Chapter I

Introduction to End-User Information Systems

Learning Objectives

Upon completing this chapter, you should be able to:

- Define end-user information systems (EUIS) and explain how it relates to other areas of information systems.
- Explain how EUIS fits into an overall enterprise information systems architecture.
- Identify the benefits of end-user information systems.
- Understand how end-user information systems relate to changing roles and expectations in the workplace.
- Explain how business processes addressed by end-user information systems differ from those handled by large data centers and transaction processing systems.
- Describe the changing requirements (characteristics) of work in the Information Age.
- Describe the impact of end-user information systems on workplace environments.
- Understand the relationship between workplace performance and technology.
- Explain the concept of Help Desk and assistance centers.
- Identify career opportunities in the area of end-user information systems.

1 .1 INTRODUCTION

Information technology is transforming how business and government enterprises operate and, as a result, how people work. Information is the critical raw material for decision making and the foundation for producing products and providing services. People create information; people use information; people control information. The growing economic importance of information in modern society led sociologists such as Alvin Toffler and John Naisbitt to characterize our society as the *Information Age*. In fact, more than half of today's workforce is employed in information-related jobs, compared to less than 20 percent 30 years ago. Most of those people spend a significant portion of their workday *"in the office,"* which might be at home, in a hotel room, at the airport, in a car, in a plane, or at some other remote location, as well as in a traditional office building.

In an information age, knowledge and core competencies (the two or three things that an enterprise does best) are key organizational assets. Only recently, the value of a company was thought to reside primarily in its tangible assets: machinery, buildings, inventory, and real estate. This Industrial Age notion that an enterprise should be measured mainly in terms of its goods and property no longer holds. In today's global economy, producing unique or lower-cost products and services requires superior knowledge of design, business processes, and distribution. Knowing how to do things effectively and efficiently in ways that other enterprises cannot duplicate easily is a primary source of profit. As knowledge becomes a critical asset, the success of the enterprise increasingly depends on its ability to gather, produce, maintain, and disseminate information and knowledge. Information technology and digital networks are transforming how this is accomplished.

More and more information today is stored, processed, and distributed in digital format. The Internet is having a profound influence, and The Next Generation Internet will provide greatly expanded capabilities for transmitting and displaying information in all formats. E-commerce and e-business are fundamentally changing the dynamics of the marketplace, opening many new possibilities for communicating, collaborating, and transacting business. The anticipated impact is so revolutionary that the pundits already are calling the twenty-first century the *Digital Age.*

A PC on the desktop is an expectation for the typical knowledge worker today. Most likely, the PC is connected to the company network, which provides access to e-mail, proprietary systems, and the Internet. In addition to individual productivity tools—such as word processing, spreadsheets, graphics, and presentation software—the PC probably provides access to work group support such as Outlook or Lotus Notes. The desktop PC also is likely to be the gateway to a wide variety of company information, such as personnel directories, human resource information, procedure manuals, and other reference information available online on a company Intranet. The company network provides connections to other offices nationwide or worldwide. If workers travel, in all likelihood, they carry a notebook and can dial in to company systems from anywhere in the world. Many workers also carry pagers and personal digital assistants (PDAs), such as the Palm Pilot. They may be assigned to work teams that are disbursed in several locations worldwide so that tasks must be coordinated with minimum face-to-face contact.

Through the application of information technologies, organizations continually are finding more effective ways for people to manage information and capture knowledge. One area of IS that has changed significantly and grown in importance in recent years is end-user information systems (EUIS). End-user technologies, also called *knowledge work* systems—especially in the form of desktop productivity tools, collaborative work group tools, knowledge management, Intranets, desktop publishing, multimedia, and online learning—are the fastest-growing applications in business today.

The digital revolution has put millions of personal computers on the desks of employees who have little experience using them, connecting them to powerful communication networks, rearranging social relations in the office, changing reporting patterns, changing business processes, and redefining business goals. Planning. designing. implementing. and supporting the technology with all its challenges is only half the picture. The challenges of transforming and managing the end-user environment have turned out to be equally as great. More often than not, the technology is successful, but projects still fall short on delivering promised benefits. These and other challenges of using technology to improve individual, workgroup, and organizational performance are the province of end-user information systems and the subject of this text.

Chapter 1 provides an overview of end-user information systems and discusses the impact of information technology on individual and work group performance. It sets the stage for topics that are discussed in more detail throughout the text In the next section, you will learn more about the field of EUIS and how it differs from other areas of IS.

1.2 END-USER INFORMATION SYSTEMS

End-user information systems (EUIS) is such a rapidly evolving field that defining it has been somewhat challenging. The field has changed noticeably in just 4 to 5 short years.

This section offers a current definition of EUIS and explains what distinguishes it from other areas of IS and where it fits into the total IS field.

1.2.1 What Is End-User Information Systems?

End-user information systems can be thought of as the application of information technology to support workplace performance. The focus is on providing systems that directly support individual, group, and departmental needs. It involves implementing, managing, and supporting computing in the workplace by non-IS technical specialists. The term *end user* emerged in the early days of computing and refers to the non technical personnel who use systems, as opposed to technical IS personnel who design them. When fourth-generation languages and PC application packages were first introduced to non technical workers, it was referred to as "end-user computing" or programming done by non-IS technical specialists. 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 accomplish their business results.

This is a field of growing importance as workers at all levels of the organizational hierarchy have powerful PC platforms on their desktop and are increasingly savvy about using them—a trend that has been greatly accelerated by the Internet. As tools continue to become more powerful and easier to use, end-user computing represents a growing proportion of all enterprise computing. Although originally the exception to the rule, end-user computing now has become part of the mainstream information systems environment. Many organizations have not yet developed strategies and policies to capitalize on the benefits while ensuring that end-user-developed applications meet organizational objectives or meet quality-assurance standards appropriate to their function.

The study of end-user information systems is a multidisciplinary field, demanding a combination of organizational savvy, business knowledge, and technical competence, but not necessarily computer programming skills. EUIS encompasses the following broad areas:

1. Productivity tools for knowledge workers
2. Work group computing
3. End-user development
4. End-user training
5. End-user support—Help Desk, information center
6. Knowledge management/performance support
7. Human factors and ergonomics
8. Business process and job (re)design
9. Change management
10. Project management

The Organizational Systems Research Association (OSRA) has defined EUIS 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. Other sources define

end-user computing simply as "the use of computers by knowledge workers without the direct intervention of professional systems analysts and programmers." EUIS, as a field of study, can be distinguished by its emphasis on the use of information technology to meet the needs of individuals, groups, and departments. One of the primary areas addressed by EUIS is the organizational issues involved in designing and implementing information systems. You can think about EUIS as a marriage between the disciplines of IS and organizational development.

Information technologies generally associated with EUIS are listed in Figure 1-1. However, EUIS is more than special types of computer systems or software programs. EUIS, as a field of specialization, offers methods and models for conceptualizing the complex dynamics of work environments—which are increasingly anytime, anyplace—and applying them to information system design and implementation. It encompasses problem analysis, needs definition, selection or development, and implementation of computer systems to support work groups and individual performance. It is concerned with the diffusion and assimilation of information technology at all levels of the enterprise. EUIS methods draw on basic systems analysis concepts and organizational design principles for applying information technology to restructure work flows, procedures, and information access to improve overall effectiveness and productivity It places a heavy emphasis on understanding how people work. How does the user view the work? What are the critical success factors for performing the job? At what point in the work process is information required? Where in the

Figure 1-1
Some EUIS tools

CATEGORY	SOFTWARE AND HARDWARE EXAMPLES
Text handling/document management	Word processing, desktop publishing, work-flow management systems, integrated document management systems, scanners, printers, copiers
Data handling tools	Spreadsheets, databases, statistical packages, project management, decision support systems
Multimedia/graphic and design	Computer graphics, presentation software, computer-aided design, Web-publishing software (Dreamweaver, Adobe Acrobat, PageMaker, illustrator, Front-Page, Shockwave, Flash)
Communication tools	Local area networks, electronic mail, voice mail, teleconferencing, compressed video, facsimile, cellular telephones, pagers, Web casting
Group systems/collaborative technologies	Group support systems, C-U/C-Me, netmeeting, distance learning software
Time management	Electronic calendars, electronic notebooks and tracking systems, electronic "to do" lists, project management software, directories, personal digital assistants
Knowledge management/performance support	Electronic sales support, sales force automation, expert systems, artificial intelligence, data warehouses, data mining, knowledge repositories, online help, performance support, online reference, help desk, GrapeVINE, Lotus Notes, Intraspect, Red Tools, search and retrieval engines, intelligent agents, Web-based tools such as Vignette Story Serve

work flow can information technology best be applied? The answers to questions of this nature are critical to improving individual and work group performance.

