CHAPTER 3

Network Computing: Discovery, Communication, and Collaboration

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

1. Understand the concepts of the Internet and the Web, their importance, and their capabilities.
2. Understand the role of intranets, extranets, and corporate portals for organizations.
3. Identify the various ways in which communication is executed over the Internet.
4. Demonstrate how people collaborate over the Internet, intranets, and extranets using various supporting tools, including voice technology and teleconferencing.
5. Describe groupware capabilities.
6. Describe and analyze the role of e-learning and distance learning.
7. Analyze telecommuting (teleworking) as a technosocial phenomenon.
8. Consider ethical and integration issues related to the use of network computing.

SAFEWAY COLLABORATES IN DESIGNING STORES

THE PROBLEM

Safeway plc, a large food retailer in the UK (now a subsidiary of Morrison Supermarkets) builds about 10 new stores every year and renovates over 100. Being in stiff competition with other supermarkets, the company must manage this construction carefully so it meets the budget and time plans. This is not an easy job, given that hundreds of the company's employees must collaborate with hundreds of vendors throughout the life-cycle of a building, including design, construction, and ongoing facility management.

In addition to stores, Safeway frequently builds public structures, such as a school or bridge, which it donates to a community in exchange for a parcel of land for a store. The diversity of structures (there are four types of stores plus community structures) adds to the difficulties in managing the construction projects. Previously, communications were handled primarily through the postal system and e-mail, an often slow and inefficient process, especially with stores scattered throughout England, Scotland, Wales, and Northern Ireland.

THE SOLUTION

By using an online project collaboration service, called Buzzsaw (from Autodesk.com), Safeway can store and share project information in a secure location that can be accessed any time and anywhere (using a Web-based extranet). This online collaboration enhances communication between internal departments and outside partners (such as developers, planning consultants, architects, structural and mechanical engineers, builders, repair staff, and building enforcement authorities). Key users can view drawings online, mock up drawings, make changes, and post revisions for other staff to view, all in real time (e.g., using screen-sharing capability). Buzzsaw also automatically tracks and logs what's been changed. Even banks with ATMs located in the stores can use the Buzzsaw, since their input is needed for designers.

THE RESULTS

The communication log time plummeted from 2 to 3 weeks to 5 to 10 minutes. Another benefit is the reduction in travel time and costs of architects and structural and mechanical engineers, who can stay in their offices collaborating electronically (10–15% reduction). Printing costs of architectural drawings have been reduced by 30 percent. Also, project turnaround time is shorter. Store modifications have been reduced from 6 to 7 months to as little as 3 months. Design changes are now transmitted in 5 to 10 minutes instead of 1 to 2 days. Also, because the design is rapid, it includes cutting-edge features; all supermarkets want the latest design. Buzzsaw is helping Safeway to be *first to market* with innovative new formats such as a design for Internet cafés and for certain store departments.

Collaboration is taken to a better, more integrated level. Users can monitor crucial information and the software, letting them know when decisions are required. Finally Buzzsaw provides enhanced e-mail that helps users to prioritize the large number of messages.

Source: Compiled from Parks (2004).

LESSONS LEARNED FROM THIS CASE

The Safeway opening case demonstrates the use of online communication and collaboration, via network computing, within a company and with its business partners. The system provides many capabilities, including the discovery of information and data. It has also resulted in significant improvements to the company and its business partners.

In this chapter we learn about the major capabilities of network computing to support discovery of information, communication, and collaboration activities in organizations. We also learn how organizations are exploiting network computing for e-learning and telecommuting.

3.1 NETWORK COMPUTING—AN OVERVIEW

An Overview of the Internet and the Web

Many aspects of the way we work and live in the twenty-first century will be determined by the vast web of electronic networks, which was referred to generally as the **information superhighway** but now is usually called the Internet. As you know from Chapter 1, the **Internet** is a *global network of computer networks*. It links the computing resources of businesses, government, and educational institutions using a common computer communication protocol, TCP/IP (described in Technology Guide 5). Because of its capabilities, the Internet (frequently referred to as "the Net") is rapidly becoming one of the most important information technologies today. It is clearly the most widely discussed IT topic of the new century.

Future versions of the Internet will allow even larger volume and a more rapid flow of information. Eventually we may see several information superhighways. It is probable that the original concept of a scientific-educational system will be separated from the commercial one. For example, in order to support advanced network applications and technologies, over 260 U.S. universities, working in partnership with industry and government, are working on a project named **Internet2** (*internet2.edu*). On Internet2, advanced next-generation applications such as remote diagnosis, digital libraries, distance education, online simulation, and virtual laboratories will enable people to collaborate and access information in ways not possible using today's Internet (Choi and Whinston, 2000). Another vision is that there will be several types of interrelated Internets, one for e-commerce, one for education, and so forth.

THE WORLD WIDE WEB. The **World Wide Web—the Web**—is the most widely used application on the Internet. Are the Internet and the World Wide

Web the same thing? Many people believe that the Web is synonymous with the Internet, but that is not the case. The Internet functions as the *transport mechanism,* and the Web (WWW, or W3) is an *application* that *uses* those transport functions. Other applications also run on the Internet, with e-mail being the most widely used.

The Web is a system with universally accepted standards for storing, retrieving, formatting, and displaying information via client/server architecture. The Web handles all types of digital information, including text, hypermedia, graphics, and sound. It uses graphical user interfaces, so it is very easy to use. See Technology Guide 5 for details.

THE EVOLUTION OF COMMERCIAL APPLICATIONS ON THE INTERNET. With the commercialization of the Internet in the early 1990s, we have seen an explosion of commercial applications. These applications evolve through four major phases: *presence, e-commerce, collaboration,* and *integration.* The major characteristics of each phase as they evolved over time are illustrated in Figure 3.1.

Specific applications in each phase are demonstrated throughout this book. Another way to look at the applications of the Internet is via the generic categories that they support, as presented next.

INTERNET APPLICATION CATEGORIES. The Internet supports applications in the following major categories:

- ***Discovery.*** Discovery involves browsing and information retrieval. As shown in the opening case, it provides customers the ability to view information in databases, download it, and/or process it. Discovery is automated by software agents since the amount of information on the Internet and

TIME

	Presence	E-commerce	Collaboration and Interaction	Integration and Services
Emphasis	Eyeballs (human review)	Revue, expansion	profit	Capabilities, services
Type of transaction	No transaction	B2C, C2C, C2B, G2C, e-CRM	B2B, B2E, supply chain, c-commerce, G2B	Portals, e-learning, m-commerce, l-commerce
Nature	Publish information	Process transaction	Collaborate	Integrate, provide services
Target	Pages	Process transaction	Digital systems	Digital environments
Concentrate on	Web sites	Web-enabled existing systems, dot-coms	Business transformation and consolidation	Internal and external integration
	1993–1994	**1995–1999**	**2000–2001**	**2001–2005**

FIGURE 3.1 The evolution of the Internet over time.

intranets is growing rapidly. Discovery methods and issues are described in Section 3.2.

- ***Communication.*** The Internet provides fast and inexpensive communication channels that range from messages posted on online bulletin boards to complex information exchanges among many organizations. It also includes information transfer (among computers and via wireline and wireless) and information processing. E-mail, chat groups, and newsgroups (Internet chat groups focused on specific categories of interest) are examples of major communication media presented in Section 3.3 and in Technology Guide 5.
- ***Collaboration.*** Due to improved communication, electronic collaboration between individuals and/or groups and collaboration between organizations are increasing rapidly. Several tools can be used, ranging from screen sharing and teleconferencing to group support systems, as we will illustrate in Section 3.5. Collaboration also includes resource-sharing services, which provide access to printers and specialized servers. Several collaboration software products, called groupware and workflow, can be used on the Internet and on other networks.

The Net is also used for education, entertainment, and work. People can access the content of newspapers, magazines, and books. They can download documents, and they can do research. They can correspond with friends and family, play games, listen to music, view movies and other cultural events, and even visit many major museums and galleries worldwide.

The Network Computing Infrastructure: Intranets and Extranets

In addition to the Internet and the Web there are a few other major infrastructures of network computing: value-added networks (VANs) (see Technology Guide 4), intranets, and extranets.

INTRANETS. As discussed in Chapter 2, an **intranet** is a network designed to serve the internal informational needs of a company, using Internet concepts and tools. It is a network confined to an organization for its internal use. It provides easy and inexpensive browsing and search capabilities.

Intranets also support communication and collaboration. They are frequently connected to the Internet, enabling a company to conduct e-commerce activities. (Such activities are facilitated by *extranets,* as described later in this chapter and in Chapter 8.) Using screen sharing and other groupware tools, intranets can be used to facilitate the work of groups. Companies also publish newsletters and deliver news to their employers via their intranets. For extensive information about intranets, see *intranetjournal.com*.

Intranets have the power to change organizational structures and cultures as well as procedures, and to help restructure corporations. Intranets can be implemented using different types of local area network (LAN) technologies including wireless LANs (see Technology Guide 4 and Chapter 6). *IT at Work 3.1* illustrates how a wireless LAN contributes to competitive advantage.

Intranets are used in all types of organizations, from manufacturers to health care providers to government agencies, to educational institutions. Examples of several intranet applications are available in Online File W3.1 at the book's Web site.

IT at Work 3.1
WIRELESS LANs SPEED STOCK REFILL

EMKE Groups, a retail giant in the Middle East, is using a wireless retail solution in its retail outlets in United Arab Emirates (UAE). The solution allows EMKE staff to make online requisition of goods from the retail outlets to a central warehouse, thus ensuring faster and correct replenishment of goods.

The group was using hand-held devices in a "batch process" to scan goods and upload the information to the back-office systems, entailing delays of several hours to update the system. Now it updates the system on wireless local area networks (WLANs) for its new stores; the new technology enables real-time updates. Real-time updates through the new system will give the retail group a strong advantage in a very competitive market, since stocks and merchandising can change quite regularly.

While implementing the new solution, the company shifted from traditional DOS-based mobile computers to the latest Pocket PC mobile computers, which enables staff to use multiple applications using the same hardware.

Performance of the new system turns out to be satisfactory. The group is going to implement the next generation of solutions in its upcoming new stores and its existing store in the UAE. It also intends to implement similar WLAN solutions in outlets in Kuwait and Oman.

Source: Compiled from Haugseth (2004).

For Further Exploration: What are possible disadvantages of using a wireless LAN?

EXTRANETS. An intranet's infrastructure is confined to an organization's boundaries, but not necessarily geographical ones; intranets can also be used to connect offices of the same company in different locations. As discussed in Chapter 2, another type of infrastructure that connects the intranets of *different organizations* is an **extranet.** An extranet is an infrastructure that allows *secure communications* among *business partners* over the Internet (using VPN; see Technology Guide 4). It offers secured accessibility to the intranets of the participating companies, as well as the necessary interorganizational communications, using Internet tools.

The use of extranets is rapidly increasing due to the large savings in communication costs (replacing expensive VANs) that can materialize. Extranets enable innovative applications of business-to-business (B2B) e-commerce (see Chapter 4). The National Semiconductor Corporation case study at the beginning of this chapter illustrates how NSC's customers could save time and effort in design by using design assistance offered through extranets. Finally, extranets are closely related to improved communications along the supply chain (for details see Technology Guide 4 and Chow, 2004).

The Internet, intranets, and extranets can be used in various ways in a corporate environment in order to gain competitive advantage. Examples are provided throughout the book and in Online File W3.2. An example of how a hypothetical company, Toys Inc., might use all network computing infrastructures is shown in Figure 3.2 (page 97). In addition, VANs are used by banks.

The *discovery, communication,* and *collaboration* capabilities available at low cost on the Internet, intranets, and extranets provide for a large number of useful applications. In the next four sections of this chapter, we discuss these capabilities. Many other applications are presented in Chapter 4 and throughout the book. See also Online Minicase W3.1 for an example of Web-based computing at National Semiconductor Corporation.

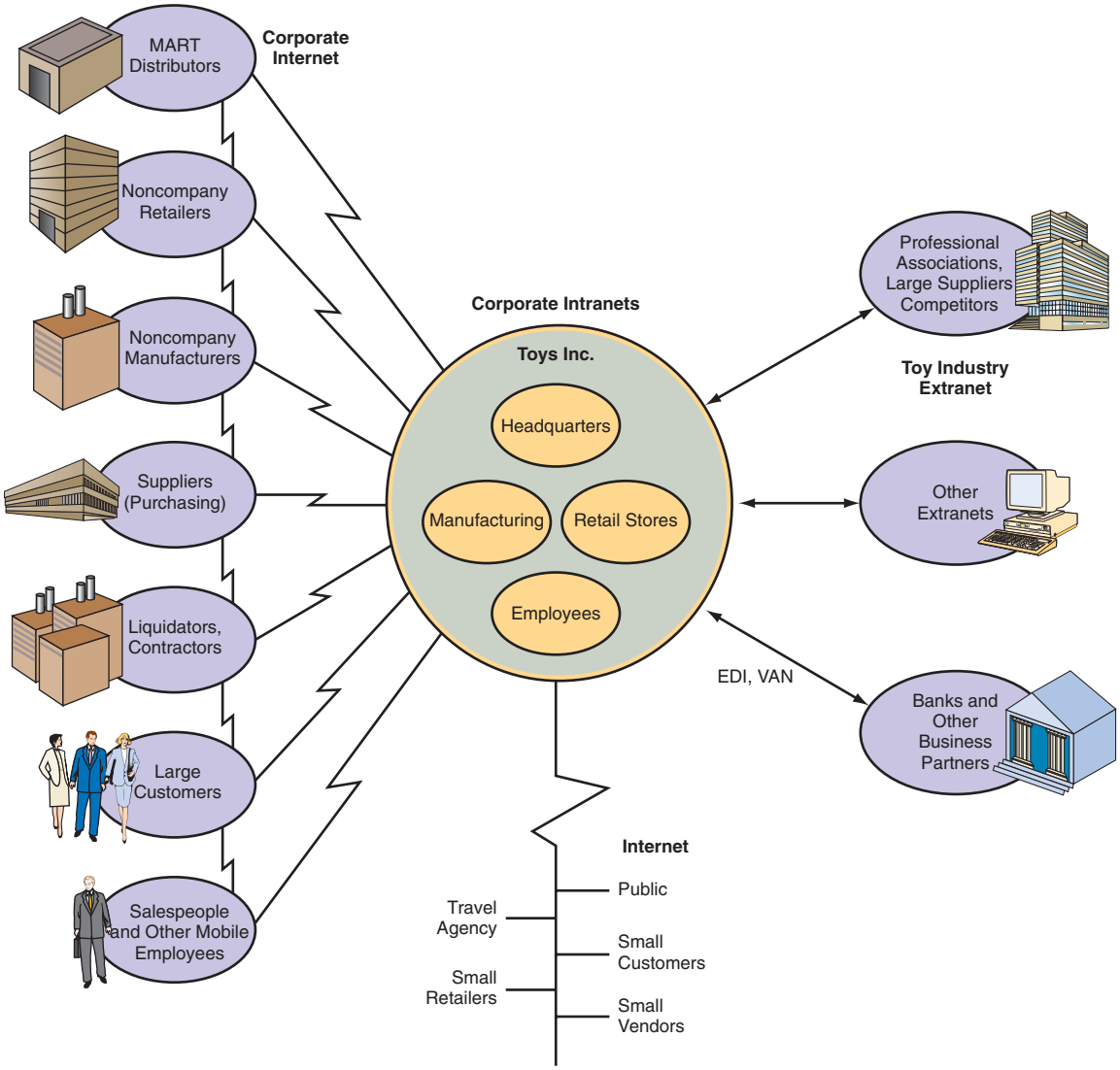


FIGURE 3.2 How a company uses the Internet, intranet, and extranets.

