CHAPTER

10 Work and Wealth

Work keeps at bay three great evils: boredom, vice, and need.

—Voltaire

10.1 Introduction

It's 6:30 p.m. and a new shift is starting at the LiveBridge call center. Twenty-year-old college graduate "Kristy Grover" begins phoning people to verify information they have provided on their credit card applications. She will work until 3:00 a.m. Her hours are unusual because "Kristy Grover" is actually Shilpa Thukral, and she is calling the United States from India. Companies like LiveBridge are saving billions of dollars every year by employing hundreds of thousands of Indians to staff call centers and back offices [1].

Back in 1996, the Indian telecommunications infrastructure supported a mere 13,000 simultaneous overseas phone conversations. Multinational corporations invested in new underwater fiber-optic cables, and by 2002 the overseas phone capacity had increased to more than 2.5 million simultaneous calls, making it possible for American companies to export hundreds of thousands of jobs to India [1].

Many Americans were unhappy with the customer service they received from Indian call centers. They complained they could not understand the accents of the agents and asked for representatives who spoke American English. Companies responded to these complaints by building new call centers in the Philippines. Filipinos learn American

English in grade school, watch American TV shows, and are familiar with American idoms. In 2011 the Philippines, with 400,000 call center employees, surpassed India, with 350,000 call center employees, to become the top offshore site for call centers. Filipino workers earn about $300 a month, slightly more than Indian call center employees, who make about $250 a month, but much less than American call center workers, who start at about $1,700 a month [2].

The globalization of the job market is just one of many changes that information technology and automation have brought to the workplace. In this chapter we examine a variety of moral problems brought about by workplace changes. First we consider the following question: Does automation increase unemployment? Some evidence supports an affirmative answer to the question, but other evidence suggests that automation actually creates more jobs than it replaces. There is no doubt that automation has led to enormous increases in productivity. That leads us to our second question: If productivity has increased so much, why is everyone working so hard? We examine how we have chosen to use our extra productivity.

Some futurists warn that advances in artificial intelligence and robotics will lead to massive unemployment in the not-too-distant future. We consider the morality of attempting to construct highly intelligent machines.

More mundane information technology has already led to significant changes in the way companies organize themselves. It has also led to an increase in telework (also called telecommuting), the use of temporary workers, workplace monitoring, and distributed, multinational teams. We consider how these changes have improved and harmed the lives of individual workers.

Globalization is now a fact of life. Some organizations are convinced globalization benefits everyone in the world, the poor as well as the rich. Others are certain that globalization harms everyone in the world. We present the arguments offered by each side to support its position. We also focus on the contentious issue of foreign IT workers in the United States.

Many view those without access to information technology as being severely disadvantaged. The term "digital divide" refers to the opportunity gap brought about because some people do not have access to modern information technology, particularly the Internet. We look at evidence of the digital divide and study two fundamentally different models of how new technologies are diffused through a society.

Information technology has made it easier for an unequal share of benefits to accumulate in the hands of a few top performers, leading some to call this the "winner-take-all society." We explore the factors creating the winner-take-all phenomenon, the economic problems it causes, and potential remedies.

10.2 Automation and Employment

Many science fiction writers have described future worlds where machines do much of the noncreative work. Some writers paint an optimistic view of these worlds. In Isaac

Asimov's short stories and novels, technology is seen as a tool for the betterment of mankind. Intelligent robots may be disliked by some people, but they are not a threat. The "Three Laws of Robotics" are etched into their positronic brains, guaranteeing that they will never turn against their creators [3]. Other writers, such as Kurt Vonnegut Jr., describe dystopias. Vonnegut's *Player Piano* concerns a future America in which nearly all manufacturing jobs have been lost to automation. People hate machines for taking away their feelings of self-worth, yet their fascination with automation makes its triumph appear inevitable [4].

In the "jobless recovery" following the Great Recession of 2008–2009, corporate profits have soared, but the unemployment rate has remained stubbornly high. Are we about to enter an era of high unemployment caused by automation? Let's consider both sides of this question.

10.2.1 Automation and Job Destruction

Automation has been blamed for the loss of both manufacturing and white-collar jobs, as well as an increase in the length of the workweek for salaried employees.

LOST MANUFACTURING JOBS

Manufacturing employment peaked in the United States in 1979, with 19.4 million jobs. By 2011 manufacturing employment had dropped 40 percent, to 11.7 million, even though the population of the United States had increased 39 percent during the same time period. The percentage of American workers involved in manufacturing has dropped significantly, from 35 percent in 1947 to 9 percent in 2011 (Figure 10.1).

Meanwhile, thanks to automation, manufacturing output in America continues to rise and has doubled since 1970 [5]. In other words, productivity has increased: fewer workers are making more products. For example, in 1977 it took 35 person-hours to manufacture an automobile in the United States. By 2008 the number of person-hours had dropped to 15 [6].

LOST WHITE-COLLAR JOBS

The effects of automation are felt in the office, too. Email, voice mail, and high-speed copy machines eliminate secretarial and clerical positions. Even jobs requiring advanced degrees are vulnerable. Spreadsheets and other software packages reduce the need for accountants and bookkeepers [7]. Twenty years ago, a pharmacist in a small Canadian town would fill about 8,000 prescriptions in a year. Today Merck-Medco runs a Web-accessible pharmacy that uses robots to dispense 8,000 prescriptions an *hour* [8].

In fact, the economic recovery of 1991–1996 was notable because of the large number of white-collar, middle-management jobs that were eliminated even as the economy grew. Unlike the recession of the early 1980s, most of the people whose jobs were eliminated in the 1990s had at least some college education. A large number of these jobs were occupied by people making more than $50,000. Only 35 percent of these higher-paid victims of downsizing were able to find jobs that paid as well [9].

FIGURE 10.1 General Motors exited bankruptcy in 2009 with 30 percent fewer employees. (© Danny Lehman/Corbis)

WORKING HARDER, MAKING LESS

While inflation-adjusted household incomes were flat between 1979 and 1994, the workweek got longer. Harvard economist Juliet Schor reports that between 1970 and 1990, the average American increased the number of hours spent at work per year by 163. That's equal to an *extra month* at work every year [10].

Some believe longer work hours are a consequence of corporate downsizing, which is facilitated by the introduction of automation and information technology (Figure 10.2). When an organization sheds some of its workers, the work that needs to be done is divided among fewer employees. Hence there is a natural tendency for the number of hours worked to increase. In addition, the fact that people have been laid off is a strong incentive for those who remain to work harder so that they won't be part of the next layoff [11].

Advances in information technology have also made it easier for people to bring work home. For example, many companies now provide their employees with laptop computers. At work, employees turn their laptop into a desktop system by plugging in a full-sized keyboard, mouse, and monitor. By bringing their laptop home, they have access to the various project files they need to continue working. Labor advocates Stanley Aronowitz, Dawn Esposito, and William DiFazio have written, "After nearly a century when homework was regarded as a wage-busting tool, computers have made it easier for employers to revive this practice. With pagers, cell phones, and laptop computers, all time becomes work time" [7, p. 35]. They conclude:

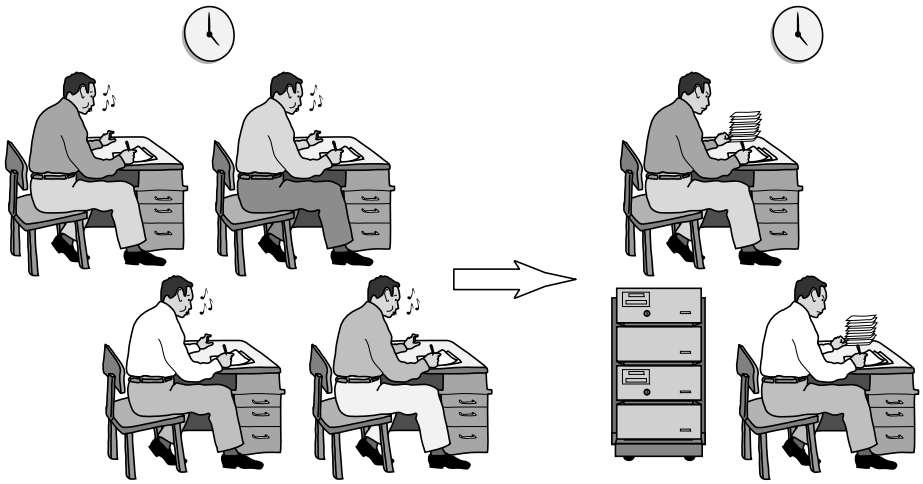

Figure 10.2 When jobs are lost to automation or the introduction of information technology, the remaining workers may work harder in order to avoid being part of the next layoff.

> Late capitalist society is engaged in a long-term historical process of destroying job security . . . More than ever, we worry about work and are working longer hours; we are more than ever driven, nervous, seemingly trapped. At the very same time, and paradoxically, the twenty-first century bodes a time of post-work: of automation and work reorganization replacing people at faster and faster rates. [7, pp. 38, 40]

10.2.2 Automation and Job Creation

Traditional economists hold a quite different view about the effects of automation and information technology on jobs. They have concluded that while new technology may destroy certain jobs, it also creates new jobs. The net result is an increase, not a decrease, in the number of available jobs.

INCREASED PURCHASING POWER

The logic of these "automation optimists" is illustrated in Figure 10.3. On the surface, it is obvious that automation eliminates certain jobs. That's what automation means. However, it's also important to look beneath the surface. Automation is introduced as a cost-saving measure: it is less expensive for a machine to perform a particular job than a human being. Because companies compete with each other, lower production costs result in lower prices for the consumer. The drop in the price of a product has two beneficial effects. First, it increases the demand for the product. In order to produce more of the product, workers must be hired. Second, people who were already purchasing the product don't have to pay as much for it. That gives them more money to spend on other things, increasing the demand for other products. This, too, results in job creation. Finally, there is an additional effect, not illustrated in the figure. Some people must be employed designing, creating, and servicing the automated devices themselves.

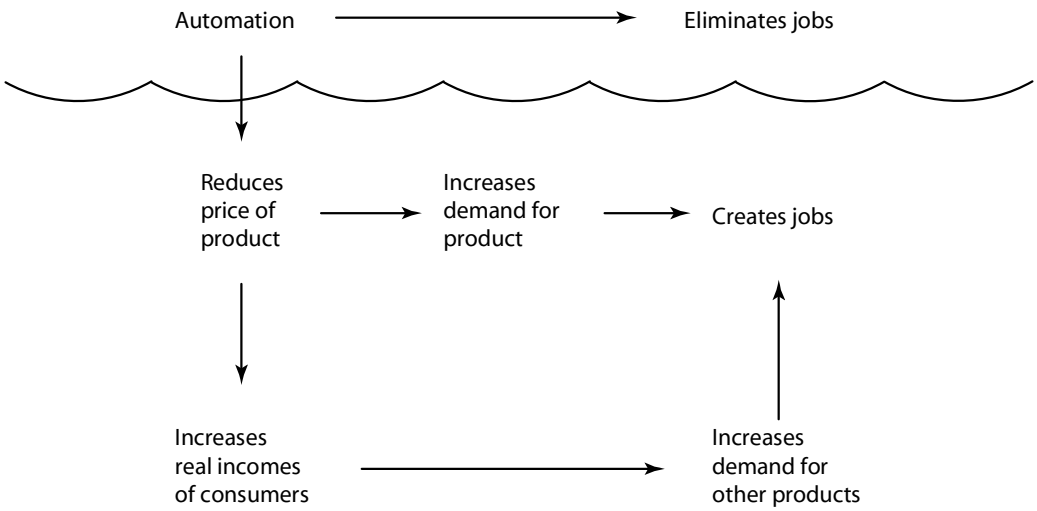

FIGURE 10.3 Superficially, automation eliminates jobs; but automation can also stimulate the creation of new jobs.

