

New Communication Technology

The impact of technology has been discussed throughout this text beginning with an analysis of the digital age (see chap. 1). Networks, the way we connect, “have reshaped our world over the past two centuries—railroads, highways, airports, oil and gas pipelines, TV broadcasting, the electric power grid, and, of course, global telecommunications.” “The IT [information technology] revolution was funded by the Pentagon, which sought to create a fast system of communication that the Russians could not access—the Internet” (Issak, 2005, p. 6). “What emerged in the late 20th century was the ‘virtual organization’: a collective learning network that can almost simultaneously produce and deliver products and services at any time, in any place, and in any variety in order to provide customer satisfaction” (Issak, 2005, p. 90). In many places, a new kind of workplace that is dispersed, flexible, and people-centered is emerging as a result of new communication technologies. “By mastering speed, the virtual corporation creates processes so functionally specific and user-friendly that they are irresistible. These organizations are fast, targeted, knock-quality. The future is your future, and made to order: You can see it, taste it, touch it, buy it” (Issak, 2005, p. 90). Companies are installing chief information officers (CIO) who ensure that organizations use information technology in ways that help its workforce develop the best competitive advantages (Gates, 1999). “The second-generation Internet technologies—combined with the Web itself and e-mail—are drastically reducing the cost of communicating, finding things, and distributing and receiving services online” (Lohr, 2006, p. E1). Globally, expertise can travel digitally so the experts do not have to. “Procter & Gamble uses online networks to get in touch with thousands of experts worldwide” (Hamm, 2006, p. 72). For example, a professor in Bologna, Italy, invented a method for printing edible images onto food, which P&G used to create Pringles potato chips with jokes and pictures printed on them. The digital collaboration boosted Pringles’ growth into the double digits whereas similar collaborations have helped P&G to produce 100 new products in the past 2 years (Hamm, 2006).

College students have become highly connected, with nearly 92% of them arriving at school with their own computer or laptop (“Survey Finds College Students,” 2005) and chatting on instant messenger an average of 10.5 hours per week (D. Anderson, 2006). This massive increase in technology usage is

reflected at home where three fourths of all U.S. homes will be wired for Internet access by 2006 (Tracy, 2004). In fact, "the typical family will spend \$595 on communications services ... to surf the Internet, use a wireless phone, or pay someone—up from \$175 in 1995" (Superville, 2001, p. 9A). "The willingness to use the Internet crosses generational gaps. In 2005, 65% of the U.S. population from 50–64 used the Internet whereas in 1998, only 31% did so" (Stockey & Laird, p. 1A). Since 1995, more than "200 million people have plugged computers into the Net, by far the fastest spread of a new communications technology ever" (Schlender, 2000, p. 90). At the same time, people do not automatically shop or bank online. "Even the tech-savvy Generation Y prefers handling the merchandise before closing the deal. When asked where they shop, most (73.8%) say they prefer stores compared with 21.9% who would rather shop online" reports the Texas Tech University Institute for Internet Buyer Behavior ("Is Gen Y," 2001, p. 16). Likewise, college students represent more than \$175 billion in consumer spending (Odell, 2005), yet only 32% of them will buy back-to-school supplies online (Hull, 2005).

As we move through the 21st century, these technologies will shape our organizations. The remainder of this chapter examines four facets of technology. First, we analyze the relationship between organizations and technology. Second, we provide an overview of the new communication technologies. Third, we examine six information systems. Perhaps the most important issue leads to the chapter's summary. What are the implications of the new technology?

This analysis covers the following key concepts:

- Organizations and technology
- Mechanization, automation, and technology
- New information technologies
- Types of systems
- Implications: Benefits and challenges

Organizations and Technology

Three claims place the impact of new technology on organizations in context. First, technology always has a major impact on organizations. Technology is a cornerstone of organizational activity ranging from equipment for mass production to delivery systems (e.g., trucks, planes) to digital processes. The new communication and information technologies (e.g., e-mail, teleconferencing, computer conferencing, personal computers and local area networks [LAN], interactive cable television, videotext and teletext, satellite communications), computer networks, computer-aided manufacturing (e.g., CAM; robotics) and computer-assisted design (CAD) shift from physically moving things to processing information. Information technologies are driving economic wealth (Katz, 1997). The performance of technology (ability to produce more effectively or efficiently) doubles every 18 months at the same cost for

operation (Hollis, 1999). The way or installing a new technological component.

