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## End-User Information Systems:Organizational And Technical Foundations

Information systems are integral to most contemporary business operations. Personal computers (PCs) have become standard desktop tools in the workplace, whether the location is a traditional office building, a room at home, an automobile, a hotel, or a plane over the Pacific. For many workers, PCs are no longer optional; they have become essential tools. Moreover, the explosive growth of the Internet has changed expectations about what information technologies can and should do for us.

Many young people today take PCs on the desktop for granted. The latest statistics show that more than half of the U.S. population now has a PC at home. It has been barely two short decades, however, since computer systems first started to move out of secluded backroom technical environments and into the workplace. The movement started with word processing, expanded to end-user computing tools, such as query and reporting systems, and exploded in the early 1980s with the introduction of end-user PC software, such a~ spreadsheets and graphics packages. The Internet is poised to have an even more far-reaching impact.

In many organizations, end users are taking a much larger role in planning and developing information systems. A growing percentage of computing is being done by end users with little or no formal assistance from technical information systems specialists. This practice, called end-user computing, is made possible by the increasingly powerful fourth-generation software tools. With fourth-generation programming languages, graphic languages, PC tools, and Web software, end users can access data, create reports, design Web pages, and create entire information systems on their own, with little or no help from technical systems analysts or programmers.

The area of IS that involves implementing, managing, and supporting computing in the workplace by non-IS technical specialists is called *end-user information systems (EUIS)*.

EUIS can be defined as "the application of information technologies to support business processes and individual performance with the objective of improving overall organizational effectiveness in direct support of business goals and strategies."

Some IS texts use the terms *knowledge work systems* (KWS) and *office automation systems* (OAS). However, in our view, the distinctions these terms suggest are no longer valid for the twenty-first-century workplace in which almost everyone has a PC on their desktop. In the typical contemporary enterprise, most routine tasks are automated, job roles have been expanded, and workers at all levels are empowered to make decisions within their scope of responsibility. Most importantly, workers at all levels of the organizational hierarchy, which is a lot flatter than it used to be, have powerful PC platforms on their desktops and are increasingly savvy about using them.

Another term that has emerged recently is *knowledge management* (KM)—the concept of managing organizational knowledge. Not yet well defined, the concept represents a convergence of several previously separate areas such as information resource management, document production, work-flow management, document imaging systems, performance support, training, artificial intelligence, group collaboration systems, and the like. A growing number of new requirements also have emerged in recent years, such as Help Desk, Web site development and maintenance, Intranets, and network administration. EUIS today encompasses this broad spectrum of individual and work group information technologies for knowledge workers at all levels. All of these areas share in common the need for a combination of organizational savvy, business knowledge, and technical competence, but not necessarily computer programming languages. EUIS is the area of IS that addresses the direct connection between technology and its application at the desktop—how end users apply computing skills to do their work and achieve their business results.

Although enterprise computing and transaction processing systems still form the backbone of information systems in most large enterprises, end-user information systems have made their way into the mainstream. EUTS puts business decision makers in the driver's seat instead of technical systems professionals. Although end-user computing has created many benefits, it also poses organizational risks because it occurs largely outside of traditional mechanisms for information systems management and control. The value of end-user information systems and desktop technologies has not been accepted universally among business personnel either, despite their rapid growth. Some detractors argue that the claimed benefits and productivity improvements from the billions invested in end-user technologies are yet to be proved.

Moving computers into the front office next to rubber tree plants and onto desk-tops has brought with it a unique set of requirements apart from technical considerations. These include the need for greater customization, flexibility, and usability than typical centralized transaction processing systems. Moreover, sociological, organizational, and business factors play a larger role than originally recognized. These and other issues are addressed by end-user information systems.

An understanding of this specialized area of information systems is important for individuals considering careers in management, computer science, management information systems, administrative services, and business education, as well as those preparing for careers in end-user information systems. Individuals charged with responsibility for end-user systems must have broad technical skills combined with an understanding of organizational dynamics, management practice, and business process.

