

# Managing Information Systems and Electronic Commerce

After reading this chapter,  
you should be able to:

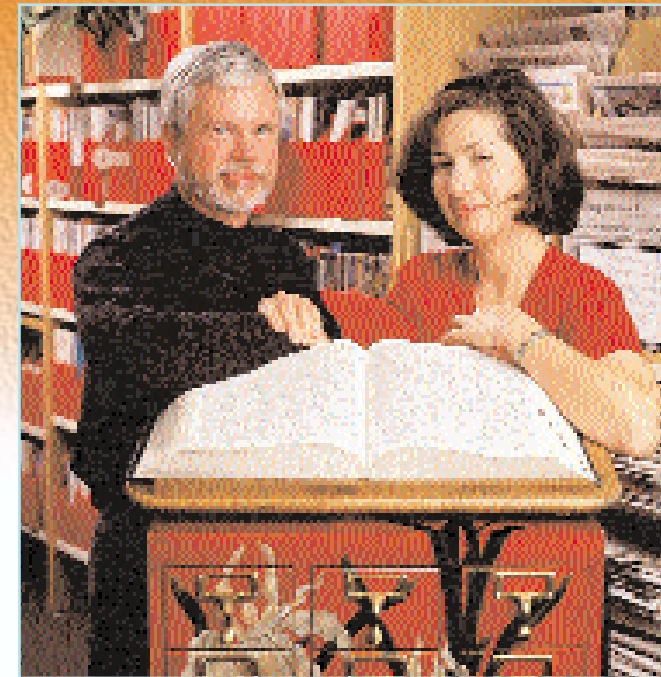
1. Explain why businesses must manage *information* and show how computer systems and communication technologies have revolutionized *information management*.
2. Identify and briefly describe three elements of *data communication* networks—the Internet, the World Wide Web, and intranets.
3. Describe five *new options for organizational design* that have emerged from the rapid growth of information technologies.
4. Discuss different information-system *applications programs* that are available for users at various organizational levels.
5. Identify and briefly describe the main elements of an *information system*.

## “Life, the Universe, and Everything”

Why does a boss want information on such varied topics as the anatomy of dragonflies, juvenile crime, and Japanese irises instead of just standard reports on department budgets and sales figures? And if gathering these eclectic tidbits is high on the agenda, how does a firm use its “knowledge workers” to build a networked information system for getting it? Consider the information system at Highsmith, Inc. of Fort Atkinson, Wisconsin. With more than 25,000 products, Highsmith is the country’s largest mail-order sup-

plier of equipment (book displays, audio-visual equipment), furniture, and supplies (educational software) for libraries and schools. Because its mission focuses on libraries and learning, it may come as no surprise that a central resource in Highsmith’s information system is its corporate library.

President and CEO Duncan Highsmith believes that external events—even some that seem remote and unrelated to the business—can create threats and opportunities for companies. He believes that if employees are focused only on internal operations, they won’t see the bigger picture, so he encourages a more eclectic approach of information gathering from a broad range of sources. New cultural trends and political forces eventually change the way a society thinks and lives, and Highsmith doesn’t want to get caught short when they do: He wants to foresee changes that can reshape the social environment, and he wants to be prepared in advance rather than forced to react after the fact. Clues might emerge from unexpected and seemingly unrelated sources ranging from *Popular Mechanics* to *South Park* to a UN health report. The job of his company’s library is to fuel information brainstorming.



“We tend to behave  
as though the future will  
be like the present.  
Only bigger.”

—CEO Duncan Highsmith  
of Highsmith Inc.

Highsmith is also convinced that if the right data is assembled in the right way, information gleaned from a variety of sources—from seemingly eclectic sources—is the only way to get a clear picture of things to come. He believes that, with access to the right information, his people can not only anticipate changes but can turn them to the company’s advantage. However, he does not believe that focusing on the future comes naturally to most people. “We tend to behave as though the future will be like the present,” he says. “Only bigger and faster.” That approach, he contends, doesn’t work when you need to make strategic-level decisions.