Consider the automation of stock exchanges. In the past, shares of securities were bought and sold on the floors of stock exchanges by people employed as floor brokers. Today electronic systems handle most of these transactions, and electronic trading has made transactions quicker and less expensive. Although electronic trading has greatly decreased the number of people employed as floor brokers, the number of shares being traded has increased sharply, and employment in the securities industry has continued to rise (except during recessions) [12]. New kinds of jobs have been created. For example, securities firms have hired mathematicians and computer scientists to develop sophisticated automated trading systems.

WORKING LESS, MAKING MORE

Martin Carnoy disputes the notion that people are working longer hours now than they used to. "Workers today," he writes, "work much less than those of a century ago, produce more, earn substantially more, and have access to a greater variety of jobs. Technology displaced workers but also contributed to a much higher labor productivity and the production of new products, which helped create new jobs, economic growth, and higher incomes" [13, p. 17].

10.2.3 Effects of Increase in Productivity

Productivity in the United States doubled between 1948 and 1990. Juliet Schor asks us to consider what our society could have done with this dramatic increase in productivity. We could have maintained our 1948 standard of living and gone to a four-hour workday or a six-month work year. Or every worker could be taking every other year off with pay. Instead of taking the path of working less, the average workweek actually rose slightly. As a result, Americans in 1990 owned and consumed twice as much as in 1948 but had less free time in which to enjoy these things [10].

AMERICANS WORK LONG HOURS

American society is remarkable for how hard its citizens work. The number of hours worked per year in the United States is significantly higher than the number of hours worked in France or Germany. It also appears modern Americans work harder than the ancient Greeks, Romans, or Western Europeans of the Middle Ages. According to Juliet Schor, "The lives of ordinary people in the Middle Ages or Ancient Greece and Rome may not have been easy, or even pleasant, but they certainly were leisurely" [10, pp. 6–7]. In the mid-fourth century, the Roman Empire had 175 public festival days. In medieval England, holidays added up to about four months a year; in Spain, five months; in France, six months. Schor notes, "There is considerable evidence of what economists call the backward-bending supply curve of labor—the idea that when wages rise, workers supply less labor. . . . [Laborers] worked only as many days as were necessary to earn their customary income" [10, p. 47].

We do not have to look back into history to find significantly shorter workweeks. Consider contemporary "stone age" societies. The Kapauku of Papua never work two days in a row. Australian aborigines and men of the Sandwich Islands work only about 4 hours per day. Kung Bushmen work 15 hours a week [10].

PROTESTANT WORK ETHIC

Why are Americans such hard workers? In his famous essay *The Protestant Ethic and the Spirit of Capitalism*, Max Weber argues that the Protestant Reformation in general, and Calvinism in particular, stimulated the growth of capitalism in Western Europe. Before the Reformation, work was seen in a traditional light. Weber describes the traditional view toward labor in this way:

> A man does not "by nature" wish to earn more and more money, but simply to live as he is accustomed to live and to earn as much as is necessary for that purpose. [14, p. 60]

According to Weber, the Calvinist theology introduced a radically different conception of work. He writes:

> Waste of time is thus the first and in principle the deadliest of sins. . . . The religious valuation of restless, continuous, systematic work in a worldly calling, as the highest means to asceticism, and at the same time the surest and most evident proof of rebirth and genuine faith, must have been the most powerful conceivable lever for the expansion of that attitude toward life which we have here called the spirit of capitalism. [14, pp. 157, 172]

We can see an example of the "Protestant work ethic" in the early history of New England. The Puritans banished all holidays, insisting that Sunday be the sole day of rest. In 1659 the General Court of Massachusetts decreed that citizens who celebrated Christmas or other holidays by refusing to work or feasting should be fined or whipped.

TIME VERSUS POSSESSIONS

We have exchanged leisure time for material possessions. Compared to medieval Europeans or modern Bushmen, we have vastly superior health care systems, educational

institutions, and transportation networks. We live in climate-controlled environments, and we have an incredible number of choices with respect to where we travel, what we wear, what we eat, and how we entertain ourselves. The cost of these freedoms and luxuries is less leisure time.

Despite our high standard of living, our expectations about what we ought to have continue to rise. In 1964 the average new American home had 1,470 square feet and one television set. Only about 20 percent of new homes had air conditioning. In 2001 the size of the average new home had risen to 2,100 square feet, and nearly 100 percent of new homes were equipped with air conditioning. The typical family home has two or three television sets. In order to maintain this lifestyle, people are working harder [11].

10.2.4 Rise of the Robots?

While automation has not yet shortened the workweek of the typical American, some experts maintain that most jobs will eventually be taken over by machines. In fact, roboticist Hans Moravec predicts that by 2050, robots will have replaced human workers not just in manufacturing jobs but in decision-making roles, too [15].

The *Encyclopedia of Computer Science* defines **artificial intelligence** (**AI**) as "a field of computer science and engineering concerned with the computational understanding of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit such behavior" [16]. The same source defines **robots** as "programmable machines that either in performance or appearance imitate human activities" [16]. According to Moravec, developments in artificial intelligence and robotics were held back for decades by inadequate computer power. Rapid increases in microprocessor speeds have resulted in many breakthroughs. Here are a few notable achievements in artificial intelligence and robotics since 1995.

- A minivan equipped with a video camera and a portable workstation drove from Pittsburgh, Pennsylvania, to San Diego, California, in 1995. The computer was in control of the steering wheel 98.2 percent of the time [17]. (A human operator controlled the minivan's gas pedal and brakes, maintaining an average speed of about 60 miles per hour.)
- The IBM supercomputer called Deep Blue defeated world chess champion Gary Kasparov in a six-game match in 1997 [18].
- In 2000 Japanese automaker Honda created ASIMO, the first humanoid robot (android) capable of ascending and descending stairs. Two years later, engineers gave ASIMO the ability to interpret and respond to human gestures and postures [19]. Some believe Japan is a hotbed of robotic research because its population is declining and becoming more elderly, and the Japanese seem to lack the cultural fears of robots that grip many Westerners [20].
- Swedish appliance giant Electrolux introduced Trilobite, the world's first domestic robotic floor vacuum cleaner, in 2001 [21].
- Stanley, a robotic car developed at Stanford University, and four other autonomous vehicles successfully completed a rugged, 128-mile course through the Nevada

Figure 10.4 The Stanford Racing Team converted a Volkswagen Touareg into an autonomous vehicle named Stanley that successfully followed a 128-mile course through the Nevada desert in 2005. (© Gene Blevins/Reuters/Corbis)

desert in 2005 (Figure 10.4). Stanley was the fastest vehicle to finish the race, averaging about 19 miles per hour [22].

- In February 2011, an AI program named Watson, running on an IBM supercomputer, easily defeated the two most successful human *Jeopardy!* champions in history: Ken Jennings and Brad Rutter (Figure 10.5). At the end of the three-episode competition, Watson had won $77,147, compared to $24,000 for Jennings and $21,600 for Rutter.

Moravec believes these innovations are just the beginning of a new era in automation. In 30 years, inexpensive desktop computers will be a million times faster than today's models, allowing them to run sophisticated AI programs. Moravec writes, "In the [21st] century inexpensive but capable robots will displace human labor so broadly that the average workday will have to plummet to practically zero to keep everyone usefully employed" [15, p. 131]. Moravec predicts humans will retire to a world of "luxurious lassitude" [15, p. 136].

Perhaps Moravec has a grossly inflated view of what robots may be able to do in 40 years, but what if he is right? The changes he is predicting would profoundly affect

Figure 10.5 In 2011 an AI program named Watson running on an IBM supercomputer trounced the two greatest (human) *Jeopardy!* champions: Ken Jennings and Brad Rutter. (© AP photo/Seth Wenig)

our society. For this reason, Richard Epstein suggests there is an urgent need to discuss ethical issues related to the creation of intelligent robots, before they become a reality [23]. Here are some of the questions Epstein raises.

- Is it wrong to create machines capable of making human labor obsolete?
- Will humans become demoralized by the presence of vastly more intelligent robots? If so, is it wrong to work on the development of such robots?
- Is it morally acceptable to work on the development of an intelligent machine if we cannot be sure that the machine's actions will be benevolent?
- How will we ensure that intelligent robots will not be put to an evil purpose by a malevolent human?
- How will our notions of intellectual property change if computers become capable of creative work?
- How will our ideas about privacy have to change if legions of superfast computers are analyzing the electronic records of our lives?

Michael LaChat notes, "Many look upon the outbreak of AI research with an uneasy amusement, an amusement masking . . . a considerable disquiet. Perhaps it is the fear that we might succeed, perhaps it is the fear that we might create a Frankenstein, or perhaps it is the fear that we might become eclipsed, in a strange oedipal drama, by our own creation" [24].

LaChat evaluates the issue in the following way. Some people would like to try to construct a **personal AI**—a machine that is conscious of its own existence. No one has proven it can't be done, so let's assume it's theoretically possible. Is it morally acceptable to attempt the construction of a personal AI?

Here is one line of reasoning: According to the second formulation of the Categorical Imperative, we should always treat other persons as ends in themselves and never treat other persons merely as means to an end. In the attempt to construct a personal AI, scientists would be treating the personal AI they created as a means to the end of increasing scientific knowledge. It is reasonable to assume that a fully conscious personal AI would be unwilling to accept its status as a piece of property. In this case, owning a personal AI would be a form of exploitation.

Are we prepared to grant a personal AI the same rights guaranteed to human persons under the United Nation's Universal Declaration of Human Rights, which (among other things) forbids slavery and servitude, and guarantees everyone freedom of movement? If we plan to treat personal AIs as property, then from a Kantian point of view any effort to bring about a personal AI would be immoral.

LaChat concedes that this line of reasoning rests on the controversial assumption that a conscious machine should be given the same moral status as a human being. The argument assumes that a personal AI would have free will and the ability to make moral choices. Perhaps any system operated by a computer program does not have free will, because it has no choice other than to execute the program's instructions as dictated by the architecture of the CPU. If a personal AI does not have free will, it cannot make moral choices, and from a Kantian point of view it should not be valued as an end in itself. Despite its intelligence, it would not have the same moral status as a human being. Creating a personal AI without free will would be morally acceptable.

We do not know whether scientists and engineers will ever be able to construct a personal AI, and we cannot say whether a personal AI would possess free will. Our predictions are uncertain because we do not understand the source of free will in humans. In fact, some philosophers, psychologists, and neuroscientists deny the existence of free will. LaChat concludes, "Though the first word of ethics is 'do no harm,' we can perhaps look forward to innovation with a thoughtful caution," knowing that we may "eclipse ourselves with our own inventions" [24].

It is important to note that mainstream opinion in the artificial intelligence research community holds that the prospects of a personal AI being constructed are quite remote. A panel of leading experts in artificial intelligence met in Pacific Grove, California, in February 2009, to reflect on the societal consequences of the advances in machine intelligence. According to a report from the meeting, the experts were skeptical of the view that machines with superhuman intelligence are on the horizon [25].

10.3 Workplace Changes

Experts debate whether or not information technology has resulted in a net reduction in available jobs, but there is no dispute that information technology has affected *how*

people work. In this section we survey a few of the ways that information technology is fundamentally changing the work experience.

10.3.1 Organizational Changes

Information technology has influenced the way manufacturing and service companies organize themselves. A typical early use of computers was to automate a back-office function, such as payroll. Using computers in this way required a company to make no changes in its organization. Later, companies began using computers inside manufacturing units. Computers enabled companies to customize products and provide better service to their customers. This use of computers delegated more responsibility to the line workers, and it encouraged a decentralization of sales and support functions, reducing a company's bureaucracy. Information technology within corporations reached a third stage with the creation of computer networks linking different parts of the business. For example, integrating cash registers with inventory systems has allowed companies to order replacements automatically.