Part I of the text is divided into two chapters. Chapter 1, "Introduction to End-User Information Systems," provides an overview of this specialized area of information systems and discusses the impact of information technology on workplace environments. It offers historical perspective and provides a foundation for understanding work environments. Chapter 1 also explains where EUIS fits into the typical enterprise's information systems organization. Finally, it offers perspectives on career opportunities in this emerging field.

Chapter 2, "Life in Networked Organizations," examines the rapidly expanding impact of information technologies and digital networks on workplace environments people, processes, and organizational structures. It also looks at implications of the economic environment, the digital divide, and the Next Generation Internet.

## Case Study The Globally Wired Organization The Facts

PricewaterhouseCoopers was created in 1998 by the merger of two firms-Price Waterhouse and Coopers & Lybrand- each with historical roots going back some 150 years. The firm had worldwide revenues of \$17.3 billion in 1999. The company has roughly 9,000 partners and 160,000 total partners and staff. The geographic coverage of the firm is 150 countries and territories.

PricewaterhouseCoopers is one of the leading organizations in the utilization of technology including the use of many types of networks and mobile computing.

At PricewaterhouseCoopers, the network isn't just the computer-it is what runs the business. That's because the primary asset of this global consulting and accounting firm is the brainpower of its employees. Increasingly, those professionals rely on Price water house Coopers's enterprise networks to share ideas with one another and, more importantly, with clients.

They're doing a lot of sharing. Thanks to an explosion of new collaborative Web-based applications, traffic on Price water house Coopers's networks is growing by two to three times per year. The demand for network bandwidth, said Karl Wagner, the New York-based company's director of global networking, is almost insatiable.

"Everyone wants it there all the time, and they always want more of it," Wagner said. "Data networks are just like the telephone today. They want to plug in their PCs and just get their stuff."

To deal with that kind of growth, PricewaterhouseCoopers has aggressively turned to newer technologies, such as virtual private networks (VPNs), and tried-and-true standards such as Synchronous Optical Network (SONET) rings. Those technologies have helped the company keep networking costs under control while increasing flexibility, reliability, and responsiveness.

Not surprisingly, the world's biggest network—the Internet—has created much of the new demand on Price water house Coopers's global network. The number of external partners and customers that want to use the Internet to plug directly into Price water house Coopers's intellectual capital has skyrocketed. To accommodate customers, the company has begun developing a series of secure Extranets that can be used to share research and collaborate with clients.

The company's six main practice areas—tax, audit, management consulting, human resources, business process outsourcing, and financial advisory services-determine the types of Extranets it is developing. The first such Extranet, launched in the fall of 1996 by Price water house Coopers's global tax services practice, is called the Tax News Network. About 5,000 corporate tax professionals at large companies now use the tax network to stay up to date on tax laws and Price waterhouse Coopers's research, said Susan O'Neill, a partner in the company's global knowledge management group

Other PricewaterhouseCoopers Extranets allow customers and consultants to link up on secure sites to collaborate on projects.

While Extranet development has been strong for about two years, "it's been exponential in growth and discussion within the organization" over the past year, O'Neill said. "We think that ebusiness is business, and we certainly think being connected to our clients through virtual communities and secure Web sites has to be part of the way we do business."

However, external customers are not the only ones driving up Price water house Coopers's network traffic. Internally, employees are relying increasingly on the company's 5-year-old Intranet to administer their benefits, stay abreast of company news, and search for technical information. They also browse the Web to conduct research.

In addition to Price water house Coopers's traditional desktop users, about 80,000 of the employees are mobile and typically work at hotel rooms or reserve space at the firm's offices worldwide. PricewaterhouseCoopers plans to implement a virtual private network—a private network configured within a public network—to provide notebook users with secure access to its data. The firm is testing this VPN at offices in North America and is preparing to roll out the network to 70,000 workers in North America and Great Britain at the rate of 3,000 per week.

PricewaterhouseCoopers also is staffing its offices with IT workers who speak multiple languages, so visiting notebook users are more likely to find someone they can talk to for technical support. That's been a problem for employees with notebook support needs that arise outside the business hours of their home offices. "If you're in a hotel room in Taiwan, you're not going to call your office in Oklahoma," says Michael Schoenholtz, a partner who oversees global IT support strategies.