To promote greater linkages with events in the external world, Highsmith launched an information-stimulation program called “Life, the Universe, and Everything”—a weekly closed-door, free-association session in which he and company librarian Lisa Guedea Carreño scan every available information source, from radio to software to newspapers to the Web. They’re looking for trends. They search the world for clues to events that might reshape the world around them. Why Guedea Carreño? “The right information,” says Highsmith, “can help create

strategic choices for a business.” An information system, therefore, has to provide more than just sales reports, internally generated cost-control documents, and spreadsheets. For external information gathering, Guedea Carreño is a premier knowledge worker with a knack for gleaning nonquantitative information and collating it with seemingly unrelated resources in different formats. Somehow, she can detect the trends and relationships that emerge as she collates seemingly unrelated information.

As for Guedea Carreño, she believes that being in a small company is an advantage for a professional information provider: She can be more effective in providing value for coworkers if she knows their needs, what they do, and the kinds of problems they deal with. Highsmith sees enormous value in his information-stimulation project, but he also believes that it should go beyond the top-management level. He wants to broaden participation to include other employees. He wants to generate an interest in the long-term development of the business instead of merely its routine operations.

Our opening story continues on page 000

## INFORMATION MANAGEMENT: AN OVERVIEW

Today's businesses rely on information management in ways that we could not foresee as recently as just a decade ago. Managers now turn to digital technology as an integral part of organizational resources and as a means of conducting everyday business. Every major firm's business activities—designing services, ensuring product delivery and cash flow, evaluating personnel, and creating advertising—are linked to information systems. Thus the management of information systems is a core business activity that can no longer be delegated to technical personnel.

In addition, most businesses regard their information as a private resource—an asset that they plan, develop, and protect. It is not surprising that companies have **information managers**, just as they have production, marketing, and finance managers. **Information management** is an internal operation that arranges the firm's information resources to support business performance and outcomes. Consider, for example, Chaparral Steel <[www.chaparralsteel.com](http://www.chaparralsteel.com)>—a high-performance steel mill that produces structural products from recycled steel. Chaparral's performance—customer service, delivery times, sales, profits, and customer loyalty—has been boosted by an information system that gives customers electronic access to the steel products that are currently available in Chaparral's inventories. To find the information that they need to make critical decisions, managers must often sift through a virtual avalanche of reports, memos, magazines, and phone calls. Thus the question that faces so many businesses today: How can they get useful information to the right people at the right time? In this section, we will explore the ways in which companies manage information with computers and related information technologies. First, however, in order to understand information management, you must understand what information is and what it is not. Only then can you appreciate what computers do and how they do it.

### Data versus Information

Although businesspeople often complain that they get too much information, what they usually mean is that they get too many data. **Data** are raw facts and figures. **Information** is the useful interpretation of data.

For example, consider the following data:

- Last year, casino gambling was available in 37 states in the United States.
- Eighty-five percent of Americans live within a three-hour drive of a casino.
- In the past five years, visitor growth, especially among wealthy Asian gamblers, has been flat.
- In the last four years, Las Vegas has added \$10 billion to its gaming capacity.
- Since Congress passed the 1988 Indian Gaming Regulation Act, some 24 states offer some form of Native American casino gambling.

If all these data were put together in a meaningful way, they might produce information about what sells gaming and, in particular, whether entertainment companies should construct new hotels and casinos to meet increasing demand. The challenge for businesses, then, is to turn a flood of data into manageable information.

## NEW BUSINESS TECHNOLOGIES IN THE INFORMATION AGE

Employees at every level in the organization, ranging from operational specialists to the top executive, use information systems to improve performance. Information systems assist in scheduling day-to-day vehicle trips, evaluating prospective employees, and formulating the firm's business strategy. The widening role of IS results from rapid developments in electronic technologies that allow faster and broader flows of information and

communications. As we shall see, however, the networked enterprise is more than a firm equipped with the latest technology. Technology has inspired new organizational designs, innovative relationships with other organizations, and new management processes for improved competitiveness.

### The Expanding Scope of Information Systems

The relationship between information systems and organizations is among the fastest-changing aspects of business today. At one time, IS applications were narrow in scope and technically focused—processing payroll data, simulating new engineering designs, compiling advertising expenditures. But as you can see in Figure 12.1, managers soon began using IS systems not merely to solve technical problems, but to analyze management problems, especially for control purposes—applying quality-control standards to production, comparing costs against budgeted amounts, keeping records on employee absences and turnover.