Second, we are interested in the development of new technologies, and efficient. With cybernetworks, as file cabinets, and in importance with technology. This increased "single point of failure" (Koulopoulos, 1999).

Third, organizations simply as and storing and cell phones and utilizing process, we are replace data for a new type. This will require and solve problems "processes" (Dunfee, 1999). ing organizations grow into stages of the

Mechanization

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operation (Hollis, 1996). Compare that speed of change with building a highway or installing a system. Table 12.1 provides a short summary of the major technological connecting processes in organizations.

Second, we are in the middle of massive changes and turbulent times (see chap. 1). For organizations, "computer networking ... may be the most important development in the management of organizations since DuPont, General Motors, and others invented the modern corporation" (Stewart, 1994, p. 44). With cybernetworks, traditional organizational sources of information such as file cabinets, memos, minutes, and face-to-face meetings will diminish in importance as they are replaced by advances in communication technology. This increased connectivity means organizational members can find a "single point of access to all the information they need to get their jobs done" (Koulopoulos, 1997, p. 223).

Third, organizations and individuals must move from using the technologies simply as a means for improving current activities (e.g., better collecting and storing of data; word processing replaces typing; e-mail replaces memos; cell phones replace land lines) to developing improved information gathering and utilizing procedures. When we improve, make easier, or replace a current process, we are automating. We move from *automate* to *informate* when we replace data-crunching with analysis and diagnosis (Zuboff, 1989). This calls for a new type of organization—one based on information (Drucker, 1998). This will require "flexible, learning organizations that continuously change and solve problems through interconnected coordinated self-organizing processes" (Daft & Lewin, 1993, p. 1). "Think of the Intranet as a living, evolving organism that feeds on information. With the proper nourishment, it can grow into a knowledge network" (Cohen, 1998, p. 56). To gain the full advantages of the new communication technologies, we must understand them.

Mechanization, Automation, and Technology

The early applications of technology included mechanization and automation. The original assembly line operations used machines to replace the physical actions of individuals, which is *mechanization*. With mechanization, employees either facilitate the machine's operation (e.g., operators, maintenance) or coordinate the people-machine process (e.g., managers, supervisors). The greater the technological complexity, the lower the human input.

The development of more sophisticated technology led to *automation*, where machines are capable of self-regulation and act as substitutes for an employees' sensory mechanisms. People changed from merely being an extension of the machine to managing the machines. In some cases, the machines relieved individuals of laborious tasks (e.g., repetitive functions—peeling potatoes; meticulous detail work—finding bad potatoes). In other cases, machines have taken over because they do a better job (e.g., finding defective

Intranet	Used to distribute information and speed data among offices. Secure "firewalls" usually protect the intranet from unauthorized users. An intranet can use the Internet to reach multiple business locations.
Extranet	When selected business partners are granted access to a company's intranet. Authorized users (e.g., suppliers, distributors, customers) can view data the company makes available.
Local area network (LAN)	A data network, typically set up within a building, which transmits data in small chunks, called packets, allowing many computers to use the network at the same time.
Wide area network (WAN)	A computer network that covers a wide geographical area, such as a state or country.
Audioconferencing	Conference calls allowing three or more sites to interact in voice only.
Videoconferencing	Conferencing that allows participants to both see and hear each other. The term includes two-way and multipoint conferencing between rooms and desktops.
Desktop videoconferencing (DVC)	Videoconferencing from a personal computer or dedicated system located on an individual's desk.
Multipoint conference unit (MCU)	The bridge linking three or more videoconferencing locations.
World Wide Web (WWW)	Comprises an area of the Internet using graphics and hypertexts to communicate information.
Wireless application protocol (WAP)	Standard for linking the Internet to mobile phones.
Short message service (SMS)	The ability to send and receive text messages on mobile phones.
Global system for mobile (GSM)	The de facto digital phone standard in use around the world.

parts, printers for computers, detail work). *Robotics* is a melding of mechanization and automation. This technology ranges in sophistication from simple, repetitive assembly line operation where the steps are stored in the robot's program to machines capable of making decisions regarding the production.