1.2.2 Where Does EUIS Fit into Enterprise Information Systems?

Information **systems are** classified generally based on types of systems and intended users. Although you may find variance in the terms used by textbooks or other literature to describe them, the five classifications most commonly used are:

1. Transaction processing systems (TPS)
2. Management information systems (MIS)
3. Decision support systems (DSS)
4. Executive information systems (EIS)
5. End-user information systems (EUTS), or Knowledge work systems (KWS)

Although this classification may be useful for studying the design of information systems, it generally does not coincide with the way a typical information systems (IS) organization assigns roles and responsibilities. Typical IS organizations are divided along lines of responsibility for managing and operating computer data centers and services versus applications development and support, as depicted in Figure 1-2. Computer data centers typically are responsible for managing communication networks, defining enterprise-wide information systems architectures and data repositories, and providing technical support for application developers. Applications development departments generally are responsible for designing, implementing, and supporting transaction processing and other business application systems. In large enterprises, application development areas may be decentralized by region or product line.

Until fairly recently, EUIS—most likely under titles of office information systems and office automation—were operated as separate departments. They may have been autonomous departments under the IS organization, but more likely they were a separate department or under some administrative services group. The trend has been to integrate EUIS into mainstream IS operations. The reasons for this will become clearer as you read on.

To better understand EUIS, let's briefly consider typical activities and contrast them with those handled by traditional IS operations in corporate organizations.

Typical assignments for EUIS specialists may range from selecting a single software package to designing a complex local area network with customized software

Figure 1-2
Typical IS organization structure

ENTERPRISE OPERATIONS AND NETWORKS	IS APPLICATIONS DEVELOPMENT
Computer center operations	Enterprise applications
Networks	Transaction processing systems (TPS)
IS planning and architectures	Management reporting systems
Data repositories	End-user information systems
Technical support	Internet, Intranet, Extranet
Typical IS organizations are divided along lines of responsibility for managing and operating computer data centers and services versus applications development and maintenance	

and special applications to support dozens of users. An EUIS specialist may be expected to analyze work flows and assess opportunities for restructuring business processes and implementing organizational changes. EUIS specialists train business personnel in the use of software, answer questions, resolve technical problems, staff hot lines and Help Desks, create user documentation, evaluate software packages, design PC applications, and perform dozens of other tasks. They also provide access to mainframe data for download to PCs and assist users with specialized packages and fourth-generation reporting and query languages, such as SQL and SAS. Typical software applications include word processing, spreadsheets, desktop publishing, micro databases, graphics, and project management. Other primary applications include online help and reference, quality printing, copying, facsimile transmission, image processing, forms design, and document management. The recent explosion of Internet technologies has created a demand for new competencies in Web-page design, Intranet development and support, and knowledge management. Typical EUIS projects run from a few days or weeks to several months.

In contrast, typical IS responsibilities include designing and maintaining traits-action processing systems, installing and operating complex national and international communication networks, operating large computer data centers, defining technical architectures, and designing and maintaining complex enterprise databases. These tasks require highly specialized technical skills and structured methodologies (systems development life cycles). Typical development cycles run from 6 months to 2 to 3 years. A large transaction processing system may process millions of transactions each day. The American Airlines SABRE reservation system, for example, processes more than 2,000 transactions per second. In such systems, technical efficiency and data security and integrity often override issues of usability or flexibility Typical IS positions include application programmers, systems analysts, technical specialists, computer operators, and systems programmers. Until recently, most business systems were programmed in COBOL, and to a lesser extent FORTRAN, BASIC, RPG, Assembler, and fourth-generation languages. Now traditional programming methods are being enhanced with the use of CASE (computer-aid software engineering) tools, database technology, and client/server architectures. New systems design methods include visual programming, object-oriented design, and Internet-based systems development. Networking has become a more integral part of systems operations, and information systems development and management has become more strategic in nature.

IS traditionally has addressed well-defined, stable processes, such as those in accounting and manufacturing. Applications include transaction-oriented, numerical applications such as payroll, inventory, order entry, and accounts receivable and payable. Processing volumes must warrant the high cost of developing systems. Changes are expensive to implement, and systems are not always interactive. Some IS applications lend themselves to batch processing (hold and process together at one time). In contrast, EUIS applications are always highly interactive. They have evolved primarily in response to loosely structured text, data analysis, and communications requirements. EUIS addresses applications that require flexibility for handling exceptions and making changes. EUIS is appropriate for individual and departmental processing. It meets a need for quick response and offers cost-effective solutions for applications that do not have volumes high enough to warrant the expense of developing mainframe or other large-scale

systems. Some of the key distinctions between IS and EUIS are summarized in Figure 1-3. However, the dividing lines are fuzzy, and the distinctions are often more a matter of emphasis and orientation than specific technologies.

EUIS ANALYST	MIS ANALYST
Focus on individual and work group productivity	Focus on enterprise information systems, networks and online transaction processing systems
Quick response	Formal development cycle
Analyzes user requirements and work flows, evaluates hardware and software packages, recommends solutions	Analyzes user requirements and translates them into programming design specifications
Develops applications with software packages (Lotus 1-2-3, Excel, Access, etc.) or fourth-generation languages (FOCUS, SAS, etc.)	Develops (codes) complex business systems using computer languages (COBOL, C++, Java, FORTRAN) or CASE tools
Integrates tools into the work environment	Ignores work flow/job issues
Assists people in using computers to perform their jobs	Develops solutions (writes programs) for people
Business tasks, people-oriented	Technical, production oriented
Flexible, less well-defined activities	Repetitive, well-defined processes
Nonprocedural	Transaction oriented
Emphasis on ad hoc requirements	Emphasis on well-defined process
User responsible for control and security procedures	Formal control and security procedures
Practical for small applications	Practical for high-volume applications
Optimizes human productivity	Optimizing processing speed/machine efficiency
Deals with hardware and software solutions	Usually concerned about writing (coding) software(hardware environment is a given; the responsibility of a separate computer operations department)
Web page development	Web-based programming and network configuration

Figure 1-3 Contrast of EUIS and MIS environments

An additional area of critical importance to EUIS and IS is networking. Networking refers to the electronic transfer of data between computer devices. Networking might be accomplished through direct coaxial wiring, leased lines, modem devices, local area networks (LANs), wide area networks (WANs), or some combination of transmission devices. Enterprises can link their LANs and WANs to create networks that connect entire enterprises. These enterprise networks put more computer power on the desktop and can connect them to other organizations outside the firm and to the Internet. Moreover, the Internet has opened up exciting new possibilities for doing business that ara transforming organizations and the use of information systems in everyday life. It is creating a universal platform for connectivity.

EUIS has grown in importance as an integral part of the total IS architecture as technologies have become increasingly integrated (see Figure 1-4). At the same time, information systems have come to play an ever-widening role in contemporary organizations. Interdependence is growing among business strategy rules, and processes on the one hand, and information systems hardware, software, databases, and networking on the other. As information systems have become more central to business

operations, managers and knowledge workers have become more savvy about their use and more involved in their design, implementation, and management. The field of EUIS provides strategies and methodologies to encourage and support EUIS while ensuring adequate controls and fit with overall IS architecture.

