. However, as soon as more or less permanent access to a computer at work, at school, or at home is obtained, specific efforts have to be made to learn to operate and use the new medium. This might be learned through practice or in some kind of formal education.

Concepts of Computer Skills

From the very beginning of the computer revolution in the 1970s, it was noticed that particular skills were needed to be able to use the new technology at all. Computers were held to be difficult and user-unfriendly machines. Only computer experts and programmers were able to deal with them in the 1960s and 1970s. In the 1980s, the shift was made to the mass of nontechnical users. In 1981, the first concept incorporating the idea that special skills were required for the use of

computers was invented and published in the *Washington Post* (Warschauer, 2003b, p. 111). The term used was *computer literacy*. It was a very narrow concept of computer skills, as it only indicated basic forms of computer operation, such as turning on a computer, opening a folder, and saving a file. Similar narrow definitions of skills required for computer use have remained customary since that time.

Broader concepts of the special computer skills required appeared under the names of *information literacy*, *digital literacy*, and *media literacy*. The American Library Association (1989) introduced the concept of information literacy, which indicated that the possessor has the ability to recognize when information is needed and to locate, evaluate, and use it effectively. The concept of digital literacy has been used more often. Paul Gilster (1997) defined it as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (p. 1). Media literacy was an older concept, from the 1970s, invented after the discovery that not only print media required some kind of literacy but also audiovisual media. It was used to promote a critical confrontation with visual culture. Silverblatt (1995) and Potter (1998) characterized media literacy as a (large) number of analytical skills needed to process audiovisual mass media contents in a critical way.

Mark Warschauer (2003b, pp. 111-119) composed a complete update of types of literacy required in working with computers and networks. He made a list containing computer literacy, information literacy, multimedia literacy, and computer-mediated communication literacy. He defined computer literacy as basic forms of computer and network operation, information literacy as managing vast amounts of information, and multimedia literacy as the ability to understand and produce multimedia content. He added computer-mediated communication literacy as the skill to manage online communications (e-mail, chatting, videoconferencing) in an effective way that included keeping to the rules of "netiquette."

In the tradition of the concept of literacy, the Dutch Sociaal-Cultureel Planbureau (SCP) research team (van Dijk et al., 2000) has tried to extend the traditional literacy of print media with *numeracy* (handling numbers, calculating) and *informacy* (having the specific skills needed to use and understand ICTs).

Finally, the most general term came from Cees Hamelink. In the tradition of Bourdieu's forms of capital, he added *information capital* (Hamelink, 2001). It indicates four abilities: (a) the financial ability to

pay for the costs of computers and networks, (b) the technical skill to deal with them, (c) the capacity to filter and evaluate information, and (d) the motivation to look for information and the capacity to use this information in society. This concept is extremely broad; the first ability clearly indicates that it means more than skills. In fact, *information capital* has become a synonym for the four types of access distinguished in this book.

Before I propose my own concepts of skills access, it might be helpful to clarify what this host of terms tries to distinguish as novel about the use of these technological media. The first thing that was new and different about computers and networks is that they were held to be difficult to operate. Particularly in the early phases of the technological development of computers, they were much more difficult to handle than radios, televisions, telephones, record players, CD players, and even videorecorders. Special technical skills seemed to be required. This aspect appears in concepts such as *computer literacy* and *computer skills*.

The second novel aspect is that more perceptual and creative skills are required than just reading and writing. Increasingly, not only text but also numbers, images, and sounds are appearing as kinds of data on multimedia computer screens. This contingency is responsible for a series of extensions of the term *literacy*.

The final innovation is the exponential growth of sources of information and the need to manage them. The presence of skills to search, select, process, and use information in the complex environment of the computer world cannot be taken for granted. These skills have to be learned. Then they will become a part of daily practice. This requirement appears in concepts such as *digital literacy*, *information literacy* and *information capital*, discussed earlier.

Every concept trying to incorporate the skills needed in using computers and networks will have to take into account these three new aspects. The general concept of *digital skills* is able to do this, provided that they are divided into at least three types of skills needed, in succession: operational skills, information skills, and strategic skills. My definition of *digital skills* is the collection of skills needed to operate computers and their networks, to search and select information in them, and to use them for one's own purposes. Within the digital skills succession, *operational skills* are the skills used to operate computer and network hardware and software. *Information skills* are the skills needed to search, select, and process information in computer and network

sources. Finally, *strategic skills* are the capacities to use these sources as the means for specific goals and for the general goal of improving one's position in society (in the labor market, in education, in households, and in social relationships). In the following sections, these three special types of skill are elaborated in detail.