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New Information Technologies

Information is a competitive tool that can be used effectively through information technologies. For example, communication technologies are used by more than 500 organizations to connect their geographically dispersed members (Kiesler, 1999). E-mail usage is on the rise. In 2002, 31 billion e-mail messages were sent daily—that number is expected to increase to 60 billion in 2006 (Kiesler & Mahowald, 2002). Internets, Intranets, videoconferencing, and other technologies are used by companies to share information at a hyper-fast speed to remain competitive (Meyers & Davis, 1998). Computers and microchips allow information to be found, stored, retrieved, and utilized in a myriad of ways (Kiesler, 1994). Computers extend the mind by offering assistance in completing numerous mental functions (e.g., keeping track of finances, spelling, research). For researchers, inventors, and designers, computers allow simulations of complex events heretofore requiring years of investigation.

New technologies tend to push older ones aside (e.g., manual typewriters, card-stack library research, handwritten letters). One powerful example is the telephone. The telephone extended the ear's hearing range, developed new patterns of interaction and connectedness, and significantly altered the ways people approach communication. For organizations, the telephone "made it possible for managers to leave the factory floor, for salespeople to change offices in quick response to client demands, for customers to order products directly, [and] for companies to establish branch offices" (Kiesler, 1986, p. 47). It also allowed for the creation of a single corporate headquarters.

The public telephone was a mainstay for salespeople, college students, and, according to the movies and television, blackmailers, drug dealers, and gangsters like Tony Soprano. Superman dressed in a telephone booth, Tippi Hedren used it for a refuge in *The Birds*, and Robert Redford had a lifeline when he was on the run from killers in *Three Days of the Condor*. Pay phones are still important to low-income American households that do not have traditional landlines. However, since cell phones have been introduced, more than 11 million pay phones have been removed (more than 300,000 were removed between the years 1998–2001; more than 700,000 were removed between the years 2000–2004; Hampson, 2001; Mallozzi, 2006). Cell phones have become ubiquitous. In June 2000, there were 97 million users (Koch, 2006). In 2001, around 188 million Americans had cell phones—this is nearly four times the number in 1995, with 54% of the 105 million U.S. households having at least one cell phone (Hampson, 2001; Superville, 2001). By 2006, there were 202.8 million U.S. cell phone users (Koch, 2006) and more than 2 billion worldwide (Hewak, 2005).

Not all media are created equal and the differences determine the potential for adoption.

Media Richness

Media are considered rich when there is a sense of social presence. Leaner media do not carry all types of information simultaneously (Harris & Sherblom, 2005). "The speed of feedback permitted by the medium, the number and types of sensory channels utilized by the medium, the perceived personalness of the source when communicating over the medium, and the richness of language used with the medium" determine media richness (Komsky, 1991, p. 314). Interpersonal communication is very rich because there are ongoing verbal and nonverbal transactions. Annual corporate reports, bank statements, or other financial documents rank very low in media richness. Newsletters are a little better because they carry some information that might involve the reader. E-mail, telephone, and videoconferences complete the path from financial statements (leanest) to interpersonal (richest).

To be effective, we must select the most appropriate communication media for the task (Rice, 1992). Ambiguous situations, such as a newly forming team or an unresolved conflict, require rich media. Studies of product development teams show the importance of working at one location rather than using information technologies (i.e., e-mail) because of the impact of media richness on the development process (Madhavan & Grover, 1998). A clear example of the impact of media richness is found in shopping behaviors. Online shopping still constitutes less than 10% of American retail, and experts do not expect online shopping to pass one fourth of consumers' spending for decades (C. Anderson, 2006). People enjoy doing things, such as shopping, with other people (C. Anderson, 2006). However, as we become more involved in certain types of computer-mediated communication activities such as teams, we learn to develop relationships that can be very interpersonally rewarding. In some cases, the "slower relationship development through a leaner medium may even be an asset to the growth of greater depths in personal intimacy, trust, co-orientation, and affection among group members" (Harris & Sherblom, 2005, p. 327; Walther, 1996).

An important distinction is between *synchronous* and *asynchronous* systems. When there is simultaneous communication (e.g., verbal, nonverbal, ongoing feedback) as in interpersonal transactions, the medium is synchronous. If there is one-way communication as with e-mail, the medium is asynchronous. Videoconferencing is synchronous whereas voice mail is not. This distinction explains the difficulty some organizational members have in adapting to new technologies that might diminish the synchronous nature of a relationship. "The most surprising result (of a Fortune 500 internal survey) was that each individual had one preferred method that he or she used almost exclusively. Almost half preferred written materials, whereas 20% wanted the reassurance of one-to-one conversations. Some had made the switch to high-tech resources and the remainder said that regardless of what other methods