3.2 DISCOVERY

The Internet permits users to access information located in databases all over the world. Although only a small portion of organizational data may be accessible to Internet users, even that limited amount is enormous. Many fascinating resources are accessible. The discovery capability can facilitate education, government services, entertainment, and commerce. Discovery is done by *browsing* and *searching* data sources on the Web. Information can be either *static,* meaning staying basically unchanged, or *dynamic*. Dynamic information, such as stock prices or news, is changing constantly. The major problem of discovery is the huge amount of information available. The solution is to use different types of search and other software agents.

The Role of Internet Software Agents

A large number of Internet software agents can be used to automate and expedite discovery. **Software agents** are computer programs that carry out a set of routine computer tasks on behalf of the user and in so doing employ some sort of knowledge of the user's goals. We examine some of these agents in this section.

SEARCH ENGINES, DIRECTORIES, SOFTWARE, AND INTELLIGENT AGENTS. The amount of information on the Web is at least doubling every year. This makes navigating through the Web and gaining access to necessary information more and more difficult. *Search engines* and *directories* are two fundamentally different types of search facilities available on the Web. A **search engine** (e.g., Altavista, Google) maintains an index of hundreds of millions of Web pages and uses that index to find pages that match a set of user-specified keywords. Such indexes are created and updated by software robots called **softbots.** A **directory** (e.g., Yahoo, About.com), on the other hand, is a hierarchically organized collection of links to Web pages. Directories are compiled manually, unlike indexes, which are generated by computers.

Search engines and directories often present users with links to thousands or even millions of pages. It is quite difficult to find information of interest from such a large number of links. Therefore we can use additional tools to refine the search. For example, *meta searchers* search several engines at once (e.g., Metacrawler.com). Most of these helpers use software agents, some of which exhibit intelligent behavior and learning and are called **intelligent agents** (D'Iavetno and Luck, 2004; Wooldridge, 2002). The topic of intelligent agents is discussed more fully in Chapter 11. Here we present only a few examples of Internet-based software agents, which appear under names such as *wizards, softbots,* and *knowbots*. Three major types of agents available for help in browsing and searching are Web-browsing-assisting agents, FAQ agents, and indexing agents.

Web-Browsing-Assisting Agents. Some agents can facilitate browsing by offering the user a tour of the Internet. Known as *tour guides,* they work while the user browses. For example, WebWatcher is a personal agent, developed at Carnegie Mellon University, that helps find pages related to the current page, adding hyperlinks to meet the user's search goal and giving advice on the basis of the user's preference.

NetCaptor (*netcaptor.com*) is a custom browser application with a simple-to-navigate Windows interface that makes browsing (only with Internet Explorer) more pleasurable and productive. NetCaptor opens a separate tabbed space for each Web site visited by the user. Users can easily switch between different tabbed spaces. The CaptorGroup feature creates a group of links that are stored together so the user can get single-click access to multiple Web sites. The PopupCaptor feature automatically closes pop-up windows ("ad blocking," see Chapter 4) displayed during browsing. NetCaptor also includes a utility, called Flyswat, to turn certain words and phrases into hyperlinks. Clicking on these links opens a window with links to Web sites with relevant information. (Take the tour.)

For more details on Web-browsing assistants see Tan and Kumar (2002), *botspot.com,* and Lieberman et al. (2001).

Frequently Asked Questions (FAQ) Agents. *FAQ agents* guide people to the answers to frequently asked questions. When searching for information, people

tend to ask the same or similar questions. In response, newsgroups, support staffs, vendors, and others have developed files of those FAQs and an appropriate answer to each. But there is a problem: People use natural language, asking the same questions in several different ways. The FAQ agent (such as FAQFinder developed at the University of Chicago) addresses this problem by indexing a large number of FAQ files. Using the text of a question submitted in natural language, the software agent can locate the appropriate answer. GTE Laboratories developed an FAQ agent that accepts natural-language questions from users of Usenet News Groups and answers them by matching question-answer pairs. A solution to natural language may be provided by a semantic Web. (See Chapter 11, Berners-Lee et al., 2001, and Van Den Hevel and Maamar, 2003.)

AskJeeves (*askjeeves.com*), another popular FAQ assistant, makes it easy to find answers on the Internet to questions asked in plain English. The system responds with one or more closely related questions to which the answers are available. Parts of such questions may contain drop-down menus for selecting from different options. After the user selects the question that is closest to the original question, the system presents a reply page containing different sources that can provide answers. Due to the limited number of FAQs and the semistructured nature of the questions, the reliability of FAQ agents is very high.

Search and Indexing Agents. Another type of discovery agent on the Internet traverses the Web and performs tasks such as information retrieval and discovery, validating links, and generating statistics. Such search agents are called *Web robots, spiders,* and *wanderers*.

Indexing agents can carry out a massive autonomous search of the Web on behalf of a user or, more commonly, of a search engine like Google, HotBot, or Altavista. First, they scan millions of documents and store an index of words found in document titles, key words, and texts. The user can then query the search engine to find documents containing certain key words.

Special indexing agents are being developed for knowledge sharing and knowledge acquisition in large databases and documents. **Metasearch engines** integrate the findings of the various search engines to answer queries posted by the users. (Examples include *Infospace, QueryServer, seek2.com, surfwax, Metacrawler, Profusion, Infofetcher, Search, ixquick, All-in-One, Dogpile, Copernic,* and *Mamma*. See *suite101.com* for details.)

Visual interface search tools display search results in a way that assists users' search for better-targeted information. Vivisimo and WiseNet group the text-based search results into categories relevant to the search terms. KartOO and Mooter provide a visual representation of the search term that attempts to cluster together similar sites or results via a visual mapping metaphor. WebBrain combines the two ways of search-result display.

IT at Work 3.2 provides an insight into a specific application of search and indexing technology in health care. An example in education is provided in Online File W3.3.

Internet-Based Web Mining

The term *data mining* refers to sophisticated analysis techniques for sifting through large amounts of information. Data mining permits new patterns and relationships to be discovered through the use of software that can do much of the mining

IT at Work 3.2
KAISER PERMANENTE USES GOOGLE TO BUILD A PORTAL

Kaiser Permanente (*kaiserpermanente.org*), America's largest not-for-profit health maintenance organization (HMO), has almost 9 million members. The amount of available medical knowledge doubles about every 7 years, so keeping up with new knowledge is an important aspect of good caregiving by HMOs.

When Kaiser Permanent developed a clinical-knowledge corporate portal for its 50,000 doctors, nurses, and other caregivers, search was a part of the plan. The Permanente Knowledge Connection, available from anywhere in the Kaiser wide area network, gives medical staff access to diagnostic information, best practices, publications, educational material, and other clinical resources. The portal's resources are distributed across the entire United States. Putting the right information quickly and easily into caregivers' hands is essential to the clinical portal's success.

Kaiser turned to the Google Search Appliance, which enabled the HMO to index 150,000 documents across the Kaiser network. Clinicians now search the site in situations that range from leisurely research to urgent care, from the exam room to the emergency room. Doctors and nurses use the search engine to help them reach diagnoses and specify treatments, check the side-effects of new medications, and consult clinical research studies and other medical publications. Google's spell checking capability is especially useful in the medical profession: Doctors' handwriting can be problematic, and pharmaceutical product names are difficult.

Source: Compiled from *services.google.com/marketing/links/banner_gsa03_eweek/casestudies* (accessed May 2004).

For Further Exploration: Why did Kaiser Permanente need Google's Search Appliance? What benefits did Kaiser gain from implementing Google's Search Appliance?

process (see Chapter 10). Software agents are key tools in discovering previously unknown relationships, especially in complex data structures. *Query-and-reporting tools,* on the other hand, demand a predefined database structure and are most valuable when asking specific questions to confirm hypotheses. For more on Web mining and its varieties, see Chapter 10.

Other Discovery Aids

Hundreds of other search engines and discovery aids are available (e.g., see McLaughlin, 2004, for over 100 sites; also see Carroll, 2003 and Sullivan, 2004). Here are some useful ones:

- ***Webopedia.com.*** This is a directory of technology-related terms, which are arranged alphabetically. If you know the term for which you want a definition, you can go to it directly. In addition to a definition you will find relevant Internet resources with links. If you do not know the exact term you are looking for, you can use some key word to find it.
- ***What Is?*** (*whatis.techtarget.com*). This knowledge exploration tool provides information about IT, especially about the Internet and computers. It contains over 4,000 individual encyclopedic definitions/topics and a number of "Fast Reference" pages. The topics contain about 12,000 hyperlinked cross-references between definitions/topics and to other sites for further information.
- ***eBizSearch*** (*gunther.smeal.psu.edu*). This engine searches the Web as well as academic and commercial articles for various aspects of e-business.
- ***High Beam*** (*highbeam.com*). This site searches for books, articles, maps, pictures, and so on that you can have for a seven-day free trial. After that, you must pay for the files. Abstracts are free.

- ***Howstuffworks.com.*** You can learn about thousands of products, things, concepts, etc. at this educational and entertaining site. It combines a search engine and a menu system.
- ***Findarticles.com.*** This search engine specializes in finding articles, usually from trade magazines, on topics of your choice. Like library search engines, it is limited to certain magazines.

Toolbars

To get the most out of search engines, you may use add-on toolbars and special software. Some are attached to the popular search engines, others are independent. Most are free. Examples are: Google Toolbar (*toolbar.google.com*), Copernic Agent Basic (*copernic.com*), KartOO (*kartoo.com*), Yahoo Companion (*companion.yahoo.com*), and Grokker (*groxis.com*).

Discovery of Material in Foreign Languages

There is a huge amount of information on the Internet in languages that you may not know. Some of this is vendors' information intended for global reach. Alternatively, you may need to create a foreign-language Web site for your company. Asking human translators for help is expensive and slow. A more useful tool is *automatic translation* of Web pages. Such translation is available to and from all major languages, and its quality is improving with time. We distinguish between real-time translation, which is offered by browsers, and delayed translation, which is offered by many others. For details and examples of both types, see *A Closer Look 3.1*.

Information and Corporate Portals

With the growing use of intranets and the Internet, many organizations encounter information overload at a number of different levels. Information is scattered across numerous documents, e-mail messages, and databases at

A CLOSER LOOK

3.1 AUTOMATIC TRANSLATION OF WEB PAGES

Automatic translation of Web pages is an application offered by many vendors. Not all automatic translations are equally good, so some evaluation of these products is needed. According to Sullivan (2001), the best way to assess machine translation is to use the following three criteria: (1) intelligibility—how well a reader can get the gist of a translated document, (2) accuracy—how many errors occur during a translation, and (3) speed—how many words per second are translated. Because the quality of automatic translation has not always been as good as human translation, many experts advocate use of the computer as a productivity booster, with human translation as a double-check. However, as time passes, automatic translation is becoming better (see Sullivan, 2001).

There are three Web page translation methods: (1) dictionary-based translation, (2) machine translation, and (3) methods using a linguistic jargon called parallel corpora. Direct dictionary-based translation is the simplest method. However, it suffers from some problems, among which are: (1) the problem of inflection (a translation problem due to differences between written and spoken words), (2) translation ambiguity, (3) how to handle compound words and phrases, and (4) how to translate proper names and other untranslatable words (Hedlund et al., 2004).

Some major translation products are: WorldPoint Passport (*worldpoint.com*), Babel Fish Translation (*world.altavista. com*), *AutoTranslate* (offered in Netscape browser), "BETA" (*google.com/language-tools*), *Freetranslation.com,* and products and services available at *tranexp.com* and *translationzone.com*. For details on these and other automatic translators, see Online File W3.4 at the book's Web site.

different locations and systems. Accessing relevant and accurate information is often time-consuming and may require access to multiple systems.

As a consequence, organizations lose a lot of productive employee time. One solution to this problem is to use portals. A **portal** is a Web-based personalized gateway to information and knowledge in network computing. It attempts to address information overload through an intranet-based environment to search and access relevant information from disparate IT systems and the Internet, using advanced search and indexing techniques. A portal is the one screen from which we do all our relevant work on the Web. In general, portals are referred to as information portals.

INFORMATION PORTALS. An **information portal** is a single point of access through a Web browser to critical business information located inside and outside of an organization, and it can be personalized for each user. One way to distinguish among portals is to look at their content, which can vary from narrow to broad, and their community or audience, which can also vary. (For a classification, see *PortalsCommunity.com/library/fundamentals.cfm.*) We distinguish seven types of portals, described below.

1. **Commercial (public) portals** offer content for diverse communities and are the most popular portals on the Internet. Although they offer customization of the user interface, they are still intended for broad audiences and offer fairly routine content, some in real time (e.g., a stock ticker and news on a few preselected items). Examples are *yahoo.com, lycos.com,* and *msn.com*.
2. **Publishing portals** are intended for communities with specific interests. These portals involve relatively little customization of content, but they provide extensive online search in a specific area and some interactive capabilities. Examples are *techweb.com* and *zdnet.com*.
3. **Personal portals** target specific filtered information for individuals. They offer relatively narrow content but are typically much more personalized, effectively having an audience of one.
4. **Affinity portals** support communities such as hobby groups or a political party (Tedeschi, 2000). They offer a single point of entry to an entire community of affiliated interests (e.g., *espn.com*).
5. **Mobile portals** are portals accessible from mobile devices. Although most of the other portals mentioned here are PC-based, increasing numbers of portals are accessible via mobile devices. One example is i-mode from DoCoMo in Japan.
6. **Voice portals** (also called *vortals*) are Web portals with audio interfaces, which enables them to be accessed by a standard or cell phone. In a voice portal, input from the user is made via spoken command, which the system can accept thanks to *advanced speech recognition (ASR)* techniques. Output from the system back to the user is performed by *text-to-speech (TTS)* (Boothroyd, 2003). AOLbyPhone is an example of a service that allows you to retrieve e-mail, news, and other content by voice. (See Figure 3.3.) Companies such as *tellme.com* and *bevocal.com* offer the software for such services. Voice portals use both speech recognition and text-to-speech technologies. The 511 system described in online Chapter 1 is an example of an e-government voice portal.

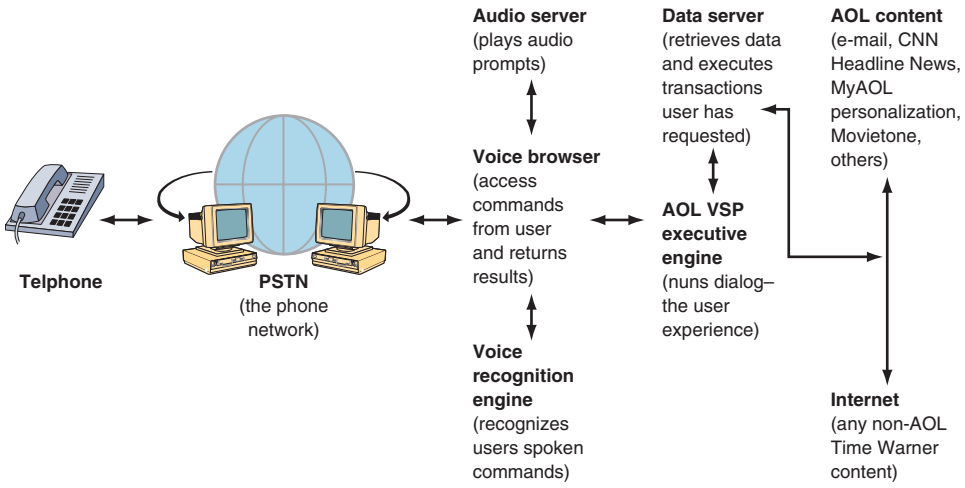


FIGURE 3.3 AOLbyphone. (*Source:* DeYoung, 2001, p. 10.)

7. **Corporate portals** coordinate rich content within relatively narrow corporate and partners' communities. Kounadis (2000) defines a corporate portal as a personalized, single point of access through a Web browser to critical business information located inside and outside of an organization. They are also known as *enterprise portals* or *enterprise information portals*.