Table 5.1 offers an overview of these skills in different types of media. Reading this table, one can see that there are many similarities in the skills needed for using print, audiovisual, and computer media. They all contain a particular type of operation, perception, cognition, and creation. This would justify the use of the concept of *(multi)media literacy*. With print and audiovisual media, getting access to these media and using them is relatively easy, although creation (printing books and magazines or making audiovisual programs) is rather difficult, as it requires expensive equipment and advanced technical skills. With computer media, it seems to be the opposite. It is rather difficult to get access to them and to develop the operational skills to use them. As soon as these conditions are met, creation is relatively easy, as all means of production are available in preprogrammed formats.

Contents of this Chapter

The following three sections specifically discuss not only operational, informational, and strategic skills but also how they are distributed among the populations of developed and developing countries. I demonstrate that the differences in mastering these skills (skills access) are enormous, or at least greater than the divides in motivational and material access described in the previous chapters. Once again, I relate these gaps to the possession of resources and to particular positional and personal categories.

In the subsequent section, a popular myth is destroyed. This myth holds that computer skills are acquired or should be acquired in courses or other types of formal education, using course material, operation manuals, and help functions. Instead, acquiring computer skills most often is a question of learning through practice, by trial and error, and with the help of others who are close. Again this reveals the importance of having a particular position in society (job, school, household, social network) and the personal qualities of motivation and ability. Of course, formal education remains necessary to create a solid basis of digital skills for young people in schools and for older adults who have missed this opportunity in their school years.

Table 5.1 Kinds of Skills Required for Using Print Media, Audiovisual Media, and Computer Media

	<i>Operational Skills</i>	<i>Informational Skills</i>	<i>Strategic Skills</i>
Print media	Read and write texts Understand and count numbers	Search, select, and process information from texts and numbers (e.g., statistical information)	Taking own initiative in searching, selecting, integrating, valuing, and applying information from all sources
Audiovisual media	View, listen to, and make audiovisual programs	Search, select, and process information from images, sounds, and narratives	as a means to improve one's position in society
Computer media	Operate computers and programs	Search, select, and process information from computer and network files	

Source: Table inspired by Steyaert (2000).

❖ OPERATIONAL SKILLS

The skills needed to operate computers and Internet connections always have dominated popular and policy ideas about computer skills. It appears as if mastering a computer is an end in itself and as if the whole problem of the digital divide vanishes as soon as someone is seated at a computer keyboard and is visibly using it in one way or another. Substantial aims in working with a computer and the Internet are lost.

In fact, being able to operate a computer to a certain degree is a necessary condition of using it. With many applications, only minor operational skills are needed for basic functions. On the other hand, we should not underestimate the problems many senior, disabled, low-educated people and manual workers have in performing even the simplest operations on keyboards. Working with extended keyboards

is an activity that is far more complex than the operation of a remote control of a television and other equipment. A personal example: I have a brother who is a manual laborer in a floral greenhouse. He learned to use a computer at the age of 42. His first experience was that his fingers were too fat to manage the keyboard without numerous errors and that he was too slow in double-clicking. These kinds of problems are much more common than a large part of the readership of this book may think.

What is the state of affairs regarding the command of operational skills among the population at large in both developed and developing countries? To answer this question, an operational definition of these skills must be provided. The definition mentioned earlier was “skills to operate computer and network hardware and software.” The most extended, concrete, and practical operational definition of the concept *operational skills* is provided by the seven modules of the European computer driving license (ECDL), extended as the international computer driving license. These modules are standardized and have to be completed with separate tests. Passing all seven tests results in achieving the computer “driver’s license,” which can be used for and will be accepted in job applications. The seven modules are

1. Concepts of Information Technology (IT)
2. Using the Computer and Managing Files
3. Word Processing
4. Spreadsheets
5. Databases
6. Presentation
7. Information (the Internet and the World Wide Web) and Communication (e-mail).

The numerous subcategories, skill sets, and task items of these modules can be examined at the ECDL Web site (<http://www.ecdl.com/main/index.php>). All the skills there are useful to command. Nevertheless, even experienced computer users will not meet the requirements of most of the skill sets tested. I have never taken a computer course myself, although I have worked with computers for more than 20 years, about 6 hours every day, and I am ready to admit that

I would certainly fail the exam for this computer driver's license. In at least three modules, I would receive an "unsatisfactory." This personal example points out one of the most important conclusions of this chapter: most digital skills are not the result of computer courses but of learning through practice in particular social user environments. However, it also shows that it is extremely difficult to determine the actual level of a person's command of operational skills.

There are very few valid and reliable estimates of the level of operational skills among populations at large. Of course, we could analyze the results of computer courses such as that of the ECDL, their number of students, dropouts, and people passing particular modules. However, they would be very (self-)selective groups to observe. The only available data for general populations are from surveys based on self-reports of skills commanded by respondents. Real tests of existing operational and informational skills for the purposes of research are very scarce. I mention some self-reports here first: two population overviews based on surveys from South Korea and the Netherlands.