Figure 12.1 Evolution of IS Scope

Today, information systems are also crucial in planning. Managers routinely use the IS to decide on a firm's products and markets for the next 5 to 10 years. The same database that helps marketing analyze demographics for millions of customers is also used for such higher-level applications as financial planning, managing materials flows, and setting up electronic funds transfers with suppliers and customers around the globe.

Another basic change in organizations is an increased interdependence between a company's business strategy and its IS. Today, the choice of a business strategy—to be the low-cost provider or the most flexible provider or the high-quality provider—requires an information system that can support that strategy. As Figure 12.2 shows, a given strategy will fail if a system's software, hardware, and other components are not integrated to support it. Consider a strategy that calls for the rapid receipt of customer orders and fast order fulfillment. Unless the system's components are specifically designed to handle these tasks, the best-laid plans are probably doomed to failure.

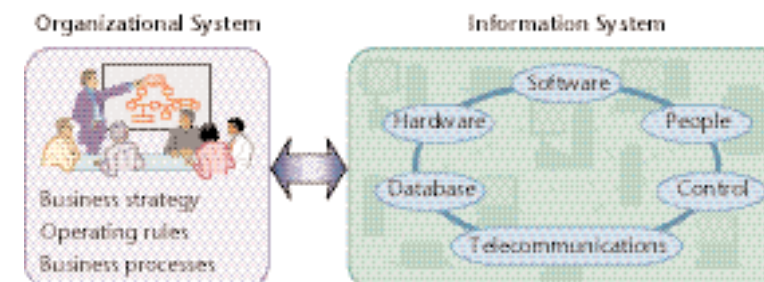


Figure 12.2 Aligning Business Strategy and the IS

### Electronic Business and Communications Technologies

The pressures to maintain better communications and information systems are increasing as competition intensifies and as organizations expand into global and e-business operations. Firms like Ralston Purina Co. <[www.ralston.com](http://www.ralston.com)> need instantaneous communi-

#### information management

Internal operations for arranging a firm's information resources to support business performance and outcomes

#### information managers

Managers responsible for designing and implementing systems to gather, organize, and distribute information

#### data

Raw facts and figures

#### information

Meaningful, useful interpretation of data

**electronic information technologies (EIT)**

Information-systems applications, based on telecommunications technologies, that use networks of appliances or devices to communicate information by electronic means

**fax machine**

Machine that can transmit copies of documents (text and graphics) over telephone lines

**voice mail**

Computer-based system for receiving and delivering incoming telephone calls

**electronic mail (e-mail)**

Computer system that electronically transmits letters, reports, and other information between computers

cations among managers in those countries in which they either sell products or buy raw materials, including China, Colombia, Canada, and Brazil. The needs of such companies are being met by new electronic information technologies and more advanced data communication networks.

**Electronic Information Technologies** Electronic information technologies (EIT) are IS applications based on telecommunications technologies. EITs use networks of appliances or devices (such as cell phones and computers) to communicate information by electronic means. EITs enhance the performance and productivity of general business activities by performing two functions:

1. Providing coordination and communication within the firm
2. Speeding up transactions with other firms

In this section, we will survey six of the most widely used innovations in today's digital business systems: fax machines, voice mail, e-mail, electronic conferencing, groupware, and digital information services.

**Fax Machines** The fax machine (short for facsimile machine) can transmit and receive digitized images of text documents, drawings, and photographs over telephone lines in a matter of seconds, thus permitting written communication over long distances. Fax machines are popular with both large and small firms because of speed and low cost.

**Voice Mail** Voice mail refers to a computer-based system for receiving and delivering incoming telephone calls. Incoming calls are never missed because a voice responds to the caller, invites a message, and stores it for later retrieval. A company with voice mail networks each employee's phone for receiving, storing, and forwarding calls.

**E-Mail** An electronic mail (or e-mail) system electronically transmits letters, reports, and other information between computers, whether in the same building or in another country. It is also used for voice transmission and for sending graphics and videos from one computer to another. E-mail thus substitutes for the flood of paper and telephone calls that threatens to engulf many offices.