The overall effect of the introduction of information technology is to flatten organizational structures. When the primary source of information distribution was the hand-typed, carbon-copied memorandum, most information flow followed the lines in organizational charts (Figure 10.6a). Today a wide variety of technologies allow any member of an organization to contact any other member with minimal effort and cost (Figure 10.6b). As a result, new opportunities arise. Many companies assemble "tiger teams" of expert workers drawn from various parts of the organizational chart. A team will work together for a short period of time to solve an urgent problem, then disband. Flexible information flow also allows companies to adopt "just-in-time" production and distribution methods, reducing inventory costs [26].

Information technology also streamlines organizations by eliminating transactional middlemen. For example, consider the automation of the supply chain. Suppose company A buys widgets from company B. In the past someone at company A called some-

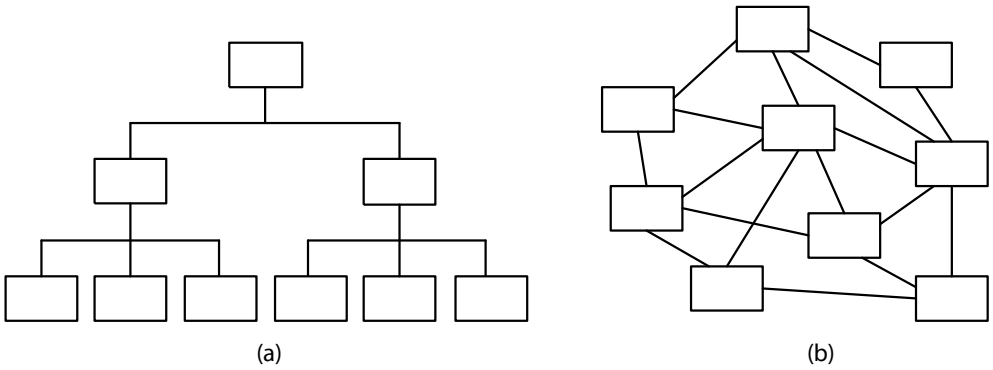

FIGURE 10.6 (a) When interactions are more expensive and time consuming, most information flows between people and their managers. Organizations are rigid and hierarchical. (b) When interactions become inexpensive and fast, the flow of information is much more flexible. Organizations become flatter and more dynamic.

Higher Demand	*Lower Demand*
Computer engineers	Bank clerks
Computer support specialists	Procurement specialists
Systems analysts	Financial records processing staff
Database administrators	Secretaries, stenographers, and typists
Desktop publishing specialists	Communications equipment operators
	Computer operators

Table 10.1 Greater use of information technology in the workplace will increase demand for employees in certain job categories while reducing demand for employees in other categories.

one at company B to order the widgets. Today many companies have adopted **supply-chain automation.** A computer at company A is linked to a computer at company B. The computers are responsible for ordering the widgets, eliminating the need for the middlemen. Automating the paperwork activities associated with purchasing supplies can reduce the number of people who produce purchase orders and invoices, pay bills, process checks, and so on. The likely effect of information technology on organizations will be an increased demand in some job categories, while the demand in other categories will drop (Table 10.1) [27].

Dell Computer is a leader in supply-chain automation. Customers order computers directly from Dell by telephone or through its Web site. Seventy percent of Dell's sales are to large corporations. These companies have custom Web sites that have preconfigured systems tailored to the needs of the purchaser. Dell does not make any computers until they are ordered, allowing it to keep its inventory small—enough for only a few days' production [28].

10.3.2 Telework

Another workplace change brought about through information technology is the rise of telework. **Telework** (also called telecommuting) refers to an arrangement where employees spend a significant portion of their workday at a distance from the employer or a traditional place of work [29]. According to the Consumer Electronics Association, 37 percent of workers in the United States telework at least one day a month [30].

One kind of telework is working out of a home office. Another example of telework is someone who commutes to a telecenter rather than the company's site. Telecenters provide employees from different firms the ability to connect to their company's computers. A third example of telework are salespersons who have no offices, instead transacting all of their business from their cars using cell phones and laptop computers.

ADVANTAGES OF TELEWORK

The rapid growth in the number of teleworkers is evidence there are significant benefits associated with telework. Here are some of the most frequently cited advantages of telework [29, 31].

1. *Telework increases productivity.*

   A variety of studies have shown teleworkers have 10 to 43 percent more productivity than on-site workers.

2. *Telework reduces absenteeism.*

   Teleworkers are less likely to miss work than someone coming into the office.

3. *Telework improves morale.*

   Employees who are teleworking have more freedom. It is easier for them to schedule their work around their personal schedules. If they are working at home, they can dress more casually.

4. *A company can recruit and retain more top employees.*

   For example, a company that allows telework can recruit employees who otherwise would not be interested in the job because they are unable or unwilling to be within commuting distance of the main office. Telework allows companies to retain employees (such as mothers of young children) who would quit otherwise.

5. *Telework saves overhead.*

   With some of its workers away from the office, a company doesn't have to invest as much of its resources in office space.

6. *Telework improves the resilience of a company.*

   Because not all the employees are in one place, the company is less likely to be harmed by a natural disaster or a terrorist attack.

7. *Telework is good for the environment.*

   Teleworkers do not take part in the daily commute, which saves energy and reduces pollution.

8. *Employees may save money by teleworking.*

   They may not have to purchase as much business attire, and they may be able to avoid paying child care expenses.

DISADVANTAGES OF TELEWORK

Telework has its detractors, too. Here are some of the reasons most frequently given why companies discourage or prohibit telework.

1. *Telework threatens the authority and control of managers.*

   When employees work at a distance from their managers, they naturally have more autonomy. How can a manager manage an employee who is not around?

2. *Telework makes it impossible for an employee to have a face-to-face interaction with customers at the company site.*

   For some jobs these interactions are crucial, meaning the job simply cannot be done from a distance.

3. *Sensitive information is less secure.*

   If a person has valuable physical or electronic files at home or in an automobile, they may be far less secure than if they were kept at the office. There is a greater chance that the information will be lost or compromised through fire or theft.

4. *When people in an organization do not keep the same hours or come into the office every day, it is more difficult to schedule team meetings.*

   Even if employees are only teleworking one or two days a week, many others in the organization can suffer significant inconvenience.

5. *Teleworkers are less visible.*

   There is a danger that teleworkers will be forgotten when it's time for raises or promotions. When somebody is "never around," others can get the idea that the teleworker is not making a contribution to the organization.

6. *When faced with a problem or a need for information, employees at the office are less likely to contact a teleworker than another person on-site.*

   Meanwhile, many teleworkers are afraid to leave their telephones even for a short time, afraid that if someone from work calls them and they are not around, they will get the reputation for not being "at work."

7. *Teleworkers are isolated.*

   Some jobs require people to bounce ideas off coworkers. What are people working at home supposed to do?

8. *Teleworkers end up working longer hours for the same pay.*

   When everything a person needs to do his job is right there at home, he is more likely to keep coming back to it. How does someone leave her work at the office when her home *is* her office? Critics of telework say that overwork is the reason why teleworkers exhibit higher productivity.

10.3.3 Temporary Work

The modern business environment is highly competitive and rapidly fluctuating. As a result, the level of commitment companies are willing to make to their employees is dropping. Some companies once boasted that they took care of their employees and did not engage in layoffs during business downturns. Those days are gone. The dot-com bust led to massive layoffs in the information technology industry.

Companies are giving themselves more flexibility and saving money on benefits by hiring more subcontractors and temporary employees. Workers cannot count on long-term employment with a single firm. Instead, they must rely on their "knowledge portfolios," which they carry from job to job [13].

10.3.4 Monitoring

Information technology has given companies many new tools to monitor the activities of their employees. An American Management Association/ePolicy Institute survey in 2007 revealed that 66 percent of employers were monitoring the Internet use of their

employees. Other examples of employee monitoring by American employers included video surveillance (48 percent), monitoring keyboard activity (45 percent), monitoring time spent on the phone (45 percent), and monitoring emails (43 percent) [32].

The principal purpose of monitoring is to identify inappropriate use of company resources [33]. A quarter of companies in the United Kingdom have fired employees for improper use of the Internet. In the majority of these cases, the employee was surfing the Web for pornography. Another study of employee emails concluded that eliminating email containing gossip and jokes would cut the time staff spend reading email by 30 percent [34]. A study conducted by IDC concluded that between 30 and 40 percent of Internet use by employees was not work related [35].

Monitoring can help detect illegal activities of employees as well. By monitoring instant messaging conversations, employers have caught employees who had performed various misdeeds, including an employee who hacked into a company computer after being denied a promotion [36].

Monitoring is also used to ensure that customers are getting the products and services they need. Reviewing customer phone calls to help desks can reveal if the company ought to be providing its customers with better documentation or training [37].

Many companies use monitoring to gauge the productivity of their workers. For example, telemarketing firms keep track of how many calls their employees make per hour. Sometimes monitoring can help an organization assess the quality of the work done by its employees. Major League Baseball has introduced QuesTec's Umpire Information System to evaluate how well umpires are calling balls and strikes [38].

Companies are beginning to investigate the use of wireless networks to track the locations of their employees (Figure 10.7). Knowing the location of service technicians would enable an automated system to respond to a breakdown by alerting the technician closest to the malfunctioning piece of equipment. A system that tracked the locations of hospital physicians could upload a patient's file into the wireless laptop held by a doctor approaching a hospital bed.

More schools are using video cameras to increase security [39]. The school district in Biloxi, Mississippi, used gambling-generated tax receipts to install digital cameras in all 500 of its classrooms. An elementary school principal gushes, "It's like truth serum. When we have a he-said, she-said situation, 9 times out of 10, all we have to do is ask children if they want us to go back and look at the camera, and they fess up" [40].

It's an open question whether monitoring is ultimately beneficial to an organization. Obviously, organizations institute monitoring because they have reason to believe it will improve the quantity and/or quality of the work performed by their employees. There is evidence that employee monitoring makes employees more focused on their tasks but also reduces job satisfaction [41].

10.3.5 Multinational Teams

In the 1980s, General Electric and Citibank set up software development teams in India. Since then, many corporations have established field offices in India, including Analog Devices, Cadence Design Systems, Cisco, Intel, Microsoft, and Sun Microsystems. Ban-

Figure 10.7 Human robots? Computers track every movement of workers filling customers' orders and direct them to take the most efficient walking route at this Amazon warehouse in England.

galore, in particular, has made an effort to become the Silicon Valley of India. Companies use Indian companies to write software, process credit card applications, and do billing. Texas Instrument's chip design team in Bangalore has 200 patents to its name. Hewlett-Packard and Oracle both have thousands of employees in India. SAP has 500 engineers in Bangalore.

Multinational teams allow a company to have people at work more hours during the day. It becomes easier to have a call support center open 24 hours a day. It is even possible for projects to be shuttled between multiple sites, allowing around-the-clock progress to be made on time-sensitive products. For example, a team in Palo Alto can spend its day finding bugs in a piece of software, then hand the bug reports over to a team in Bangalore that spends *its* day fixing the bugs [42].

However, the main attraction of India is cost savings. Wages in India are substantially lower than in the United States or Western Europe. The total cost of an Indian computer programmer is about $20,000 a year. Companies say they need to lower their expenses in order to stay in business. If they go out of business, their US employees will lose their jobs. Hence creating multinational teams is a way for companies to stay in business and preserve jobs in the United States [43].

Creating multinational teams has disadvantages, too. The principal disadvantage is that the infrastructure in less developed countries can make business more difficult. For example, because India has only two international airports—one in New Delhi and the other in Mumbai—it is hard to travel to and from Bangalore. The highway system in India is primitive, and electrical power is unreliable.