CORPORATE PORTALS. In contrast with publishing and commercial portals such as Yahoo, which are gateways to general information on the Internet, corporate portals provide single-point access to *specific* enterprise information and applications available on the Internet, intranets, and extranets.

Corporate portals offer employees, business partners, and customers an organized focal point for their interactions with the firm any time and from anywhere. Through the portal, these people can have structured and personalized access to information across large, multiple, and disparate enterprise information systems, as well as the Internet. Many large organizations have already implemented corporate portals to cut costs, free up time for busy executives and managers, and improve profitability. (See ROI white papers and reports at *plumtree.com*.) In addition, corporate portals enable efficient knowledge management (Benbya et al., 2004) and offer customers and employees self-service opportunities (see CRM in Chapter 6), which reduces a company's cost. (See discussion and examples at *Peoplesoft.com*.) *A Closer Look 3.2* describes several types of corporate portals. (For more, see Sullivan, 2003 and Jafair et al., 2003).

Online File W3.5 takes a look at the corporate portals of some well-known companies. Also, look at Online Minicase W3.2, which tells about a business intelligence portal at Amway.

Figure 3.4 depicts a corporate portal framework based on Aneja et al. (2000) and Kounadis (2000). This framework illustrates the features and capabilities required to support various organizational activities using internal and external information sources.

APPLICATIONS OF CORPORATE PORTALS. According to a survey by the Delphi Group, over 55 percent of its 800 respondents had begun corporate portal projects, with about 42 percent of them conducting the projects at the enterprisewide

A CLOSER LOOK
3.2 TYPES OF CORPORATE PORTALS

The following types of portals can be found in organizations.

A Portal for Suppliers. Using corporate portals, suppliers can manage their own inventories online. They can view what they sold to the portal owner and for how much. They can see the inventory levels of products at the portal owner's organization, and they can send material and supplies when they see that a reorder level is reached. Suppliers can also collaborate with corporate buyers and other staff via the portal.

A Portal for Customers. Customers can use a *customer-facing portal* for viewing products and services and placing orders, which they can later self-track. They can view their own accounts and see what is going on there in almost real time. Thus, customers personalize their views of the corporate portal. They can configure products (services), place orders, and pay for and arrange delivery and warranty. They can see their order status and outstanding invoices as well.

For example, Halliburton (*halliburton.com*) created a portal, called myHalliburton, to provide its customers access to technical tools, best practices, SAP account data, and private forums for project management. The company's 5,000 customers worldwide can also gather product information, track invoices, tap a knowledge base of technical expertise, and collaborate securely with Halliburton teams through the portal.

A Portal for Employees. Such portals are used for training, dissemination of news and information, and workplace discussion groups. They also are used for self-service activities, mainly in the human resources area (e.g., change your address, fill in an expense report, register for classes, get reimbursed for tuition). Employees' portals are sometimes bundled with supervisors' portals (see next item).

For example, in the myHalliburton portal described earlier, corporate geologists, geophysicists, and production engineers, located at customer sites, can use 3-D simulators, unit conversion calculators, custom-tool builders, and other interactive tools integrated into the portal, allowing them to isolate problems and make decisions more quickly.

Supervisors' Portals. These portals, sometimes called *workforce portals,* enable managers and supervisors to control the entire workforce management process—from budgeting to scheduling workforce.

For example, Mazda North America Operations provides its field managers, who supervise 700-some dealerships, with a Dealer Analysis portal. The portal integrates application information and resources from diverse repositories into a "dashboard." Using the dashboard on the portal, regional managers can analyze consolidated data on both sales and customer support performance, 24 hours a day, and can track near-real-time sales figures for all dealerships nationwide.

Other Types. Several other types of corporate portals also exist: *business intelligence portals* (Imhoff, 2001; Ferguson, 2001), *intranet portals* (Ferguson, 2001), and *knowledge portals* (Kesner, 2003).

level (cited in Stackpole, 1999). The number of corporate portals can only have increased since that study was conducted. The top portal applications cited in the study, in decreasing order of importance, were: knowledge bases and learning tools; business process support; customer-facing sales, marketing, and service; collaboration and project support; access to data from disparate corporate systems; internal company information, policies, and procedures; best practices and lessons learned; human resources and benefits; directories and bulletin boards; identification of subject matter experts; and news and Internet access.

The Delphi Group also found that poor organization of information and lack of navigation and retrieval tools contributed to over 50 percent of the problems for corporate portal users. For this reason it is advisable for organizations to develop a corporate portal strategy, as discussed in Online File W3.6.

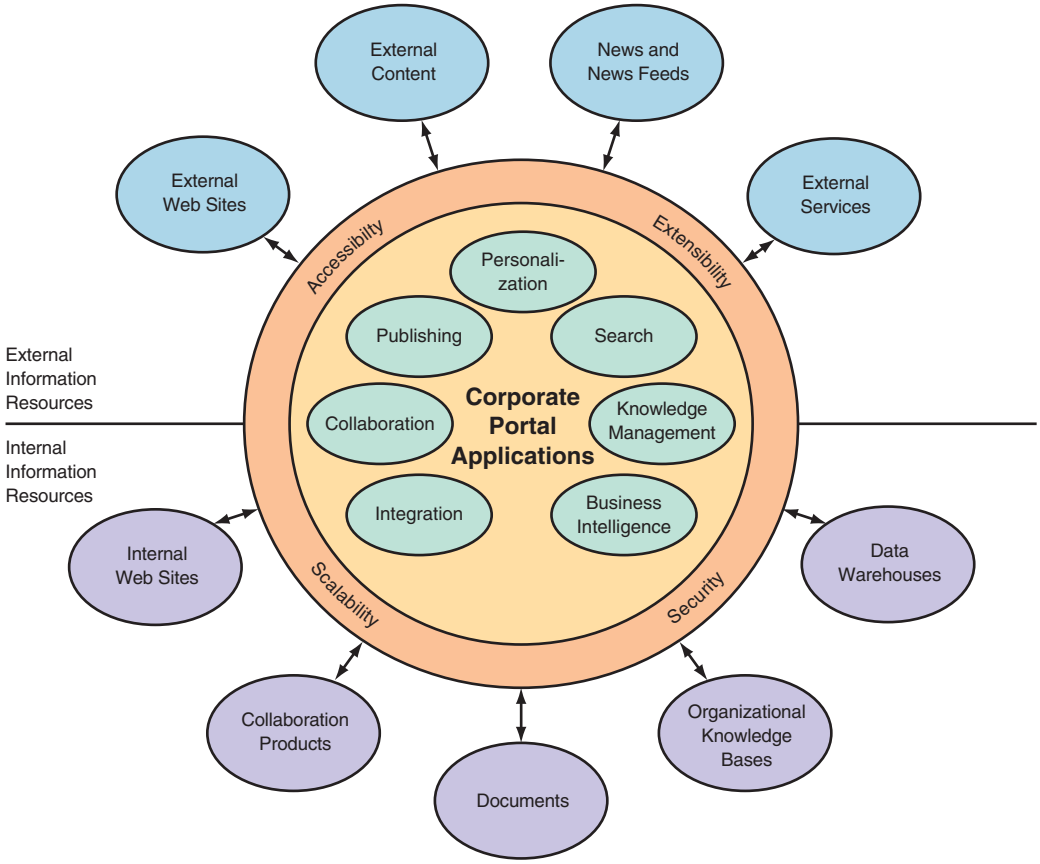


FIGURE 3.4 A corporate portal framework. (*Sources:* Compiled from A. Aneja et al., "Corporate Portal Framework for Transforming Content Chaos on Intranets," *Intel Technology Journal,* Q1, 2000, and from T. Kounadis, "How to Pick the Best Portal," *e-Business Advisor,* August 2000.)

INTEGRATION OF PORTALS. Many organizations are creating several corporate portals. While in some cases these portals are completely independent of each other, in other cases they are interrelated. For example, they may share content, and they may draw from the same applications and databases.

Tool-building software, such as WebSphere Portal (from IBM), allows companies to create multiple portals as one unit. It enables three different portals to be used by a single company—a portal for business partners (B2B), a portal for employees (B2E), and a portal for customers (B2C). If portals are built one at a time over a long period, and possibly with different tools, it is wise to keep in mind that it may be beneficial to integrate them (Ojala, 2002).

INDUSTRYWIDE COMMUNICATION NETWORKS (PORTALS). In addition to single-company portals, there are also portals for entire industries. Thanks to the Internet, entire industries can now create communication networks (portals). An example is *chaindrugstore.net,* which links retailers and product manufacturers, and provides product and industry news and recall and promotional information. The site was created in 2001 by the National Association of Chain Drug Stores. The objective is to facilitate the rapid exchange of needed information. The site has an offshoot for independent pharmacies (called CommunityDrugStore.net). The service, according to Brookman (2003), reaches

more than 130 retailers representing 32,000 stores. The service is free to the retailers; suppliers pay annual fees, in exchange for being able to use the portal to communicate information to retailers (e.g., to advertise special deals, to notify retailers about price changes). The portal also provides industry news, and it can be personalized for individual retailers. Retailers also use it as a productivity tool. For example, the site has "Call Me" and "Send Me" buttons, so retailers can click and receive product information in seconds. Although some people fear that the site will reduce the effectiveness of face-to-face meetings, the participants are more than happy with the communication and collaboration support. The membership renewal rate has been 100 percent, and additional members have joined. For details see Brookman (2003).

3.3 COMMUNICATION

Communication is an interpersonal process of sending and receiving symbols with messages attached to them. Through communication, people exchange and share information as well as understand and influence each other. Most managers spend as much as 90 percent of their time communicating. Managers serve as "nerve centers" in the information-processing networks called organizations, where they collect, distribute, and process information continuously. Since poor communication can mean poor management, managers must communicate effectively among themselves and with others, both inside and outside of organizations. Information technologies have come to play a major role in providing communication support for organizations.

On the Web we distinguish three communication modes:

1. ***People-to-people.*** This was the earliest mode of network communication, when people used e-mail and newsgroups. They also discovered information on bulletin boards and communicated there.
2. ***People-to-machine***. This was the next step, when people conducted discovery on the Web, searching and finding information.
3. ***People and machine-to-machine.*** This mode occurs when applications need to "talk" to applications, either in complete automation or in automation but including people.

Factors Determining the Uses of Information Technologies for Communication

Several factors determine the IT technologies that could be used to provide communication support to a specific organization or group of users. The major ones are the following:

- ***Participants.*** The number of people sending and receiving information can range from two to many thousands.
- ***Nature of sources and destinations.*** Sources and destinations of information can include people, databases, sensors, and so on.
- ***Media.*** Communication can involve one or several IT-supported media, such as text, voice, graphics, video, pictures, and animation. Using different media for communicating can increase the effectiveness of a message, expedite learning, and enhance problem solving. Working with multiple media may, however, reduce the efficiency and effectiveness of the system (its speed, capacity, quality) and may significantly increase its cost.

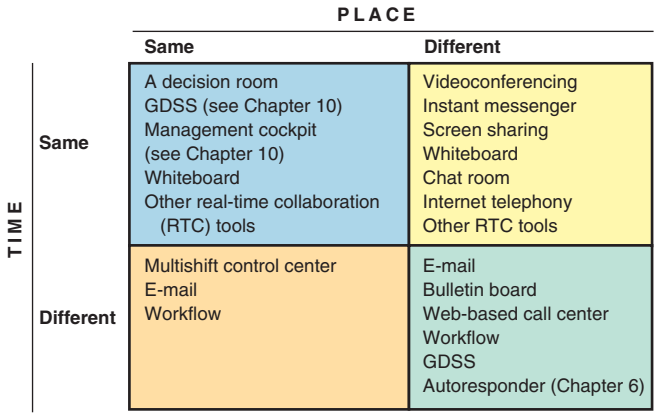


FIGURE 3.5 A framework for IT communication support.

- ***Place (location).*** The sender(s) and receiver(s) can be in the same room (face-to-face) or at different locations.
- ***Time.*** Messages can be sent at a certain time and received almost simultaneously. Such **synchronous (real-time) communication** is provided by telephones, instant messaging online, teleconferencing, and face-to-face meetings. **Asynchronous communication,** on the other hand, refers to communication in which the receiver gets an answer sometime after a request was sent. E-mail and electronic bulletin boards are examples.

A TIME/PLACE FRAMEWORK. The last two factors in the preceding list—place and time—were used by DeSanctis and Gallupe (1987) to create a framework for classifying IT communication and collaboration support technologies. According to this framework, IT communication can be divided into four cells, as shown in Figure 3.5, with representative technologies in each cell. The time/place cells are as follows:

1. ***Same-time/same-place.*** In this setting, participants meet face-to-face in one place and at the same time. An example is communication in a meeting room, which can be electronically supported by group support systems (see *group systems.com* and Chapter 11).
2. ***Same-time/different-place.*** This setting refers to a meeting whose participants are in different places but communicate at the same time. A telephone conference call, desktop videoconferencing, chat rooms, and instant messaging are examples of such situations.
3. ***Different-time/same-place.*** This setting can materialize when people work in shifts. The first shift leaves electronic or voice messages for the second shift.
4. ***Different-time/different-place.*** In this setting, participants are in different places, and sending and/or receiving messages at different times (e.g., e-mail). This setting is known as *virtual meetings*.

Businesses require that messages be transmitted as fast as they are needed, that the intended receiver properly and timely interprets them, and that the cost of doing this be reasonable. Communication systems that meet these conditions have several characteristics. They allow two-way communication:

Messages flow in different directions, sometimes almost simultaneously, and messages reach people regardless of where they are located. Efficient systems also allow people to access various sources of information (such as databases). IT helps to meet these requirements through the electronic transfer of information using tools such as e-mail.

The Internet has become a major supporter of interactive communications. People are using a variety of Internet technologies—Internet phones, smart cell phones, Internet videoconferencing, Internet radio, whiteboards, chat rooms, and more—for communication. In Section 3.5 we will discuss some of the IT tools cited in connection with Figure 3.5. E-mail, including instant and universal messaging services, is discussed in Online File W3.7 at the book's Web site. Other Internet-based communication tools and technologies are described in Technology Guide 4.

Web-Based Call Centers

Effective personalized customer contact is becoming an important aspect of customer support through the Web. Such service is provided through *Web-based call centers* (also known as *customer care centers, contact centers,* or *customer interaction centers*). Enabling Web collaboration and simultaneous voice/Web contact can differentiate a company from its competitors. There are at least four categories of capabilities employed by Web-based call centers—e-mail, interactive text chat, callbacks, and simultaneous voice and Web sessions. (For discussion of how companies might decide among the possible choices for Web-based call centers, see Sharp, 2003.) WebsiteAlive (*websitealive.com*), a Web-based call center support product, delivers live customer-service capabilities for any online company. Further details and examples are provided in Chapter 6.

Electronic Chat Rooms

Electronic chat refers to an arrangement whereby participants exchange messages in real time. The software industry estimates that millions of chat rooms exist on the Internet. A **chat room** is a virtual meeting place where groups of regulars come to gab. Chat programs allow you to send messages to people who are connected to the same channel of communication *at the same time*. It is like a global conference call system. Anyone can join in the online conversation. Messages are displayed on your screen as they arrive, even if you are in the middle of typing a message.

The chat rooms can be used to build a community, to promote a commercial, political, or environmental cause, to support people with medical problems, or to let hobbyists share their interest. And since many customer-supplier relationships have to be sustained without face-to-face meetings, online communities are increasingly being used to serve business interests, including advertising (see *Parachat.com* and Technology Guide 5). Chat capabilities can be added to a business site by letting software chat vendors host your session on their site. You simply put a chat link on your site and the chat vendor does the rest, including the advertising that pays for the session.