**Electronic Conferencing** Electronic conferencing is becoming increasingly popular because it eliminates travel and thus saves money. Teleconferencing allows groups of people to communicate simultaneously from various locations via electronic mail or via telephone. One form of electronic conferencing, dataconferencing, allows people in remote locations to work simultaneously on the same document. Working as a team, they can modify part of a database, revise a marketing plan, or draft a press release.

**Servers and Browsers** Each Web site opens with a homepage—a screen display that welcomes the visitor with a greeting that may include graphics, sound, and visual

enhancements introducing the user to the site. Additional pages give details on the sponsor's products and explain how to contact help in using the site. Often, they furnish URLs for related Web sites that the user can link into by simply pointing and clicking. The person who is responsible for maintaining an organization's Web site is usually called a Webmaster. Large Web sites use dedicated workstations—large computers—known as Web servers that are customized for managing, maintaining, and supporting Web sites.

With hundreds of thousands of new Web pages appearing each day, cyberspace is now serving up billions of pages of publicly accessible information. Sorting through this maze would be frustrating and inefficient without access to a Web browser—the software that enables the user to access information on the Web. A browser runs on the user's PC and supports the graphics and linking capabilities needed to navigate the Web. Netscape Navigator <[home.netscape.com/browsers/index.html](http://home.netscape.com/browsers/index.html)> has enjoyed as much as an 80-percent market share, although its dominance is now being challenged by other browsers, including its own Netscape Communicator and Microsoft Corp.'s Internet Explorer <[www.microsoft.com/windows/ie](http://www.microsoft.com/windows/ie)>.

**More Flexible Operations** Electronic networks allow businesses to offer customers greater variety and faster delivery cycles. Recovery after heart surgery is expedited by custom-tailored rehabilitation programs designed with integrated information systems: Each personalized program integrates the patient's history with information from physicians and rehabilitation specialists and then matches the patient with an electronically monitored exercise regimen. Products such as cellular phones, PCs, and audio systems can be custom-ordered, too, with your choice of features and options and next-day deliv-

**Web server**

Dedicated workstation customized for managing, maintaining, and supporting Web sites

**browser**

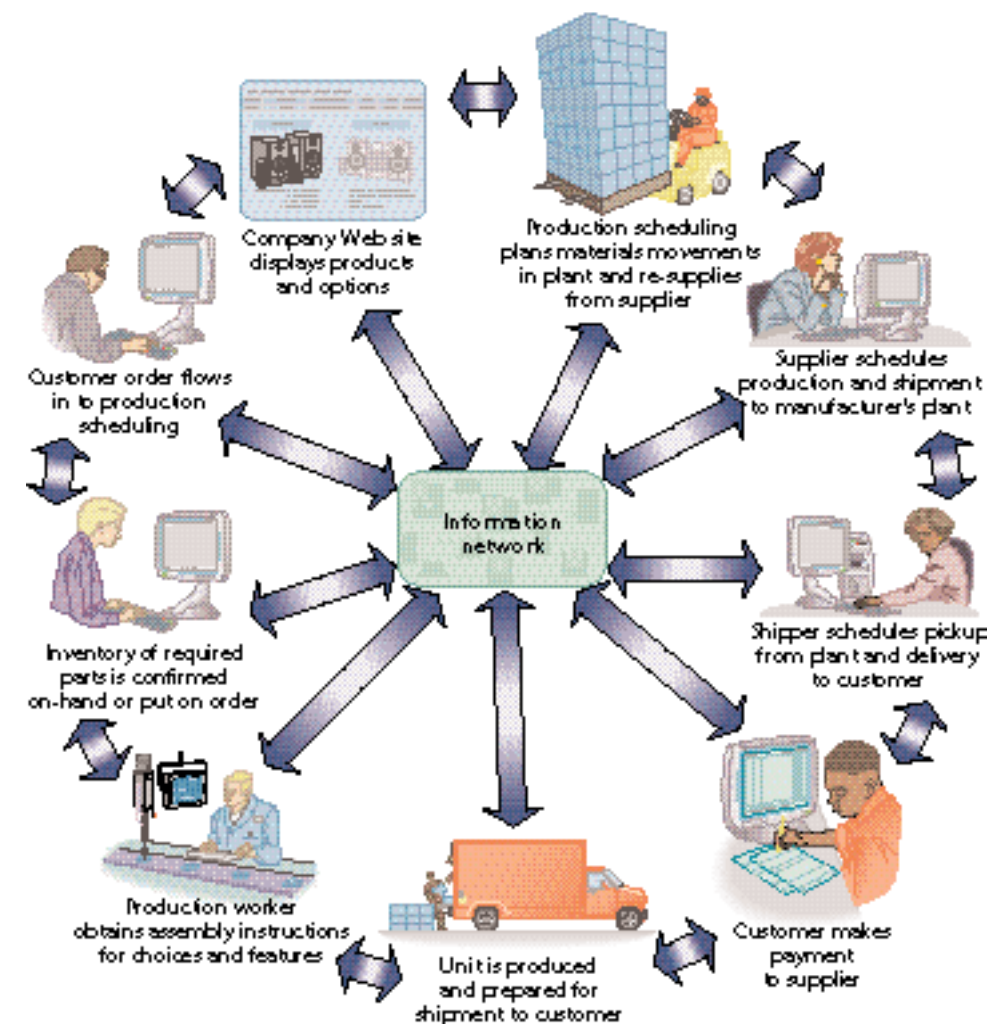
Software supporting the graphics and linking capabilities necessary to navigate the World Wide Web