Despite the difficulties, corporations are increasingly making use of multinational teams. About 90,000 IT-related jobs in the United States are moving to foreign countries every year, and at American companies whose revenues are at least $5 billion, about a quarter of IT jobs have already moved offshore [44].

10.4 Globalization

Globalization refers to the process of creating a worldwide network of businesses and markets. Globalization results in a greater mobility of goods, services, and capital around the world. Investments are made across national boundaries. Products manufactured in one country are sold in another. Consumers calling a telephone help center get connected with support technicians located on the other side of the world.

The rapidly decreasing cost of information technology has made globalization possible (Figure 10.8). The cost of computing dropped by 99.99 percent between 1975 and 1995. The cost of an international telephone call from New York to London dropped by 99 percent between 1930 and 1996 [45]. Companies have made extensive use of low-cost information technology to coordinate operations distributed around the planet.

10.4.1 Arguments for Globalization

Those who favor globalization seek the removal of trade barriers between nations. The North American Free Trade Agreement (NAFTA) between Canada, the United States, and Mexico was a step toward globalization.

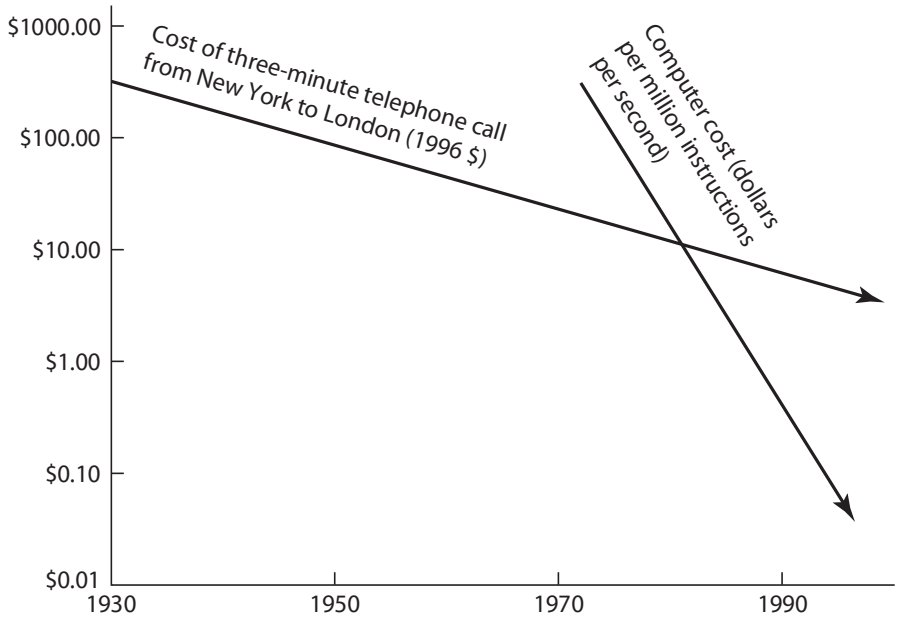

FIGURE 10.8 The dramatic declines in the cost of computing and communications have made global enterprises feasible.

The World Trade Organization (WTO) is an international body that devises rules for international trade and promotes the goal of free trade among nations. The WTO and other proponents of globalization support free trade with these arguments:

1. *Free trade can increase everyone's standard of living.* Every country has a **comparative advantage** at producing certain products and services, meaning it can produce them at a lower opportunity cost than any other country. Consumers get better prices when each area produces the goods or services it does best—corn in Kansas, automobiles in Ontario, semiconductors in Singapore, and so on—and then these products and services are bought and sold without trade barriers. When prices are lower, the real purchasing power of consumers is higher. Hence globalization increases everyone's standard of living.
2. *People in poorer countries deserve jobs, too.* When they gain employment, their prosperity increases.
3. *Every example in the past century of a poor country becoming more prosperous has been the result of that country producing goods for the world market rather than trying for self-sufficiency* [46]. Contrast the remarkable success story that is South Korea with the economic basket case that is North Korea.
4. *Creating jobs around the world reduces unrest and leads to more stability.* Countries with interdependent economies are less likely to go to war with each other.

10.4.2 Arguments against Globalization

Ralph Nader, American trade unions, the European farm lobby, and organizations such as Friends of the Earth, Greenpeace, and Oxfam oppose globalization. They give these reasons why globalization is a bad trend:

1. *The United States and other governments should not be subordinate to the WTO.* The WTO makes the rules for globalization, but nobody elected it. It makes its decisions behind closed doors. Every member country, from the United States to the tiniest dictatorship, has one vote in the WTO.
2. *American workers should not be forced to compete with foreign workers who do not receive decent pay and working conditions.* The WTO does not require member countries to protect the rights of their workers. It has not banned child labor. Authoritarian regimes such as the People's Republic of China are allowed to participate in the WTO even though they do not let their workers organize into labor unions.
3. *Globalization has accelerated the loss of both manufacturing jobs and white-collar jobs overseas.*
4. *The removal of trade barriers hurts workers in foreign countries, too.* For example, NAFTA removed tariffs between Canada, Mexico, and the United States. Because they receive agricultural subsidies from the US government, large American agribusinesses grow corn and wheat for less than its true cost of production and sell the grain in Mexico. Mexican farmers who cannot compete with these prices are driven out of business. Most of them cannot find jobs in Mexico and end up immigrating to the United States [47].

Even if globalization is a good idea, there are reasons why a company may not choose to move its facilities to the place where labor is the least expensive. Interestingly, these arguments are more relevant to "blue-collar" jobs such as manufacturing than they are to "white-collar" jobs such as computer programming. With automation, the cost of labor becomes a smaller percentage of the total cost of a product. Once the labor cost is reduced to a small enough fraction, it makes little difference whether the factory is located in China or the United States. Meanwhile, there are definite additional costs associated with foreign factories. If you include products in transit, foreign factories carry more inventory than identical factories in the United States. There are also more worries about security when the product is being made in a foreign country. For these reasons, moving a factory to a less developed country is not always in the best interest of a company [5].

10.4.3 Dot–Com Bust Increases IT Sector Unemployment

In the 1990s, Intel's stock rose 3,900 percent, Microsoft's stock increased in value 7,500 percent, and Cisco System's stock soared an incredible 66,000 percent. That means $1,000 of Cisco stock purchased in 1990 was worth $661,000 at the end of 1999. Investors looking for new opportunities for high returns focused on **dot-coms,** Internet-related start-up companies. Speculators pushed up the values of many companies that had never earned a profit. Early in 2000, the total valuation of 370 Internet start-ups was $1.5 trillion, even though they had only $40 billion in sales (that's *sales*, not profits) [48].

In early 2000, the speculative bubble burst, and the prices of dot-com stocks fell rapidly. The ensuing "dot-com bust" resulted in 862 high-tech start-ups going out of business between January 2000 and June 2002. Across the United States, the high-tech industry shed half a million jobs [49]. In San Francisco and Silicon Valley, the dot-com bust resulted in the loss of 13 percent of nonagricultural jobs, the worst downturn since the Great Depression [50].

10.4.4 Foreign Workers in the American IT Industry

Even while hundreds of thousands of information technology workers were losing their jobs, US companies hired tens of thousands of foreigners to work in the United States. The US government grants these workers visas allowing them to work in America. The two most common visas are called the H-1B and the L-1.

An H-1B visa allows a foreigner to work in the United States for up to six years. In order for a company to get an H-1B visa for a foreign employee, the company must demonstrate that there are no Americans qualified to do the job. The company must also pay the foreign worker the prevailing wage for the job. Information technology companies have made extensive use of H-1B visas to bring in skilled foreign workers and to hire foreign students graduating from US universities.

In the midst of the high-tech downturn, the US government continued to issue tens of thousands of H-1B visas: 163,600 in 2000–2001 and 79,100 in 2001–2002. Meanwhile, the unemployment rate among American computer science professionals was about 5.1 percent. Many of the 100,000 unemployed computer scientists complained to Congress about the large number of H-1B visas being issued. Some professional organizations

argued against giving out any H-1B visas at all [51]. Congress decided to drop the H-1B quota to 65,000 for the fiscal year beginning October 1, 2003, and it initially set a quota of 65,000 for the following fiscal year. However, the 65,000 H-1B visas approved for 2004–2005 were filled in a single day; representatives of universities and technology companies said the quota was set too low [52]. Bill Gates said, "Anyone who's got the education and the experience, they're not out there unemployed" [53]. Congress responded in May 2005 by allowing an exemption for an additional 20,000 foreigners with advanced degrees (master's or higher).

The annual quota of 65,000 H-1B visas and the exemption for 20,000 foreigners with advanced degrees remain in effect. During the deep economic recession of 2008–2009, the unemployment rate rose sharply, and the US Citizenship and Immigration Service had a difficult time filling the quota mandated by Congress. With about a month to go in the 2008–2009 fiscal year, the USCIS had received only 45,000 petitions for the regular H-1B visa and about 20,000 petitions for the advanced degree exemption [54].

The other important work visa is called the L-1. American companies use L-1 visas to move workers from overseas facilities to the United States for up to seven years. For example, Intel employees in Bangalore, India, could be transferred to Hillsboro, Oregon, if they held an L-1 visa. Employees brought in to the United States under an L-1 visa do not need to be paid the prevailing wage. That saves employers money.

Critics of L-1 visas claim lower-paid foreign workers are replacing higher-paid American workers within the walls of high-tech facilities located in the United States. The US Congress has put no limit on the number of L-1 visas that may be issued in any given year, but the number of foreigners working in the United States under L-1 visas is much smaller than the number holding H-1B visas. In 2006 about 50,000 foreigners were employed in the United States under the L-1 visa program [55].

10.4.5 Foreign Competition

The debate over the number of visas to grant foreign workers seeking employment in the United States should not mask another trend: the increasing capabilities of IT companies within developing nations, particularly China and India.

In 2004 IBM agreed to sell its PC division to Chinese computer manufacturer Lenovo for $1.75 billion, making Lenovo the number three manufacturer of PCs in the world [56]. A few months later, Chinese premier Wen Jiabao visited India to encourage new collaborations between Chinese hardware companies and Indian software companies [57]. Today China is the world's number one producer of computer hardware (Figure 10.9).

India's IT outsourcing industry is growing rapidly; Indian companies now employ more than a million people and have annual sales exceeding $17 billion. About 70 percent of these sales are in software engineering work, such as designing, programming, and maintaining computer programs. The other 30 percent of these sales are in IT-related services, such as call centers, medical transcription, and X-ray interpretation [58].

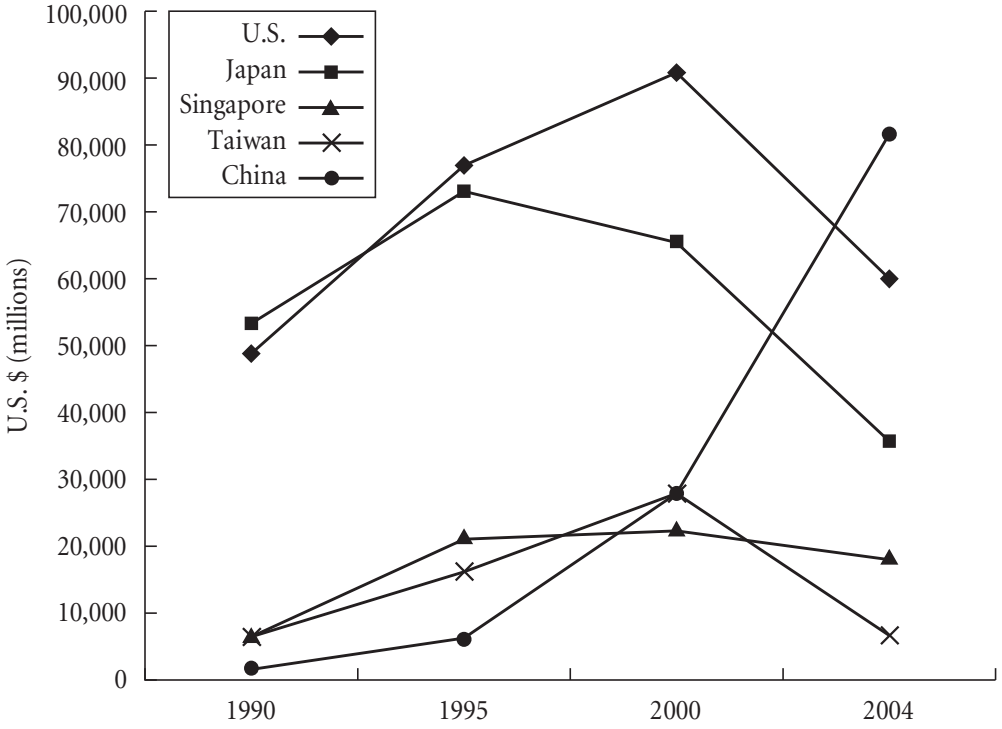

FIGURE 10.9 In 1990 China's computer hardware industry was virtually nonexistent. By 2004 China had become the world's leading computer hardware–producing nation.