These surveys asked respondents for their mastery of a number of skills closely corresponding to the ECDL and international computer driving license modules. The South Korean survey measured four items of skill: word processing, Excel, utilities such as WinZip, and information searching on the Internet (Park, 2002). The Dutch survey asked for nine skills: use of Windows, word processing, spreadsheets, presentation programs such as PowerPoint, capacity to install programs, ability to find information on the Internet, and the e-mail skills of making folders and distribution lists and sending attachments (de Haan, 2003). Although the Dutch study is more elaborate in its analysis, I present in Table 5.2 the results of the South Korean survey held in the year 2000. South Korea is perhaps the most important instance of a country in which both government and industry are making enormous efforts to provide physical access to computers and the Internet (see chapter 10). According to the data in Table 5.2, this effort does not automatically solve skills access problems.

The differences of operational digital skills among South Koreans of different sexes, ages, occupations, and education are highly significant. On average, males have higher skills than females. The age difference is the largest: South Koreans older than 50 years (actually, older than 40) have practically no operational skills. White-collar workers and college students have far more skills than blue-collar workers, farmers, and fishers. Finally, the differences between Koreans with low,

Table 5.2 Distribution of Operational Digital Skills Among South Koreans in 2000

Category		Value	No or Very Few Skills	Reasonable Skills	Good Skills
All			45.6	41.0	13.4
Gender	Male		41.3	42.3	16.3
	Female		51.8	39.2	9.0
Age	13-19		47.5	41.3	11.2
	20-29		31.3	50.4	18.3
	30-39		51.4	34.6	14.0
	40-49		63.2	30.5	6.3
	50-59		72.9	27.1	0.0
	60-64		100	0.0	0.0
Occupation	Farmer or fisher		66.7	25.0	8.3
	Self-employed		61.9	28.5	9.6
	Blue-collar		52.2	37.4	10.3
	White-collar		27.2	51.8	21.0
	Housewife		68.5	26.6	4.8
	Middle or high school student		49.2	39.8	11.0
	College student		27.8	53.3	18.9
Education	Unemployed		39.4	48.5	12.1
	Low		93.3	6.7	0.0
	Low-middle		59.7	33.2	7.1
	High middle		42.0	44.0	13.9
	High		28.1	50.0	21.9

Source: Information Culture Center (2000), quoted in Park (2002).

Note: N = 1513, index reliability Cronbach's alpha = 0.82.

middle, and high levels of education are very telling. No Koreans with low levels of education have good operational skills, and 93.3% have no or very few skills.

The Dutch survey, which measured operational skills in 1998 and 2001, produced results that are very similar to the South Korean case. The differences are a bit less extreme but nevertheless highly statistically significant (de Haan, 2003, p. 39). Here, detailed multivariate analyses were made. "After controls, women still turned out to be less skilled than men, the lower educated less skilled than the higher educated and students and working people more skilled than those responsible for the household" (de Haan, p. 37). However, the differences between age groups also are the largest in the Netherlands. The

“beta” (a statistical measure of association) was .29 in 1998 and .34 in 2001. The second most important variable is income (.24 and .19 in 1998 and 2001, respectively), directly followed by education (.23 and .19), gender (.21 and .18), and labor market position (.16 and .19). The total explained variance of these variables increased from 42% in 1998 to 48% in 2001, indicating that the *relative* differences of operational skills between groups are increasing, not decreasing.

Two remarks have to be made about the validity of self-reported skills in surveys. The first is that *relative* differences concerning age and gender probably are smaller in reality. It is common knowledge that senior and female respondents are more modest in reporting the level of their skills than younger and male respondents. The second remark is that the *absolute* level of operational skills possessed will be lower in tests than in self-reports. I think that the result would be amazingly low. The actual development of digital skills is highly affected by personal experience and practice in particular settings and applications. Software and applications are very much underused. As soon as users have found their way through a particular program and reached their specific goals, they have not much intention of looking for other applications of or other ways in which to use the program. In most general tests of their abilities in using this program, they would fail.

Explanation of Operational Skill Divides

What are the resources and positional and personal categories explaining these significant divides in operational skills? Here the most important resources are mental resources (general technical skill and understanding, tenacity in learning), material resources (permanent availability of the digital hardware, software, and connections required) and social resources (social network positions and relationships). The distribution of these resources is explained by labor market and educational positions and the availability of the digital media in one’s household and nation or region. Further, these divides are clarified by the personal categories of age, gender, personality, intelligence, and health or ability. I explain and underpin these statements in the following paragraphs.