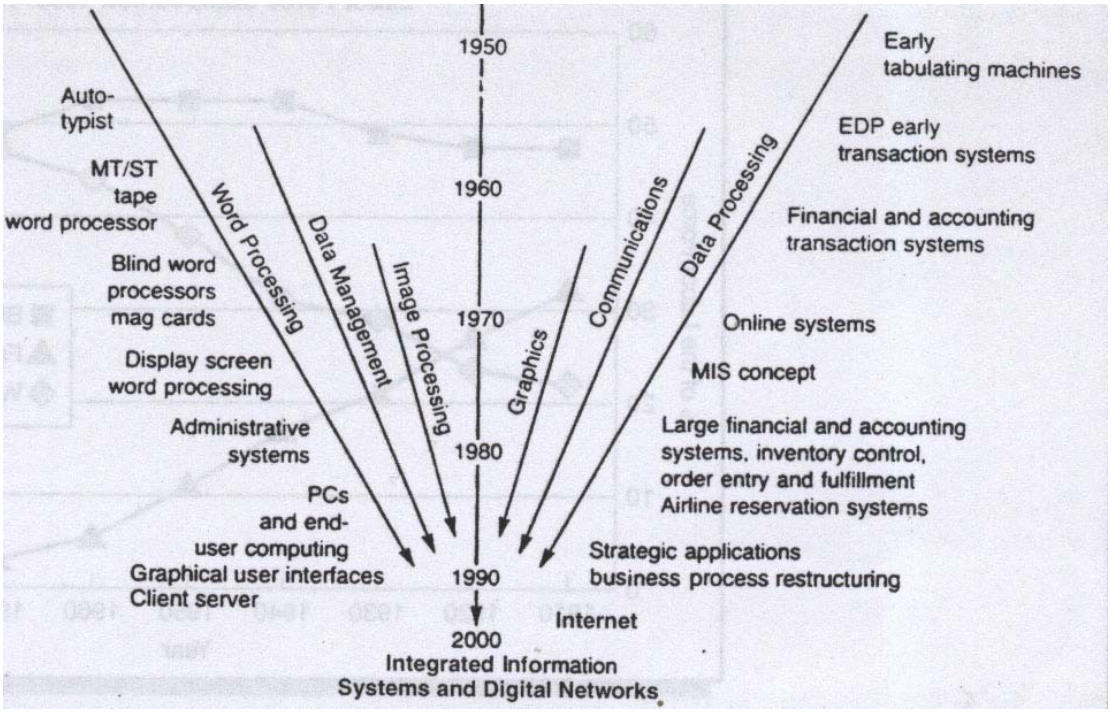

Figure 1-4 Converging information technologies

1 .3 WORKPLACE ENVIRONMENTS IN AN INFORMATION AGE

EUIS specialists address the diverse information needs of knowledge workers in the changing workplace. Who are knowledge workers? What is the nature of knowledge work? How are workplaces changing? What is the role of the organization? What are the important issues that differentiate end-user applications from enterprise applications? These and other questions are addressed in this section.

1.3.1 Who Are Knowledge Workers?

According to the U.S. Bureau of Labo? Statistics, the white-collar workforce constitutes 60 percent of adult employees in the United States (see Figure 1-5). About 70 percent of salaries and wages are paid to this white-collar workforce. The white-collar workforce generally is defined to include the following employment categories:

1. Executive and managerial personnel
2. Professional and technical knowledge workers
3. Sales and marketing personnel

4. Administrative support, including clerical

Some sources are using the terms *knowledge workers* or *information workers* to describe these employment categories. Other sources define knowledge workers much more narrowly to include only the second category of professional and technical knowledge workers. In this text, knowledge worker is used in the broader

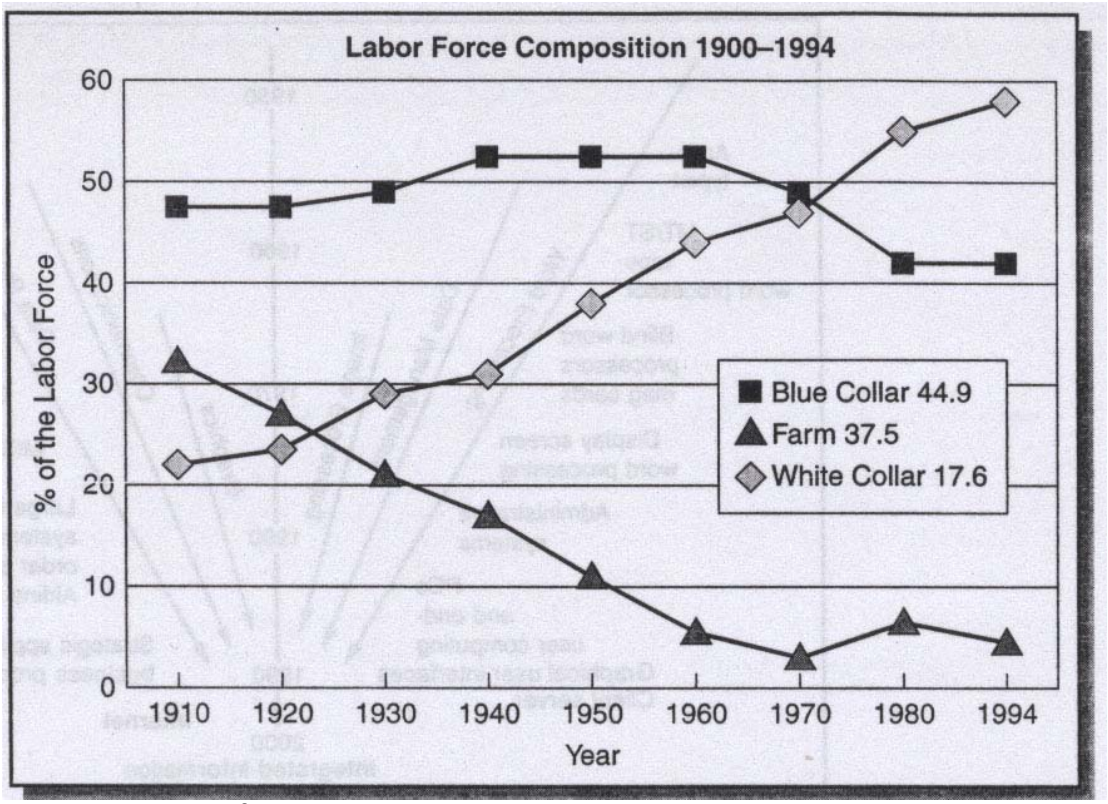

Figure 1-5 Labor force composition 1900—2000

Source: Adapted from US. Department *of* Commerce, Bureau of the Census, Statistical Abstract of the United States, 1994, Table 644, and Historical Statistics of the United States, Colonial Times to 1970 Vol 1, Series D, 182-232.

sense to include all four categories. Whatever terms are preferred, these workers are the target population for EUIS and productivity-improvement efforts.

1.3.2 The Role of Organization

Whenever two or more people work together to accomplish specific objectives, some form of organization is necessary. Organization is required to coordinate the efforts of the various people so that each individual and each group contributes to the overall goals. To be purposeful and personally satisfying, work must contribute to an enterprise's goals. Organization also brings other necessary resources such as materials,

equipment, capital, and markets together in a practical format to accomplish enterprise goals.

Through organization, people can accomplish more work than individuals working alone can. Activities are organized into manageable units in which the work can be planned and controlled effectively. Group goals are defined, and individuals are assigned specific responsibilities. Through team effort to accomplish defined organizational goals, the value of each member's contribution is increased. Confusion about who is to do what work is minimized. A supportive work environment is provided. A good organizational structure creates synergy: 2 + 2 produces 5, not just 4.

In any work environment, people, tasks, and technology are organized to facilitate the accomplishment of specific objectives. Generally, these objectives are directed toward producing some type of marketable product or service. Information is central to the operation and coordination of required activities. Information may take the form of decisions, directives, or documents. The way in which work is organized into the functions or business processes people perform depends primarily on three factors:

1. The nature of the tasks.
2. The knowledge and skills of the staff.
3. The technology and resources available to accomplish those tasks.

The role of *technology* is to help accomplish required tasks. In performing that role, the technology influences how people and tasks are organized. Each organization is not only unique, it is also dynamic. The ways in which technology, tasks, and people are organized into specific functions or processes change over time in response to changing business requirements.

