Information Technology and Society

BACKGROUND

The personal computer and the Internet are transforming office, school, and home; there are vast opportunities—and risks—offered by these new technologies. It is a mistake, however, to assume that the information revolution is only about computers or only 50 years old. Wire-based and wireless (cellular) telephones, facsimile machines, cable television, radio, and even the humble photocopier are other widely deployed information-technology devices, and some have roots stretching back more than a century. One of the most important information devices—the printing press—dates back to the mid-1400s.

GLOSSARY

Disintermediated market
A market in which there are no brokers or agents ("middlemen").

Information technology
(1) The technology of data processing/information management; (2) any number of devices that transmit or store information (e.g., computer, voice mail, facsimile machine, photocopier, telephone, television, radio).

Internet service provider (ISP)
A company that provides access to the Internet.

Virtual office
An organization in which members are geographically separated but appear to others to be a single, unified organization in a real physical location; members stay in touch primarily through information technology rather than by face-to-face communication.

The modern information revolution has benefitted from the research and development laboratories at large corporations. Rather than rely on an unpredictable stream of inventions from independent scientists and inventors, companies such as 3M, Dupont, and AT&T many years ago began systematic programs to develop new devices and technologies in-house and bring the products to market on a massive scale. This created what some observers call the "business of invention," wherein companies turn out a perpetual stream of new products. One of 3M's guiding principles, for example, is that 30 percent of all sales must come from products fewer than four years old.

The new research and production techniques—along with the products of the research and development associated with World War II, development of the transistor in the late 1940s, and development of the microprocessor in the early 1970s—have helped fuel the accelerating pace of technological change (which consistently lowers the price of each new generation of existing devices) and the creation of new products, companies, and industries. One measure of change in the computer industry, for example, is known as Moore's Law, named after a co-founder of the computer-processor manufacturer Intel. Moore observed that the number of transistors in a chip—one measure of a computer's power—doubles every 18–24 months. His law has held for 25 years. The modern Pentium II processor contains 7.5 million transistors, more than 3,000 times that contained in the original Intel chip produced in 1974.

Rapid growth in transistor and microprocessor performance has helped lower the cost of many devices, which in turn helps businesses, schools, and individuals better afford information technology equipment. Michigan business spending alone on information technology is about $8 billion annually—roughly equal to the state's annual General Fund budget.

This rapid change has helped create a new class of companies, which specialize in communications equipment, communications services, and computer hardware and software. While some companies, such as AT&T, are well-established and have a long history of operation, others—such as Intel (founded in 1971), Microsoft (1975), and WorldCom (the 1980s)—are comparative newcomers. But in the information-technology sector a company's relative age is not always an asset: Microsoft, at 137 on the 1998 Fortune 500 list, has a stock value greater than the *combined* stock value of General Motors (first on the list), Ford Motor Company (second), and Chrysler Corporation (seventh). WorldCom, for its part, recently bought MCI Communications, winning the bidding war against British Telecommunications.

DISCUSSION

Effect on People's Time

Growing computer power and other telecommunications developments have helped accelerate the speed of modern communications. In the 1960s and 1970s the original U.S. Defense Department and National Science Foundation computer networks could transmit 100 pages of text every two minutes; today, high-speed lines in use by the largest Internet service providers (ISPs) in Michigan can transmit the same amount of text in under a second.

Information technology can enable people to increase their productivity and/or complete tasks in less time than before. For example, McKinsey, a global consulting firm, finds that it takes 25 minutes to locate a high-rate certificate of deposit if one uses a telephone but only 10 minutes using the World Wide Web (WWW or "the Web"); updating a stock portfolio can be cut from 5.1 minutes if one uses a newspaper to 1.8 minutes on the Web. Cellular telephones have turned long commutes and travel time into opportunities to conduct business and stay in touch. In fact, more than half the new telephones installed worldwide are mobile. Personal computers, fax machines, pagers, cable television, Internet e-mail, and second telephone lines have created telecommuting, the home office, and the virtual office. And electronic commerce has widely expanded home shopping: such goods as airline tickets and even automobiles now may be purchased from one's home or office.