Two major types of chat programs exist: (1) Web-based chat programs, which allow you to send messages to Net users using a Web browser and visiting a Webchat site (e.g., *chat.yahoo.com*), and (2) an e-mail-based (text only) program called *Internet Relay Chat (IRC)*. A business can use IRC to interact with customers, provide online experts' answers to questions, and so on.

Today, there are several hundred IRC networks in operation in the world. They run various implementations of IRC servers, and are administered by various groups of IRC operators. The largest IRC networks have traditionally been

grouped as the "Big Four": EFNet, IrcNet, QuakeNet, and UnderNet. The most popular IRC client at the moment is called mIRC (*mirc.com*).

The biggest difference between IRC and instant messaging (IM) applications (such as ICQ and MSN Messenger) is the fact that all the users on IRC channels normally see everything other users say—in other words, it is real-time public conversation. In addition to this, IRC also supports IM-style private messaging between users as well. Many long-time IRC users see IM applications as just a sidekick of the IRC phenomenon. (For further information about IRC, refer to *irchelp.org* and *mirc.com/links.html*.)

Voice Communication

The most natural mode of communication is voice. When people need to communicate with each other from a distance, they use the telephone more frequently than any other communication device. Voice communication can now be done on the Internet using a microphone and a sound card (see *protocols. com/pbook/VOIP*). You can even talk long distance on the Internet without paying the normal long distance telephone charges. This is known as **Internet telephony (voice-over IP),** and it is described in Technology Guide 5. Voice communication enables workers, from forklift drivers to disabled employees to military pilots, to have portable, safe, and effective access to computer technology from their work areas. In addition, voice communication is faster than typing (about two and half times faster), and fewer errors in voice data entry are made compared to keyboard data entry.

You can get freeware (free software) for Internet telephony from *pc-telephone. com*. Also, some browsers provide you with Internet telephony capability. To connect from computers to regular telephones try, for example, *dialpad.com,* which offers low-cost long-distance calls through the Internet to regular telephones in U.S. cities from anywhere in the world. For more information see *tmcnet.com/it*.

Voice and data can work together to create useful applications. **Voice mail,** a well-known computerized system for storing, forwarding, and routing telephone messages, is one such application. For some other applications of voice technologies, see Online File W3.8 at the book's Web site. More advanced applications of voice technology such as natural language speech recognition and voice synthesis are described in Chapter 11.

Weblogging (Blogging)

The Internet offers an opportunity for individuals to do personal publishing using a technology known as **Weblogging,** or **blogging.** A **blog** is a personal Web site, open to the public, in which the owner expresses his or her feelings or opinions. People can write stories, tell news, and provide links to other articles and Web sites. At some blogs you can find fascinating items that you might otherwise have overlooked. At others, you can rapidly get up to speed on an issue of special interest. Blogs are growing rapidly, estimated by BBC News (February 2003) to be close to 500,000.

Blogs became very popular after the terrorist attacks of September 11, 2001, and during the 2003 Iraqi war. People were looking for as many sources of information as possible and for personal connections. Blogs are comforting for people in times of stress. They are a place at which people feel their ideas get noticed, and they can result in two-way communication and collaboration and group discussion.

Building blogs is becoming easier and easier. Programs downloadable from *blogger.com*, *pitas.com*, and others are very user friendly. "Bloggers" (the people who create and maintain blogs) are handed a fresh space on their Web site to

write in each day. They can easily edit, add entries, and broadcast whatever they want by simply clicking on the send key. Other services are provided by *zblogger.com* and *moveabletype.org*.

As indicated by MacDonald (2004), one of the greatest limitations of blogs is their temporal nature. Posting are always arranged in date order, irrespective of their other dimensions (e.g., importance, substance, and popularity). This limitation leads to problems in the documentation, management, and search of information in the blogs.

Blogs are also criticized for their tendency to coalesce into self-referential cliques. Bloggers are blamed for their mutual backslapping, endlessly praising and linking to one another's sites. However, bloggers are creating their own communities and have developed a rich terminology. (For a bloggers dictionary, see *marketingterms.com/dictionary/blog* and *samizdata.net/blog/glossary*.) Blogs have just begun to be used for commercial purposes. For example, Weidlich (2003) reports that some company executives use blogs for informal talk to customers. Also see Lewin (2003). For further discussion on blogs, see Stauffer (2002) and Stone (2002).

3.4 COLLABORATION

One of the abiding features of a modern organization is that people collaborate to perform work or attain a goal. **Collaboration** refers to mutual efforts by two or more individuals who perform activities in order to accomplish certain tasks. The individuals may represent themselves or organizations, or they may be members of a team or a group. Group members work together on tasks ranging from designing products and documents, to teaching each other, to executing complementary subtasks. Also, people work with customers, suppliers, and other business partners in an effort to improve productivity and competitiveness. Finally, group members participate in decision making. In all of the above cases they need to collaborate. Collaboration can be supported electronically by several technologies as described later in this chapter.

The Nature of Group Work

Group work is increasing in importance. Indeed, it is a cornerstone in some business process restructuring (BPR) projects and in e-commerce. Also, group work is needed in virtual corporations as well as in multinational organizations. The use of group work is also increasing due to the support provided by IT, especially the support provided to groups whose members are in different locations.

The term **workgroup** refers to two or more individuals who act together to perform some task. The group can be permanent or temporary. It can be in one location (face-to-face meetings) or in several. If group members are in different locations we say we have a **virtual group (team),** and they conduct *virtual meetings* (they "meet" electronically). Members can meet concurrently or at different times. The group can be a committee, a review panel, a task force, an executive board, a team, or a department. Groups conduct their work by using different approaches or processes.

CONVENTIONAL APPROACH TO GROUP WORK. For years, people have recognized the benefits of collaborative work. Typical benefits that relate to decision making in groups are listed in Table 3.1. But despite the many benefits of group interaction, groups are not always successful. The reason is that the process of collaborative work is frequently plagued by dysfunctions, as listed in Table 3.2.

TABLE 3.1 Benefits of Working in a Group

- Groups are better than individuals at understanding problems.
- People are accountable for decisions in which they participate.
- Groups are better than individuals at catching errors.
- A group has more information (knowledge) than any one member and, as a result, more alternatives are generated for problem solving.
- Synergy can be produced, so the effectiveness and/or quality of group work can be greater than the sum of what is produced by independent individuals.
- Working in a group may stimulate the participants and the process.
- Group members have their egos embedded in the decision they make, so they will be committed to its implementation.

TABLE 3.2 Dysfunctions of Group Process

- Social pressures to conform ("groupthink") may eliminate superior ideas.
- Group process can be time-consuming, slow, and costly.
- Work done in a group may lack appropriate coordination.
- Some members may dominate the agenda.
- Some group members ("free riders") may rely on others to do most of their work.
- The group may compromise on solutions of poor quality.
- The group may be unable to complete a task.
- Unproductive time is spent socializing, getting ready, waiting for people, or repeating what has already been said.
- Members may be afraid to speak up.

To reconcile these differences, researchers have worked for many years to improve the process used by people working in groups. If the causes of group dysfunctions could be lessened or eliminated, the benefits of group work would be greatly enhanced. Several approaches have been developed to attempt to solve the problems inherent in group work. Two representative manual methods are the *nominal group technique* and the *Delphi method* (see Online File W3.9 for explanations of those two methods).

The limited success of the above approaches to group work and the availability of IT tools and the Internet has created an opportunity for supporting groups electronically, which is part of virtual collaboration. We describe the general support in this section. The support that is intended to facilitate decision making is described in Chapter 11.

VIRTUAL TEAMS. Much of the work in transnational corporations, and increasingly even in domestic firms, is performed by virtual teams—teams whose members are spread across countries and continents. Virtual teams help employers recruit qualified employees from a larger talent pool dispersed across multiple geographic locations and allow companies to minimize travel and relocation expenses. Furthermore, locating staff in different time zones simplifies the challenge of around-the-clock operations that many firms face. Another benefit of virtual teams stems from the fact that the teams work in a digital environment, where most communications are digitally encoded and can be stored in a central repository. Thus, virtual teams reduce infromation loss and facilitate knowledge transfer throughout the organization (Alexander, 2000).

Virtual teams transform the work environment, changing organizational cultures, job content, and job requirements, as well as the nature of supervision and evaluation. Virtual teams tend to promote a more formal organizational culture in which interactions among employees take place mainly through reports and e-mails as opposed to informal conversations in the hallways of traditional organizations (Alexander, 2000). They change job content by placing a greater emphasis on regular, accurate, and precise communications among team members via telephone, video conferencing, e-mail, instant messaging, and other communication and collaboration systems.

Skills and qualities required to succeed in virtual teams are quite different from the demands of traditional workgroups. Virtual team members must be self-starters to set their individual goals and must proactively work toward the goals without direct supervision from the boss located hundreds or thousands of miles away. Supervision and employee evaluations also need to be adapted to the virtual team environment. Managers are more likely to evaluate what virtual team members actually accomplish as opposed to relying on observations of whether they appear to be working, which are commonly used in traditional workplaces. *IT at Work 3.3* illustrates the use of virtual teams at Sabre, Inc.

While virtual teams represent a compelling work arrangement for many organizations, they can be challenging to implement and manage. Members of virtual teams face such issues as rapidly learning to work with individuals whom they do not know and with whom they may not share a common background. Conflict in virtual teams can occur as a result of relationship difficulties, task difficulties, or process difficulties (Hinds and Bailey, 2003). These difficulties are exacerbated in situations where the teams engage in little, if any, face-to-face communication. High-performing virtual teams exhibit marked differences in their patterns of communication compared with lower-performing virtual teams. High-performance teams have been shown to engage in regular, predictable, content-focused communication, whereas low-performance teams often exhibit irregular patterns of communication such that team members fail to keep current by reading each other's messages (Jarvenpaa and Leidner, 1999).

Managers of virtual teams also face unique challenges, in that they are not aware of the day-to-day activities of those whom they are responsible for supervising. Effective leaders must ensure that all team members share an understanding of the team's task and of the individual members' roles (Kayworth and Leidner, 2002). Effective leaders must learn to display both assertiveness and empathy using predominantly computer-based communication (Kayworth and Leidner, 2002). For many managers, this is difficult to accomplish and the performance of the team suffers as a result.

Virtual Collaboration

Virtual collaboration (or *e-collaboration*) refers to the use of digital technologies that enable organizations or individuals to collaboratively plan, design, develop, manage, and research products, services, and innovative IT and EC applications. Although e-collaboration can involve noncommerce applications, the term frequently refers to **collaborative commerce**—collaboration among business partners. An example would be a company that it is collaborating electronically with a vendor that designs a product or a part for the company (see Minicase 1, about General Motors). Collaborative commerce implies communication, information sharing, and collaborative planning done electronically through tools such as groupware and specially designed EC collaboration tools. For details see Turban (2006) and Poirier (2001).

Numerous studies (e.g., *line56.com,* 2002) suggest that collaboration is a set of relationships that can bring significant improvements in organizations' performance. Major benefits cited are cost reduction, increased revenue, and improved customer retention. These benefits are the results of fewer stockouts, less exception-processing (doing things as an exception to the standard way, usually more expensive than the standard way), reduced inventory throughout the supply chain, lower material costs, increased sales volume, and increased competitive advantage. According to a survey conducted by Deloitte Consulting

IT at Work 3.3
VIRTUAL TEAMS AT SABRE, INC.

Sabre, Inc. is one of the leading firms providing travel reservation services worldwide. The company's roots go back to 1960, when American Airlines developed a proprietary computerized travel reservation system. This unique system made American Airlines the originator of electronic commerce in the travel industry. In March 2000, AMR (the parent company of American Airlines) spun off Sabre as a separate company headquartered in Texas. Today, Sabre, Inc. employs over 6,000 people in 45 countries and generates over $2 billion in annual revenues. Sixty thousand travel agents in 114 countries rely on Sabre to make travel arrangements for their clients. The total volume of reservations processed by the system each year exceeds 400 million, which represents 40 percent of all travel reservations worldwide. Consumers may be familiar with Travelocity.com, which is Sabre's business-to-consumer travel site; corporate travel agents would recognize GetThere—the world's leading supplier of business-to-business online travel reservation systems operated by Sabre.

With employees working both in headquarters and field offices scattered around the globe, Sabre made a decision to use virtual teams, whose overall purpose was to improve customer focus, enhance productivity, and grow market share and profitability. The company discovered that cross-functional teams were better suited for the marketplace demands than the single-function teams it had used in the past. Now, a typical virtual team at Sabre includes representatives from several areas of the company: Account executives sell reservation systems, technicians install and service the systems, trainers teach travel agents how to use the systems, account management specialists handle billing and collections, and customer service representatives respond to miscellaneous inquiries.

Following the introduction of virtual teams, Sabre encountered several challenges related to managing and working in the teams. One of the primary challenges was building trust among team members. Managers and employees soon recognized that building trust requires a high level of responsiveness to electronic communications from other team members, dependable performance, and a proactive approach to completing team tasks. The second challenge involved generating synergy in virtual teams—making the team greater than the sum of its parts. To resolve this challenge, Sabre offered team-building activities, as well as extensive classroom and computer-based training that preceded the launch of new virtual teams.

A third challenge was that team members had to cope with the feeling of isolation and detachment that characterizes virtual teamwork. The company discovered that certain employees preferred independent work and operated well without much social interaction. Thus, Sabre conducted interviews with potential team members to determine their suitability for virtual teamwork. Furthermore, the company's teams are only partially virtual—the relationships may occasionally involve face-to-face interactions during certain meetings and teambuilding exercises. In addition, employees have the option to work either from home or from an office where they can interact with other employees, who may or may not be their teammates.

The fourth challenge involved balancing technical and interpersonal skills among team members. Sabre was surprised to find that despite the infrequent face-to-face communications, interpersonal abilities were extremely valuable and important to virtual teams. As a result, the company made a change in its hiring and team-member selection practices, to shift the emphasis from technical to interpersonal skills.

A fifth major challenge was related to employee evaluation and performance measurement. Over time, the company implemented a system of team-level and individual metrics that were intended to measure objective, quantifiable contributions of each team member and the performance of the virtual team as a whole. Nevertheless, the company admits that striking the right balance between the measures of individual contributions and group performance continues to be difficult.

The results of creating virtual teams at Sabre have been quite positive. Most managers and emplyees of the company agree that the shift from functional face-to-face teams to cross-functional virtual teams improved customer service. Customers themselves support these assertions: Sabre's customer satisfaction ratings have increased from 68 percent in 1997 to 85 percent in 2000. Besides, the company increased its market share in North America from 43 percent in 1997 to 50 percent in 2000. While virtual teams are not the only factor contributing to these positive changes, they seem to indicate that the use of virtual teams may be a rewarding choice for a global organization.

Sources: Compiled from Kirkman et al. (2002) and sabreholdings.com (2004).

For Further Exploration: Are the challenges faced by virtual teams at Sabre unique to this company? What additional challenges with virtual teams might Sabre encounter in the future? If you were an employee at Sabre, would you prefer to work in a physical face-to-face environment or in a virtual team?

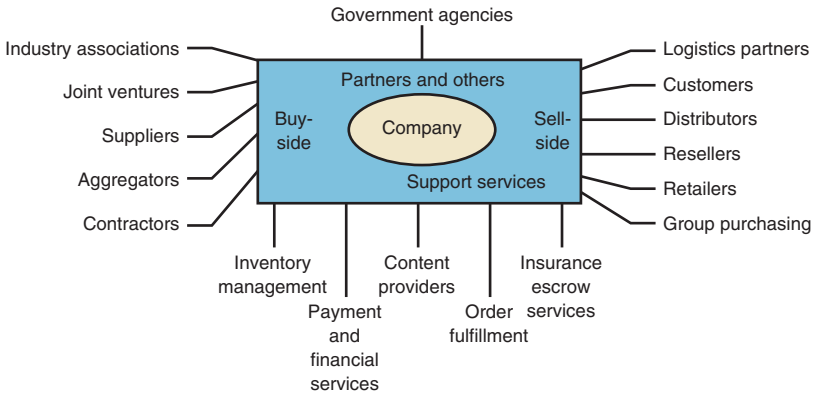


FIGURE 3.6
E-collaboration for commerce.

and reported in *Manageradvisor.com* (2002), 70 percent of the companies conducting collaborative commerce are showing higher profitability than those who do not. Of those companies surveyed, 75 percent consider online collaboration (especially linking business processes) to be a top executive priority. These figures, gathered in 2002, are more than 20 percent higher than responses from a 2000 survey. Finally, 85 percent of all companies plan to have advanced collaborative commerce initiatives by 2005. Some of the major strategic benefits reported are an increase in process flexibility, faster delivery speed, and improved customer service. (See Powell et al., 2004.)