**WEB Connection**

The name pretty much tells the story: CandyCommerce.com is the B2B marketplace of the confectionery industry. Among other pages, the Web site includes an "Auction House" at which sellers can list products for sale and a "Product Showcase" that allows members to shop the organization's listing of online confectionery-supplier catalogs. You can visit the National Confectioners Association Web site for more information.

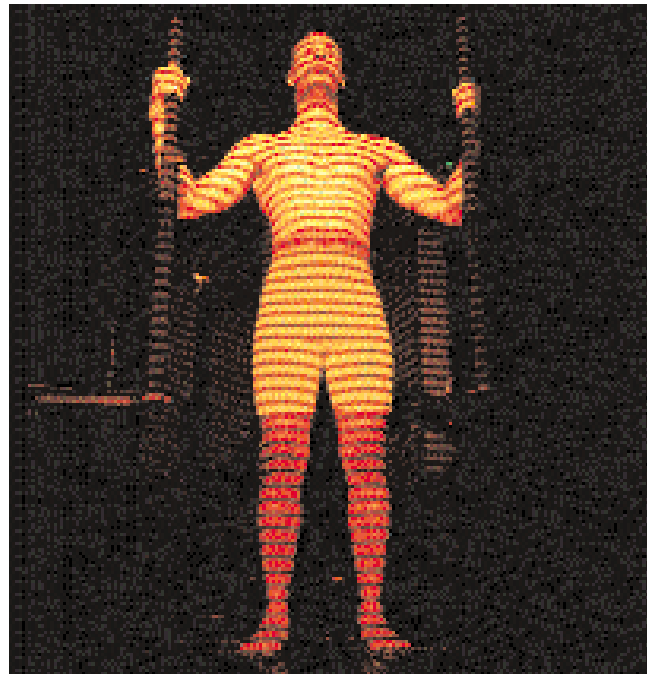


[www.candycommerce.com](http://www.candycommerce.com)



**Figure 12.3**  
Networking for Mass-Customization

Thanks to networking technology, customers can give manufacturers information that manufacturers can feed into production systems at relatively little cost. The result is so-called mass customization. At Levi Strauss & Co., New technologiex can take an apparel buyer's body measurements and transfer the information, via the Web, to a manufacturing plant. There, the data is fed into equally advanced machines designed to handle one-of-a-kind items on an assembly line.



ery. The principle is called mass-customization: Although companies produce in large volumes, each unit features the unique variations and options that the customer prefers. As you can see in Figure 12.3, flexible production and fast delivery depend on an integrated network to coordinate all the transactions, activities, and process flows necessary to make quick adjustments in the production process.