Clearly, the most important variable is age (see de Haan, 2003). This can be explained by the distribution of mental, material, and social or cultural resources. It is common knowledge that children and young people have much more manual and technical skill in working

with keys or buttons and visual interfaces than do older people. The speed of young people's operations is much higher. They are growing up with these skills. Moreover, most young people in the developed countries have the material resources of broadly available digital media at their disposal at schools and in households. Finally, young people have a social network of peers and friends hailing the control of digital skills as a matter of status and exchanging clues and new ideas continually. In practice, young people appropriate the available hardware and software in their households and other places. They take these material sources from older people in their environment, often teaching their elders to manage computers instead of the older people teaching them.

Unlike young people, elderly people did not grow up in the age of push-button media. People older than 35 or 40 years rarely have had any experience with computers at schools. Depending on circumstances, most people above this age in the developed countries have still been able to learn (more or less) to use extended keyboards and computer programs. However, learning is much slower for them. It gets worse about the age of 50, when many seniors start to experience physiological changes in vision and hearing abilities, cognitive functioning, and motor skills.

Younger people with these kinds of disabilities also have difficulties in mastering operational skills, of course. They have to use the special utilities for the disabled. Unfortunately, these utilities are not developed and disseminated to such an extent that they sufficiently help the disabled to compensate for their vision, hearing, or motor deficiencies and other physical shortcomings.

Gender differences in operational skills are primarily caused by elderly women. Young women are almost equal to men in mastering these skills, in particular when they have learned them at schools. Moreover, the majority of (executive) computer work in the labor market of the developed countries is performed by women. Remaining differences are caused by motivation and cultural resources; these appear when technical or operational problems have to be solved.

In regard to positional categories, positions in the labor market and in education are decisive for the acquisition of operational skills. The South Korean and Dutch data described earlier testify to this conclusion. Most adults have to (first) learn operational skills in practice on the job and at schools to carry them on at home. For people without jobs or education, self-training of operational skills at home depends

on sufficient income or other material resources, such as the availability of a computer in the household. One develops these skills sooner at a home computer that is always within reach than at a community access center or other public place.

❖ INFORMATION SKILLS

Operational skills have received all the attention, but the information skills needed to apply them to reach particular goals rarely are elaborated. Perhaps they are conceived to be too abstract. Still, it has become a commonplace to say that being able to work with information is vital in an information society and that the possession of a large stock of ready knowledge is not that valuable anymore. Instead, knowledge continually has to be extracted from an overload of information. Knowledge can become obsolete within days or even within seconds; for instance, at a stock exchange.

I have defined information skills concisely as the skills used to search, select, and process information in computer and network sources. In fact, they are an extended collection of abilities that I split up here into *formal* and *substantial* information skills. Formal information skills are the abilities to understand and work with the formal characteristics of a particular medium. A book has a table of contents at the beginning; chapters, sections, and paragraphs in the middle; and references with indexes at the end. A television program has an introductory sequence; a large number of items with episodes, sequences, scenes, and shots; and an end. Computer disks, files, and programs, as well as Web sites, have a completely different order. They have file and menu structures, and sites are hyperlinked. The formal structures of computer and network media are complicated and novel. One has to learn to use them. *Substantial information skills* are the abilities to find, select, process, and evaluate information in specific sources following particular questions. Basically, they are the same in all media. However, as the contents of media may vary considerably, finding, selecting, processing, and evaluating information in them will be different too. For example, finding, selecting, and evaluating a particular fact in an encyclopedia is rather different from doing the same in a search engine on the Internet. The difference is not only a matter of the formal structure of the medium but of the nature and value of its contents.

Formal Information Skills

Some of the formal information skills of computer and network media are part of computer operation courses, such as the seventh module of the ECDL, in which students become familiar with the makeup and structure of e-mail and Web addresses and have to combine selection criteria in using a search engine, but most of them are not. This means that they have to be learned in practice, or they will not be learned. The following are the seven formal information skills.

1. Getting to know and to control the *file structure* of a computer and the Internet. The infinite subdivision of computer filing makes this operation very much different from any traditional office archive. Most people do not attain the level of abstraction and systematization needed to exploit all the opportunities of computer filing and Web sites. The file structure of the average computer user is a mess. When surfing on Web sites, many users do not even discover Back and Find buttons (Hargittai, 2003).

2. Getting to know and to control the *information structure* of the Internet in general and a Web site in particular. Many people have no understanding of the makeup of the Internet; that is, what happens when a search engine is used or a Web site is consulted. This makes it difficult to assess the results. Web sites should be designed in such a way that users can easily find what they want. When this condition is met, there still is no guarantee that users will succeed in doing this. They simply may not understand the structure offered because it is completely new to them, compared to books, libraries, encyclopedias, and so on.