Some Chinese universities are becoming recognized for their research expertise. For example, the Institute of Computing Technology at the Chinese Academy of Science and Tsinghua University have been actively involved in the development of the Open64 optimizing compiler [59].

More evidence of global competition comes from the annual Association for Computing Machinery International Collegiate Programming Contest. When the contest began 29 years ago, only schools from North America and Europe competed. Today it is a truly international competition. In fact, no American team has placed first since Harvey Mudd College in 1997. In the five-year period from 2009 through 2013, only one of the 20 teams earning medals was from the United States [60].

During the deep recession of 2008 and 2009, American corporations like Microsoft, General Electric, JPMorgan Chase, and Best Buy continued "offshoring" white-collar jobs to India and other countries in order reduce their cost of doing business [61].

10.5 The Digital Divide

The **digital divide** refers to the situation in which some people have access to modern information technology while others do not. The underlying assumption motivating the term is that people who use cell phones, computers, and the Internet have opportunities

denied to people without access to these devices. The idea of a digital divide became popular in the mid-1990s with the rapid growth in popularity of the World Wide Web.

According to Pippa Norris, the digital divide has two fundamentally different dimensions. The **global divide** refers to the disparity in Internet access between more industrialized and less industrialized nations. The **social divide** refers to the difference in access between the rich and poor within a particular country [62].

10.5.1 Global Divide

There is plenty of evidence of what Norris calls the global divide. One piece of evidence is the percentage of people with Internet access (Figure 10.10). In 2012 about 2.2 billion people, representing roughly 34 percent of the world's population, had access to the Internet. Access to the Internet in North America, Oceania/Australia, and Europe was significantly above this average, while access in Asia and Africa was well below. Only about 16 percent of the population—one out of every six persons—had Internet access in Africa in 2012 [63].

What is hampering Internet development in less technologically developed countries?

1. *Often there is little wealth.*

   In many of these countries there is not enough money to provide everyone in the country with the necessities of life, much less pay for Internet connections.

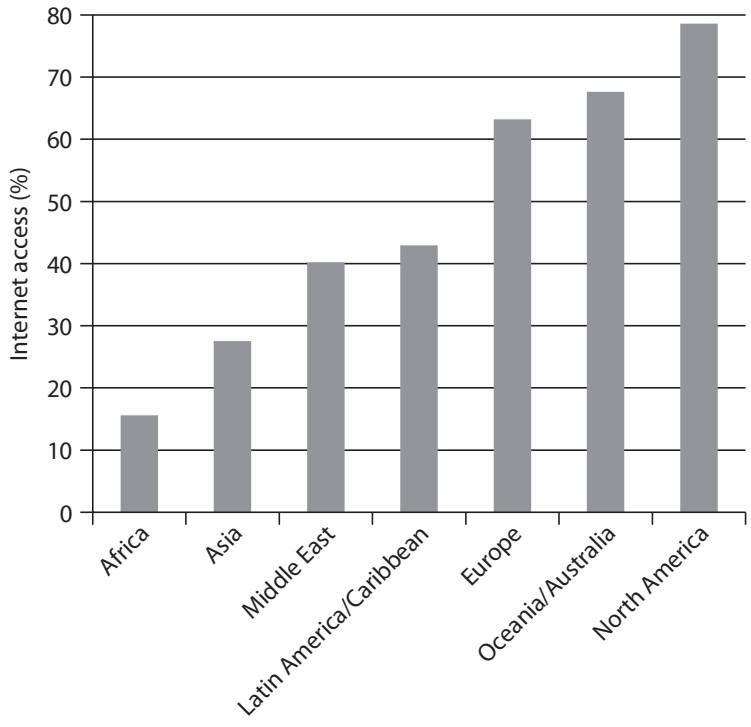

Figure 10.10 Percentage of people with Internet access, by world region.

2. *Many of these countries have an inadequate telecommunications infrastructure.*

   For example, less than 25 percent of the people in the following countries have cell phones: North Korea, Eritrea, Cuba, Kiribati, Somalia, South Sudan, Burundi, Ethiopia, Tuvalu, and Djibouti [64]. Many poor people have no access to newspapers, radio, or television [62].

3. *The primary language is not English.*

   English is the dominant language for business and scientific development, giving English-speaking countries a comparative advantage with respect to competing in the global marketplace.

4. *Literacy is low, and education is inadequate.*

   Half the population in poorer countries has no opportunity to attend secondary schools. There is a strong correlation between literacy and wealth, both for individuals and for societies [28].

5. *The country's culture may not make participating in the Information Age a priority* [65].

10.5.2 Social Divide

Even within wealthy countries such as the United States, the extent to which people use the Internet varies widely according to age, wealth, and educational achievement. Pew Internet polled Americans to find out how many made use of the Internet in the year 2008. Online access varied from 93 percent of 12- to 17-year-olds to 27 percent of those 76 and over [66]. A 2011 study revealed that fully 96 percent of adults living in households with annual incomes of at least $75,000 used the Internet, compared to 63 percent of adults living in households with annual incomes less than $30,000. While 94 percent of those with a college degree used the Internet, only 42 percent of those who dropped out of high school went online [67].

10.5.3 Models of Technological Diffusion

New technologies are usually expensive. Hence the first people to adopt new technologies are those who are better off. As the technology matures, its price drops dramatically, enabling more people to acquire it. Eventually the price of the technology gets low enough that it becomes available to nearly everyone.

The history of the consumer VCR illustrates this phenomenon. The first VHS VCR, introduced by RCA in 1977, retailed for $1,000 ($3,562 in 2009 dollars). In 2009 you could buy a VHS VCR from a mass-marketer for under $30. That means between 1977 and 2009, the price of a VCR in constant dollars fell by more than 99 percent! As the price declined, more people could afford to purchase a VCR and sales increased rapidly. The VCR progressed from a luxury that only the rich could afford to a consumer product found in nearly every American household.

Technological diffusion refers to the rate at which a new technology is assimilated into a society. Two different theories predict how a new technology is acquired by people

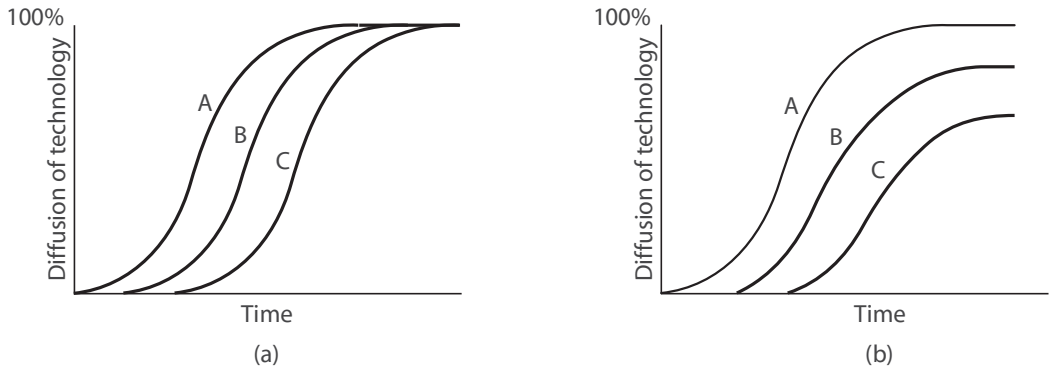

Figure 10.11 Two models for technological diffusion. In both models the most advantaged group A is the first to adopt a new technology, while the least advantaged group C is the last to adopt it. (a) In the normalization model, the technology is eventually embraced by nearly everyone in all groups. (b) In the stratification model, the eventual adoption rate of the technology is lower for less advantaged groups.

in a society, based on their socioeconomic status (Figure 10.11). We divide society into three groups. People with the highest socioeconomic status are in group A, people with the lowest socioeconomic status are in group C, and group B consists of those people in the middle.

In the **normalization model** (Figure 10.11a), group A begins to adopt the technology first, followed by group B, and finally group C. However, at some point nearly everyone in all three groups is using the new technology.

In the **stratification model** (Figure 10.11b), the order of adoption is the same. However, in this model the eventual number of people in group C who adopt the technology is lower than the number of adoptees in group A. The percentage of people in group B who adopt the technology is somewhere between the levels of the other two groups.

Technological optimists believe the global adoption of information technology will follow the normalization model. Information technology will make the world a better place by reducing poverty in developing countries. Creating opportunities elsewhere will reduce the number of people trying to immigrate into the United States.

Technological pessimists believe information technology adoption will follow the stratification model, leading to a permanent condition of "haves" and "have nots." Information technology will only exacerbate existing inequalities between rich and poor nations and between rich and poor people within each nation [62].

Technological pessimists point out that the gap between the richest 20 countries and the poorest 20 countries continues to grow. In 1960 the average gross domestic product (GDP) of the richest countries was 18 times larger than the average GDP of the poorest countries. By 1995 the gap had grown to 37 times greater. Some of the poorest countries grew even poorer during the last third of the twentieth century [28].

Figure 10.12 Unemployed workers in Ennis, Ireland, resisted using the Internet to receive their benefits, preferring to report in person to the social welfare office, where they could visit with other people. (© Richard Cummins/Corbis)

10.5.4 Critiques of the Digital Divide

Mark Warschauer has suggested three reasons why the term "digital divide" is not helpful. First, it tends to promote the idea that the difference between the "haves" and the "have nots" is simply a question of access. Some politicians have jumped to the conclusion that providing technology will close the divide. Warschauer says this approach will not work. To back his claim, he gives as an example the story of a small town in Ireland.

While many factories in Ireland produced IT products, there was not a lot of IT use among Irish citizens. Ireland's telecommunications company held a contest in 1997 to select and fund an "Information Age Town." The winner was Ennis, a town of 15,000 in western Ireland (Figure 10.12). The $22 million in prize money represented $1,200 per resident, a large sum for a poor community. Every business was equipped with an Integrated Services Digital Network (ISDN) line, a Web site, and a smart card reader. Every family received a smart card and a personal computer.

Three years later, there was little evidence of people using the new technology. Devices had been introduced without adequately explaining to the people why they might want to use them. The benefits were not obvious. Sometimes the technology competed with social systems that were working just fine. For example, before the introduction of the new technology, unemployed workers visited the social welfare office three times a

week to sign in and get an unemployment payment. These visits served an important social function for the unemployed people. It gave them an opportunity to visit with other people and keep their spirits up. Once the PCs were introduced, the workers were supposed to "sign in" and receive their payments over the Internet. Many of the workers did not like the new system. It appears that many of the PCs were sold on the black market. The unemployed workers simply went back to reporting in person to the social welfare office.