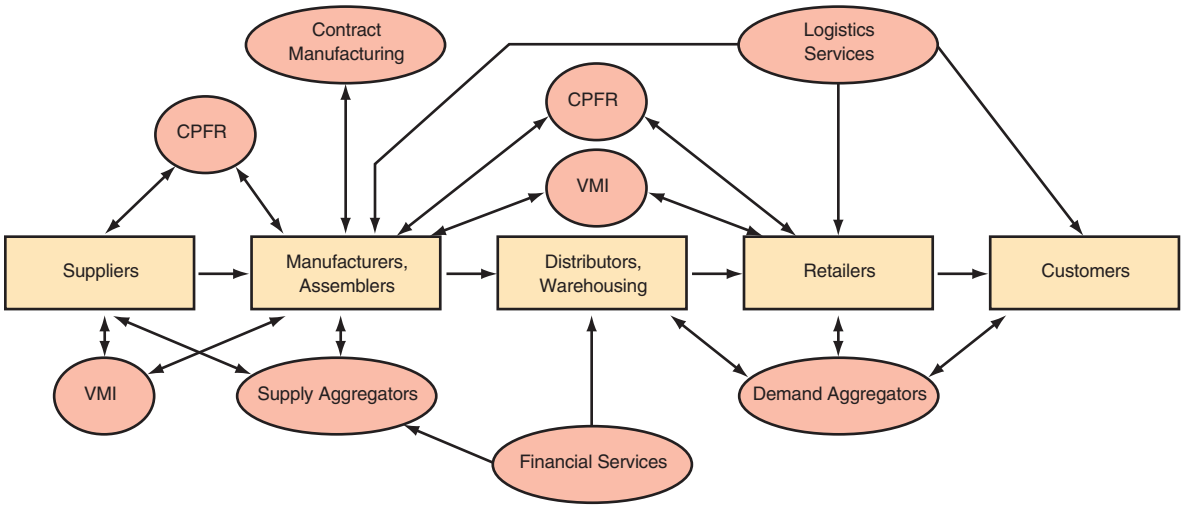
C-commerce activities are usually conducted between and among supply chain partners. For example, see the opening case in this chapter.

The opening case shows how one company becomes a *nucleus firm,* or a hub, for collaboration. Such arrangement can be expanded to include all business partners, as shown in Figure 3.6. This concept is the basis for many-to-many e-marketplaces (see Chapter 4), in which a third-party company is the nucleus firm, creating a place not only for collaboration but also for trade.

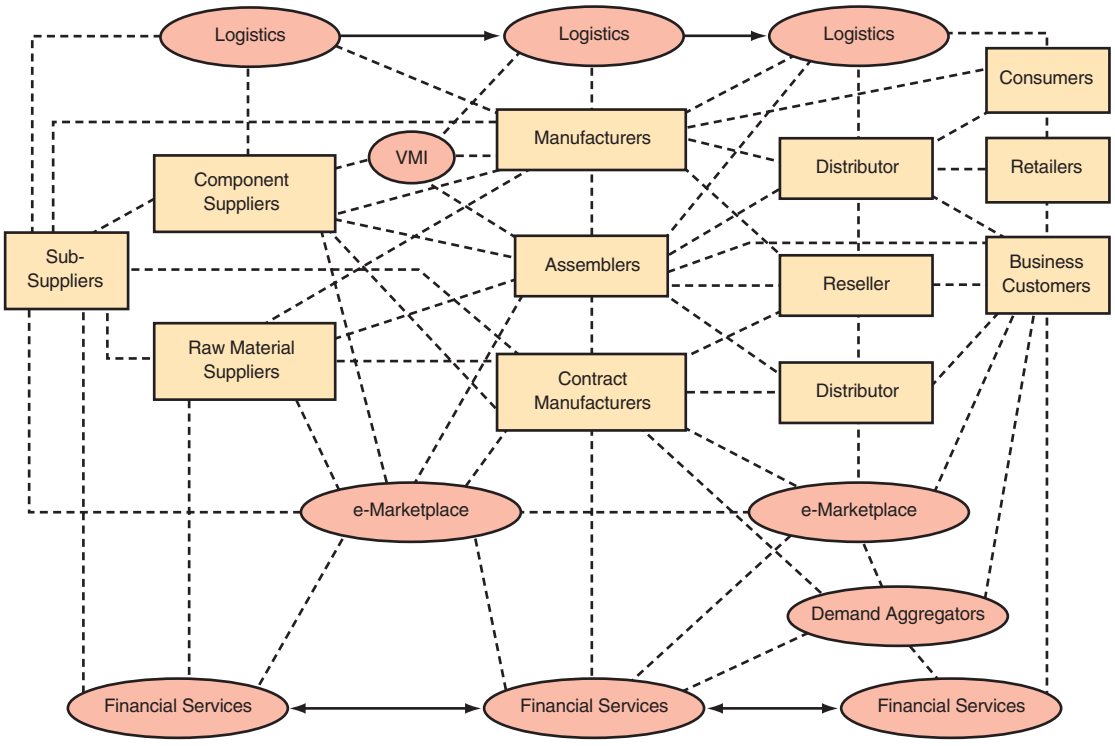
There are several other varieties of virtual collaboration, ranging from joint design efforts to forecasting. Collaboration can be done both between and within organizations. The following are some types and examples of virtual collaboration.

COLLABORATIVE NETWORKS. Traditionally, collaboration took place among supply chain members, frequently those that were close to each other (e.g., a manufacturer and its distributor, or a distributor and a retailer). Even if more partners were involved, the focus has been on the optimization of information and product flow between existing nodes in the traditional supply chain.

The traditional collaboration resulted in a vertically integrated supply chain. However, as discussed in earlier chapters, IT and Web technologies can *fundamentally change* the shape of the supply chain, as well as the number of players within it and their individual roles and collaboration patterns. The new supply chain can be a hub, as in the Webcor case, or even a network. A comparison between the traditional supply chain collaboration and the collaborative network is shown in Figure 3.7 (page 115). Notice that the traditional chain (part a, for the food industry) is basically linear. The collaborative network (part b) shows that partners at any point in the network can interact with each other, bypassing traditional partners. Interaction may occur among several manufacturers



Part (a) Traditional collaboration, including CPFR. Collaboration agents and services are shown as ovals. (VMI and CFPR are described later in this section.)



Part (b) Supply chains are evolving into collaborative networks. Ovals designate agents and services.

FIGURE 3.7 Comparing traditional supply chain collaboration and collaborative networks. Collaborative places and efforts are shown as ovals. (*Sources:* Part a based on Walton and Princi, 2000, p. 193, Fig. 1.8. Part b based on Poirier, 2001, p. 9-8, Fig. 1.)

and/or distributors, as well as with new players such as software agents that act as aggregators, B2B e-marketplaces, or logistics providers.

The collaborative network can take different shapes depending on the industry, the product (or service), the volume of flow, and more. Examples of collaborative networks are provided by Poirier (2001) and by Szekely (2003). As the mobile technologies mature, mobile collaborative networks will gradually develop. These networks have the ability to share valuable business information in mobile scenarios with people who are co-located or remote, and not necessarily from the same company. Mobile workers will be able to communicate and share information any time, anywhere (Bartram and Blackstock, 2003 and Divitini et al., 2004). The latest and most ambitious attempt at collaborative networks is grid computing (see Chapter 2, *ibm.com/grid,* and Vallés et al., 2004.)

REPRESENTATIVE EXAMPLES OF VIRTUAL COLLABORATION. Leading businesses are moving quickly to realize the benefits of e-collaboration. For example, the real estate franchiser RE/MAX uses an e-collaboration platform to improve communications and collaboration among its nationwide network of independently owned real estate franchises, sales associates, and suppliers. Similarly, Marriott International, the world's largest hospitality company, started with an online brochure and then developed a c-commerce system that links corporations, franchisees, partners, and suppliers, as well as customers, around the world. In addition, as described in Online File W3.10, Nygard of Canada has developed a collaborative system along its entire supply chain.

There are many examples of e-collaboration. Here we present some additional representative ones. For more see Frank (2004), and Davison and de Vreede (2001).

Information Sharing Between Retailers and Their Suppliers: P&G and Wal-Mart. One of the most publicized examples of information sharing is between Procter & Gamble (P&G) and Wal-Mart. Wal-Mart provides P&G access to sales information on every item Wal-Mart buys from P&G. The information is collected by P&G on a daily basis from every Wal-Mart store, and P&G uses the information to manage the inventory replenishment for Wal-Mart. This is known as *VMI, vendor-managed inventories* (see Chapter 8). By monitoring the inventory level of each P&G item in every Wal-Mart store, P&G knows when the inventories fall below the threshold that triggers a shipment. All this is done electronically. The benefit for P&G is that they can sell to a good customer, and the benefit to Wal-Mart is adequate inventory on its shelves. P&G has similar agreements with other major retailers.

Retailer–Supplier Collaboration: Asda Corporation. Supermarket chain Asda (*asda.com*) has begun rolling out Web-based electronic data interchange (EDI) technology to 650 suppliers. Web-EDI technology is based on the AS2 standard, an internationally accepted HTTP-based protocol used to send real-time data in multiple formats securely over the Internet. It promises to improve the efficiency and speed of traditional EDI communications, which route data over third-party value-added networks (VANs). Asda believes that Web-EDI will bring a number of benefits. Parent-company Wal-Mart has been using the technology in the United States since 2003. The technology will speed up the stock replenishment cycle, give flexibility to increase data volume at no extra cost, and improve tracking of inbound and outbound data (*http://articles,* . . . Jan. 27, 2004).

Lower Transportation and Inventory Costs and Reduced Stockouts: Unilever. Unilever's 30 contract carriers deliver 250,000 truckloads of shipments annually. Unilever's Web-based database, the Transportation Business Center (TBC), provides these carriers with site specification requirements when they pick up a shipment at a manufacturing or distribution center or when they deliver goods to retailers. TBC gives carriers all the vital information they need: contact names and phone numbers, operating hours, the number of dock doors at a location, the height of the dock doors, how to make an appointment to deliver or pick up shipments, pallet configuration, and other special requirements. All mission-critical information that Unilever's carriers need to make pickups, shipments, and deliveries is now available electronically 24/7. TBC also helps Unilever organize and automate its carrier selection processes based on contract provisions and commitments. When a primary carrier is unable to accept a shipment, TBC automatically recommends alternative carriers (*http://articles . . .* Aug. 4, 2004).

Reduction of Product Development Time: Caterpillar, Inc. Caterpillar, Inc. (*caterpillar.com*) is a multinational heavy-machinery manufacturer. In the traditional mode of operation, cycle time along the supply chain was long because the process involved paper-document transfers among managers, salespeople, and technical staff. To solve the problem, Caterpillar connected its engineering and manufacturing divisions with its active suppliers, distributors, overseas factories, and customers, through an extranet-based global collaboration system. By means of the collaboration system, a request for a customized tractor component, for example, can be transmitted from a customer to a Caterpillar dealer and on to designers and suppliers, all in a very short time. Customers also can use the extranet to retrieve and modify detailed order information while the vehicle is still on the assembly line. Remote collaboration capabilities between the customer and product developers have decreased cycle time delays caused by rework time. Suppliers are also connected to the system, so they can deliver materials or parts directly to Caterpillar's repair shops or directly to the customer if appropriate. The system also is used for expediting maintenance and repairs.

For comprehensive coverage of collaborative virtual design environments, see Ragusa and Bochenek (2001) and Manninen (2004). See also Minicase 1 at the end of this chapter.

Barriers to E-Collaboration and C-Commerce

Despite the many potential benefits, e-collaboration and c-commerce are moving ahead fairly slowly. Reasons cited in various studies include technical reasons involving integration, standards, and networks; security and privacy concerns over who has access to and control of information stored in a partner's database; internal resistance to information sharing and to new approaches; and lack of internal skills to conduct collaborative commerce (Murphy, 2003). A big stumbling block to the adoption of c-commerce is the lack of defined and universally agreed-on standards. New approaches such as the use of XML and its variants and the use of Web Services could lessen significantly the problem of standards. (See Bradley, 2002, and *cpfr.com* for discussion of the CPFR—collaboration, planning, forecasting, and replenishing—initiative.)

Sometimes collaboration is an organizational culture shock—people simply resist sharing. One reason is the lack of trust, especially in ad-hoc relationships. According to Gibson-Paul (2003), companies such as Boeing and Spalding are grappling with the trust factor. Some techniques she suggested include starting small (e.g., synchronizing one type of sales data), picking up projects that are

likely to provide a quick return on investment for both sides, meeting face-to-face at the beginning of a collaboration; and showing the benefits to all parties. Despite initial lack of trust, if potential collaborators judge the benefits of collaboration to be sufficient, and about equal among collaborators, they will be more eager to join in.

Finally, global collaboration (Chapter 8) involves all of these potential barriers, and more. For further discussion, see Davison and de Vreede (2001) and Carmel (1999).

3.5 Collaboration-Enabling Tools: From Workflow to Groupware

As mentioned earlier, corporate portals facilitate e-collaboration. Also available for this purpose are a large number of tools and methodologies, whose types and features are listed in Online File W3.11. In this section we present workflow technologies, groupware, and other collaboration-enabling tools. For an e-collaboration technologies framework, see Brown and Sappenfield (2003).

Workflow Technologies

Workflow is the movement of information as it flows through the sequence of steps that make up an organization's work procedures. **Workflow management** is the automation of workflows, so that documents, information, or tasks are passed from one participant to another in a way that is governed by the organization's rules or procedures. Workflow management involves all of the steps in a business process from start to finish, including all exception conditions.

The key to workflow management is the tracking of process-related information and the status of each activity of the business process, which is done by workflow systems (see van der Aalst, 2002). **Workflow systems** are business process automation tools that place system controls in the hands of user departments. They employ a set of software programs that automate almost any information-processing task. The major workflow activities to be managed are job routing and monitoring, document imaging, document management, supply chain optimization, and control of work. These activities are done by workflow applications. See Online File W3.12 and Online Minicase W3.3.

There are multiple benefits of workflow management systems. For example, they improve control of business processes, with far less management intervention, and far less chance for delays or misplaced work than other systems. They also improve the quality of services, by quicker response, with the best person available. They lower costs, both of staff training (since the work can be guided through complex procedures) and of management in general, because managers can have a far wider span of control while also being able to concentrate on nurturing the employees and handling special cases rather than routine reporting and distribution issues. Finally, workflow management systems also improve user satisfaction. Users typically have greater confidence that they are doing the best they can and the satisfaction of completing that work with fewer conflicting requirements. For more information on workflow management, see Fischer, 2002, and Basu and Kumar, 2002. Also, visit *wfmc.org*, *aim.org*, and *waria.com*.

Since workflow management systems usually support more than one individual, they are considered by some to be a subset of groupware, our next topic.

Groupware

Groupware refers to software products that support groups of people who share a common task or goal and who collaborate on its accomplishment. These products provide a way for groups to share resources and opinions. Groupware

implies the use of networks to connect people electronically, even if the people are in the same room. Many groupware products are available on the Internet or an intranet, enhancing the collaboration of a large number of people worldwide. There are many different approaches and technologies for the support of groups on the Internet.