**User Groups and System Requirements**

Four user groups, each with different system requirements, are identified in Figure 12.4, which also indicates the kinds of systems best suited to each user level. Among users we include the knowledge worker—the employee whose job involves the use of information and knowledge as the raw materials of their work. Knowledge workers are specialists, usually professionally trained and certified—engineers, scientists, information technology

**Figure 12.5**

Matching User Levels with Functional Areas and Business Processes

	Organization Function			Business Process			
	Marketing	Finance	Production	Strategic planning	Product development	Order fulfillment	Supply chain management
Top-level managers				↑	↑	↑	↑
Mid-level managers							
Knowledge workers							
First-level managers				↓	↓	↓	↓



"Smaller, more powerful chips allow me to have a smaller team."

specialists, psychologists—who rely on information technology to design new products or create new business processes.

**Managers at Different Levels** Because they work on different kinds of problems, top managers, middle managers, knowledge workers, and first-line managers have different information needs. First-line (or operational) managers need information to oversee the day-to-day details of their departments or projects. Knowledge workers need special information for conducting technical projects. Meanwhile, middle managers need summaries and analyses for setting intermediate and long-range goals for the departments or projects under their supervision. Finally, top management analyzes broader trends in the economy, the business environment, and overall company performance in order to conduct long-range planning for the entire organization.

**IT'S A WIRED WORLD**  
**"These Two Companies Are a Natural Fit"**

Even a high-tech giant can't be an expert in every new development in the digital world. Consider, for example, America Online <www.aol.com> (including its CompuServ service <www.compuServe.com>—America's largest online Internet service provider (ISP), with 22 million subscribers. AOL's customers have Internet access through traditional phone lines. But AOL is thinking about ways to give them even faster Internet service by means of high-speed cable lines. Traditional phone lines are slower than cables in connecting to the Net. They're also slower in downloading information and slower in reading graphics files. AOL already knows that if it's going to stay competitive in the home Internet market, it will need to offer customers faster Internet connections. On one level, the problem is fairly simple: How do you get from phone lines to cables? One approach—replacing all those phone lines with cables—is more than prohibitively expensive: It simply can't be done. Because AOL doesn't own.



## Researching with a Purpose

On Duncan Highsmith's organizational chart, the library is listed on the same level as the firm's other important functions, including marketing, human resources, and accounting. As part of the information system, it adds the power of the Internet to human judgment. It also directs information toward the people who can use it and get results with it, and it's readily available and affordable.

The strength of the system is its knowledge-management tool: Lisa Guedea Carreño. Although Guedea Carreño relies on the Internet, she also realizes that as an information source it isn't necessarily all that it's cracked up to be. It's full of hype and promises, and it's unfamiliar territory to new users. Web-search services—Internet search directories, Web browsers, and search engines—often provide spotty information, ranging from full-disclosure sites to sites that offer the truth but not the whole truth. Some Web services report information only for sites that pay to be listed and ignore others. Even among

those that report on a huge number of companies, some may give preferential treatment—that is, more favorable reports—to business partners.

To help internal Highsmith users, Guedea Carreño has thus devised her own rules of thumb for navigating the Net efficiently, sorting through Web sites to discard the bad and retain the useful. Through experience, she's compiled a checklist and some questions. Here's a sample:

- **Quality control** A quick rule is watch for typos. If it's typed sloppily, the site's content is also probably of questionable quality.
- **Timeliness** Is the information current? Does the site tell you when it was updated? If not, chances are it's old information (and thus not information at all).
- **Purpose** What's the site's purpose? If it's ambiguous or not readily apparent, you, too, will probably end up wandering around without purpose.
- **Linkages** Does the site contain links to other sites? Are the others relevant, accessible, and current? If it links you to unreliable sites, you will be misdirected and lose precious time.

and economically via *telecommunication systems*. The largest public communications network, the Internet, is a gigantic system of networks linking millions of computers offering information on business around the world. The Net is the most important e-mail system in the world. Individuals can subscribe to the Net via an *Internet service provider (ISP)*. The *World Wide Web* is a system with universally accepted standards for storing, formatting, retrieving, and displaying information. It provides the common language that enables users around the world to "surf" the Net using a common format. *Intranets* are private networks that any company can develop to extend Net technology internally—that is, for transmitting information throughout the firm. Intranets are accessible only to employees, with access to outsiders prevented by hardware and software security systems called *firewalls*.