For IT to make a difference, social systems must change as well. The introduction of information technology must take into account local culture, which includes language, literacy, and community values.

Warschauer's second criticism of the term "digital divide" is that it implies everyone is on one side or another of a huge canyon. Everybody is put into one of two categories: "haves" and "have nots." In reality access is a continuum, and each individual occupies a particular place on it. For example, how do you categorize someone who has a 56k modem connecting his PC to the Internet? Certainly that person has online access, but he is not able to retrieve the same wealth of material as someone with a broadband connection.

Third, Warschauer says that the term "digital divide" implies that a lack of access will lead to a less advantaged position in society. Is that the proper causality? Models of technological diffusion show that those with a less advantaged position in society tend to adopt new technologies at a later time, which is an argument that the causality goes the other way. In reality, there is no simple causality. Each factor affects the other [28].

Rob Kling has put it this way:

> [The] big problem with "the digital divide" framing is that it tends to connote "digital solutions," i.e., computers and telecommunications, without engaging the important set of complementary resources and complex interventions to support social inclusion, of which informational technology applications may be enabling elements, but are certainly insufficient when simply added to the status quo mix of resources and relationships." [28, pp. 7–8]

Finally, Warschauer points out that the Internet does not represent the pinnacle of information technology. In the next few decades, dramatic new technologies will be created. We will see these new technologies being adopted at different speeds, too.

10.5.5 Massive Open Online Courses

For the past several decades, the rate of tuition increases at universities and colleges in the United States has exceeded the inflation rate, making a college education increasingly difficult for students from poorer families. Free massive open online courses (MOOCs) are often promoted as a way to make higher education more affordable, which would help all students, but particularly those from lower socioeconomic backgrounds. In 2012 Colorado State University-Global became the first university in the United States to grant credit to students completing a particular MOOC in computer science [68]. Other universities are likely to follow. Is solving the problem of ever more expensive higher education as simple as providing access to online courses?

The Community College Research Center conducted a study of online education at two statewide community systems, one in the southern United States and the other in the western United States. Their study revealed that students who take online courses are less likely to complete and perform well in them, compared with students who take the same courses in a traditional classroom setting. The study also showed that the online experience widened the achievement gap between white and black students and between those with higher GPAs and those with lower GPAs [69].

The Community College Research Center study provides evidence that a shift toward online education could exacerbate differences in success rates that already exist between different subgroups of students. It reinforces Warschauer's point that the difference between the "haves" and the "have nots" in society is not simply a question of access to a technology or even information.

10.5.6 Net Neutrality

The corporations that operate the long-distance Internet backbone connections in the United States have suggested that they may begin **tiered service**—charging more for higher-priority routing of Internet packets. These companies have said that tiered service will be needed in the future to guarantee a satisfactory level of service to companies that require it, such as voice over IP (VoIP) providers [70].

Content providers such as Google and Yahoo! have combined with the American Library Association and consumer groups to oppose any notion of tiered service. These groups have asked the US Congress to enact "net neutrality" legislation that would require Internet service providers to treat all packets the same. Consumer groups suggest that if tiered service is enacted, only large corporations would be able to pay for the highest level of service. Small start-up companies wouldn't be able to compete with established corporate giants. Hence tiered service would discourage innovation and competition. Another argument against tiered service is based on the concern that companies controlling the Internet might block or degrade access to nonfavored content or applications [70]. For example, a customer with an AT&T/Yahoo! DSL connection might find that high-definition video content from AT&T channels performs better than high-definition video from other providers [71]. Net neutrality advocates say this is unfair and must be prevented, pointing out that 95 percent of consumers have only two choices for broadband access: the local cable company or the local telephone company [72].

Opponents of "net neutrality" legislation suggest that allowing people to pay more to get a higher quality of service can sometimes be to the benefit of consumers. For example, rapid delivery of data packets is more valuable to a person using the Internet for videoconferencing than a person who simply sends email messages. Internet backbone providers argue that even though there is currently enough bandwidth, the rapidly increasing popularity of YouTube and other online video sites will soon fill the Internet's data pipes. A significant amount of money is needed to upgrade the Internet infrastructure to support the higher-bandwidth applications of the future. This money ought to come from the companies that are selling access to the data-intensive content [70].

In a 2007 report, the US Federal Trade Commission concluded the market was becoming more, not less, competitive and suggested that Congress "proceed with caution"

before passing any legislation [70]. Even though it appears unlikely that Congress will pass any net neutrality legislation in the near future, Internet backbone providers are unlikely to move toward tiered service without getting some kind of approval from the FTC [73].

10.6 The "Winner–Take–All Society"

The Declaration of Independence states that "all men are created equal," but we live in a society in which some people have far more wealth and power than others. What if everyone were guaranteed roughly the same amount of income? The traditional answer to this question is that there would be little motivation for people to exert themselves, either mentally or physically. If everyone were paid the same, there would be no point in getting an education, taking risks, or working hard. Productivity would be low, and the overall standard of living would be poor. For this reason, many people believe a superior alternative is a market economy that rewards innovation, hard work, and risk taking by compensating people according to the value of the goods they produce.

In *The Winner-Take-All Society*, economists Robert Frank and Philip Cook explore the growth of markets in which a few top performers receive a disproportionate share of the rewards. Their book is the primary source for this section [74].

Frank and Cook observe that the winner-take-all phenomenon has existed for quite a while in the realms of sports, entertainment, and the arts. A few "superstar" athletes, actors, and novelists earn millions from their work and garner lucrative endorsements, while those who perform at a slightly lower level make far less. However, the winner-take-all phenomenon has now spread throughout our global economy. Sometimes the qualitative difference between the top product and the second-best product is very slight, yet that can be the difference between success and failure. Hence corporations compete for the top executive talent that can give them the edge over their competition. The compensation of CEOs at America's largest corporations has risen much faster than the wages of production workers (Figure 10.13) [75].

Several factors have led toward winner-take-all phenomena in our economy:

1. *Information technology and efficient transportation systems make it easier for a leading product to dominate the worldwide market.*

   For example, consider a music studio that has a digital recording of the world's best orchestra playing Beethoven's Symphony no. 5 in C Minor. The studio can produce millions of perfect copies of this recording, enough for every classical music lover on the planet. Why would anyone want to listen to the second-best orchestra when a CD of the best orchestra is available for virtually the same price?

2. *Network economies encourage people to flock to the same product.*

   If by chance you should need to use someone else's computer, it is far more likely that person will own a Windows PC than a Macintosh. In this respect, knowing how to use a Windows computer has greater utility than knowing how to use a Macintosh. If a person cannot decide which computer to purchase, this factor alone may encourage someone to buy a Windows PC.

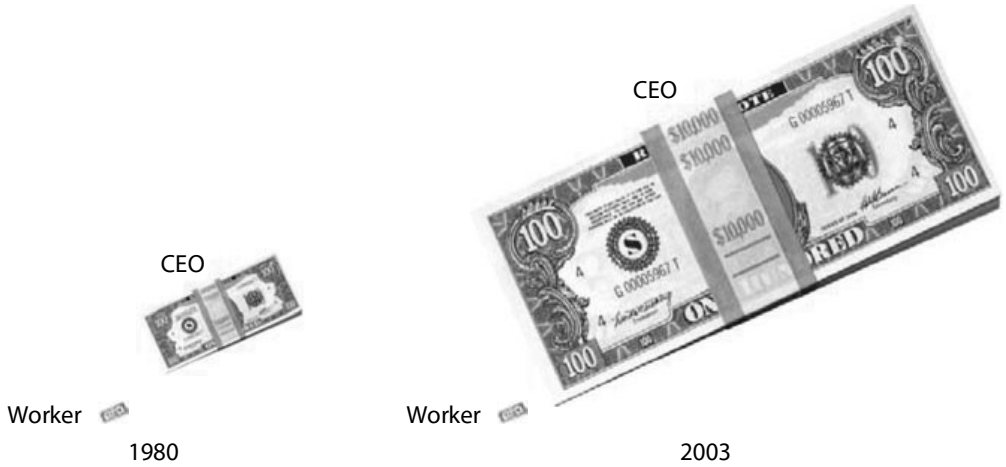

FIGURE 10.13 In 1980 the average pay for a CEO at a large American company was about 40 times the pay of a production worker. By 2003 the ratio had risen to about 400 to 1.

3. *English has become the de facto language of international business.*

   English is the native language in 12 countries, including the United States, which is the dominant economic power on the planet. Another 56 countries teach English in their schools. The dominance of English makes it easier for products to find a worldwide market.

4. *Business norms have changed.*

   In the past large businesses promoted from within and would not recruit executives from other firms. Today firms vigorously compete with each other for top executive talent.

10.6.1 Harmful Effects of Winner–Take–All

Frank and Cook argue that winner-take-all effects are bad for the economy for a variety of reasons. First, winner-take-all markets increase the gap between the rich and the poor. Between 1979 and 1989, the inflation-adjusted incomes of the top 1 percent of US wage earners doubled, while the median income was flat and the average income of the bottom 20 percent actually declined.

Winner-take-all effects draw some of the most talented people into socially unproductive work. The problem with winner-take-all contests is that they attract too many contestants. For every comedian who hosts a late-night talk show, tens of thousands of comedians struggle in nightclubs, hoping for their big break. The multimillion-dollar incomes of a relatively few high-profile attorneys help attract many of the brightest college students toward law school. We end up with a glut of lawyers. Meanwhile, there is a shortage of nurses and nuclear engineers.

Winner-take-all markets create wasteful investment and consumption. For example, there is fierce competition among candidates for slots in the top business and law schools. No one wants to go for an interview looking less than his or her best. For this reason, male interviewees are reluctant to show up for an interview wearing a suit that

costs less than $600. But if everyone is wearing a $600 suit, no one has an advantage over the others due to his attire. If they had all spent $300 on their suits, there would have been the same relative equity. The behavior of business school applicants is similar to an arms race. The desire to seek an advantage leads to an escalation of consumption, even if the eventual result is simply parity.

A disproportionate share of the best and brightest college students become concentrated in a few elite institutions. "The day has already arrived," write Frank and Cook, "when failure to have an elite undergraduate degree closes certain doors completely, no matter what other stellar credentials a student might possess" [74, p. 11]. Many Wall Street firms will not even interview candidates who did not graduate from one of a very small number of top law schools. These law schools show a preference for graduates of elite undergraduate programs. Hence high school students interested in reaching the top of the legal profession know their best chance is to do their undergraduate work at an elite school. The result is a tremendous competition for a relatively small number of openings at these colleges, while in truth there are hundreds of top-quality public and private colleges and universities in the United States.

Winner-take-all is not fair because it gives much greater rewards to the top performers than those whose performance is only slightly inferior. Here is an example from the world of professional sports, where winnings and performance data are objective and publicly available. Jim Furyk and Brian Bateman both play on the PGA Tour. Their skill levels are very close (see Table 10.2), but near the end of the 2009 season, Furyk had won 99 times as much in prize money as Bateman.

Winner-take-all markets harm our culture. Here's why. People are social; they like to read the same books and see the same movies as their friends. It gives them something to talk about. Suppose two books have about the same appeal to a consumer, but one of them is on a best-seller list. The consumer is more likely to select the book on the best-seller list, because it increases the probability she will encounter a friend who has read it. But that means it's really important for a book publisher to get its books on the best-seller list. Publishers know that books written by "name" authors have a greater chance of making the best-seller list than books written by new authors. This knowledge

Metric	*Brian Bateman*	*Jim Furyk*
Driving distance (yards)	289.1	278.1
Driving accuracy (%)	56.23	70.24
Greens in regulation (%)	63.95	64.67
Putts/round	29.42	28.17
Scoring average	71.89	70.24
Tournaments entered	21	21
Winnings	$35,379	$3,514,215

Table 10.2 Comparison of personal statistics of PGA Tour professionals Brian Bateman and Jim Furyk near the end of the 2009 season.

can lead a publisher to give a big advance to a well-known author to produce a second-rate work, rather than invest the same resources in developing an unknown, but more talented, author. The same effect happens with movie producers. Hoping for the largest possible sales on the first weekend, they bankroll second-rate sequels to big hits rather than original stories filmed by lesser-known directors.