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...they would continue to rely on their coworkers" (Rupp, 1996, 35% of 400 managers polled by the American Management Association said they used e-mail the most over the telephone (26%) and face-to-face (15%). However, "despite the high use of electronic messaging, they still prefer the in-person talks" (Armour, 1998, p. 1A). The concept of richness is important because predictions are that people will have communication satisfaction with a richer media as we just learned. ...and phone calls, however efficient, cannot substitute for face time. ...certain chemical reactions between individuals when we go face to face can't happen in a virtual organization" (Dahl, 2005, p. 44). Studies show that as we become more familiar with certain media (e.g., e-mail), we use emoticons such as :-(for unhappy or <:-) for dumb question, we adjust our expectations and find additional means for creating a sense of richness. *What types of systems are organizations utilizing?*

Communication Systems

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Communication Systems

...communication systems are designed to augment human communication; computer-mediated communication systems (CMCS) "have become a corner-stone of the activities of knowledge workers in the information age and the future" (Compton, White, & DeWine, 1991, p. 23). CMCS change the way of information people receive, overcome temporal and geographical barriers, standard operating procedures, and organizational norms. Examples of CMCS. E-mail has extended our ideas of what we define as asynchronous communication. It is remarkably popular because we can write, edit, and send on our own timetable. Because it is *asynchronous*, meaning messages can be sent and received at different times, no coordination of time and face communication is needed. It works well when the messages are brief, such as giving instructions, and it increases the likelihood for asynchronous communication. Likewise, "blogs, collaborative databases (called wikis) and open-source software development all use the Net to handle much of the coordination among people rather than relying on top-down command and control" (Mandel, 2005, p. 62).

...wanting ideas without physical presence is one of the clear benefits of CMCS. ...forums, connected knowledge bases, electronic bulletin boards, library virtual conference rooms all facilitate exchanges between employees,

...were available they would continue to rely on their coworkers" (Rupp, 1996, p. 17). More than 35% of 400 managers polled by the American Management Association said they used e-mail the most over the telephone (26%) and face-to-face meetings (15%). However, "despite the high use of electronic messaging, 56% admit they still prefer the in-person talks" (Armour, 1998, p. 1A).

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Communication Systems

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Voice messaging, e-mail, videoconferences, and integrated systems are all examples of CMCS. E-mail has extended our ideas of what we define as *asynchronous communication*. It is remarkably popular because we can write, edit, store and send on our own timetable. Because it is *asynchronous*, meaning the messages can be sent and received at different times, no coordination of face-to-face communication is needed. It works well when the messages are well defined, such as giving instructions, and it increases the likelihood for upward communication. Likewise, "blogs, collaborative databases (called *wikis*) and open-source software development all use the Net to handle much of the coordination among people rather than relying on top-down command and control" (Mandel, 2005, p. 62).

Sharing ideas without physical presence is one of the clear benefits of CMCS. Online forums, connected knowledge bases, electronic bulletin boards, libraries, and virtual conference rooms all facilitate exchanges between employees,

allow researchers and problem solvers to exchange proposals, presentations, spreadsheets, technical specs, and swap ideas. The *law of telecoms* states that distances will shrink and eventually become irrelevant and the web of computer networks expand (J. S. Brown, 1998). To utilize the full benefits of these opportunities, organizations must alter traditional information control processes. "A realization that organizations using Intranets have accepted is that to remain competitive in the future, organizations will need to abandon their ideas of information hoarding and embrace knowledge-sharing" (Greengard, 1998, p. 82).

Meetings can be dramatically altered. Absent participants can eavesdrop and add information electronically. Meeting notes can be available to all interested parties instantaneously. Chase Manhattan, Merrill Lynch, and IBM are using software to create *chat rooms* where discussions can be held in real-time (Row, 1998). Discussions with customers, colleagues, or distant experts can occur without leaving your PC.

This electronically created trail also raises a limitation because it might inhibit participants from even using the electronic channels that act as a permanent record. Information, such as deleted e-mail messages, reside in the company's computer system just waiting for a data specialist to retrieve it (E. Brown, 1998). There are other limitations to e-mail. Some individuals react quickly to situations with emotional responses called *flaming*. Because we can post our messages instantly, we might send the emotionally charged message before we have calmed down, presenting a significant issue for organizations (Kennedy, 1997).