## SUMMARY OF LEARNING OBJECTIVES

- 1 **Explain why businesses must manage information and show how computer systems and communication technologies have revolutionized information management.** Because businesses are faced with an overwhelming amount of data and information about customers, competitors, and their own operations, the ability to manage this input can mean the difference between success and failure. The management of its information system is a core activity because all of a firm's business activities are linked to it. New digital technologies have taken an integral place among an organization's resources for conducting everyday business.
- 2 **Identify and briefly describe three elements of data communication networks—the Internet, the World Wide Web, and intranets.** *Data communication* networks, both public and private, carry streams of digital data (electronic messages) back and forth quickly

- 3 **Describe five new options for organizational design that have emerged from the rapid growth of information technologies.** Information networks are leading to *leaner* organizations—businesses with fewer employees and simpler organizational structures—because networked firms can maintain electronic, rather than human, information linkages among employees and customers. Operations are *more flexible* because electronic networks allow businesses to offer greater product variety and faster delivery cycles. Aided by intranets and the Internet, *greater collaboration* is possible,

both among internal units and with outside firms. *Geographic separation* of the workplace and company headquarters is more common because electronic linkages are replacing the need for physical proximity between the company and its workstations. *Improved management processes* are feasible because managers have rapid access to more information about the current status of company activities and easier access to electronic tools for planning and decision making.

## QUESTIONS AND EXERCISES

### Questions for Review

1. Why does a business need to manage information as a resource?
2. How can an e-mail system increase office productivity and efficiency?
3. Why do the four levels of user groups in an organization need different kinds of information from the information system?
4. In what ways are local area networks (LANs) different from or similar to wide area network (WANs)?
5. What are the main types of electronic information technologies being applied in business information systems?

## EXPLORING THE WEB

### On the Cutting Edge with Experts

Most firms rely on expert assistance to get started on network development and buy the technology they need for their Internet systems. Cisco Systems Inc. is the worldwide leader in Internet networking, providing most of the systems that make the Internet work. By looking at Cisco's products, including hardware, software, and services, we can get an idea about both the needs of Internet users and some of the leading-edge solutions that are available. To learn about Cisco, its products, and its customers, visit its Web site at:

[www.cisco.com/](http://www.cisco.com/)

Spend some time navigating through the homepage. To get an idea of the variety of Cisco's products and services, enter each of the subject gates (point the mouse to the title and click) located up, down, and across the page. Scroll down the page and select "Services" and

"Solutions" titles that seem interesting to you. Be sure to note the different kinds of customers at whom each product is directed. After getting acquainted with the site, consider the following items:

## ETHICAL DILEMMA

### The Experts Say So

Most firms rely on expert assistance to get started on network development and buy the technology they need for their Internet systems. Cisco Systems Inc. is the worldwide leader in Internet networking, providing most of the systems that make the Internet work. By looking at Cisco's products, including hardware, software, and services, we can get an idea about both the needs of Internet users and some of the leading-edge solutions.

## BUILDING YOUR BUSINESS SKILLS

### The Art and Science of Point-and-Click Research

This exercise enhances the following SCANS workplace competencies: demonstrating basic skills, demonstrating thinking skills, exhibiting interpersonal skills, working with information and applying system knowledge.