### The Payoff

The VPN is paying off so far. In the United States, the cost of a remote dial-up connection is between \$4.20 and \$6.10 per hour. Through the VPN, the same connection averages about \$1.40 per hour for the Internet access provided by an Internet service provider (ISP).

Along with lowering remote access costs, the VPN provides a secure tunnel over the Internet, allowing encrypted data to travel from behind Price water house Coopers's fire-wall to a user who has accessed the Internet through a dial-up connection, another company's LAN, or a broadband connection at home.

Several thousand PricewaterhouseCoopers employees are using digital subscriber line and cable modem services in conjunction with the VPN to conduct business from their homes. Later this year, PricewaterhouseCoopers will connect three major European offices through a VPN service managed by an ISP. The corporate locations—in Paris; London; and Frankfurt, Germany—represent about 20,000 employees.

PricewaterhouseCoopers is at the forefront of global companies realizing that site-tosite VPNs can help bring the costs of their European networks more in line with those in the United States, experts say. In general, the cost of private telecommunications services in Europe is about five times what it costs in the United States.

### **CASE STUDY QUESTIONS**

1. What are some of the ways in which digital networks are changing the way PricewaterhouseCoopers employees work? How have these changes increased their effectiveness? What disadvantages/negatives do you see?

Accommodating all those new global users and applications, however, means a lot more traffic on Price water house Coopers's LANs and WANs. To help manage it all, the company has begun turning to SONET technology.

SONET technology involves the use of fiber optics to connect networks. These networks are sometimes called Ti or T3 lines. These networks offer high-speed connections that can transport huge amounts of data quickly.

Price water house Coopers started using SONET in the spring of 1998 at its data centers in Floral Park, New York, and Tampa, Florida. The company had started consolidating its servers for enterprise wide applications, such as Lotus Development Corp.'s Notes and enterprise resource planning (ERP) software, into the data centers as a way to cut costs and better manage the applications.

"Once some change happens, either a new application or a change in business, or, heaven forbid, they combine three offices and forget to tell you, then you've got to be able to respond to that quickly," Wagner said.

Price water house Coopers officials expect that the company's need for networking bandwidth and flexibility will only increase. The next wave of demand could well come from the trend toward hosted applications. In addition to beginning to provide hosting services to clients through its business process outsourcing practice, Price-water house-Coopers has begun using application service providers.

Currently, in fact, the company is discussing an arrangement with its ERP vendors and expects to have the application hosted by the end of the year, said Rowan Snyder, the company's deputy CIO.

With the use of these present technologies and other advancements on the horizon, PricewaterhouseCoopers truly is becoming a networked organization both digitally and collaboratively.

*Sources:* Hicks, Matt, "Keeping Ideas Flowing—PricewaterhouseCoopers turns to VPN, SONET to Plug Global Users into Its Intellectual Capital," *eWeek* (May 8,2000): 105; Vitiello, Jill, "Road Rage; Companies Are Going after Remote and Mobile Computing with a Vengeance, Creating Lots of Opportunities for IT Pros with the Right Skills," *Computerworld* (March 27,2000): 88;

Davey, Tom, and Amy K. Larsen, "The Mobile Infrastructure— As Use of Notebooks Increases, So Does the Demand for Security and Support," *Information Week* (June 23, 1999): 20.

2. What axe some of the ways in which digital networks are changing Price water houseCooper's relationship with partners and clients? What do you think might be some of the results?

## CASE STUDY CLASS PROJECTS

- 1. Check out the PricewaterhouseCoopers Web site. How has PWC implemented some of the changes discussed in this case?
- 2. Imagine that you or your assigned group are (an) employee(s) at PricewaterhouseCoopers. Using this case, information in chapter 2, the PricewaterhouseCoopers Web site, and other references regarding the changing digital workplace, create a one- to two-page scenario of a typical day of work on a consulting assignment at PricewaterhouseCoopers. Make up any details you wish within the context established by the PWC case.
- 3. Share stories with classmates. Summarize the results by listing and discussing how digital networks are enhancing performance of individuals and groups.