But information technology also can cut *into* one's time. A professor lamented to the *Wall Street Journal* in December 1997 that he yearned for the days when students had to *walk* to his office to see him if they had a question. Now, with e-mail, students send him messages at all hours, with little effort on their part; the professor reports having to spend up to three hours a day answering messages from his students. Abundant communication pathways only add to the pressure to stay in touch—faxes, voice mail, e-mail, pagers, cellular telephones, call forwarding, and call waiting are examples of recent additions. High-speed data lines make it possible for global companies to hand off projects from operations in one nation to another, following daylight around Earth; but such perpetual projects need constant supervision and can interrupt the rhythm of the typical ebb and flow of work.

Effect on the Economy

Information technologies are giving rise to "friction-free capitalism" or "disintermediated markets"; that is, a business environment in which brokers and agents are removed from typical transactions. Two examples are presented here.

- Dell Computer is a highly successful company built on the premise that it will deal directly with the customer, bypassing stores and resellers; founded in 1984, Dell has grown into a $12 billion company. In recent years Dell has added a very successful Web site on which customers can configure and purchase computers in real time, and the company hopes that half its sales will be conducted over the Internet by the end of 2000.
- The travel industry also is experiencing substantial upheaval due to information technology. Travel agents benefitted in the past from computers and central-reservation systems but

now must redefine their services, because airlines, also using computers plus Web sites, have begun dealing directly with customers. According to one source, on-line travel transactions during 1997 are expected to account for nearly half of the more than $2 billion spent on line. Airlines, which now may rely on travel agents less than before for individual ticket sales, are cutting agents' commissions. In response, some travel agents are passing on ticket booking charges to customers; others are ceding low-cost reservations to the airlines and focusing instead on higher-margin trips to multiple destinations or corporate travel.

Various pricing structures are involved in selling information technology to consumers. Internet service providers typically charge a flat monthly fee for access, while cablevision providers charge a flat monthly fee for a basic group of network channels and allow customers to add, at additional cost, more extensive groups, premium channels, high-speed Internet access, and pay-per-view events and movies. Local telephone calls in the United States generally are free with a flat monthly payment, but in most of the world, local calls are charged on a per minute basis. American cellular telephone users are charged by the minute for both outgoing *and* incoming calls, while cellular telephone users in Europe and Asia are only charged for outgoing calls.

This plethora of pricing practices can confuse and irritate consumers and therefore may change as information technologies converge and businesses wish to satisfy their customers or stimulate demand. AT&T, for example, recently announced that it will begin billing the person who places a call to a cellular telephone rather than to the person who receives it, which will bring cellular pricing in line with the general "caller pays" practice for wire-based calls. Moreover, some consumers already may receive a single bill for telephone, pager, and Internet access, with increasing discounts if more services are purchased.

And although the cost of information technology equipment has diminished with time, it does not mean that either equipment or software is inexpensive. Direct Internet access is very expensive, especially in rural areas: The same high-speed data lines may cost more than $1,000 month in a rural area but just over $200 in a urban center. Just putting a computer in each classroom in the nation's 87,000 public schools is estimated to cost $40–100 billion, and this expense is only part of the equation—ongoing training and technical support also are costly. While some federal assistance is available for schools, libraries, and health centers, it will not be sufficient to cover the entire bill. Universal Service Fund monies—expanded through the federal Telecommunications Act of 1996—may be used only to reduce telecommunications network equipment charges; these monies may not be used to buy computers or train teachers to use them.

Effect on Employment and Workplace

The information age means workers need new skills. Computer skills, according to one federal report, were required in 25 percent of all jobs in 1983 and 47 percent in 1993; by 2000 the figure is expected to rise to 60 percent. The report also finds that jobs involving computer skills pay an average of 10–15 percent more than jobs that do not. Just acquiring computer skills is not enough, however: The rapid pace of information technology change requires workers to engage in continuous education and training.