Telecommuting or teleworking is the ability to work at locations away from the traditional office with an electronic (e.g., computer, telecommunication connection) connection. In 2000, an estimated 25 million people telecommuted all or part time, an increase from 11 million in 1995. By the end of 2005, the number of people worldwide who work from home at least 1 day a month reached 82.5 million and is predicted to grow to more than 100 million by the end of 2008 (Cable News Network, 2006). "Productivity gains of 10% to 40% and cost savings of \$6,000 to \$12,000 per year are common in employers" who allow telecommuting ("Virtual offices," 2000, p. 9). Eighteen companies on *Fortune's* "100 Best Companies to Work For" offer telecommuting (Levering & Moskowitz, 2000). High-tech, information processing, or knowledge-driven industries are the most likely users. Telecommuting can place the employee close to a customer or client. Any organization can use telecommuting if a job requires more time on the computer or phone than in face-to-face meetings. Currently, 87% of the executives polled by Robert Half International indicated that there would be an increase in telecommuting in the coming decade (Cable News Network, 2006). "According to the recent *Fortune* magazine's survey of the 100 best U.S. companies, 79 allow employees

to telecommute at least 1 day a week. 40% of the employees at Hewlett Packard, 30% at Microsoft, and 20% at IBM telecommute on a full time basis.

Distance is its biggest barrier. Rarely part of the important information, the telecommuter is at a disadvantage for additional information to be undertaken. Telecommuting is less successful than face-to-face regular visits to the office.

Mobile, or mobile telecommuting, connects workers to the office. Hewlett Packard, 2005; Microsoft, 2000; IBM, 2000. Mobile systems (e.g., mobile phones, PDAs) feature wireless connectivity.

Operational telecommuting is the ability to work at locations away from the traditional office with an electronic (e.g., computer, telecommunication connection) connection. In 2000, an estimated 25 million people telecommuted all or part time, an increase from 11 million in 1995. By the end of 2005, the number of people worldwide who work from home at least 1 day a month reached 82.5 million and is predicted to grow to more than 100 million by the end of 2008 (Cable News Network, 2006). "Productivity gains of 10% to 40% and cost savings of \$6,000 to \$12,000 per year are common in employers" who allow telecommuting ("Virtual offices," 2000, p. 9). Eighteen companies on *Fortune's* "100 Best Companies to Work For" offer telecommuting (Levering & Moskowitz, 2000). High-tech, information processing, or knowledge-driven industries are the most likely users. Telecommuting can place the employee close to a customer or client. Any organization can use telecommuting if a job requires more time on the computer or phone than in face-to-face meetings. Currently, 87% of the executives polled by Robert Half International indicated that there would be an increase in telecommuting in the coming decade (Cable News Network, 2006). "According to the recent *Fortune* magazine's survey of the 100 best U.S. companies, 79 allow employees

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proposals, presentation of telecommute at least 20% of their time. In one of the chosen organizations, 70% of the employees work from home!" ("Can I Work at Home," 2006). "At Hewlett Packard, 70% of the U.S. employees have the flexibility to telecommute on a full time, regular, or occasional basis" (Frauenheim, 2005, p. 12).

Distance is its biggest drawback. Employees are disconnected from the culture, rarely participate in information problem-solving, and fail to develop important interpersonal relationships. When political issues arise, the telecommuter is at a distinct advantage and may fail to be adequately considered for additional opportunities or promotions. Careful training needs to be undertaken to assist the telecommuters and managers in making the process successful (Deeprase, 1999; Maruca, 1998; Tergesen, 1998). IBM requires regular visits to office at least once a week.

Mobile, or cell phones, are creating a revolution in how organizational members connect. By the end of 2005 there were 2 billion cell phones worldwide (Hewak, 2005) more than double the number of cell phones reported in 2001 (Bing, 2001). Most organizations have abandoned traditional communication systems (e.g., walkie-talkies, landlines) for the convenience and 24/7 (24 hrs/7 days) features of cell phones.

Operational Systems

Operational systems help with the structural aspects of work. As the name implies, routine activities can be examined to see where inefficiencies are occurring. Because procedures are standardized, a great deal of time and effort can be eliminated. "Computers and information technologies link previously semi-independent aspects of the production system more closely" (Osterman, 1989, p. 7). An overdependence on these systems, however, leads to a significant amount of depersonalization in the organization (Robey, 1991).