Groupware products come either as a standalone product supporting one task (such as e-mail), or as an integrated kit that includes several tools. In general, groupware technology products are fairly inexpensive and can be easily incorporated into existing information systems. The Internet, intranets, extranets, and private communication lines provide the infrastructure needed for the hardware and software of groupware. The software products are mostly Web-based, which is the trend today. In this section we will describe some of the most common groupware products.

ELECTRONIC MEETING SYSTEMS. An important area of virtual collaboration is electronic meetings. For decades, people have attempted to improve face-to-face meetings. Initially, people attempted to better organize group meetings in one room by using a facilitator and established procedures (known as *group dynamics*). More recently, there have been numerous attempts to improve meetings by using information technologies. The advancement of Web-based systems opens the door for electronically supported **virtual meetings,** those whose members are in different locations, frequently in different countries.

The events of September 11, 2001 and the economic slowdown of 2001–2003 made virtual meetings more popular, as corporate travel waned. It is also hard for companies to ignore reported cost savings, such as the $4 million a month that IBM reported it saved just from cutting travel expenses to meetings (Callaghan, 2002). In addition, improvements in supporting technology, reductions in the price of technology, and the acceptance of virtual meetings as a respected way of doing business are fueling their growth (see Vinas, 2002).

Virtual meetings can be supported by a variety of tools, as will be shown in the remainder of this section. The direct support provided to decision making is presented in Chapter 11.

ELECTRONIC TELECONFERENCING. **Teleconferencing** is the use of electronic communication that allows two or more people at different locations to have a simultaneous conference. There are several types of teleconferencing. The oldest and simplest is a telephone conference call, where several people talk to each other from three or more locations. The biggest disadvantage is that it does not allow for face-to-face communication. Also, participants in one location cannot see graphs, charts, and pictures at other locations. One solution is *video teleconferencing,* in which participants can see each other as well as the documents.

Video Teleconferencing. In a **video teleconference** (or *videoconference*), participants in one location can see participants at other locations. Dynamic pictures of the participants can appear on a large screen or on a desktop computer. Originally, video teleconferencing was the transmission of live, compressed TV sessions between two or more points. Video teleconferencing today, however, is a digital technology capable of linking various types of computers across networks. Once conferences are digitized and transmitted over networks, they become a computer application.

With videoconferencing, participants can share data, voice, pictures, graphics, and animation. Data can also be sent along with voice and video. Such **data**

conferencing makes it possible to work on documents together and to exchange computer files during videoconferences. This allows several geographically dispersed groups to work on the same project and to communicate by video simultaneously.

Video teleconferencing offers various benefits. We've already mentioned three of them—providing the opportunity for face-to-face communication for individuals in different locations, supporting several types of media during conferencing, and lower travel time and costs. Other benefits of video teleconferencing are shown in Online File W3.13 at the book's Web site.

Web Conferencing. **Web conferencing** is conducted on the Internet for as few as two and as many as thousands of people. Web conferencing is done *solely* on the Web. (Videoconferencing is usually done on regular telephone lines, although it may also be done on the Web.) Like video teleconferencing, Web conferencing allows users to simultaneously view something, such as a sales presentation in Microsoft PowerPoint or a product drawing, on their computer screens; interaction takes place via messaging or a simultaneous phone teleconference. (Without interaction, it is simply webcasting.) However, Web conferencing is much cheaper than videoconferencing because it runs on the Internet.

The latest technological innovations permit both business-to-business and business-to-consumer applications of Web conferencing. For example, banks in Alaska use *video kiosks* in sparsely populated areas instead of building branches that will be underutilized. The video kiosks operate on the banks' intranet and provide videoconferencing equipment for eye-to-eye interactions. Some examples of other uses are: to educate staff members about a new product line or technology; to amplify a meeting with investors; or to walk a prospective client though an introductory presentation.

Web conferencing is becoming very popular. Some Web conferencing products provide whiteboarding (see discussion below) and polling features, and allow you to give presentations and demos and to share applications. Popular Web conferencing products are: Centra EMeeting (*centra.com*), Genesys Meeting Center (*genesys.com*), PlaceWare (*placeware.com*; see the demos), and WebEx Meeting Center.

RTC TOOLS. The Internet, intranets, and extranets offer tremendous potential for real-time and synchronous interaction of people working in groups. *Real-time collaboration (RTC)* tools (see same time–different location in Figure 3.5) help companies bridge time and space to make decisions and to collaborate on projects. RTC tools support synchronous communication of graphical and text-based information. These tools are being used in distance training, product demonstrations, customer support, and sales applications. RTC tools can be either purchased as standalone tools or used on a subscription basis. Some examples follow:

Interactive Whiteboards. Computer-based **whiteboards** work like the "physical world" whiteboards with markers and erasers, except with one big difference: Instead of one person standing in front of a meeting room drawing on the whiteboard, all participants can join in. Throughout a meeting, each user can view and draw on a single document "pasted" onto the electronic whiteboard on a computer screen. Digital whiteboarding sessions can also be saved for later reference or other uses. Some whiteboarding products let users insert graphics files that can be annotated by the group.

Take, for example, an advertisement that needs to be cleared by a senior manager. The proposed ad would be scanned into a PC, and both parties would see it on their screens. If the senior manager does not like something, he or she can highlight what needs to be changed, using a stylus pen. The two parties can also share applications. For example, if party A works with Excel, party B does not have to have Excel in order to work with it in the whiteboarding tool.

Besides being used for supporting people working on the same task, whiteboards are also used for training and learning. See Online File W3.14 for a description of two whiteboarding products that can be used for training and learning.

Screen Sharing. In collaborative work, members are frequently in different locations. Using **screen sharing** software, group members can work on the same document, which is shown on the PC screen of each participant. For example, two authors can work on a single manuscript. One may suggest a correction and execute it so the other author can see the change. Collaborators can work simultaneously on the same spreadsheet or on the resulting graphics. Changes can be done by using the keyboard or by touching the screen. This capability can expedite the design of products, the preparation of reports and bids, and the resolution of conflicts. A special screen sharing capability is offered by Groove Inc. (*groove.net*). Its product synchronizes people, computers, and information to enable the joint creation and/or editing of documents on your PC.

Instant Video. With the spread of **instant messaging** and Internet telephony has come the idea to link people via both voice and audio. Called *instant video,* the idea is for a kind of video chat room. It allows you to chat in real time, seeing the person you are communicating with. A simple way to do it is to add video cameras to the participants' computers. A more sophisticated approach that produces pictures of better quality is to integrate existing online videoconferencing service with instant messaging software, creating a service that offers the online equivalent of a videophone.

INTEGRATION AND GROUPWARE SUITES. Because groupware technologies are computer-based, it makes sense to integrate them with other computer-based or computer-controlled technologies. A *software suite* is created when several products are integrated into one system. Integrating several technologies can save time and money for users. For example, PictureTel Corporation (see *polycom.com*), in an alliance with software developer Lotus, developed an integrated desktop video teleconferencing product that uses Lotus Notes. Using this integrated system, publisher Reader's Digest has built several applications combined with videoconferencing capabilities. A seamless integration is provided in groupware suites. Lotus Notes/Domino is one example of popular *groupware suites*. For discussion of others, see Online File W3.15.

Lotus Notes/Domino. The **Lotus Notes/Domino** suite provides online collaboration capabilities, workgroup e-mail, distributed databases, bulletin whiteboards, text editing, (electronic) document management, workflow capabilities, instant virtual meetings, application sharing, instant messaging, consensus building, voting, ranking, and various application development tools. All these capabilities are integrated into one environment with a graphic menu-based user interface.

Group members using Lotus Notes/Domino might store all their official memos, formal reports, and informal conversations related to particular projects in a shared, online database. Then, as individual members need to check on the

contents, they can access the shared database to find the information they need. For an interesting Notes/Domino application, see Online Minicase W3.4.

By the end of 2002, there were over 60 million Notes users worldwide (*lotus.com*, 2002). For even more capabilities of Lotus Notes/Domino, see Internet Exercise 3 at the end of the chapter.

SOCIAL SOFTWARE. **Social software** can be defined as any software that supports actual human interactions. According to Udell (2004), the category includes groupware and knowledge management tools, as well as other computer-mediated communication, Weblogs ("blogs," a personal Web site on which the site owner post feelings or opinions) and wikis (a collaborative site on which many authors post their collective work), and large numbers of other products. (See the sampler listing social software at Online File W3.16.) These tools can help workers build relationships based on what they know and who they know. For how social networks provide competitive advantage, see Tynan (2004).

Implementation Issues of Virtual Collaboration

Throughout this chapter we have described a variety of online collaboration methods. Here we mention a few implementation issues that must be addressed when planning online collaboration. First, to connect you and your business partners, you need an effective collaborative environment. Such an environment is provided by groupware suites such as Lotus Notes/Domino. Another issue is the need to connect collaborative tools with file management products on the intranet. Two such products are e/pop servers and clients (*wiredred.com*) and eRoom's server (from *documentum.com*).

In addition, throughout the book, we have documented the general trend toward moving e-commerce applications onto the Web. To change the read-only Web to a truly collaborative environment, one needs *protocols,* rules that determine how two computers communicate with one another over a network. The protocols make possible the integration of different applications and standardize communication. One such protocol, which is relatively new, is WebDAV (Web Distributed Authoring and Versioning protocol). For details see *webdav.org*.

Finally, we should point out that online collaboration is not a panacea for all occasions or in all situations. Many times, a face-to-face meeting is a must. Human workers do sometimes need the facial cues and the physical closeness that no computer system can currently provide. (*Pervasive computing* attempts to remove some of these limitations, e.g., by interpreting facial cues. For more, see Chapter 5.) For implementation guidelines, see Buy IT Best Practice Network (2004).

3.6 E-Learning and Virtual Work

Web-based systems enable many applications related to discovery, communication, and collaboration. Three important applications are presented in this section—e-learning, distance learning, and telecommuting.

E-Learning versus Distance Learning

There can be some confusion between e-learning and distance learning since they overlap each other. Therefore we begin with brief definitions.

E-learning refers to learning supported by the Web. It can be done inside classrooms, as was demonstrated in the Dartmouth College Minicase in Chapter 1. It can be done as a support to conventional teaching, such as when students work on the Web at home or in the classroom. It also can be done in

virtual classrooms, in which the entire coursework is done online and classes do not meet face-to-face, and then it is a part of distance learning.

Distance learning (DL) refers to situations where teachers and students do not meet face-to-face. It can be done in different ways. The oldest mode was correspondence, where all communication was done by "snail mail." As early as the 1920s the radio was added to support DL. Then came voice cassettes, videotapes, and TV for delivering lectures. Students communicated with professors by "snail mail," telephone, and faxes. A breakthrough occurred when the CD-ROM was introduced, since they are media rich and enabled self-testing and feedback. Finally the Web provided a multimedia interactive environment for self-study. (For an overview of DL see Shin and Chan, 2004 and Keart et al., 2004.)

E-learning is only one channel of distance learning. At the same time, some types of e-learning are done in the face-to-face mode, and not from a distance. What is common to the two is some of the delivery tools as well as some pedagogical issues. In both cases, Web-enabled systems make knowledge accessible to those who need it, when they need it, any time, anywhere. E-learning and DL can be useful both as an environment for facilitating learning at schools and as an environment for efficient and effective corporate training.

Liaw and Huang (2002) describe how Web technologies can facilitate learning. For an overview and research issues related to e-learning, see Piccoli et al. (2001); this resource also provides a comparison of e-learning with traditional classroom teaching. Our discussion here concentrates on e-learning, which in its broader scope is known as *e-education* (see Albalooshi, 2003).

The Benefits of E-Learning

In theory, there are many benefits to e-learning: Self-paced and self-initiated learning has been shown to increase content retention (Urdan and Weggen, 2002). Online materials offer the opportunity to deliver very current content, of high quality (created by content experts), and consistent (presented the same way every time). Students in e-learning situations have the flexibility of learning from any place, at any time, and at their own pace. Finally, some learners in both educational and corporate settings appreciate what they perceive as the risk-free environment offered by e-learning, in which they feel more free to express themselves than in a face-to-face learning setting. In corporate training centers, learning time generally is shorter, and more people can be trained due to the faster training time. As a result, training costs can be reduced by 50 to 70 percent (Urdan and Weggen, 2002), and savings can be made on facility space as well.

E-learning provides a new set of tools that can add value to traditional learning modes. It does not usually replace the classroom setting, but enhances it, taking advantage of new content and delivery technologies. The better the match of content and delivery vehicle to an individual's learning style, the greater the content retention, and the better the learning results. Advanced e-learning support environments, such as Blackboard and WebCT, add value to traditional learning in higher education. See *A Closer Look 3.3* for descriptions of these e-learning tools, with which you may already be familiar from personal experience. Several other e-learning courseware tools are discussed in Online File W3.17.

Some drawbacks do exist that offset the benefits of e-learning. Issues cited as possible drawbacks of e-learning are discussed in Online File W3.18 at the book's Web site. Suggestions on how to overcome such drawbacks and prevent e-learning failures are provided by Weaver (2002) and by Hricko (2003).

A CLOSER LOOK
3.3 BLACKBOARD AND WEBCT

There is a good chance that you will use the Blackboard Inc. or WebCT frameworks when taking a college class. These competing products provide the Internet infrastructure software for e-learning in schools, serving one of the fastest-growing industry segments in the world. Eduventures.com, a leading independent e-learning industry analyst, projected that the higher-education e-learning market will grow from $4 billion in 2001 to $11 billion by 2005 (*eduventures.com*, 2001).

The publisher places a book's content, teaching notes, quizzes, etc. on Blackboard or WebCT in a standardized format. Instructors can access modules and transfer them into their own specific Blackboard or WebCT sites, which can be accessed by their students.

Blackboard Inc. offers a complete suite of enterprise software products and services that power a total "e-education infrastructure" for schools, colleges, universities, and other education providers. Through this system, instructors can electronically manage the collection and organization of assignments. The built-in assessment management function allows simple assessment of workflow and provides flexibility in deploying tests and surveys. Of special interest are the discussion rooms that can be for everyone or for a restricted group. Last but not least, Blackboard also enables customization, extension, and integration of the sections of each course, providing flexibility in curriculum management.

WebCT provides a similar set of tools, but with a different vision and strategy. It uses advanced pedagogical tools to help institutions of higher education make distance-learning courses possible. Such courses enable schools to expand campus boundaries, attract and retain students and faculty, and continually improve course and degree program quality.

Textbook publishers are embracing these tools by making their major textbooks Blackboard and/or WebCT enabled. Thus, your professor can easily incorporate this book's content into the software that is used by thousands of universities worldwide. (For comparison between the two systems, refer to Siekmann, 2001 and CMS Task Force, 2002.)

Sources: Compiled from *webct.com* and *blackboard.com* (spring 2004).

Virtual Universities

The concept of **virtual universities**—online universities from which students take classes from home or an off-site location, via the Internet—is expanding rapidly. Hundreds of thousands of students in dozens of countries, from Great Britain to Israel to Thailand, are studying via such institutions. A large number of existing universities, including Stanford University and other top-tier institutions, offer online education of some form. Some universities, such as University of Phoenix (*phoenix.edu*), California Virtual Campus (*cvc.edu*), and the University of Maryland (*umuc.edu/distance*), offer thousands of courses and dozens of degrees to students worldwide, all online. Other universities offer limited online courses and degrees and also use innovative teaching methods and multimedia support in the traditional classroom.

The virtual university concept allows universities to offer classes worldwide. Moreover, we may soon see integrated degrees, where students can customize a degree that will best fit their needs by taking courses at different universities. Several all-virtual schools include *eschool-world.com*, *walden.com*, and *trainingzone.co.uk*.