10.6.2 Reducing Winner–Take–All Effects

If winner-take-all markets have harmful consequences on our economy and society, what can be done? Frank and Cook suggest four ways to reduce winner-take-all effects. First, societies can enact laws limiting the number of hours that stores remain open for business. These laws ensure parity among competing businesses and prevent them from engaging in positional arms races. Without these laws, one business may extend its hours in order to gain an advantage over its competitors. Soon all of its competitors follow suit. Parity is restored, but now all the employees must bear the burden of the longer hours. Regulations on business hours are often called "blue laws."

Second, in the absence of laws, businesses can form cooperative agreements to reduce positional arms races. An example is when a group of professional sports team owners agree to establish a cap on team salaries.

Third, more progressive tax structures reduce excess competition for the few handsomely rewarded positions. Back in 1961, the marginal tax rate on income in the highest tax bracket was 91 percent. By 1989, the highest marginal income tax rate had been lowered to 28 percent. Consumption taxes and luxury taxes are other ways of targeting the wealthiest people. Heavily taxing those with the highest incomes makes a higher income less attractive and dissuades some people from competing for the highest-paying jobs. Society benefits when these people engage in more productive work.

Finally, campaign finance reform can reduce the political power of the wealthiest 1 percent of the population, who control more than one-third of the wealth. Reducing the political power of the very wealthy is another way to reduce the attraction of competing for the highest-paying positions.

Summary

This chapter has explored a variety of ways in which information technology and automation have affected the workplace. We began by asking the question, Does automation increase unemployment? On the surface, the answer to this question seems obvious: of course automation increases unemployment. That is what automation means—replacing human labor with machine labor. Industrial robots, voice mail systems, and a myriad of other devices have displaced millions of workers over the past 50 years. However, a deeper look reveals how automation can create jobs, too. When products are less expensive, more people want to buy them, increasing the number that must be made. If products are less expensive, consumers have more money left to spend, which increases demand for other products. Finally, some people are involved in creating and maintaining the machines themselves. For these reasons, the rapid introduction of auto-

mation has not yet led to widespread unemployment in the countries where automation is used the most. In fact, the total number of manufacturing jobs worldwide continues to increase.

Thanks to automation, productivity has more than doubled since World War II. However, the length of the workweek in the most highly industrialized nations has not decreased by half. Instead, productivity has been used to increase the standard of living. This choice is understandable, since our society defines success in terms of wealth and material possessions. However, not all cultures have the same values. People in some "primitive" cultures choose to work much shorter hours.

Intelligent robots have been a fixture of science fiction novels for more than 60 years. In the past decade, however, faster microprocessors have enabled AI researchers to create systems capable of amazing feats. A few ethicists have suggested that we temper our efforts to create ever more intelligent computers with some reflection about how highly intelligent computers would affect society.

Information technology has transformed the way businesses organize themselves. Rapid and inexpensive communications allow many more information channels to open up within organizations, which can speed processes and eliminate middlemen. Evidence of more flexible organizational structures include the rise of telework and multinational teams. Improvements in information technology have also given management unprecedented access to the moment-by-moment activities of employees. Workplace monitoring has become the rule rather than the exception in large corporations.

As modern information technology has spread around the world, corporations form tightly connected networks and sell their products and services in many markets. This process is called globalization. Advocates of globalization claim it creates jobs for people in poorer countries and increases competition, resulting in lower prices and a higher standard of living for everyone. Critics of globalization say it forces workers in highly developed countries to compete with people willing to work for a fraction of the pay.

The notion that only manufacturing jobs could be lost to overseas competition has been disproved by recent events. While the dot-com bust has put hundreds of thousands of IT professionals out of work in the United States, American companies shipped hundreds of thousands of jobs to India and other countries where well-educated people work for a fraction of what an American earns. Unemployed American high-tech workers have criticized companies for hiring large numbers of foreigners to work in the United States under H-1B or L-1 visas. Companies respond that reducing labor costs is a necessity in a competitive marketplace. In order to survive and thrive, companies must keep prices down and profits up.

The "digital divide" is a way of dividing people into two groups: those who have access to information technology and those who do not. The term is based on the premise that access to information technology is a prerequisite for success in the Information Age. Some also assume that simply giving people access to the technology solves the problem. Pippa Norris points out that there are several fundamentally different dimensions to the digital divide. One dimension separates the more industrialized nations from the less industrialized nations. Another dimension separates rich and poor within

a particular country. Mark Warschauer says the notion of a digital divide is too simplistic for three reasons. First, people have widely varying access to information technology. Access should be seen as a continuum, not a division into "haves" and "have nots." Second, simply giving people information technology devices, such as computers, cell phones, and Internet accounts, does not guarantee they will take full advantage of the opportunities those devices provide. For IT to make a difference, social systems must be taken into account. According to Warschauer, the use of information technology "is a social practice, involving access to physical artifacts, content, skills, and social support" [28, p. 46]. Third, it's too simplistic to say that a lack of access causes someone to have lower socioeconomic status. You could just as easily say that people with lower socioeconomic status adopt new technologies later. In reality, each factor influences the other.

Frank and Cook invented the term "winner-take-all society" to refer to the way that information technology, the spread of English, network effects, and other factors are creating marketplaces where a few top performers gain a disproportionate share of the rewards. They present evidence that winner-take-all effects harm our economy and our culture, and they suggest actions that can be taken to reduce the winner-take-all phenomenon.

Review Questions

1. What are some benefits brought about by automation? What are some harms brought about by automation?
2. What evidence has been given to show that automation eliminates jobs? What evidence has been given to show that automation creates more jobs than it destroys?
3. If automation has doubled productivity since World War II, why hasn't the workweek gotten shorter?
4. How can information technology lead to changes in the structure of an organization?
5. How can telework improve the environment?
6. Why do teleworkers fret about being less visible?
7. Proponents of globalization claim that it helps workers in developing countries. Opponents of globalization claim the opposite. Summarize the arguments pro and con.
8. How does Norris categorize the digital divide?
9. Why does Warschauer say the notion of the digital divide is too simplistic and perhaps harmful?

Discussion Questions

10. Do you agree with Voltaire that a lack of work results in boredom and vice?
11. Would you accept a salaried position (paying a certain amount each month) if you knew it would require you to work at least 50 hours per week in order to complete the required work?

12. If automation leads to chronic and widespread unemployment, should the government provide long-term unemployed adult citizens with the opportunity to do meaningful work at a wage that will keep them out of poverty? Why or why not?

13. Is it wrong to create machines capable of making human labor obsolete?

14. The Umpire Information System, produced by QuesTec, demonstrates that a computer can call balls and strikes more accurately than a human umpire. In fact, the system is being used by Major League Baseball to evaluate the accuracy of the umpires' calls. Should Major League Baseball allow the Umpire Information System to have the final say on calling balls and strikes?

15. Will humans become demoralized by the presence of vastly more intelligent robots? If so, is it wrong to work on the development of such robots?

16. Is it morally acceptable to work on the development of an intelligent machine if it cannot be guaranteed the machine's actions will be benevolent?

17. How will our notions of intellectual property change if computers become capable of creative work?

18. How will our ideas about privacy have to change if legions of superfast computers are analyzing the electronic records of our lives?

19. Kant says that humans should always be treated as ends in themselves, never merely as means to an end. Are there any circumstances under which an intelligent computer should be given the same consideration?

20. It is possible to program responses into computers that simulate human emotions. For example, when a computer taking on the role of a nurse hears a parent say, "My child has diarrhea," it can respond, "I'm sorry to hear that." Studies have shown that people can develop an emotional bond with machines that appear to demonstrate human feelings such as empathy. Is it wrong to encourage these attachments by programming computers to mimic human emotions?

21. A multinational corporation has an office in Palo Alto, California, and an office in Bangalore, India. A 21-year-old American computer science graduate works as a software tester at the Palo Alto office. A 21-year-old Indian computer science graduate has an identical position at the Bangalore office. The American earns $65,000 per year in salary and benefits; the Indian earns $15,000 per year in salary and benefits. Is this arrangement moral? Should the company give equal pay and benefits for equal work?

22. Do you support the concept of tiered Internet service, providing higher bandwidth to those who pay for premium service? To what extent does tiered Internet service already exist?

23. Would the music industry be healthier if winner-take-all effects were reduced? If so, which of the proposed solutions in Section 10.6.2 would make the most sense for the music industry?

24. Should the federal government discourage companies from taking advantage of their salaried employees by requiring firms to pay overtime to any employee who works more than 40 hours in one week?

25. Do you agree with Martin Ford (interviewed at the end of this chapter) that countries need to introduce guaranteed income schemes to preserve the market for goods and services?

In–Class Exercises

26. A multinational corporation transfers a foreign employee to the United States on an L-1 visa. The foreign employee is a computer programmer, working alongside an American computer programmer doing the same work. Both programmers joined the company five years ago after graduating from college. Their training, skills, and experience are virtually identical.

    Divide the class into two groups, pro and con, to debate the following proposition: "The salaries and benefits of the two computer programmers should be roughly equivalent."

27. You lead a group of five software engineers involved in the testing of a new product. Your manager tells you that because of a company-wide layoff, you need to give notice to one member of your team. From your interactions with the team members, you can easily identify the two members who are least productive, but you are not sure which of them you should lay off. You know that the company keeps track of all Internet traffic to each person's computer, although you have never shared this information with your team. You could use this information to determine how much time, if any, these two employees are spending surfing the Web. Is it wrong to access these records?

28. A company runs a large technical support office. At any time, about 50 technical support specialists are on duty, answering phone calls from customers. The company is considering paying the technical support specialists based on two criteria: the average number of phone calls they answer per hour and the results of occasional customer satisfaction surveys. Debate the pros and cons of the proposed method of determining wages.

29. In this role-playing exercise, students weigh the pros and cons of working for companies with different philosophies about work.

    Company A is a large, established hardware and software company. Employees have a reasonable level of job security, although there have been layoffs in the past few years. Salaries are highly competitive. The company offers stock options, but the stock price is not rising rapidly, and employees know they are not going to get rich from selling their options. The typical programmer works about 45 hours a week.

    Company B is a medium-sized, mature software company that plays a dominant role in a specialized market. The company has never had to lay off employees. Salaries are a little low by industry standards, but programmers get paid overtime when they work more than 40 hours a week. The company discourages managers from resorting to overtime work on projects. Many employees are involved in community activities, such as coaching their kids' sports teams.

    Company C is a small start-up company trying to be the first to bring a new kind of shopping experience to the Web. Salaries are not high, but all the employees have a lot of stock options. If the product is successful, everyone expects to become a multimillionaire when the company goes public in a couple of years. In return for the stock options, the founders expect a total commitment from all the employees until the

product is released. Every programmer in the company is working 10 hours a day, 7 days a week.

Divide the class into four groups: three groups of recruiters and one group of students about to graduate from college. Each group of recruiters, representing one of the three companies, should make a "pitch" that highlights the reasons why their company represents the best opportunity. The graduates should raise possible negative aspects of working for each company.

30. Debate the following proposition: "It is immoral for a corporation to pay its chief executive officer (CEO) 400 times as much as a production worker."

Further Reading and Viewing

Nick Bilton. "The Robot World Is Emerging at Amazon." *New York Times*, March 26, 2012.

Jason Borenstein. "Work Life in the Robotic Age." *Communications of the ACM*, July 2010.