3. Getting to know and to control the *hyperlink structure* of the Internet. This structure is a completely new media characteristic, with a revolutionary potential for media production and use. The center of attention in both production and use is shifting from separate items (e.g., books, articles, and programs) to networked pieces of information that can be linked in self-chosen sequences. Making these links according to clear individual criteria and priorities is a new skill that is rarely mastered by people who are not experienced information seekers like academics and journalists. Most users stop when they have found the link that seems to serve their needs. Usually, not a fraction of the opportunities of the hyperlink structure is used.

4. Getting to know and to control the layout and design of *multi-media screens*. Increasingly, these screens have become filled with

different kinds of data combined in a particular way (images, sounds, texts, and numbers). They are ordered in very complex new ways, with banners, trailers, and special frames rolling over the screen, not to mention the surprise of special pop-up screens. The speed and complexity of multimedia computer (and television) screens is not, or is only partially, digested by a majority of computer and Internet users. This is true primarily, but not only, for middle-aged and elderly people.

5. Learning to handle the *fragmented nature* of computer and network sources. Traditional information sources such as manuals, encyclopedias, standard works, and the libraries containing them offer coherent collections of knowledge, and a lot of effort is made to produce them. Computerized and Web-based information sources have a highly fragmented information structure. Users are expected to produce order and coherence themselves; for instance, when students have to complete assignments or write a paper using Internet sources. The skill to do this varies enormously. Therefore all kinds of services (e.g., portals, frequently asked questions [FAQs], thesis and paper services) are offered to average users so that they do not have to learn the skill necessary to do it themselves. Nevertheless, this kind of skill is required for special tasks and original work.

6. Learning to handle the *continually changing contents* of computer and Internet information sources. This is the skill to deal with digital information and its sources, which changes from 1 day, or perhaps 1 minute, to another. Who is able to keep up with these shifting sources? How should they be evaluated, stored, and referred to? Perhaps this skill is not even completely mastered by experienced journalists.

7. The final, but certainly not the least important formal information skill, is the ability to *read and write English*, as a clear majority of Internet sources, in particular, still use the English language although this is not the native language of a vast majority of Internet users. To a lesser extent, the same goes for computer programs and information content. According to Warschauer (2003, p. 95), about 350 million people worldwide speak English from birth, 350 million speak it as a second language, and 700 million speak it as a foreign language, the last two groups often rather poorly. Three quarters of the world population knows almost no English.

In a limited way, the first three of these formal information skills are learned in computer and Internet classes. However, the last four are

never learned there. They are other skills learned before (such as English skills) or they are (more or less) learned in practice by those who strongly lean on existing intellectual skills.

Substantial Information Skills

Existing intellectual skills are even more vital to substantial information skills. In fact, these skills are more or less learned, as far as formal education is concerned, in regular classes of language, history, mathematics, geography, social studies, and art. Here one should be able to learn the skills of the selection, abstraction, generalization, and evaluation of information in general. They are required for the following list of six substantial information skills:

1. Learning to *search information*. This skill is summarized by Warschauer (2003b) in the following steps:
 - a. Develop good search questions
 - b. Determine the most likely places to seek relevant information
 - c. Select the most appropriate search tool
 - d. Formulate appropriate search queries
 - e. Rapidly evaluate the result of a search query (reliability, authorship, current nature of the source)
 - f. Save and archive located information
 - g. Cite or refer to located information. (p. 113)

These search skills are most often not even sufficiently mastered by university students, let alone the population at large (data follow).

2. Learning to *select information* continually (not only in search operations). The growing overload of information requires ceaseless selection. One has to keep up a strict discipline not to drown in a sea of information. It is easy to download information and to pile up an endless amount of digital files. It is far more difficult to refrain from doing this and develop an attitude of being focused on an explicit information need.

3. Learning to *edit information oneself*. In the old media of the press and broadcasting, editors and publishers serve as gatekeepers, selectors, processors, and editors of information in an attempt to protect the reliability, validity, and usability of information for readers, viewers, listeners, and other consumers. In the new media, especially on the

Internet, enormous amounts of unedited “raw” material presenting themselves as information are appearing. It is left to the users to do the editing job. Moreover, in using computers and the Internet, the consumers of information are able to become producers of information themselves. However, this editing and producing job is simply too much for the average user. Thus all kinds of professional editors appear on the Internet in the role of portals, electronic papers and magazines, special information services, and sites for special expertise and advice. According to Hargittai (2003), most users heavily rely on these sites to present them with information instead of developing sophisticated search strategies themselves. In this way, the skills of those who are themselves able to search, produce, and edit information on computers or the Internet are running further ahead of the skills of those who are not.