For information about specific e-learning programs, see *Petersons.com*, *ECollege.com*, *icdl.open.ac.uk*, and *usdla.org*. For experiences in moving courses and partial courses to e-learning environments, see Gale (2003). Hofmann (2002) describes the role of the Internet in distance learning in higher education, surveying implementation issues in terms of technology, course content, and pedagogy.

Online Corporate Training

Like educational institutions, a large number of business organizations are using e-learning in at least some courses (e.g., see Kapp, 2002). Web-based learning technologies allow organizations to keep their employees up-to-date, and training via the Web can run 24 hours per day, every day ("24/7"). Online corporate training also offers striking cost advantages: Conventional classroom training costs (in 2000) were about $75 an hour, with full-week programs costing $3,000 to $5,000 (ENTmag.com, 2000). Computer-based training costs about half that amount, without travel costs or class-size restrictions. IBM estimates a savings of $500,000 for every 1,000 hours of training not done in the traditional classroom (Reeder, 2002). E-learning can provide 30 percent more training content in 40 percent less time and at 33 percent of the cost of more traditional techniques (Beckett, 2004).

Corporate training is often done via the intranet and corporate portals. However, in large corporations with multiple sites, and for studies from home, the Internet is used to access the online material. Some companies, like Barclays Bank, COX Industries, and Qantas Airways, offer online training in learning centers that they call "universities." For discussion of strategies for implementing corporate e-learning, see Delahoussaye and Zemke (2001). Vendors of online training and educational materials can be found at *digitalthink.com*, *click2learn.com*, *deitel.com*, and *smartplanet.com*.

E-learning is radically changing education and corporate training, and the socioeconomic and technological changes should be examined as the learning behaviors and expectations of learners change. There is a sharply growing demand for flexible and adaptive learning environments that are independent of time and geography (Meso and Liegle, 2000). For an overview of and guidelines for e-learning, see Piskurich (2003), Hartley (2002), and Cone and Robinson (2001).

Virtual Work and Telecommuting

Virtual (distributed) work environments refer to geographically distributed work teams, global project teams, interorganizational teams, and nontraditional work environments such as virtual organizations, satellite work centers, and telecommuting. The use of such distributed work environments in organizations is increasing rapidly. Many of the participants in such environments are mobile workers. The popularity of these environments is growing in direct relationship to the IT support for them. Wireless and wearable devices are one example, and the groupware tools described earlier are another.

Due to the large number of people participating in virtual work, organizations are faced with problems of how to implement virtual work environments and how to use the IT support (see Belanger et al., 2002). In Chapter 11 we will deal with one aspect of virtual work, the support to group decision making. The topic of supporting mobile employees is covered throughout the book. Here we deal with one such virtual work environment—telecommuting.

TELECOMMUTING. **Telecommuting,** or **teleworking,** refers to an arrangement whereby employees can work at home, at the customer's premises, in special work places, or while traveling, usually using a computer linked to their place of employment. Regular and overnight mail, special messengers, and fax typically have been used to support telecommuting, but they are

relatively slow and expensive, and the Internet is gradually replacing them. Almost all groupware technologies can be used to support telecommuting. With laptops, broadband, and IP phones, maintaining a home office can be less expensive, and more productive, than setting up workers in larger facilities (Willis, 2004). For more on telecommuting, see Chapter 16.

3.7 Some Ethical and Integration Issues

Of the many issues involved in implementing network computing environments, ethics and integration issues are discussed here.

Ethics on the Net

Several ethical, legal, and security issues have been raised as a result of the use of electronic networks in general and the Internet in particular. For example:

- Does an employer have the right to look at your e-mail without your permission? (Yes, it is legal. But is it ethical?)
- Is someone's desire to download pornographic images from a newsgroup protected by freedom of speech and privacy laws?
- Should someone post critical or negative comments about a product, service, or person to a newsgroup?
- Should an Internet access provider be held liable for the content of the traffic on the network?

Whenever there are no specific answers to such questions and their legal dimensions are vague, ethics become an important factor. Here we discuss some representative ethical issues.

PRIVACY AND ETHICS IN E-MAIL. The increased use of e-mail raises the question of privacy. While letters are sealed, e-mail material is open (unless encrypted). Many organizations are monitoring e-mail, which they have the *legal* right to do in most states; this raises questions of invasion of privacy (see discussion in Chapter 16). Other issues include the use of e-mail at work for personal purposes and for sending and receiving material that is not related to work. (For privacy protection tips surrounding e-mail, see *PC World,* February 1997.)

RIGHT TO FREE SPEECH. The dissemination of information such as pornographic and racist material via e-mail, newsgroups, electronic bulletin boards, and public networks may offend some people. But dissemination of such information in the United States is believed to be a right protected by the U.S. Constitution. At the time of this writing, the degree of freedom in the online world, and who should be liable for transmissions that are illegal, is still very much in debate. Legislation has been proposed that would require Internet access providers to create filters allowing adults to keep children from accessing inappropriate material. In fact, the commercial online providers have largely done so. The Internet, however, remains entirely accessible for anyone with a direct connection.

COPYRIGHT. The material you access on the Internet may be marked as being in the public domain; in that case it can be used by anyone for any purpose. Some material is marked as "copyrighted," which indicates that you need

permission for anything other than a "fair use." *Fair use* refers to use for educational and not-for-profit activities. If you make a profit from use of copyrighted material, you should pay the copyright owner some fee or royalties.

Much of the material on the Internet is not marked as either in the public domain or copyrighted. Therefore, at least from an ethical point of view, it should be considered copyrighted. This includes software: You cannot legally copy any licensed software. However, *freeware* on the Internet can be downloaded and distributed. *Shareware* can be downloaded for review, but you are expected to pay for it if you decide you want to use it.

THE PRIVACY OF PATIENTS' INFORMATION. In the United States, several specialized online healthcare networks exist, such as Telemed, a network that tracks tuberculosis patients in order to prescribe the most suitable drugs. These systems could be abused. How do patients know they are getting qualified advice? What if personal medical records fall into the wrong hands? The growth of computerized networks makes medical confidentiality harder to preserve. The problem is how to strike a balance between the benefits of health information systems and their potential ethical problems.

INTERNET MANNERS. Two well-known behaviors on the Internet are spamming and flaming. **Spamming** refers to indiscriminate distribution of messages, without consideration for their appropriateness. Spamming is a major online problem since it is widely used by advertisers (see Chapters 5 and 16). Spamming is frequently answered by **flaming,** which refers to sending angry messages. The Internet can become a war zone between spammers and flamers. Both sides may be equally guilty of ruining newsgroups. Flamers are known for their attacks on inexperienced visitors to newsgroups as well as on those who make spelling errors. A *spam shield* can stop spamming (for examples see *spamcop.com* and *mailwatch.com/stopspam.cfm*). For more discussion of spamming and legislation to control it, see Chapter 16.

There are certain general "rules," called *netiquette* (network etiquette), governing Internet manners. One of these "rules," for example, is to think carefully before sending a public message; keep in mind that you are making your reputation internationally through the messages you send out. Another useful rule of Internet manners is to apply the Golden Rule: Do unto others in cyberspace as you would do unto them face to face, which is, of course, as you would want them to do unto you. A list of various "netiquette" rules is shown in Online File W3.19 at the book's Web site.

Likewise, it is far easier to take offense online because online interaction excludes the nuances of body language, rhythm, mood, and context. E-mail users developed an expressive language that can be used to overcome this problem. A sample is shown in Online File W3.20.

UNSOLICITED ADVERTISING. An extension of spamming is the use of junk mail which may clog providers' systems and which frequently annoys people. Similarly, the use of pop-ups (see Chapter 4) irritates many people.

MONITORING EMPLOYEES' USE OF THE INTERNET. Some companies use special software that monitors time spent on the Internet by each employee (and by site address). The objective is to eliminate abuse of access during working

hours and the accessing of "indecent" sites. Other companies simply disconnect sites they do not want their employees to visit. Some people believe that such monitoring is either unethical or an infringement of their freedom of speech. Is freedom of speech an absolute right, or does it also involve associated responsibilities?

MONITORING STUDENTS' USE OF THE INTERNET. In Chapter 1 we introduced the issue of using a university's network for nonstudy use (e.g., for P2P file sharing). This usage may result in insufficient bandwidth in many universities. Some universities monitor students' activities on the Internet. Some students question whether it is ethical for universities to do so.

Integration Issues

When people discover, communicate, and collaborate by just using the Internet or other open systems, there are no problems of doing so. But in many cases, network computing involves other types of networks, such as value-added networks (VANs), as well as legacy and other specialized systems, such as computer-aided-design (CAD) or wireless systems. In such a case, users may encounter problems in connecting applications to such systems, a problem known as *integration*. The problem of integration was ranked by a group of chief information officers (CIOs) surveyed in 2001, 2002, and 2003 as their number-one technology problem.

The integration issue can be complicated since information systems involve not only networks, applications, and people, but also hardware, software, and support services of multiple organizations. We discussed the integration problem briefly in Chapter 2 and here. Many possible solutions to the integration problem have been developed over the years. They will be discussed in Chapters 4, 6, 7, and 14. One of the newest and most promising approaches to this problem is Web Services, as discussed in Chapter 2 and in Technology Guide 6. An example of how Expedia is using Web Services is provided in Chapter 12.

MANAGERIAL ISSUES

1. ***Security of communication.*** Communication via networks raises the issue of the integrity, confidentiality, and security of the data being transferred. The protection of data in networks across the globe is not simple (see Chapter 15).
2. ***Installing digital dashboards.*** Many companies are installing "digital dashboards," which are a sort of one-way portal display that is continuously updated with online displays. The dashboard is available to employees and visitors in visible places around the company and is also accessible from PCs, PDAs, etc. Large companies, such as General Electric, believe that the cost of the dashboards can be justified by the better discovery and communication they promote within the company.
3. ***Control of employee time and activities.*** To control the time that employees might waste "surfing the Net" during working hours, some companies limit the information that employees have access to or use special monitoring software. Providing guidelines for employee use of the Internet is a simple but fairly effective approach.

4. ***How many portals?*** A major issue for some companies is how many portals to have. Should there be separate portals for customers, suppliers, employees, for example? Regardless of the answer, it is a good idea to integrate the separate portals. If you build a separate portal, make sure it can be easily connected to the others (see the tips at "Experts offer key tips. . . ," 2002).
5. ***Organizational impacts.*** Technology-supported communication may have major organizational impacts. For example, intranets and groupware force people to cooperate and share information. Therefore, their use can lead to significant changes in both organizational culture and the execution of business process restructuring. Further impacts may be felt in corporate structure and the redistribution of organizational power.
6. ***Telecommuting.*** Telecommuting is a compelling venture, but management needs to be careful. Not all jobs are suitable for telecommuting, and allowing only some employees to telecommute may create jealousy. Likewise, not all employees are suitable telecommuters; some need the energy and social contact found in an office setting.
7. ***Cost-benefit justification.*** The technologies described in this chapter do not come free, and many of the benefits are intangible. However, the price of many networking technologies is decreasing.
8. ***Controlling access to and managing the content of the material on an intranet.*** This is becoming a major problem due to the ease of placing material on an intranet and the huge volume of information. Flohr (1997) suggests tools and procedures to manage the situation.

KEY TERMS

Affinity portals *xxx*
Asynchronous communication *xxx*
Blog *xxx*
Blogging (Web logging) *xxx*
Chat room *xxx*
Collaborative commerce *xxx*
Collaboration *xxx*
Commercial (public) portals *xxx*
Corporate portals *xxx*
Data conferencing *xxx*
Directories *xxx*
Distance learning (DL) *xxx*
E-learning *xxx*
Extranet *xxx*
Flaming *xxx*
Groupware *xxx*
Information portal *xxx*
Information superhighway *xxx*
Instant messaging *xxx*
Intelligent agents *xxx*
Internet *xxx*
Internet2 *xxx*
Internet telephony (voice-over IP) *xxx*
Intranet *xxx*
Lotus Notes/Domino *xxx*
Metasearch engines *xxx*
Mobile portals *xxx*
Personal portals *xxx*
Portal *xxx*
Publishing portals *xxx*
Screen sharing *xxx*
Search engine *xxx*
Social software *xxx*
Softbot *xxx*
Software agents *xxx*
Spamming *xxx*
Synchronous (real-time) communication *xxx*
Telecommuting (teleworking) *xxx*
Teleconferencing *xxx*
Video teleconference *xxx*
Virtual collaboration *xxx*
Virtual group (team) *xxx*
Virtual meetings *xxx*
Virtual universities *xxx*
Virtual work (distributed work) *xxx*
Voice mail *xxx*
Voice portals *xxx*
Web conferencing *xxx*
Whiteboard (electronic) *xxx*
World Wide Web (the Web) *xxx*
Workflow *xxx*
Workflow management *xxx*
Workflow systems *xxx*
Workgroup *xxx*

CHAPTER HIGHLIGHTS (Numbers Refer to Learning Objectives)

1. The Internet is a network of many networks.
1. The Internet and the Web will enable us to integrate voice, text, and other interactive media and bring them into every home, school, and business.
2. Intranets are an implementation and deployment of Web-based network services within a company.
2. Intranets and extranets have the potential to change organizational structures and procedures.
3. There are four configurations of supporting communication in meetings: same-time/same-place, same-time/different-place, different-time/same-place, and different-time/different-place.
3. Electronic mail allows quick communication across the globe at minimal cost.
4. Electronic meeting systems, computer-supported cooperative work, groupware, and other names designate various types of computer support to groups.
4. Video teleconferencing utilizes several technologies that allow people to communicate and view each other as well as view and transfer documents.
4. Voice technologies can be used to increase productivity and usability of communication.
5. Lotus Notes/Domino is a major integrated software that supports the work of dispersed individuals and groups.
6. Software agents help to carry out mundane tasks on the Internet such as searching, browsing, and sorting e-mail.
7. Distance learning and telecommuting are supported by network computing.
8. Ethical behavior on the Internet is critical in order to conduct business in a professional way. You need to know what is right and wrong.

VIRTUAL COMPANY ASSIGNMENT

Instructions for accessing The Wireless Café on the Student Web Site

1. Go to **wiley.com/college/turban**
2. Select Turban/Leidner/McLean/Wetherbe's *Information Technology for Management, Fifth Edition.*
3. Click on Student Resources site, in the toolbar on the left.
4. Click on the link for Virtual Company Web site.
5. Click on Wireless Café.

Network Computing at The Wireless Café

Go to The Wireless Café's link on the Student Web Site. There you will find a description of some communications problems the restaurant is having as a result of its 24/7 operations. You will be asked to identify ways network computing can facilitate better staff communications.

More Resources

More resources and study tools are located on the Student Web Site. You'll find additional chapter materials and useful Web links. In addition, self-quizzes that provide individualized feedback are available for each chapter.

QUESTIONS FOR REVIEW

1. List the major advantages of the Internet.
2. Define an intranet.
3. Define discovery, communication, and collaboration.
4. Describe corporate portals and their benefits.
5. Distinguish corporate portals from information (Internet) portals.
6. What are some major benefits and limitations of working in groups?
7. Describe the time/place framework.
8. Define software agents applications and list their Internet applications.

9. Describe differences and relationships between intranets and extranets.
10. Define groupware.
11. Describe the major capabilities of real-time collaboration tools.
12. List the major capabilities of teleconferencing.
13. Define workflow systems.
14. Describe software agents.
15. List the major Internet-based agents.
16. Define Internet and Internet2.
17. Define voice technology and list its major business uses.
18. Describe and distinguish between DL and e-learning.
19. Define telecommuting and describe its benefits.
20. Define flaming and contrast it with spamming.
21. Define netiquette.