#### GOAL

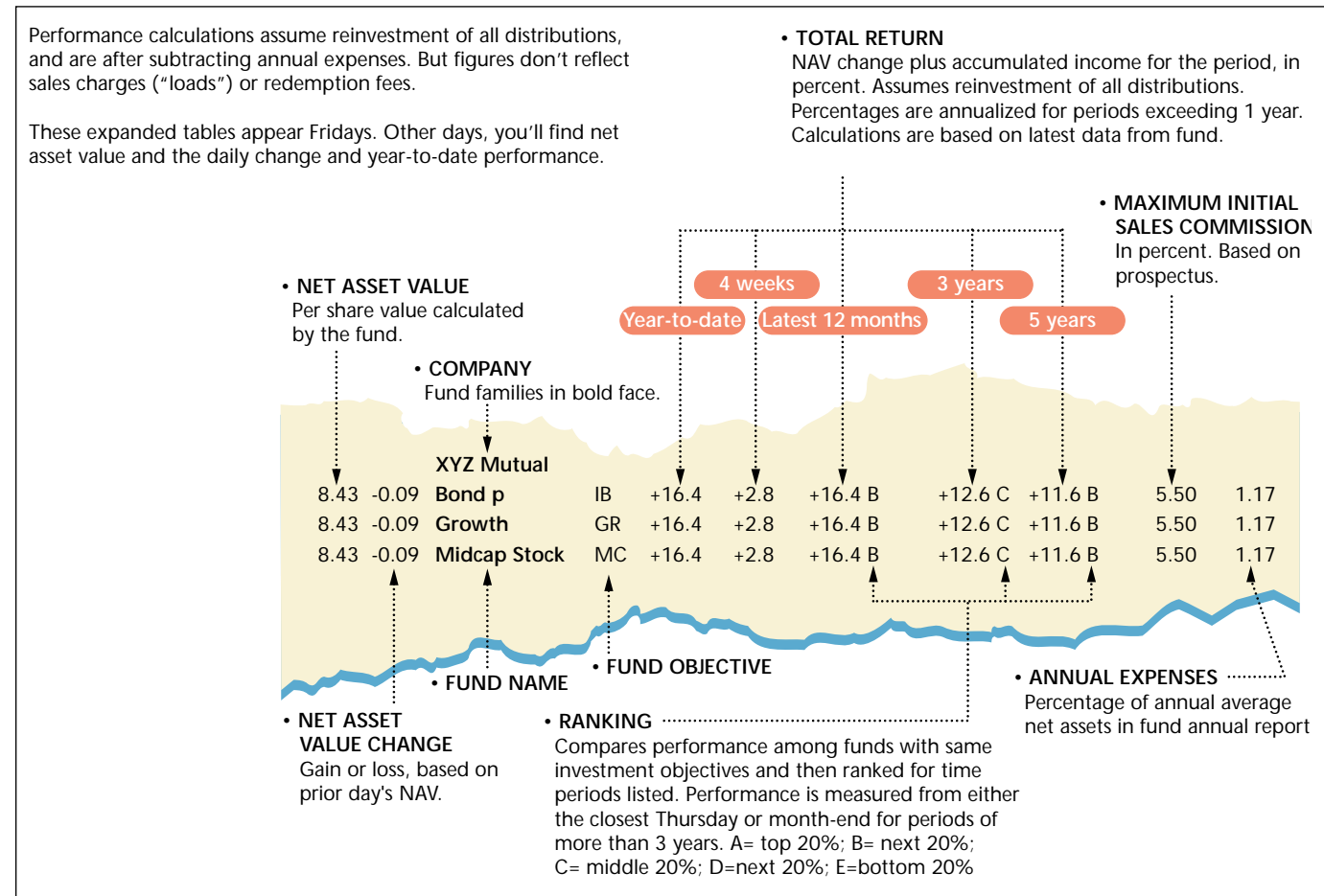
To introduce students to World Wide Web search sites.

New digital technologies have taken an integral place among an organization's resources for conducting everyday business.

#### BACKGROUND

In a recent survey of nearly 2,000 Web users, two-thirds stated that they used the Web to obtain work-related information. With an estimated 320 million pages of information on the Web.

**Figure 20.5**  
Reading Mutual Fund Quotations



colors in red are less than guideline allowance?

**Table 18.3**  
Revenue Recognition and the Matching Principle

(A) THE CORRECT METHOD REVEALS EACH ACCOUNTING PERIOD'S ACTIVITIES AND RESULTS		
	Year Ended December 31, 2000	Year Ended December 31, 2001
Revenues	\$10,000	\$12,000
Expenses	8,000	9,000
Net income	2,000	3,000

(B) THE INCORRECT METHOD DISGUISES EACH ACCOUNTING PERIOD'S ACTIVITIES AND RESULTS		
	Year Ended December 31, 2000	Year Ended December 31, 2001
Revenues	\$14,000	\$8,000
Expenses	8,000	9,000
Net income	6,000	(1,000)

1. Since 2000.