4. Being able to apply a *quality assessment of information sources* in computer files and on the Internet. As authorized or competent editors and publishers are not a majority on the Internet, users have to make quality assessments themselves. They have to evaluate the validity, reliability, and usefulness of sources themselves. The speed of Internet use forces them to do this very fast. The sites passed while surfing and found as the result of a search operation open themselves immediately as a string of sources and pieces of information. Estimating the validity of sources means being able to judge their authority and credentials. For example, everybody can offer themselves as doctors or medical experts on the Internet. Assessing the reliability of a source means being able to estimate whether it is biased in a particular direction, whether it is inaccurate or outdated, whether its information is controlled, and even whether it is committing fraud. Everybody is selling all kinds of things on the Internet. In general, the origins of and the dividing lines between types of information, such as controlled news items and propaganda or advertisement, that used to be clearly visible, are getting lost in this medium (van Dijk, 1999). Finally, estimating the usefulness of sources means being able to assess whether they really give an answer to one’s questions and whether the answer is appropriate to one’s purposes. Again, the urge to catch the eye among the overload of sources on the Internet is enormous.

5. Being able to *combine information from an increasing number of media, channels, and individual sources*. In the present multimedia environment, with an increasing number of old and new media working in

parallel and linked to each other, users need the skill to estimate the value of, for instance, a news program on television, the editorial quality of a newspaper, the news items of a particular Web portal, and a posting in a newsgroup on the Net. As has been discussed before, information sources increasingly are fragmented in the new media environment. Combining them in a number of coherent views and conclusions is not easy. Actually, this would require the skills of a professional journalist.

6. Being able to *derive associations and to generalize from specific pieces of information*. As the possession of ready knowledge is becoming less important, continually developing new knowledge from endless pieces of information becomes a vital skill in the information society. To begin with, this means being able to distinguish between important and unimportant pieces of information. After that, one should be capable of making connections between separate pieces of information—this means making associations. Third, the ability to distinguish the particular from the general is required. Finally, one should be competent in producing valid generalizations from the abundance of pieces of information. This presupposes the strong mental skill of abstraction.

These six substantial information skills certainly are not specific to the use of computers and their networks. They also are needed for print media and audiovisual media and, where print media are concerned, they are learned in several traditional courses and subjects at schools, such as in language courses, history, and art, in which pupils learn to distinguish main and side issues in reading. Perhaps it is even better to learn them first in these courses. In these traditional courses, the learning process is not distracted by technical problems and the need to master operational skills. However, in computer and network media, they acquire special importance, for the reasons mentioned.

Clearly, the substantial information skills required are intellectual skills. They are increasingly so when following the series from one to six just given. One is tempted to say that the first skills noted are those best mastered by professional journalists and the last by academic researchers. Even so, average users of the new media should command them to a certain extent as well, as they are necessary for proper use (valid, reliable, and useful). What is the state of affairs concerning both formal and substantial information skills among the populations at large?

Information Skill Divides

Unfortunately, generalizable data from surveys and tests of these skills are very scarce. Most data are from experiments and tests on user groups of Web sites and search engines. Eszter Hargittai (2002, 2003) conducted experiments and tests with American user groups charged with tasks of finding particular information. In one experiment, a demographically diverse group of 54 subjects (although people with higher education were overrepresented) was charged with five Internet tasks, from finding a music file and downloading a tax form to discovering a Web site that compared different presidential candidates' views on abortion. Only half of the group was able to complete all tasks. Music files were found by almost everyone (51 of the total of 54), but the time needed varied from 5 seconds to 7.83 minutes. However, only 33 out of 54 subjects succeeded in finding a Web site comparing candidates' views. The time required ranged from 27 seconds to 13.53 minutes (Hargittai, 2002).

No significant gender differences were found in this investigation, although age and education proved to be highly significant. Subjects older than 30 years completed many fewer tasks than subjects in their late teens and 20s. Moreover, they needed much more time. Those between 30 and 50 years old used twice as much time and those between 50 and 80, three times as much. People with a graduate degree completed more tasks and were much faster than people with no college degree. The same applied to people with 3 to 7 years' experience on the Internet compared to people with fewer than 3 years' experience.

In another test of a random sample of 100 Internet users, Hargittai (2003) found that only one subject ever used the Find button on a Web site and that many users were not even aware of the Back button. Silverstein, Henzinger, Marais, and Moricz (1999) and Spink, Jansen, Wolfram, and Saracevic (2002) observed the amazingly primitive use of search engines. Analyzing almost a billion queries on the AltaVista search engine, Silverstein et al. discovered that 85% of users only viewed the first page of results. Spink et al. found approximately the same with the use of the Excite search engine from 1997 to 2001. Also, the amount of pages looked at decreased in these years. Increasingly, search engines show the most popular and commercially viable sites first; they may be adequate for many users, but it is not at all certain that they are the best options. Even more important is these

researchers' conclusion that the large majority of users only makes simple queries and does not use any advanced search options.