A useful example of the speed gained, and the personal influence lost, is with the credit approval process for a Visa charge. When a Visa card is used for a purchase, the elapsed time between the moment the clerk passes the card through a credit verification terminal and the approval code is 15 seconds (Verity, Coy, & Rothfeder, 1990). The approval path begins with National Data Corp.'s (NDC) computers in Cherry Hill, New Jersey. The request transfers to NDC headquarters in Atlanta for acceptance. If the amount is more than \$50, the Visa microcomputers send the query to the mainframes in McLean, Virginia, or San Mateo, California. The mainframe verifies the card and checks with the individual issuing bank to see if the money is available. The approval, or denial, is back—in 15 seconds. Your ATM card is an additional example.

Swipe cards have replaced time clocks, bar codes trace deliveries (e.g., UPS, FedEx), and prepayment cards are used for meals at universities and organizations. The data developed can be used to understand how people interact.

drawbacks

Control Systems

Control systems, using data collection and entry, monitor and evaluate organizational performance. These systems allow organizations to obtain "up-to-the-second views of inventories, receivables, and market demand at business units ranging from fast food to industrial chemicals to toy retailing. For many companies, networks have become essential means of production—their very 'value system'" (Verity et al., 1990, p. 143).

Computer checkouts at supermarkets, Wal-Marts, and other stores allow the control of inventories and a rapid response to changes in customer demand. Manufacturers, like Saturn, use SCADA (supervisory control and data acquisition) to run their complexes. At Saturn, the system became highly efficient when all employees were given easy-to-use graphical computers. Employees have been able to spot problems with brakes, air-bag deployments, power train controls, and so on (Gates, 1999). Office Depot links its trucks on 22,000 delivery routes through a wireless system that plans routes and keeps track of deliveries. The system has cut the time spent on filing and searching for delivery paperwork by 50% (Kessler, 2001). Aramark, a Philadelphia snack-supply company, keeps tracks of sales via a wireless handheld computer carried by delivery truck drivers.

Earlier, we discussed electronic monitoring. “Search engines make it possible for employers to scour all manner of digital dirt to vet employees” (Cain, 2006, p. 53). The American Management Association’s *2001 Survey of Workplace Monitoring & Surveillance* found that “more than three quarters of major U. S. companies now check employees’ e-mail, Internet, or telephone conversations, or videotape employees at work,” which is more than double the 53.3% in 1997 (“Employee surveillance,” 2001, pp. 8–9). Twenty-seven percent have fired employees for misuse of office e-mail or Internet connections and 65% have taken some disciplinary actions. “Your online reputation may precede you during a job search” (“Digital dirt,” 2006, p. 1D). “More than three fourths of executive recruiters said they routinely use search engines like Goggle and Yahoo to learn more about candidates. Even more significant, 35% said they have eliminated a candidate from consideration based on information discovered online” (“Digital dirt,” 2006, p. 1D).

Decision Support Systems

Decision support systems (DDS) operate as extensions of the planning and decision-making processes. Many management information systems (MIS) provide important information to managers to enhance the decision-making process. These systems range from relatively simple data support systems to complex forms of expert systems.

Group support systems (GSS) are various types of groupware to enhance the team process. The eight general categories are electronic

...messaging, calendar utilities and the support, information and business process. Decision-making cases can facilitate. In addition, a common news, and vigilance. Face-to-face situations. Face groups (Sussman). Regardless of the user has proven that (Partridge, 1990). The indicated the degree of formal members. Situations measure (see, 1994/6). The

mail/messaging, calendaring/scheduling, group document handling, workgroup utilities and development tools, group decision systems and meeting support, information sharing/conferencing products, workflow management, and business process design. Through a combination of computer technology, decision-making techniques, and group meeting procedures, these processes can facilitate problem solving and decision-making (Miranda, 1994). In addition, a commitment to full participation, consideration of diverse views, and vigilance in the information processing seem to be better than in face-to-face situations (Bordia, 1996). These systems take longer than face-to-face groups (Scott, 1999).

Regardless of the decision making system, leaving the final decision to the user has proven to be more successful than letting the system replace the user (Turnage, 1990). Earlier we discussed the use of information (see chap. 10) and indicated the depth of decision-making quality possessed by many organizational members. In many cases, the familiarity of an individual with specific situations means the best decision cannot simply be digitized (Groleau & Taylor, 1996). The entire process of empowerment assumes individual choices in making decisions and over control by DDS could become counterproductive.

Interorganizational Systems

Interorganizational systems link different organizations. Organizations have been able to increase their competitive advantage by cooperating in the design and use of interorganizational systems (Johnston & Vitale, 1988). All the previous communication technologies are used to link organizations to each other.