The organizational framework, as reflected in a formal organization chart, defines who does what in an enterprise. How are responsibilities divided, coordinated, and linked together? Who should report to whom? Who should make what decisions? Which members should be in which groups? What amounts of what basic resources should be used, and by whom? What work environment should be provided? An effective organization should facilitate the exchange of information and minimize duplication of effort.

Generally, enterprises are organized into two main categories: *primary functions*, such as product research and development, production, and marketing; and *support functions*, such as human resources, public relations, and information systems. The primary functions constitute those activities directly involved in producing and marketing the enterprise's products or services. Support functions provide essential ancillary services. The nature of the enterprise is defined by its primary functions. EUIS specialists must have a good understanding of these primary and support functions.

1.3.3 Changing Organizational Structures

Coordination and control of an organization are responsibilities of management. In many enterprises, management is becoming less authoritarian and more participative. Traditionally, planning and decision making were done at the top of the organization structure. Today, however, authority is frequently accorded by expertise as well as by position. Information technologies allow managers to oversee and control more workers

spread over greater distances, which has led to pushing responsibility down the organizational hierarchy, empowering workers.

As more responsibility is "pushed down" in the organization, offices are experiencing an increase in technical/professional positions and a decline in clerical positions. Until 1980, clerical jobs increased at a rate faster than the national employment growth rate. Since then, however, the growth rate in clerical positions has eased to 2 percent below the national employment growth rate. According to one study, the number of jobs for secretaries, stenographers, and typists has declined by 100,000 since 1980. Researchers attribute this decline to EUTS, job loss in industrial areas resulting from the shift away from manufacturing toward a service-based economy, and drops in government employment levels.

Joseph V. Brophy, former Senior Vice-President of Data Processing, Travelers Insurance Company, says that the microcomputer is instrumental to a "fundamental demographic transformation in our company." In 1970, two-thirds of Travelers'

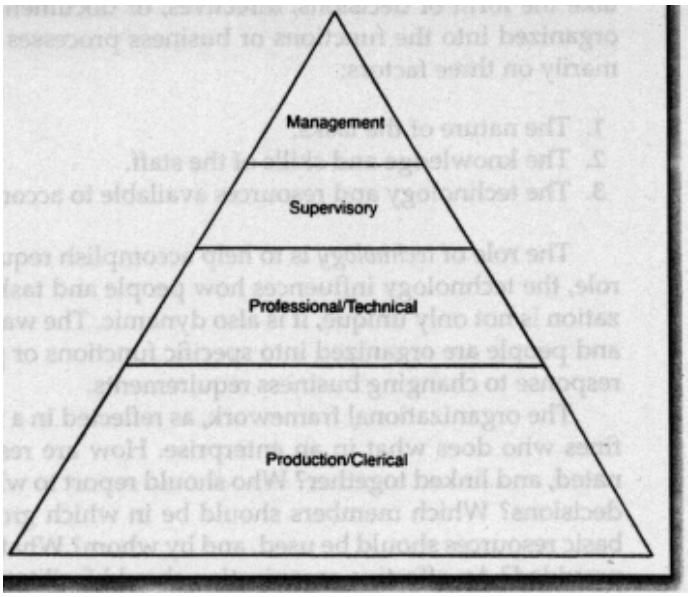

Figure 1-6
Historical organizational hierarchy. Historically, organizational hierarchy has been represented by a triangle with a broad base of low-level employees and a much smaller number of professional, technical, supervisory, and managerial personnel, 30,000 employees were clerical and one-third were professional. Today, that ratio is reversed.

The typical representation of an organizational hierarchy is shaped like a pyramid, as shown in Figure 1-6. The purpose of the hierarchical structure is *control.* Computers are diminishing the need for this hierarchical structure by providing direct access to information and greater control of business processes. In view of the recent statistics on the white-collar workforce, a truer characterization of the organizational hierarchy today would be diamond-shaped (see Figure 1-7).

1.3.4 The Changing Nature of Knowledge Work

Much more is known about what kinds of tasks are performed by knowledge workers than is known about *how* workers perform these tasks. Yet the questions about how work is performed are crucial to efforts to improve productivity. When systems analysts deliver a tool, it quickly falls into disuse when it does not match the task that needs to be performed. For example, a follow-up or tracking system that does not allow staff to look up information in all the ways needed would lead them to keep and use their old manual system as a cross-reference. In all likelihood, maintaining two separate systems soon would become cumbersome, and the new, automated tracking system would fall into disuse. It has become apparent that the developers of EUIS must understand more about the nature of work performed at all levels of an organization if technology is to serve information-processing needs at those levels effectively.

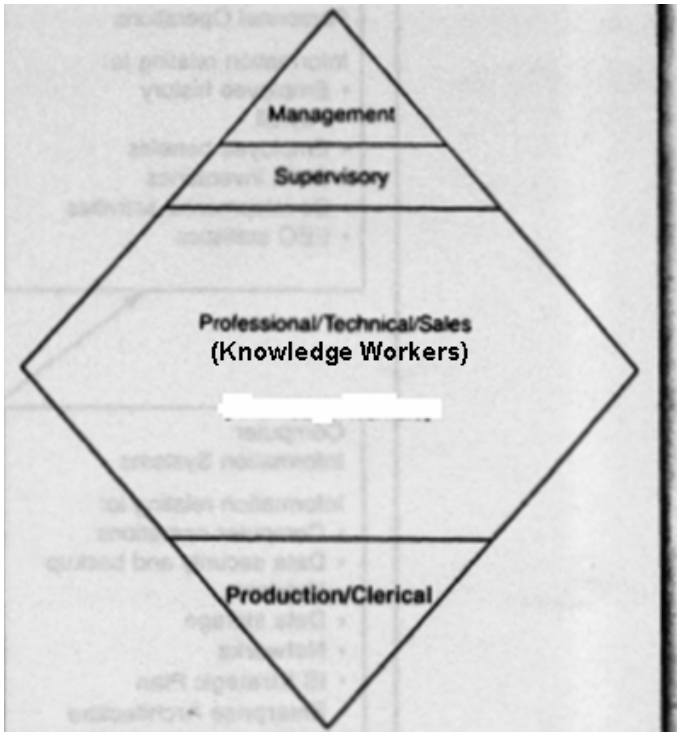

Figure 1-7 Organizational hierarchy in the Information Age. Today, the typical organizational hierarchy is more accurately represented as a diamond than as the traditional triangle of the past.

Although identifying lists of tasks is easy, little is known about the nature of knowledge work from the standpoint of *information processing;* that is, how people interact with their work. How do they identify information that is critical to their tasks or decision making? How do they go about locating or researching this information? How do they organize it, use it, store it, and assimilate it? How do they interact and interface with other information-processing functions? What information-processing tasks do professional, technical, sales, supervisory, and managerial personnel do themselves, and what do they delegate to support personnel? To what extent are these tasks based on the

nature of the work and to what extent on personal preference? What aspects are performed individually and what aspects involve collaboration?

Work/low analysis is an industrial engineering technique that has been applied frequently to job design for clerical personnel and factory production workers. At higher levels, however, work-flow techniques are seldom applied. In fact, until fairly recently few people were concerned about the productivity of professionals and managers. The transition in the United States to an information-based economy and the opportunities afforded by EUIS are changing that attitude.

The nature of information processing performed by professional, technical, and managerial knowledge workers is aligned closely to the functional areas in which they work. Primary functions such as finance, marketing, production, and research and development, as well as support functions such as legal services and personnel administration, have information requirements unique to their operations. Information may be used for planning, maintaining operations, evaluating results, reporting to executive management, and complying with government regulations. Typical functional divisions in large organizations and examples of information relating to their operations are depicted in Figure 1-8.

Descriptions of office work often depict clerical support personnel as processors of information for managers who use the information for decision making.