One has to consider that these facts and categorical differences are found with the most basic of formal information skills. Imagine what the facts and differences will be when the distribution of more advanced substantial information skills is finally investigated. It is a safe prediction that the differences will be more spectacular and much larger. These skills are extremely unequally divided between people with high and low education, intellectual and manual jobs, and long and short media experience.

❖ STRATEGIC SKILLS

I argue here that deficiencies and differences between categories of users are even more pronounced with strategic skills, defined as the capacities to use computer and network sources as the means for particular goals and for the general goal of improving one's position in society. Searching, processing, and using information can be the means to reach a particular goal by one's own initiative. This is goal-oriented behavior in the contexts of business, employment, educational careers, politics, social relationships, and leisure activities. However, not all computer and Internet use is particularly goal directed. As with all media, their use may be a matter of daily routine or habit, or they may only be used because teachers, parents, or managers are demanding it. Explicit and conscious goal orientation in the use of computers and networks is a matter of having adequate resources in general and motivation and position in particular. This orientation is found more at the highest levels of business organizations and educational careers than at the lowest. It is more widespread among people with a large social network than with a small one. Finally, it is to be observed more with all kinds of people who are heavily engaged with cultural and political activities than with people exhibiting a relatively passive lifestyle.

Goal-oriented behavior and strategic skills for using computers and networks are vital in the information and network society (this is argued in chapters 7 and 8). In this society, an increasing number of activities is affected by purposive searching, processing, and use of information and by attaining or retaining positions in all kinds of relationships. Those able to search, process, use, attain, and retain will have a considerable advantage in social competition and educational or job careers.

Strategic Skill Divides

Strategic skills for working with computers and the Internet are not learned in school or on the job in explicit ways. They are incorporated into the daily practices of education, work, and leisure time. This is the main reason why there are scarcely any data about the distribution of these skills among the population. We are only able to observe how some people get better chances to learn them on the job and at school than others. For example, using data from a National Assessment of Educational Progress in mathematics in the United States in 1996, Wenglinsky (1998) found that eighth-grade pupils from disadvantaged groups used computers in the classroom significantly more for remedial drills and practices; pupils from advantaged groups used them more often for applications and simulations promoting higher order thinking. "In eighth grade, minority (Black or Hispanic), poor and urban students are more likely to find themselves learning lower-order skills than their White, non-poor and suburban counterparts; disadvantaged students are also less likely to find themselves learning higher-order skills" (Wenglinsky, 1998, pp. 23-24). In a comparative investigation of Hawaiian schools, Warschauer (2003b, p. 132) concluded that "the elite school used technology to help prepare scholars, whereas the poorer school used technology to help prepare people for the workforce."

Wenglinsky's and Warschauer's conclusions are extremely important. They show that the acquisition of information and strategic skills is not only a matter of personal but also of positional categorical inequalities and that these inequalities tend to become institutionalized in school practices.

Strategic skills are not only defined by the substantial and practical *goals* attained but also by a proper and effective use of *means*, in this case a computer or Internet connection. For most users, these media still are opaque machines or worlds. They do not know their composition, the way they are designed, or the way they are working. This means that they cannot help themselves when things go wrong or when they are maltreated by others in the computer world. I am referring to problems of security and privacy in particular. It is evident that those who know how to protect their connections and personal data, because they know how the technology and the organizations offering it work, will feel more free to use these connections and data and accomplish more. This is not only a matter of operational skills but also of technical, organizational, and political know-how. This means that the most experienced users in the computer world, from hackers to

system operators, information officers, and managers of government and business organizations, probably have the best chances of developing strategic skills. It also means that all other users will acquire a level of strategic skill that ranges from fairly high to extremely low, depending on their knowledge of the contexts they are working in.

❖ WHY PRACTICE IS MORE IMPORTANT THAN FORMAL EDUCATION

The context in which people are working is the breeding ground of all digital skills. Accompanying the (wrong) idea that digital skills are equal to operational skills and that they always are difficult to master is the fallacy that they primarily are learned, or should be learned, in computer courses or classes. The second source of learning, in particular for individuals, is supposed to be operating manuals, help files, and help desks. Anyone trying to remember how she or he has gathered digital skills in the past knows that on most occasions these assumptions are wrong. The data of two surveys in the Netherlands, one among pupils of secondary schools and the other among the general Dutch population, reveal a more familiar picture (see Table 5.3). First, it shows that computer courses and books are not the most important sources for learning computer skills. From other data in the secondary school survey, it appeared that 40% of Dutch computer users in 1998 had followed no computer course at all. Most popular were courses in word processing (42%), specialist programs (32%), Windows (28%), and spreadsheets (22%). Other courses, such as those for the Internet (7%) and e-mail (6%), received minor attention.