QUESTIONS FOR DISCUSSION

1. Identify some commercial tools that allow users to conduct browsing, communication, and collaboration simultaneously.
2. Describe how software agents can help people find specific information quickly.
3. Explain the advantages of electronic mail over regular mail.
4. Discuss the role of Web-based call centers and their contribution to competitive advantage.
5. Explain why the topic of group work and its support is getting increased attention.
6. It is said that collaboration tools can change organizational culture. Explain how.
7. How can computers support a team whose members work at different times?
8. Based on what you know about Lotus Notes, can it support different-time/different-place work situations?
9. Relate telecommuting to networks.
10. Distinguish between flaming and spamming. How are they related? How is flaming related to netiquette?

EXERCISES

1. From your own experience or from vendors' information, list the major capabilities of Lotus Notes/Domino. Do the same for Microsoft Exchange. Compare and contrast the products. Explain how the products can be used to support knowledge workers and managers.
2. Visit *polycom.com* and sites of other companies that manufacture conferencing products for the Internet. Prepare a report. Why are conferencing products considered part of video commerce?
3. Marketel is a fast-growing (hypothetical) telemarketing company whose headquarters are in Colorado, but the majority of its business is in California. The company has eight divisions, including one in Chicago. (The company has just started penetrating the Midwest market.) Recently the company was approached by two large telephone companies, one in Los Angeles and one in Denver, for discussions regarding a potential merger.

   Nancy Miranda, the corporate CEO who was involved in the preliminary discussions, notified all division managers on the progress of the discussions. Both she and John Miner, the chief financial officer, felt that an immediate merger would be extremely beneficial. However, the vice presidents for marketing and operations thought the company should continue to be independent for at least two to three years. "We can get a much better deal if we first increase our market share," commented Sharon Gonzales, the vice president for marketing.

   Nancy called each of the division managers and found that five of them were for the merger proposal and three objected to it. Furthermore, she found that the division managers from the West Coast strongly opposed discussions with the Colorado company, and the other managers were strongly against discussions with the Los Angeles company. Memos, telephone calls, and meetings of two or three people at a time resulted in frustration. It became apparent that a meeting of all concerned individuals was needed. Nancy wanted to have the meeting as soon as possible in spite of the busy travel schedules of most division managers. She also wanted the meeting to be as short as possible. Nancy called Bob Kraut, the chief information officer, and asked for suggestions about how to conduct a conference electronically. The options he outlined are as follows.

   (1) Use the corporate intranet. Collect opinions from all division managers and vice presidents, then disseminate them to all parties, get feedback, and repeat the process until a solution is achieved.

   (2) Fly all division managers to corporate headquarters and have face-to-face meetings there until a solution is achieved.

(3) Use the Web for a meeting.
(4) Fly all division managers to corporate headquarters. Rent a decision room (a facility designed for electronic meetings) and a facilitator from the local university for $2,000 per day, and conduct the meetings there.
(5) Conduct a videoconference. Unfortunately, appropriate facilities exist only at the headquarters and in two divisions. The other division managers can be flown to the nearest division that has equipment. Alternatively, videoconferencing facilities can be rented in all cities.
(6) Use a telephone conference call.

Answer the following questions:

a. Which of these options would you recommend to management and why?
b. Is there a technology not listed that might do a better job?
c. Is it possible to use more than one alternative in this case? If yes, which technologies would you combine, and how would you use them?

GROUP ASSIGNMENTS

1. You are a member of a team working for a multinational finance corporation. Your team's project is to prepare a complex financing proposal for a client within one week. Two of the team members are in Singapore, one is in Seoul, South Korea, one is in London, and one is in Los Angeles. You cannot get the team members together in one place. Your team does not have all the required expertise, but other corporate employees may have it. There are 8,000 employees worldwide; many of them travel. You do not know exactly who are the experts in your company.

Your company has never prepared such a proposal, but you know that certain parts of the proposal can be adapted from previous proposals. These proposals are filed electronically in various corporate databases, but you are not sure exactly where. (The company has over 80 databases, worldwide.) Finally, you will need a lot of external information, and you will need to communicate with your client in China, with investment groups in Japan and New York, and with your corporate headquarters in London.

If the client accepts your proposal, your company will make more than $5 million in profit. If the contract goes to a competitor, you may lose your job.

Your company has all the latest information and communication technologies.

a. Prepare a list of tasks and activities that your team will need to go through in order to accomplish the mission.
b. Describe what information technologies you would use to support the above tasks. Be specific, explaining how each technology can facilitate the execution of each task.

2. The world of the Internet is growing very fast, and it keeps changing. The task for the group is to report on the latest developments on the Internet's uses. Members of the group will prepare a report to include the following:

a. New business applications on the Internet.
b. New books about the Internet.
c. Information about new software products related to the Internet.
d. New managerial and technological issues related to the Internet.
e. Also, send an e-mail message about a topic of concern to you to the White House and include the reply in your report.

3. Assign each group member to an integrated group support tool kit (Lotus Notes, Exceloncorp.com, GroupWise, etc.). Have each member visit the Web site of the commercial developer and obtain information about this product. As a group, prepare a comparative table of the major similarities and differences among the kits.

4. Assign each team to a college collaborative tool such as Blackboard, WebCT, etc. Establish common evaluative criteria. Have each team evaluate the capabilities and limitations of its tool, and convince each team that its product is superior.

5. Have each team download a free copy of Groove from *groove.net*. Install the software on the members' PCs and arrange collaborative sessions. What can the free software do for you? What are its limitations?

INTERNET EXERCISES

1. Your friend wishes to pursue graduate studies in accounting in the United States. She is especially interested in two universities: the University of Illinois and the University of Southern California. Use the Internet to find information that will help her choose between the two universities. Such information should include, *but not be limited to,* the following:

a. The types of degree programs in accounting offered by the two universities.

b. The admission procedures and school calendar.
c. Coursework and dissertation requirements of the programs under consideration.
d. The costs of tuition and other expenses associated with the programs.

2. You plan to take a three-week vacation in Hawaii this December, visiting the big island of Hawaii. Using the Internet, find information that will help you plan the trip. Such information includes, *but is not limited to,* the following:
a. Geographical location and weather conditions in December.
b. Major tourist attractions and recreational facilities.
c. Travel arrangements (airlines, approximate fares).
d. Car rental; local tours.
e. Alternatives for accommodation (within a moderate budget) and food.
f. Estimated cost of the vacation (travel, lodging, food, recreation, shopping, etc.).
g. State regulations regarding the entrance of your dog that you plan to take with you.
h. Shopping (try to find an electronic mall).

3. Enter *lotus.com* and identify the various tools it provides for collaboration. Mark the capabilities that are not cited in this chapter.

4. Visit *cdt.org*. Find what technologies are available to track users' activities on the Internet.

5. You are assigned the task of buying desktop teleconferencing equipment for your company. Using the Internet:
a. Identify three major vendors.
b. Visit their Web sites and find information about their products and capabilities.
c. Compare the least expensive products of two vendors.
d. Find a newsgroup that has an interest in video teleconferencing. Post new questions regarding the products selected. (For example, what are the users' experiences with the products?)
e. Prepare a report of your findings.

6. Both Microsoft Explorer and Netscape Navigator have the capability for Internet telephony; all you need is a sound card, microphone, and speakers on your PC. (If you do not have these browsers, access the VocalTec Web site at *vocaltec.com/*, and download and install its fully functional Internet long-distance telephone software.) Get a friend in another city to do the same. Contact each other via the Internet using your computer as a telephone. What are the advantages and disadvantages of using the Internet for telephone service? Compare your experience to that of making a standard telephone call.

7. Visit *albion.com/netiquette/netiquiz.html* and take the online quiz about netiquette.

8. Visit *tibco.com* and examine its Smartsockets product. Read the Southwest Airlines case at that site and prepare a list of the advantages of the system.

9. Visit *microsoft.com* and *slipstick.com* and find information about their digital dashboards. Examine their capabilities and compare them to information portals.

10. Enter *intranets.com*. Is this site a portal or an advertising company? Why are the services provided of interest to real estate companies?

11. Enter *hpe-learning.com*. Find what programs they have and how they conduct training. Write a report.

12. Enter *setiathome.ssl.Berkeley.edu* and download the free software. Join the efforts to analyze radiotelescope data. Comment about this collaborative effort. Explain why it uses P2P technology.

13. Enter *PCSVision.com*. Describe its services.

Minicase 1

How General Motors Is Collaborating Online

The Problem

Designing a car is a complex and lengthy task. Take, for example, General Motors (GM). Each model created needs to go through a frontal crash test. So the company builds prototypes that cost about one million dollars for each car and tests how they react to a frontal crash. GM crashes these cars, makes improvements, then makes new prototypes and crashes them again. There are other tests and more crashes. Even as late as the 1990s, GM crashed as many as 70 cars for each new model.

The information regarding a new design and its various tests, collected in these crashes and other tests, has to be shared among close to 20,000 designers and engineers in hundreds of divisions and departments at 14 GM design labs, some of which are located in different countries. In addition, communication and collaboration is needed with design engineers of the more than 1,000 key suppliers. All of these necessary communications slowed the design process and increased its cost. It took over four years to get a new model to the market.

The Solution

GM, like its competitors, has been transforming itself into an e-business. This gradual transformation has been going on since the mid-1990s, when Internet bandwidth increased sufficiently to allow Web collaboration. The first task was to examine over 7,000 existing legacy IT systems, reducing them to about 3,000, and making them Web-enabled. The EC system is centered on a computer-aided design (CAD) program from EDS (a large IT company, subsidiary of GM). This system, known as Unigraphics, allows 3-D design documents to be *shared online* by both the internal and external designers and engineers, all of whom are hooked up with the EDS software. In addition, collaborative and Web-conferencing software tools, including Microsoft's NetMeeting and EDS's eVis, were added to enhance teamwork. These tools have radically changed the vehicle-review process.

An even more recent innovation is GM's Advanced Design Studio. Here, three 20-foot "power walls" wrap around one section of the room, displaying larger-than-life, three-dimensional projections of vehicles in progress, for everyone to examine and dissect. Engineers, designers, digital sculptors, and software programmers sit side by side, collaborating on various aspects of each vehicle appearing on the screens. The vehicle model manager addresses the Smart Board, a 50-inch flat-panel computer display synchronized with the power wall. He maneuvers around the screen 3-D sketches of upcoming GM vehicles.

GM also has a Virtual Reality Lab, equipped with a wraparound, floor-to-ceiling display wall. Wearing special 3-D glasses, managers can occupy the virtual space of the driver's seat and get a sense of the interior. They can also "drive" the prospective vehicle through simulations of downtown Las Vegas or along a twisting highway. The lab is digitally linked to all 14 GM engineering centers overseas via a corporate intranet, allowing executives and designers to collaborate on product reviews with colleagues around the world and around the clock.

To see how GM now collaborates with a supplier, take as an example a needed cost reduction of a new seat frame made by Johnson Control. GM electronically sends its specifications for the seat to the vendor's product data system. Johnson Control's collaboration systems (eMatrix) is integrated with EDS's Unigraphics. This integration allows joint searching, designing, tooling, and testing of the seat frame in real time, expediting the process and cutting costs by more than 10 percent.

Another area of collaboration is that of crashing cars. Here designers need close collaboration with the test engineers. Using simulation, mathematical modeling, and a Web-based review process, GM is able now to electronically "crash" cars rather than to do it physically.

The Results

Now it takes less than 18 months to bring a new car to market, compared to 4 or more years before, and at a much lower design cost. For example, 60 cars are now "crashed" electronically, and only 10 are crashed physically. The shorter cycle time enables more new car models, providing GM with a competitive edge. All this has translated into profit. Despite the economic slowdown, GM's revenues increased more than 6 percent in 2002, while its earnings in the second quarter of 2002 doubled that of 2001.

Sources: Compiled from Sullivan (2002), press releases at *gm.com,* and from *amrresearch.com* as reported by Sullivan (October 2002).

Questions for Minicase 1

1. Why did it take GM over four years to design a new car?
2. Who collaborated with whom to reduce the time-to-market?
3. How has IT helped to cut the time-to-market?

Minicase 2

Cisco Systems Pioneers E-Learning

The Problem

Cisco Systems is one of the fastest-growing high-tech companies in the world, selling devices that connect computers and networks to the Internet and other networks. Cisco's products are continuously being upgraded or replaced; so extensive training of employees and customers is needed. Cisco has recognized that its employees, business partners, and independent students seeking professional certification all require training on a continuous basis. Traditional classroom training was flawed by its inability to scale rapidly enough. Cisco offered in-house classes for each course, 6 to 10 times a year, in many locations, but the rapid growth in the number

of students, coupled with the fast pace of technological change, made the training both expensive and ineffective.

The Solution

Cisco believes that *e-learning* is a revolutionary way to empower its workforce and partners with the skills and knowledge needed to turn technological change to an advantage. Therefore, Cisco implemented e-learning programs that allow students to learn new software, hardware, and procedures. Cisco believes that once people experience e-learning, they will recognize that it is the fastest, easiest way to get the information they need to be successful. The company created the Delta Force—made up of the CEO, the IT unit, and the Internet Learning Solution Group—to implement e-learning. The first project was to build two learning portals, one for 40 partner companies that sell Cisco products, and one for 4,000 systems engineers who implement the products after the sale.

To encourage its employees to use e-learning, Cisco:

- Makes e-learning "nonthreatening" by using an anonymous testing and scoring process that focuses on helping people improve rather than penalizing those who fail
- Gives those who fail the tests precision learning targets (remedial work, modules, exercises, or written materials) to help them pass and remove the fear associated with testing
- Enables managers to track, manage, and ensure employee development, competency change, and, ultimately, performance change
- Offers additional incentives and rewards such as stock grants, promotions, and bonuses to employees who pursue specialization and certification through e-learning
- Adds e-learning as a strategic top-down metric for Cisco executives, who are measured on their deployment of IT in their departments
- Makes e-learning a mandatory part of employees' jobs
- Offers easy access to e-learning tools via the Web

Cisco also wants to serve as a model of e-learning for its customers, hoping to convince them to use e-learning programs.

Cisco operates E-Learning Centers for Excellence that offer training at Cisco's centers as well as at customers' sites via intranets and the Internet. Some of the training requires the use of partnering vendors. Cisco offers a variety of training programs supported by e-learning. For example, in 2001, Cisco converted a popular 4 1/2-day, instructor-led training (ILT) course on Cisco's signature IOS (interorganizational information system) technologies into an e-learning program that blends both live and self-paced components. The goal was to teach seasoned systems engineers how to sell, install, configure, and maintain those key IOS technologies, and to do so in a way that would train more people than the 25 employees the ILT course could hold.

The Results

On the IOS course alone, Cisco calculated its return on investment as follows:

- It cost $12,400 in labor to develop the blended course.
- The course saved each system engineer one productivity day and 20 percent of the travel and lodging cost of a one-week training course in San Jose. Estimating $750 for travel and lodging and $450 for the productivity day, the savings totaled $1,200 per engineer.
- Seventeen system engineers attended the course the first time it was offered, for a total savings of $20,400. Cisco therefore recovered the development costs in the first offering—and saved $8,000 over and above the development costs. Since March 2001, the IOS Learning Services team has presented two classes of 40 engineers per month. At that rate, Cisco saves $1,152,000 net for just this one course every 12 months.

In 2003, there were over 10,000 corporate salespeople, 150,000 employees of business partners, and 200,000 independent students, all taking courses at Cisco learning centers, many using the e-learning courses. By 2003, Cisco had developed over 100 e-learning courses and was planning to develop many more soon. According to Galagan (2002), e-learning became a major force in Cisco's economic recovery, which started in 2002.

Sources: Compiled from miscellaneous news items at *Cisco.com* (2001–2003), Galagan (2002), and Delahoussaye and Zemke (2001).

Questions for Minicase 2

1. What were the drivers of e-learning at Cisco?
2. How can e-learning empower employees and partners?
3. What, in your opinion, made this project a success?
4. Can a small company use such e-training? Why or why not?

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