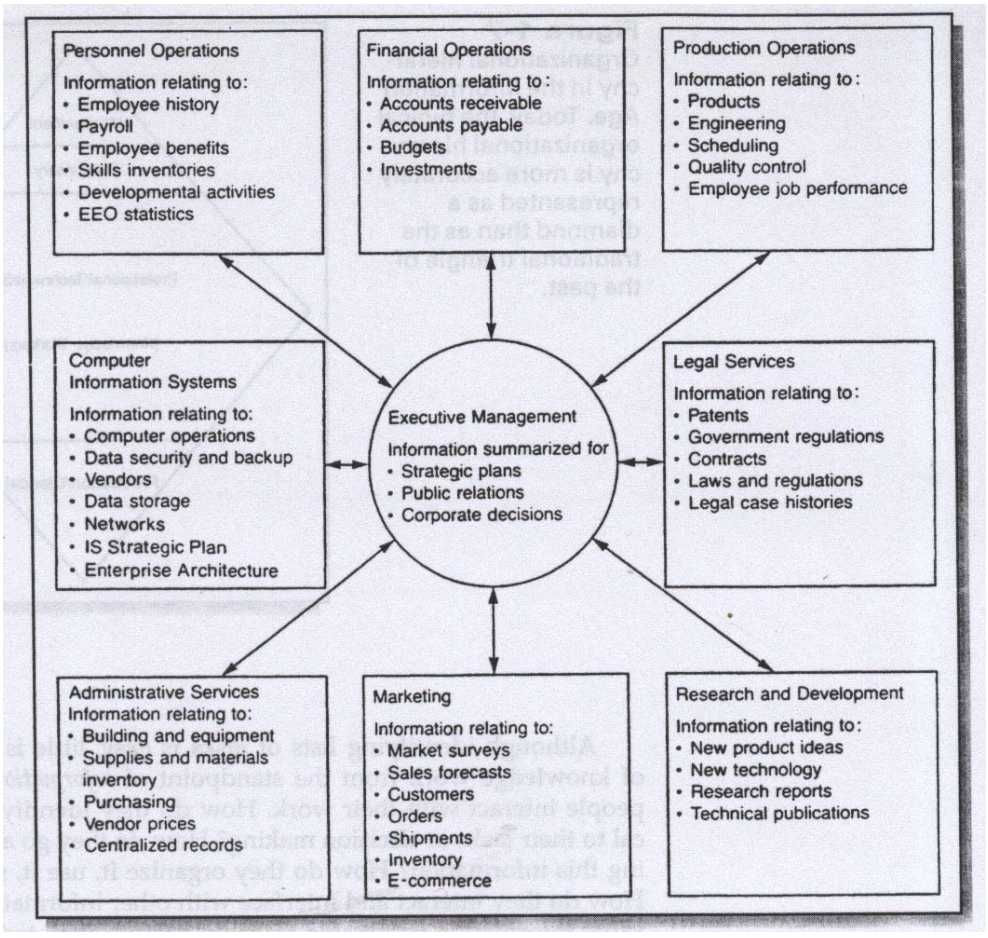

Figure 1-8
Typical functional divisions and related information requirements in a large enterprise

The tendency is to think of the office as an information factory that produces correspondence, reports, and other information products. These descriptions are misleading, however, and conceptualizing the office in these ways poses several risks for designing effective information systems.

First, professional, technical, sales, supervisory and managerial personnel process a great deal of information themselves in addition to the information that is processed by clerical staff. Determining how technology can provide support for these professional information-processing tasks is a prime challenge for EUIS.

Second, the focus on highly visible products of the office such as reports, correspondence, transactions, and decisions leads analysts to focus on product *quantity* rather than *quality*. Computer systems tend to be based on the inherent structure of these products instead of on the processes people use to create them.

Third, the true objective of information processing activities generally is to *filter* information rather than *produce* information. The office serves to capture information and reduce it to a form that is useful for decision making. In this sense, the filtering process of the office resembles the filtering process of the human mind. The office also serves as a collective memory for the organization, documenting results of past actions and maintaining resources that may be useful for future actions.

The best source of information about how end users perform their jobs and the tools they need is the end users themselves. Thus, information systems professionals, working alone, never will be able to devise systems that truly meet individual needs. New tools and procedures, if they are to evolve, will evolve out of a joint effort. EUIS, therefore, must be driven by business needs—not by technology. Solutions must focus on enhancing the capacity of end users to perform their jobs. In order for EUIS to serve information processing needs effectively at all levels, it is crucial to understand more about the nature of work performed at those levels. Chapter 3 discusses characteristics of the knowledge work environment and provides approaches for understanding end-user needs and matching those needs to software solutions.

1.3.5 A Shift in Focus to Business Process and Work Group Support

Much of the focus of EUIS has shifted recently from individuals to departmental and work group computing. In the 1980s, the major application of information technology in the office environment was to support the automation of clerical tasks. As PCs grew more powerful and easier to use, the emphasis shifted to supporting knowledge workers and managers at all levels of responsibility. However, the emphasis was still primarily on individual performance. Today, information technology is being used increasingly to support group processes and to coordinate activities in addition to individual tasks.

Improving individual performance does not necessarily add up to increased effectiveness, reduced cost, or improved performance for the organization as a whole. Saved time, for example, may not necessarily be spent on more productive activities. Bottlenecks may be shifted. Incremental improvements do not necessarily lead to significant productivity improvements in an overall process. Eliminating inefficiencies in one part of a process may even compound problems somewhere else. To bring gains

to the bottom line, enterprises must address individual productivity within the larger picture of the work group and the overall business process.

Consequently, emphasis in 2001 ~nd beyond is expected to be on work flow or business process reengineering to take advantage of digital networks. Because of the need for workers to work together to solve problems, acceptance of groupware tools is expected to grow dramatically. The area of departmental and work-group computing holds much promise but is fraught with challenges. it is hard to predict what the future will bring in this area. Chapter 4, "Work Group Computing," addresses the rapidly growing area of work group support.

1.3.6 Characteristics of the Knowledge Work Environment

Tailoring information systems for work groups or individuals involves a different set of considerations than designing systems on an enterprise level. User interface issues and flexibility for example, become much more important, and security and

Table 1-1
Characteristics of the knowledge work environment

1.3.7.1 *Variability*

The EUIS specialist will find that work varies considerably from one department to the next. Even for similar functions, procedures for doing work may vary considerably

1.3.7.2 *Work styles*

Personal work styles are an important influence on the acceptance and use of hardware and software. End users may demand workstations that are customized to their needs.

1.3.7.3 *Departmentalization*

Although all business units and departments contribute to organizational objectives, not all activities are corporate in nature. Much of the work that goes on in separate departments is unique to their particular operation, with only specific products or services that move to other departments or up the organizational hierarchy. EUIS specialists are likely to find *that* different departments operate fairly autonomously. Even the culture may vary from department to department in large enterprises, depending on the management style of the unit head.

1.3.7.4 *Dispersed*

Today's anytime/anyplace office may be a hotel room, a car, a plane, a room at home, a temporary site at another company or in another country or almost anywhere. Even within the office operations per Se, people may be scattered in various buildings and locations.

1.3.7.5 *Specializations*

The work of professional, managerial, and technical knowledge workers varies considerably depending upon the business function in which they work. The workdays for accountants, engineers, actuaries, human resource personnel, and salespeople, for ex-

ample, all differ significantly, even though they work for the same company and are located in the same office building.

1.3.7.6 *Nonproductive activities*

A significant percentage of office work activities could be termed *nonproductive.* These activities may include incomplete telephone calls, waiting time, poorly run meetings, false starts, misunderstood assignments, searching for information, following up on activities or requests, rework, work scrapped due to changing priorities, duplication of effort, and moving from location to location due to restructuring, among others. These areas represent opportunities for significant productivity improvement with information techno1ogy

1.3.7.7 *Soft information*

Much of the information dealt with in the office environment might be termed *soft information.* It is loosely structured, anecdotal, variable, and specific to the task at hand. This is in sharp contrast to the type of information handled by typical TPS, which can be precisely defined, calculated, and coded. For example, consider names, ID numbers, addresses, product names, prices, and quantities in contrast to telephone inquires from clients, complaints, problems, tax laws, government regulations, special requests, and analyses of marketing data.

1.3.7.8 *Deadline pressures*

The business of end users is business, not computers. When pressured by deadlines, end users have little tolerance for learning complex software or putting up with hardware problems.