Compared to this, the do-it-yourself approach is a much more important source of learning. Most computer and Internet users learn by trial and error, young people even more than seniors.

The second most important source of learning is people close to the user. For children and adolescents, this means parents (fathers in particular), friends, brothers or sisters, and teachers at school. It is striking that the first are more important than the last. When new users are in their 20s, 30s, and 40s, the most important sources after self-tries are becoming first, tertiary education (for those 18-34 years old) and, subsequently (for those 35 and older), colleagues at work and friends, acquaintances, or neighbors.

With people older than 50, an important shift occurs. Formal education loses its significance: Relationships with colleagues, friends,

Table 5.3 Important Sources for Learning Computer Skills for People of Different Ages in the Netherlands (2001) (%)

<i>"I learned a lot from. . ."</i>	<i>Pupils in Secondary School (15-17 years old)</i>	<i>Ages 18-34</i>	<i>Ages 35-49</i>	<i>Ages ≥ 50</i>
Self-try	92	92	87	64
Computer courses	19	32	46	48
Computer books	26	41	46	51
Secondary education		25	1	0
Tertiary education		56	17	6
Colleagues		54	56	43
Friends, acquaintances, neighbors		52	41	24
Parents		20	1	0
Children		3	18	29
Teacher (primary school)	34			
Teacher (secondary school)	46			
Father	51			
Mother	20			
Brother or sister	42			
Friends	49			

Sources: van Dijk et al. (2000) and de Haan and Huysmans (2002).

acquaintances, and neighbors are diminishing and external help is getting more significant. Increasingly, people older than 50 have to rely on computer courses, computer books, and the help of their children (see Table 5.3). This is one of the reasons why it would be utterly wrong to draw the conclusion that, as practice is more important than courses, the digital divide problem can be solved without computer courses. I return to this later.

Learning by doing and learning from people who are close are cases of learning in *communities of practice* (Brown & Duguid, 2000; Lave & Wenger, 1993). People do not only learn by transmission or discovery but also by acting as members of particular social and cultural contexts that can be called communities. They simultaneously work or entertain, communicate and learn here. Communities of practice are at home, in neighborhoods, at schools, at workplaces, and in all kinds of clubs and associations. In all these settings—even in formal educational settings—informal learning is happening. "It occurs informally or incidentally as learners and experts observe, imitate, experiment, model, appropriate, and provide and receive feedback" (Warschauer, 2003, p. 121). In this relational view on learning (and inequality, when conditions differ), people learn from each other by question and

answer and by observation and imitation. The experts can be both mentors (teachers, instructors, parents) and peers. They can work both offline and in online learning communities.

❖ CONCLUSIONS

In this chapter, I have shown that the inequalities of skills access are even bigger than the differences of material or physical access observed in the former chapter. Regarding skills access in its own right, I stressed that the series of three types of digital skills distinguished—operational, information, and strategic skills—exposes an increasing level of inequality. Few data are available about the command of information and strategic skills possessed by different parts of the population in developed and developing countries. However, all indications point in the direction of extreme unequal divisions of these skills, which are so important for the information and network society (see chapters 7 and 8). This type of inequality is one of the main reasons to call this book *The Deepening Divide*.

This type of inequality rests more on the distribution of mental than of material resources. Increasingly, the inequality is in intellectual skills. Those having a high level of traditional literacy also possess a high level of “informacy,” or digital skills. For these skills, literacy appears to be more important than “numeracy,” the capacity to deal with numbers and to calculate with computers (van Dijk et al., 2000). The second most important type of resources for digital skills is social and cultural resources. In this chapter, it was emphasized that the social context of computer and Internet users is a decisive factor in the opportunities they have for learning digital skills. They learn more from practice than from formal computer education and guidance.

Both positional and personal categorical inequalities are responsible for the unequal distributions of these resources. The positional categories of having a particular education and employment define the social contexts that enable computer and Internet users to learn digital skills in practice. The personal categories of age and intelligence appear to be the strongest individual determinants of digital skills, followed by sex or gender.

The importance of practice does not rule out the absolute necessity of formal education for particular purposes. Operational skills will remain incomplete when they are only learned by trial and error. For

users to learn better information and strategic skills, school subjects and didactics will have to change considerably, as is argued in chapter 10. Finally, adult education regarding digital skills requires formal education in computer classes, community technology centers, computer books, help desks, or online learning communities. However, the extent and diversity of daily computer and Internet usage are decisive in learning the broadest set of digital skills. It is to this kind of access that we turn now.