Philip K. Dick. *Do Androids Dream of Electric Sheep?* Del Ray, New York, NY, 1996. (Originally published in 1968)

Alan Joch. "Debating Net Neutrality." *Communications of the ACM*, October 2009.

Kevin Kelly. "Better Than Human: Why Robots Will—and Must—Take Our Jobs." *Wired*, December 24, 2012. www.wired.com.

Yul Kwon. "Made in the USA." *America Revisited*, May 2, 2012. 53:10. video.pbs.org.

Steven Levy. "The AI Revolution Is On." *Wired*, January 2010.

"Morals and the Machine" and "March of the Robots." *Economist*, June 2, 2012.

"Not Always with Us." *Economist*, June 1, 2013.

A. Pawlowski. "Why Is America the 'No-Vacation Nation'?" CNN, May 23, 2011. www.cnn.com.

Daniel Suarez. "The Kill Decision Shouldn't Belong to a Robot." TED Talk, June 2013. 13:20. www.ted.com/talks/.

Sebastian Thrun. "Google's Driverless Car." TED Talk, March 2011. 4:14. www.ted.com/talks/.

Kurt Vonnegut, Jr. *Player Piano*. Dell, New York, NY, 1988. (Originally published in 1952.)

References

[1] Jeffrey Kosseff. "US Calls, India Answers." *Sunday Oregonian* (Portland, Oregon), October 5, 2003.

[2] Vikas Balaj. "A New Capital of Call Centers." *New York Times*, November 25, 2011.

[3] Isaac Asimov. "Runaround." *Amazing Science Fiction*, March 1942.

[4] Kurt Vonnegut Jr. *Player Piano*. Delacourte Press, New York, NY, 1952.

[5] "The Misery of Manufacturing." *Economist*, pp. 61–62, September 27, 2003.

[6] Todd Lassa. "Toyota, Chrysler Have North America's Most Efficient Plants." *Motor Trend* (blog), July 5, 2008. blogs.motortrend.com.

[7] Stanley Aronowitz, Dawn Esposito, William DiFazio, and Margaret Yard. "The Post-Work Manifesto." In *Post-Work: The Wages of Cybernation*, pp. 31–80. Edited by Stanley Aronowitz and Jonathan Cutler. Routledge, New York, NY, 1998.

[8] Michael Gurstein. "Perspectives on Urban and Rural Community Informatics: Theory and Performance, Community Informatics and Strategies for Flexible Networking." In *Closing the Digital Divide: Transforming Regional Economies and Communities with Information Technology*, pp. 1–11. Edited by Stewart Marshall, Wallace Taylor, and Xinghuo Yu. Praeger, Westport, CT, 2003.

[9] Louis Uchitelle and N. R. Kleinfield. "The Price of Jobs Lost." In *The Downsizing of America*. Times Books/Random House, New York, NY, 1996.

[10] Juliet B. Schor. *The Overworked American: The Unexpected Decline of Leisure*. Basic Books, New York, NY, 1991.

[11] Melissa Will. "Hyper Business or Just . . . Hyperbusy." *Women in Business* 53(3), May/June 2001.

[12] Michael H. Strople. "Bears, Bulls, and Brokers: Employment Trends in the Securities Industry." *Monthly Labor Review Online* 128(12), December 2005. www.bls.gov.

[13] Martin Carnoy. *Sustaining the New Economy: Work, Family, and the Community in the Information Age*. Russell Sage Foundation/Harvard University Press, New York, NY/Cambridge, MA, 2000.

[14] Max Weber. *The Protestant Ethic and the Spirit of Capitalism*. Translated by Talcott Parsons, with foreword by R. H. Tawney. Charles Scribner's Sons, New York, NY, 1958.

[15] Hans Moravec. *Robot: Mere Machine to Transcendent Mind*. Oxford University Press, Oxford, England, 1999.

[16] Anthony Ralton, Edwin D. Reilly, and David Hemmendinger, editors. *Encyclopedia of Computer Science*. 4th ed. Groves Dictionaries, New York, NY, 2000.

[17] Steven Ashley. "Driving between the Lines." *Mechanical Engineering* 117(11), November 1995.

[18] Monty Newborn. *Deep Blue: An Artificial Intelligence Milestone*. Springer, 2002.

[19] "Humanoids on the March." *Economist*, March 12, 2005.

[20] "Better Than People." *Economist*, December 20, 2005.

[21] Electrolux. "The Trilobite 2.0." August 3, 2005. www.electrolux.com/node613.asp.

[22] Joshua Davis. "Say Hello to Stanley." *Wired*, January 2006.

[23] Richard G. Epstein. "Now Hiring: Dogs and Humans Need Not Apply." *Ethics and Information Technology* 1:227–236, 1999.

[24] Michael R. LaChat. "Artificial Intelligence and Ethics: An Exercise in the Moral Imagination." *AI Magazine*, pp. 70–79, Summer 1986.

[25] AAAI Presidential Panel on Long-Term AI Futures. "Interim Report from the Panel Chairs." August 2009. http://research.microsoft.com/en-us/um/people/horvitz.

[26] M. Castells. "The Informational Economy and the New International Division of Labor." In *The New Global Economy in the Information Age: Reflections on Our Changing World*, pp. 15–43. Edited by M. Carnoy, M. Castells, S. S. Cohen, and F. H. Cardoso. Pennsylvania State University Press, University Park, PA, 1993.

[27] Charles Babcock, Doug Brown, and Louis Trager. "Do You Live in the Internet's Rust Belt?" *Interactive Week*, September 4, 2000.

[28] Mark Warschauer. *Technology and Social Inclusion: Rethinking the Digital Divide*. MIT Press, Cambridge, MA, 2003.

[29] Mike Gray, Noel Hodson, and Gil Gordon. *Teleworking Explained*. John Wiley & Sons, Chichester, England, 1993.

[30] Lance Whitney. "Report: Two of Every Five of Workers Telecommute." *CNET News*, October 9, 2009. news.cnet.com.

[31] Joel Kugelmass. *Telecommuting: A Manager's Guide to Flexible Work Arrangements*. Lexington Books, New York, NY, 1995.

[32] American Management Association. "2007 Electronic Monitoring & Surveillance Survey." February 28, 2008. press.amanet.org.

[33] "Employers Take a Closer Look." *InformationWeek.com*, pp. 40–41, July 15, 2002.

[34] Rachel Fielding. "Management Week: Web Misuse Rife in UK Firms." *VNU NET*, July 15, 2002.

[35] "Stopping Workplace Internet Abuse—First Step Is Identifying Scope of the Problem." *PR Newswire*, October 7, 2002.

[36] Carl Weinschenk. "Prying Eyes." *Information Security*, August 2002.

[37] Melissa Solomon. "Watching Workers; the Dos and Don'ts of Monitoring Employee Productivity." *Computerworld*, July 8, 2002.

[38] Murray Chass. "Umpires Renew Objections to Computer System." *New York Times*, March 4, 2003.

[39] Katie Hafner. "Where the Hall Monitor Is a Webcam." *New York Times*, February 27, 2003.

[40] Sam Dillon. "Classroom Cameras Catch Every Move." *Sunday Oregonian* (Portland, Oregon), September 28, 2003.

[41] Andrew Urbaczewski and Leonard M. Jessup. "Does Electronic Monitoring of Employee Internet Usage Work?" *Communications of the ACM* 45(1):80–83, January 2002.

[42] Robert X. Cringely. "Holy Cow! What Are All These Programmers Doing in India?" *I, Cringely*, PBS, July 10, 1997. www.pbs.org/cringely.

[43] Cindy Easton. "Offshore Software Development: Is It Helping or Hurting Our Economy?" *Cursor* (Software Association of Oregon Newsletter), February 2003.

[44] Patrick Thibodeau. "Survey: One in Four IT Jobs Moving Offshore." *Computerworld*, December 9, 2008. www.computerworld.com.

[45] "One World?" *Economist*, October 16, 1997.

[46] Paul Krugman. "Enemies of the WTO; Bogus Arguments against the World Trade Organization." *Slate*, November 24, 1999. www.slate.msn.com.

[47] Anthony B. Bradley. "Corn Subsidies at Root of US–Mexico Immigration Problems." Acton Institute, February 29, 2012. www.acton.org.

[48] Anthony Perkins. "Investors: Brace Yourselves for the Next Bubble Bath." *Red Herring*, pp. 21–22, November 13, 2000.

[49] Reuters. "Technology Sector Lost 560,000 Jobs in Two Years." *NYTimes.com*, March 19, 2003.

[50] Joseph Menn. "Data Reveals Severity of Tech's Pain." *Los Angeles Times*, March 7, 2003.

[51] Patrick Thibodeau. "H-1B Visa Count Down, Anger Up." *Computerworld*, February 3, 2003.

[52] Patrick Thibodeau. "Feds to Research 20,000 H-1B Visas Next Week." *Computerworld*, May 4, 2005.

[53] Eric Chabrow. "Opposing Views: The Debate over the H-1B Visa Program." *Information Week*, May 9, 2005.

[54] US Citizenship and Immigration Services. "Cap Count for H-1B and H-2B Workers for Fiscal Year 2010." September 3, 2009. www.uscis.gov.

[55] Ephraim Schwartz. "Senators Open Inquiry of L-1 Visa Program." *InfoWorld*, June 27, 2007. www.infoworld.com.

[56] "Chinese Firm Buys IBM PC Business." *BBC News*, December 8, 2004.

[57] S. Srinivasan. "Chinese PM Seeks Indian Tech Cooperation." *Associated Press*, April 10, 2005.

[58] Stella M. Hopkins. "Offshoring to India Taking Off." *Charlotte* (*NC*) *Observer*, June 28, 2005.

[59] Alban Douillet, Juergen Ributzka, and Suneel Jain. "Open64 Compiler and Tools." sourceforge.net/projects/open64/.

[60] ACM International Collegiate Programming Contest (Web site). Accessed August 1, 2013. cm.baylor.edu /ICPCWiki/.

[61] Betsy Stark. "Companies Moving White-Collar Jobs Abroad." *ABC News*, July 29, 2009. http://abcnews.go.com.

[62] Pippa Norris. *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*. Cambridge University Press, Cambridge, England, 2001.

[63] Internet World Stats: Usage and Population Statistics. "World Internet Usage and Population Statistics." June 30, 2012. www.internetworldstats.com.

[64] Telecom Asia. "World's Least Penetrated Mobile Markets." *Telecom Ramblings*, January 24, 2013. www.telecomramblings.com.

[65] Elena Murelli. *Breaking the Digital Divide: Implications for Developing Countries*. Edited and with foreword by Rogers W'o Okot-Uma. SFI Publishing, 2002.

[66] Sydney Jones. "Generations Online in 2009." Pew Internet & American Life Project. January 28, 2009. www.pewinternet.org.

[67] Pew Internet & American Life Project. "Demographics of Internet Users." May 2011. www.pewinternet.org.

[68] Steve Kolowich. "A University's Offer of Credit for a MOOC Gets No Takers." *Chronicle of Higher Education*, July 8, 2013.

[69] Community College Research Center. "What We Know about Online Course Outcomes." Columbia University, April 2013. ccrc.tc.columbia.edu.

[70] "Broadband Connectivity Competition Policy." Federal Trade Commission, Washington, DC, June 2007.

[71] Jim Louderback. "Winter of My Discontent." *PC Magazine*, April 10, 2007.

[72] S. Derek Turner. "Give Net Neutrality a Chance." *BusinessWeek Online*, July 12, 2007.

[73] Joan Engebretson. "Giants Face Off on Net Neutrality." *Telephony*, February 19, 2007.

[74] Robert H. Frank and Philip J. Cook. *The Winner-Take-All Society*. Penguin Books, New York, NY, 1995.

[75] "Where's the Stick?" *Economist*, p. 13, October 11, 2003.