1.3.7.9 *Project versus production environments*

Needs and solutions vary based on whether the business environment is production or project oriented. A production environment (underwriting, accounting, sales, claims processing) is characterized by structured work flow, repetitive or cyclical work, procedural orientation, and little discretionary time. In contrast, professional or project environments (legal services, research and development, engineering, information systems) have less structured work flows. They tend to be deadline oriented; involve analysis, research, and creative-type activities; and allow personnel more discretion in allocating time to tasks.

control issues become less overriding. Table 1-1 identifies important characteristics of the knowledge work environment, which will be elaborated in more detail in part II. EUIS analysts must keep these characteristics in mind when designing and supporting systems.

1 .4 WORKPLACE PERFORMANCE: THE IMPACT OF EUIS ON WORK

Workplace performance, discussed in part IV, is a measure of the *quantity and quality of work.* The idea of using technology to improve performance is far from new, of course.

In fact, history shows that people constantly strive to improve their ability to get things done by using technology. They strive to do more work faster and better with less effort; in short, to be more productive.

New technologies are not always welcomed, however. The individuals on whom technological improvements are imposed frequently resist the changes that technology brings. An interesting example of resistance to technology was the Luddites' protest against industrialization in the weaving mills of England during the early 1800s. Organized bands of masked English handicraft workers rioted and tried to destroy the textile machinery that was displacing them from their traditional jobs (see Figure 1-9). This example also illustrates how advances in one area

Figure 1-9 Luddites rioting in weaving mills

of technology often lead to breakthroughs in other areas. Ironically, the same Jacquard weaving looms that the Luddites opposed later inspired Hollerith's invention of punched cards, the original computer storage medium.

As one might expect, knowledge workers have not always welcomed new technologies either. When typewriters were introduced in the mid-1800s, businessmen rejected typed correspondence as too impersonal. Thus, many eighteenth-century businessmen continued to handwrite their letters long after typewriters became available. Typewriters often were used to create drafts of documents, and the final copy was then carefully handwritten. Gradually, the need for efficiency forced businesses to change.

Typing machines predicated other rather revolutionary changes in the nineteenth-century business world. They brought women into the business world in large numbers for the first time. In 1881, the New York City YWCA began teaching typing to its first class of eight young women. Those who were trained to operate typing machines were called

typewriters. These typing-course graduates were in high demand. Eager to gain employment, thousands of women soon discovered that being a typewriter provided entry into the business world. Proprietary business schools sprang up to train eager students. The secretarial and clerical jobs previously held by men became dominated by women. Jobs multiplied rapidly as the size and number of industrial organizations exploded during the Industrial Revolution.

As many enterprises race to implement IS technologies, others are proceeding more slowly with decidedly less enthusiasm. So while some firms are transforming their businesses into new age global networked enterprises and dot.coms have become Wall Street's hottest commodities, many firms and institutions struggle with making the necessary changes. The power of computer technology has grown much more rapidly than the ability of most organizations to apply and use it. This is a major challenge faced by today's EUIS specialists.

Some authorities still question whether use of EUIS technologies has resulted in any significant gains in white-collar productivity. Even organizations that have been aggressive in implementing new technology sometimes report less-than-dramatic results. The disappointing results have received increasing attention in the past few years as enterprises seek ways to assess the value of information technologies. Recognition is growing that it is not sufficient merely to throw technology at problems. Significant productivity improvements require attention to human factors and thoughtful restructuring of business operations. Payoffs are achieved through business process redesign and careful management of change.

As we just discussed, efforts to introduce change are not always welcome. Resistance to change may manifest itself in both overt and subtle ways. The impact of change in the workplace is an important consideration in the implementation of EUIS. The potential of EUIS can be realized only when technology is implemented as part of a carefully planned program for performance improvement. Such a program requires a systems approach that gives adequate attention to business requirements, business process, job design, and technology. *People* make technology work; the inverse cannot be taken for granted. In and of itself, technology does not make people more productive.

1.4.1 EUIS and Business Value

Assessing the value of information technology has drawn increased attention in recent years. As budgets for information systems have skyrocketed, executives have

demanded better justification and more accountability for results. The value of information technology usually is assessed in relation to its ability to reduce costs or increase revenues. The ratio of costs to revenues generally is defined as productivity~ In order to assess the value of information technology, an EUIS specialist must understand how to improve productivity and measure results.

For several years, economists have been modifying the idea that capital investment produces gains in national wealth. They have been moving toward a theory of human capital, recognizing that people and human behavior also affect productivity. These ideas are reflected in the growing emphasis on productivity-improvement programs such as self-managed work groups, empowerment, total quality management (TQM), continuous quality improvement (CQI), and other worker-centered efforts to improve

productivity. Technology plays an important role in most restructuring (reengineering) efforts.

Technology is important to these efforts because it extends what people can do and offers new alternatives for structuring business processes. The EUIS specialist who understands workplace performance and how technology can facilitate performance can bring much relevant experience to work-improvement efforts. Chapter 9, "Assessing the Value of Information Technology," addresses the issues and complexities of quantifying and measuring the results of EUIS.

1.4.2 EUIS and Human Factors

Concern about productivity as well as the health, safety, and comfort of workers in the workplace has led to increased interest in human factors—the application of information about physical and psychological characteristics to the design of devices and systems for human use. The term *human factors* generally is used synonymously with the term *ergonomics,* which is the study of the natural laws of work. Ideally, knowledge workers should be in an environment that fosters good work habits, combining design and usability principles that balance technology procedures, and human needs.

Software, hardware, and workspace design can impact productivity Applications of human factor principles already known, and still being developed, can have a positive outcome for the organization and the individual. Chapter 10, "Human
Factors: Software, Hardware, and Workplace Design," offers an overview of principles related to software design, hardware design, and workplace design.

1.4.3 EUIS and Job/Business Process Design

In reality worker performance is a result of the inter dynamics of several factors. These factors include management practices, skill variety, task significance, task identity, autonomy, and feedback on the job. Understanding the nature of job performance is important to successful implementation of EUIS. If one is to improve performance, which is the prime objective, one must first understand what factors contribute to performance.

The past decade has witnessed a renewed emphasis on quality and service. Enterprises facing the demands of a more diverse workforce are implementing more flexible work arrangements. Technology alone cannot achieve the productivity increases needed to keep American industry competitive. Old work processes and practices need to be revamped to take advantage of new technologies. Restructuring, or reengineering, has become the watch word. Enterprises are capitalizing on information technologies by pushing decision making down the organization structure, empowering workers and reducing the levels of middle management.

The importance of leadership and teamwork is being emphasized at all levels., of the enterprise. Empowered workers are expected to take more initiative in solving problems and identifying opportunities to make concepts such as continuous quality improvement the way of doing business. Expertise and performance may be more important determinants of recognition and reward than rank or time at the job. All of these trends are bound to influence the implementation of EUIS.

Topics related to business process reengineering and job design for individuals and work groups are addressed in detail in chapter 12, “Business Process and Job (Re)Design.”

1.4.4 EUIS and Organizational Change

The organizational learning curve for assimilating new technology often is underestimated. The typical pattern can be characterized by a series of stages. Attempts to solve a problem often lead to invention or application of technology in new ways. However, the technology tends to be adapted to old ways of doing things and is often slow to catch on. As technology is used, it slowly generates new ideas or insights, which, in turn, lead to improvements, modifications, or new technologies. This can be a slow process when left to chance. Progression through the stages of technological innovation is not automatic. Organizations can accelerate the assimilation process with intervention strategies.

Moreover, business process redesign requires changes in the work behavior of peopie; managers, professionals, salespeople, and secretaries may need to change their habits, thinking, and values. To effect permanent changes in work behavior requires more than training in the use of a system. Patterns in the flow of work may need to be altered. Reporting relationships may shift. New standards and procedures may need to be established. Jobs may have to be redesigned and performance criteria revamped. Experience indicates that innovation often comes from those who know the job best. This factor is one reason why empowerment and self-managed work teams can be highly effective when appropriately implemented. Before managers rush out to buy the latest in information techno1ogy~ they must take a long, hard look at organizational and work changes that will be required to achieve intended results with the new technology.

Change must be supported by an educational process that enables individuals to assimilate new technologies. Implementing new technologies requires new procedures and new problem-solving skills. It disturbs the way people work and disrupts accustomed patterns of handling and using information. New opportunities associated with the technology may not always be evident immediately. A detailed discussion of organizational change is provided in chapter 11.