Communications also is playing a large role in "flattening" organizational hierarchies, i.e., reducing the distance between the top and bottom of a company, generally by removing some intervening levels of administration. Moreover, workers increasingly are working in team settings, and organization lines are becoming more flexible. Information technology also makes telecommuting (working at home but linked electronically to the work place) possible for some workers, which may increase participation in the work force for people who otherwise would be unable or unwilling—for

any number of reasons—to work in an office for eight hours a day, five days a week.

But information technology poses a substantial challenge for displaced workers. Manufacturing employment in the United States is expected to drop by 7 percent from 1994 to 2005, while services and retailing jobs are expected to produce 96 percent of all new jobs created during this period. Workers displaced from the manufacturing sector almost certainly will need training to enable them to move into the new jobs in services and retailing. In the 1994–2005 period, two of the five fastest growing occupations are expected to be systems analyst and computer engineer—the growth rate for both is projected at well over 80 percent. Such changes affect both blue- and white-collar workers: The former may face the end of a traditional industry or product, while the latter (especially middle management) are caught by the disintermediation of the modern company and corporate restructuring.

In addition, there is some question as to whether information technology—especially computers—really enhances the general productivity of office workers. On the one hand, computers can perform repetitive tasks and simplify record keeping in offices, giving workers more time for other projects. On the other hand, computer hardware and software sometimes is difficult to operate, and a substantial and ongoing commitment of resources is required to keep the system running. The Gartner Group (Stamford, Conn.), an information-technology consulting firm, estimates that the annual cost to maintain one Windows 95–equipped computer is $9,784, nearly half of the which is for "futzing"—the time wasted by the user in trying to get the computer to do what s/he wants it to. While some take issue with the Gartner Group's figures, few deny that computer support and repair can require substantial and continual expenditures.

Effect on Privacy

As computers become interconnected, whether via a private network or the public Internet, one major question is what exactly is "private" information. Media stories about the electronic availability of information—including one's Social Security number, mother's maiden name, credit history, and other financial information—reinforce the public's apprehension about "big brother," be it business or government, looking over their shoulder. With interconnected computer networks there is potential for health data on a person's insurance claim form to be shared with the his/her life insurer, employer, or a pharmaceutical company looking for new customers. But *what* information would be shared—the precise nature of the claim or merely the fact that the person filed a claim? Would his/her medical history be released to the other organizations, or does each have to ask for the person's consent? If, in making a purchase from one company, a person voluntarily provides his/her Social Security number or date of birth, is that information a private matter between the buyer and the one company, or may the company give, or even sell, it to others?

A current example of the privacy issues involves the U.S. Navy. In January 1998, the Navy moved to discharge a sailor after receiving notice that his America Online (AOL) profile—a page of information on which AOL users may describe themselves and their hobbies to other users—included the word "gay." Concerned that the profile violated the military's "Don't ask, don't tell" policy, Navy investigators asked AOL to release the account owner's name. When the name matched that of an active duty sailor, the Navy moved to discharge him. The sailor has sued the Navy for improper dismissal and violation of his privacy rights under the Electronic Communications Privacy Act. For its part, AOL claims that the Navy investigators misled the AOL representative into releasing the account owner's name.

Some actions already have been taken to define what information is private (or at least not publicly accessible). In 1997 a data provider consortium that includes some of the major database and credit-history reporting agencies agreed to a voluntary set of standards for releasing information. The companies pro-

pose that upon request, they will limit general *public* access to a person's Social Security number, birth date, unlisted telephone number, and mother's maiden name, but *commercial* users still may receive most of the information. Supporters applaud the voluntary plan to protect privacy, but opponents point out that a person has to *request* the restriction and question how many people know that such information about them is available at all.

See also Internet and Computers; Job Training.

FOR ADDITIONAL INFORMATION

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Electronic Frontier Foundation
1550 Bryant Street, Suite 725
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(415) 436-9333
(415) 436-9993 FAX
www.eff.org

Electronic Privacy Information Center
666 Pennsylvania Avenue S.E., Suite 301
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(517) 484-6549 FAX
www.michinfotech.org

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