Implications

There are extensive arguments concerning the impact of new technology. We examine some of these arguments as they relate to the following three groups: organizations, leaders, and organizational members. At this point, many of the issues related to these three areas have been discussed in this chapter and earlier in the text. We focus on the benefits and challenges related to each of the three groups.

Implications for Organizations

Organizational Benefits

Improves Coordination and Productivity New communication technology has been associated with improvements in planning, promoting timely and complete feedback, controlling organizational activities, managing time, initiating action plans, responding to the environment, planning flexible work schedules, eliminating manual labor, composing documents, and preparing written documents" (Compton et al., 1991). GE expects to save \$18 million a year by going to a paperless office. It is removing almost any machine (e.g., fax

machines, desktop printers, copiers) that "spits out paper and isn't shared by a group of workers" (Moore, 2001, p. 10).

At Boeing, the time needed to complete a wide range of projects has been cut by 91% through groupware. Ford Motor Company uses an Intranet to manage design centers in Asia, Europe, and the United States, and to develop specific engineering designs. General Electric is saving \$240,000 a year in printing costs by using its Intranet to publish a dictionary of company information that is always up to date. FedEx allows customers to click their way through Internet web pages to track their parcels themselves, which saves \$2 million a year (Motz, 1998).

Flattens the Organization At practically every juncture in this text we have pointed to the virtues of increased contact within organizations and functional boundaries. In addition, empowering employees is fundamental to success. Increased amounts of participation, less centralized leadership, and more egalitarian participation occur with e-mail (Hollingshead, McGrath, & O'Connor, 1993). "It is now possible to have the economic benefits of very small organizations: freedom, motivation, creativity, and innovation" (Malone, 2006, p. 103). Because digital communication flattens organizations by removing access to information, people have the information to make decisions themselves instead of taking orders from someone above them. This creates a 'collective intelligence' where thousands of people and numerous computers solve problems in 'as intelligent a way as possible' (Malone, 2006, p. 103). Examples include Google, Wikipedia (world's biggest and perhaps most accurate encyclopedia), and InnoCenter, an Eli Lilly creation, which uses the world's largest research and development lab.

Organizational Challenges

Organizational Structures Must Change Outdated management schemes stand in the way of successful utilization of the new communication technologies. "Communications in the network are absolutely incompatible with a strict, parochial hierarchy" (Stewart, 1995, p. 50). Superiors must learn to empower, develop teams, and get out of the way. As organizations flatten and become wired, teams will need to create electronic meeting places, share files, develop message boards, and provide access to data if the potential savings are to be realized. If the current practices of using electronic monitoring and control continue, the potential benefits could be lost. In theory these networks should empower people to become better employees. In practice these knowledge-management networks create brave new information structures that effectively enforce employee compliance with organizational norms" (Schrage, 1999, p. 198).

Implications for Leaders

Leader Benefits

Increases Influence In contrast to our earlier discussions of how technology works to flatten organizations and to decrease the amount of top-down influence in decision-making, it also has the power to increase a leader's influence and visibility throughout multiple levels within the organization. New technology provides leaders with a variety of options with which to broadcast their messages. Many of these options have been discussed earlier in this chapter. Along with the increase in options comes the ability to follow up and reinforce messages like never before. Because technology has allowed for ease of messages transfer, middle managers can give feet to the leader's vision. As such, technology enables managers to tie operational goals into larger organizational strategies further enhancing the leader's influence at all levels.

Increases Accessibility Based on the *equalization hypothesis* (Dubrovsky, Kiesler, & Sethna, 1991; Hollingshead, 1996), communication through the use of new technologies may promote the development of what we call *electronic confidence* or *on-screen confidence*. This *e-confidence* not only encourages equal participation in decision-making within the organization, but also it can increase the flow of upward communication. E-mail and videoconferencing are just two ways in which organizational members who are in remote locations (or just down the hallway) can communicate regularly with each other and more importantly with the leadership of the organization. Leaders who, in the past, have found themselves losing touch with ground-level operations, may now have more insight into and more input from team members at all levels within the organization.

Leader Challenges

Greater Accountability The benefit of increased accessibility brings with it the challenge of greater accountability. This challenge works on two levels. First, technological advances allow leaders to more easily follow-up with subordinates regarding operational goals. Second, subordinates may also hold leaders to higher standards of follow-through when it comes to communicating organizational outcomes and effectiveness.