In summary, EUIS, like all information systems, must be aligned closely to enterprise goals and workplace performance. Indeed, the greatest challenges EUIS professionals face lie in helping their enterprises harness technology in ways that improve business processes and bring benefits to the bottom line. These are all topics that will be explored in greater depth in part IV, “Workplace Performance: The Impact of Information Technology on Individuals, Groups, and Organizations.”

1 .5 PLANNING AND IMPLEMENTING EUIS

The complexity of introducing EUIS increases with the size and complexity or the organization. Just attempting to stay informed about technological changes and the *wide* range of available alternatives is almost overwhelming. To be manageable, EUIS

solutions must address specific needs and solve specific business problems. questions such as which technology is best, which software should be used, and what capabilities are most important can be answered only in relation to the specific objectives one wants to accomplish.
This section provides a brief overview of EUIS planning and implementation. These topics are covered in detail in part V. “End-User Information Systems Project Management.”

1.5.1 Strategic Planning: Linking EUIS to Business Needs

To achieve maximum benefit from EUIS, organizations need to link their systems planning to business plans. All too often, acquisition and implementation of technologies are disjointed and unmanaged. In such cases, the potential for substantial benefits is unrealized. While specific applications may be effective, the overall impact of EUIS in the organization may be short changed. Achieving substantial gains in productivity, as well as information processing support, requires more than simply building and installing computer-based systems.
Organizations need a business framework to prioritize projects and guide selection among the dizzying array of hardware and software. Addressing requirements on an application-by-application basis will not necessarily add up to information systems that produce significant business benefits. To be confident that their firm is addressing the appropriate applications and spending technology dollars effectively, management must develop a strategy based on business objectives.
AneffectiveInformationSystemsStrategicPlandirectlysupportsthebusinessplan and establishes the enterprise systems architecture within which EUTS are planned and implemented. Ideally, this enterprise IS plan allows for flexibility while ensuring compatibilities expandability, and security. A comprehensive discussion of planning and innovation is provided in chapter 13, “Innovation and Strategic Planning.”

1.5.2 Overview of EUIS Project Management

The steps for EUIS project management are described briefly in this section. It involves a number of specific steps and procedures (See Figure 1-10) that are generally followed to initiate and carry out projects. If you are familiar already with traditional IS systems development life cycle (SDLC) methodologies, you will notice many parallels, although significant differences also can be found. In general, EUIS project management is less rigid and less formal because of the variability in types of projects. The formality of the project management process depends on a number of factors, including organizational culture and policies, scope of project, resources, and time frames, among others. Even the smallest project requires some level of planning. With experience, the EUIS analyst learns to make these kinds of value judgments. Part V of the text provides a detailed discussion of steps, methods, and alternatives for planning and implementing EUIS projects.

1.5.2.1 Defining Project Scope

The first step is to define the project scope. This step involves defining the business problem or opportunity and identifying the business objectives, issues to be addressed,

and project deliverables. The description of project scope basically becomes the "contract" between the business sponsor and the EUIS specialist or team.

Step	DELIVERABLES
1. Define the project's scope	Business objectives Expected results Time frames Budget
2. Plan the project	
3. Assess the requirements	Economic, technical and operational issues Evaluate alternatives Identify impact/interface with other systems Prototype
4. . Design: Describe the solution in detail	Requirements, costs, user input, outside assistance
5. Select or develop the solution	Purchase externally Buy and customize, build, document, user interface, programming
6. Convert and implement the solution	Detailed plan identifies tasks, dates, responsibilities Phased, parallel, or direct conversion Trial/pilot period Train users Modify work flow Redesign job
7. Evaluate the results	Measure results against defined objectives Incorporate insights from new learning Correct problems; modify to improve results
8. Institutionalize the results	Reinforce and reward desired behaviors Provide advanced training Align other organizational operations with new system

Figure 1-10 EUIS project management

1.5.2.2 Plan the Project

Generally, a project will have a project sponsor, usually a senior business manager of a business unit, and an EUIS project manager who is responsible for planning and carrying out all project activities.

1.5.2.3 Assess Requirements

The requirements study involves investigating the economic, technical, and operational issues. EUIS analysts must determine who will be affected by the proposed system, including the primary users and anyone who will be impacted. To start, it is important to understand the basic purpose and structure of the current system or proposed new system. Analysts identify basic business requirements for a new system and identify possible alternatives for achieving them. A rough estimate is then made of the costs and benefits of the various alternatives.

1.5.2.4 Describe the Solution in Detail

If approval is granted to proceed with the project, analysts then begin the detailed analysis stage. This stage begins with documenting the structure and purpose of the current system. Then, system requirements for the new system are defined in detail. This step may involve significant process redesign. Next, analysts evaluate alternative solutions and develop a detailed proposal for the recommended solution. The proposed development plan, budget, and hardware and software to be acquired are submitted to management for approval.

1.5.2.5 Select or Develop Proposed Solution

If the project budget is approved, analysts proceed to evaluate and select application software that is to be acquired, evaluate and select hardware and system software, develop application software or customize purchased software, and develop business applications.

1.5.2.6 Convert and Implement Solution

The conversion from existing systems must be planned and managed carefully. Detailed plans must be developed to identify tasks, dates, and responsibilities. Analysts must develop and deliver documentation, implementation procedures, and training materials and programs.

1.5.2.7 Evaluate Results

After a new system has been implemented and all users have been fully trained, results of the new system are measured against defined business objectives. Problems are corrected. Modifications and follow-up training are provided to improve results. Strategies are needed to take advantage of insights from new learning.

1.5.2.8 Institutionalize Results

The final stage is critical to achieving benefits of information technology Specific strategies are needed to align business processes and sustain workplace changes.

A project plan, whether brief or detailed, is critical to ensure that there is agreement on objectives, the process for achieving them, and who will be responsible for what by when. The plan serves to keep everyone informed about what is going on and what is expected of them.

1.6 How ENTERPRISES STAFF AND MANAGE EUIS

Every enterprise must staff and manage the activities required to plan, implement, operate, and support information systems needed to produce and deliver their products and services. This is generally the role of an IS organization. This section describes typical approaches and explains how EUIS fit into the picture.

1.6.1 Who Is Responsible for EUIS?

Who is responsible for EUIS in enterprises? The answer to this questions depends on the enterprise. EUIS can be found with many names, roles, and responsibilities.
Most enterprises .have integrated EUIS with IS to varying degrees. Integration may range from fairly autonomous departments within IS to almost total merger with other IS operations. For example, a large insurance company in the Northeast assigns EUIS analysts, called business analysts, to the IS teams that support each business unit. PC/LAN, minicomputer, and mainframe technical support all operate as specializations within the same support department. A "Professional Computing Services" department provides EUIS support as part of the overall IS technical consulting area. PC training is offered by the corporate training department. Hotline and Help Desk services are coordinated under one IS centralized area.

1.6.2 IS Organizations

The increased integration of computer and communications technologies seems to be driving most enterprises toward merging IS, EUIS, and Networking (or Telecommunications) under one IS organization. As indicated in the previous section, the degree of integration varies considerably. It may occur only at a high level, creating a sort of IS umbrella over all systems-related activities, or the integration may go deep into the IS organization. Clearly, enterprises are struggling to find the most effective ways to meet the demands for information technologies in a constantly changing world.

The IS organization generally is responsible for overall management of the enterprise's information architecture and information technology (IT) infrastructure (discussed in more detail in the next section). The IS organization typically is managed and operated by technical personnel. However, information technologies usually are viewed as shared resources available to all of a firm's units and applications, and ultimate responsibility for allocating resources and making decisions regarding investment in IT resources belongs to general management.

Management and organization of IS resources in all likelihood will continue to evolve with the network revolution and growing role of computers in business operations. EUIS professionals must be aware of the overall IS management structure and how EUIS fits into the picture.