Competency Development Keeping pace with new technologies can be a daunting and expensive task. Organizations spend millions of dollars each year just to support computer-based technologies (Rains, 2005). Similarly, leaders will need to develop and maintain a level of technological competence to instill confidence in their ability to lead in the new world of virtual organizations. This, however, is a delicate balance. Leaders who are too tech-savvy may come

across as too involved and/or dependent on technology and thus lacking the human element involved in effective leadership (see chap. 11).

Implications for Organizational Members

Organizational Member Benefits

Improves Communication Electronic transmissions increase communication velocity, support collaborative work, and sustain both strong and weak ties among communication (Wellman et al., 1996). When the amount of participation is enhanced, the quality of ideas improves (Wellman et al., 1996). Communication with customers can be improved dramatically. The workforce is more connected—20% of U.S. workers are mobile at any one time and new communication technologies allow them to stay in contact with one another (Kessler, 2001). “Intranets are causing a systematic rethinking about the nature of employee-to-corporation and employee-to-employee relationships where every employee has instant ability to communicate work, thoughts, experiences, and solutions to every other employee. This new and expanded power of the employee will also create a set of responsibilities for all members in the organization” (Mutz, 1998, p. 16).

Increases Participation If used correctly, e-mail and other technologies can document an employee’s workload and involvement in organizational projects—giving them an opportunity to be recognized for outstanding contributions. Additionally, technology-driven group support systems (GSS) “minimize barriers to interaction and make it possible for all members to potentially influence group processes (Rains, 2005, p. 194). “[O]rganizational members are less aware of status differences and feel less inhibited about contributing information and sharing ideas ... [likewise] the opportunity for simultaneous input, or parallelism, makes it easier for all members to contribute” (Rains, 2005, p. 195).

Organizational Member Challenges

Decreases Personal Knowledge Confidence “[A] human being’s sense of confidence in using personal knowledge is forgotten in the absorption of Internet surfing, computer games, and derivative work on the computer. People seek knowledge in sorting through information that exists, rather than creating knowledge through personal experimentation and experience” (Issak, 2005, p. 90). But, technology is not the only means through which knowledge is obtained. “We have some experiences. We think through them. We develop a theory. And then we put two and two together. That’s the way learning works” (Gladwell, 2005, p. 9). Therefore, in contrast to access to new technology and information overload, we must also have confidence in our “adaptive unconscious” (Gladwell, 2005, p. 11). “The mind operates most efficiently by

integrating a good deal of high-level, sophisticated thinking to the unconscious. The adaptive unconscious does an excellent job of sizing up the world ... setting goals ... and initiating action ... " (Wilson, 2002).

Difficult to Escape Work We have moved from 9-to-5 to 24/7. Beepers, cell phones, and laptops make it difficult to leave the work behind. At work, many use e-mail, voice mail, and other technologies have lengthened their workday. ("More Tech," 199, p. 4). For example, *information overload* can occur. In 2001, workers spent an average of 49 minutes a day on e-mail, which is 30% more time than they did in 2000. In 2002, management-level workers were predicted to spend 4 hours a day on e-mail according to Ferris Research (Swartz, 2001). And, by 2005, employees were so overwhelmed by e-mail, they would invent ways to conceal the time they spent online from their employers (Sears, 2005).

Part of the overload problem stems from a lack of training. "While e-mail and voice mail have become the corporate way of life, only 15% of companies say they have trained their employees to use these tools" (Rupp, 1996, p.17).

Not all communication technologies create an overload. Internet- and e-mail-based messages can be controlled because we do not have to download the information. Of executives worldwide, 61% who were in the United States indicated that the Internet with the control feature is reducing information overload and only 19% claimed it was making matter worse ("New Age," 1998).

As we examine the benefits and challenges, we are confronted by the fundamental questions for any change. Will organizations, leaders, and organizational members make the appropriate adjustments to allow the potential power to develop? Ironically, with new communication technologies there is little doubt but that organizations will have to learn to utilize the potential power.

Conclusion

The new communication technologies are having a major impact on organizations and society. Mechanization, automation, and information technology represent the phases in the introduction of technology into organizations. Media richness explains how communication processes differ.

There are five types of information systems: communication, operational, control, decision support, and interorganizational. Each of these provides an organization with important opportunities for growth.

The benefits and challenges posed by the new communication technologies bring us back to the content of this text. Change is inevitable. How we respond to the change is the critical issue.

Handwritten notes:
 Difficult to escape work
 information overload
 employees were so overwhelmed by e-mail
 they would invent ways to conceal the time they spent online from their employers