1.6.3 Information Technology Architecture

Information technology architecture refers to the specific design that information technology (IT) takes in a specific organization to achieve selected goals or functions.[2] It encompasses the IT infrastructure or platform and the *business system applications* they support. The IT infrastructure consists of hardware; software; data storage; digital networks; and the technical specialists to build, operate, and maintain them. The business system applications include the wide range of solutions for which computers are used, including end-user information systems.
Currently, many enterprises seem to be moving toward a concept of enterprise wide information architecture. it is unclear, however, exactly what shape such an organization should take. In fact, definitions of enterprise wide computing even vary. Some firms have a vision of retaining strong, centralized control over all enterprise information systems. Others envision centralized coordination and operation of corporate data

centers with distributed departmental networks and PCs under the control of business units. Yet another group envisions decentralized computing with each business unit responsible for all of its own information systems, both IS and EUIS. Clearly, there are tradeoffs, and clearly the direction taken is likely to have a major impact on EUIS.

SPOTLIGHT ON SOLUTIONS –Technology, People, Structure, Processes

AN ALTERNATIVE VIEW OF THE IS ORGANIZATION An organizational design works only if the people at all levels of the IS function understand the model, their role, and their relationship to others within and outside the department. Without such a shared vision, it is unreasonable to expect people to evolve toward excellence in their assigned function. A prominent EUJS consultant, N. Dean Meyer, believes that many IS departments are organized less than optimally to meet today's demands to provide a far broader variety of technologies and disciplines. Most IS organizations have evolved under numerous top executives. Structural adjustments were made to accommodate new technologies and services, special projects, and occasionally to handle personal career issues. Periodically, charters and working relationships were changed as cyclic pressures for centralization and decentralization were felt. As new IS functions spring up, such as new technology groups or a strategic systems implementation team, new organizational issues arise. Whether by word or action, these groups' initial activities will specify their charters and relationships to other IS groups. Simply patching the bid organization to accommodate new functions and technologies will no longer work. To address these problems, N. Dean Meyer and Associates (NDMA) applies the principles of structural cybernetics Cybernetics is the study of the control of complex systems. The NDMA approach to structural cybernetics is comprised of three parts principles of healthy organizational design a straightforward model of the discrete functions man IS department and a practical process of organizational change.	NDMA suggests this alternative view of an IS structure that advocates dividing responsibilities along the lines of functions rather than technologies. NDMA suggests the following roles: ▪ Art architecture function that addresses requirements such as computing platforms, technical strategies, planning for hardware and software, and standards. ▪ Service bureaus that are responsible for operating the data centers and networks. ▪ Technologists who specialize in business applications development (IS), process applications development (computer integrated manufacturing or CIM), and end-user information systems (EUIS). ▪ Consultants who are business specialists and technology genera1i~ts. Consultants provide the interface for linking business strategy and information technologies. Two types of consultants are needed: those who work proactively with business leadership to link technology planning with business strategies and those who provide the needed services and support for the effective use of information technologies in the workplace.[4] Although it is too early to point to any definite trends, many enterprises are struggling to find more effective ways to organize the IS function. NDMA's alternative is consistent with the growing need to link technology more closely with business

Source: N Dean Meyer *Structural Cybernetics* (Ridgefield Conn N Dean Meyer and Associates Inc 1995)

These organizational questions a~ control issues. IS executives argue that a centralized "service center" operation is the most economical from a corporate perspective. They also view it as essential to providing integrated global networks. Such an organization can provide a challenging technical environment that attracts highly qualified personnel. It is in a better position to provide ongoing technical training, plus it can provide cross training, rotate assignments, and shift personnel to meet changing needs. Strong, centralized coordination is essential to maintain any semblance of standardization and interoperability among the jungle of technical alternatives.

Business unit executives, on the other hand, argue that if they are to be held accountable for bottom line results, they must have more control over their IS expenditures, which constitute a major chunk of most budgets. Executives may not understand the long lead times for systems development and concerns for standardization. They believe that under their control, systems development and support could be more flexible and responsive to changing business needs.

The future is unclear. Some firms that have highly centralized IS functions are moving toward decentralization. Other firms that tried decentralization, such as Aetna Life and Casualty Insurance Company and General Motors, are now moving back toward more centralized control. Sometimes these shifts are driven by changes in philosophy as executive management changes hands. Others are driven by business requirements. A firm with decentralized IS that needs to provide interconnectivity may find itself faced with an impossible mix of incompatible equipment. Moreover, the costs of supporting a highly complex environment with multiple hardware and software platforms may spiral out of control.

Some leaders are advocating a middle ground—the centralization of data center operations and architecture planning with some degree of decentralization for TPS application development and EUIS. In this vision, computer services are seen to operate as a utility, much like the telephone company or electric company, where users can select from an array of services and "plug in" their own equipment as necessary.

For the near future, EUIS specialists are likely to find the IS environment highly variable depending on the enterprise. There is no right approach for everyone. EUIS specialists will need to understand the IS environment within their enterprise and operate accordingly.

1.6.4 Help Desks and Information Centers

A rapidly growing area of end-user support is the *Help Desk.* Formerly called an information center, this user support function has evolved with the rapid growth of computers at the desktop. Originally, information centers provided training, consulting, and user assistance. Through these information centers, users obtained the necessary skills and guidance to manipulate and analyze mainframe data, create and modify their own reports, produce graphs, and make ad hoc inquiries. Originally limited to use of mainframe tools, information centers evolved to support PCs as well, and often played a key role in managing end-user information systems. In fact, in some firms, information centers assumed accountability for guiding and supporting acquisition of PCs throughout the organization. Common information center services included hot lines and user support groups.

Over time, the support functions were decentralized, and as demand grew, hot lines evolved into today's Help Desk. Most modern Help Desks are high-volume call centers that use sophisticated technology and are staffed with trained specialists to assist users with technical

problems. Help Desks are discussed in detail in chapter 7, "Support and Help Desk Management."

1.6.5 The Role of the Chief Information Officer (ClO)

The concept of a chief information officer (CIO) has caught on in recent years. The CIO is defined as "the highest ranking executive at the corporate, business unit, or functional division level with primary responsibility for information systems."[3] Perspectives on what has led to the emergence of this new executive role vary. John P. Imlay, Jr., chairman and CEO of Management Science America, Inc., writing in *FE: The Magazine for Financial Executives,* linked the rise of the CIO to the growing importance of information technology:

All of this implies a changing role for the information manager. He or she will now aspire to being CEO, because in automating administration, in automating mail, in automating the standard computing functions, and tying in communication, he becomes the heartbeat of the company. And the computer is his tool. Do you doubt a new title is forthcoming? You've seen him or her go from data processing manager to MIS director. Now you're going to see all this coming together as he becomes a new officer in the firm and is called the chief information officer.[5]

The *role* of the CIO (but not necessarily the title) is emerging in response to the increased importance of information technologies:

By centralizing information management in the hands of a CIO, business can coherently manage increased office automation, the proliferation of PCs, and the expanding use of communications technology. . . . Furthermore, the CIO offers a focal point for determining how to control access to data, what types of end-user support are needed most, how to integrate data and telecommunications systems effectively, and what impact the implementation of new technologies will have on corporate culture. The CIO can also be a leader in strengthening his or her company's current and future competitive position by using technology wisely.[6] An annual IS survey of executives sponsored by Coopers & Lybrand and *CIO*
magazine revealed that CIOs have continued their ascent into the ranks of senior management. The survey sampled 201 non-IS executives ranging from CEOs to vice presidents from a broad spectrum of industries about the role of IS in their organizations and their perceptions of their CIO (used generically to describe the organization's top IS manager). Three-quarters of those surveyed called the ClO a key part of the executive decision-making process. Ninety percent said that their CIO is at least somewhat involved in the formulation of overall business strategy and plans, and just over half stated that the CIO is "very" or "extremely" involved, up from 45 percent the previous year. In addition, 72 percent said that "ideally," the CIO should be very or extremely involved, compared to 62 percent the prior year. Three quarters of the respondents said IS is a significant component of business strategy in achieving a competitive advantage, 82 percent said the same of management effectiveness, and 87 percent of improving productivity. Even more significant, the numbers citing IS influence in facilitating organizational change and restructuring the business shot up to 59 percent and 78 percent, respectively, which is an increase of almost 20 percent from the previous year.[7]

1.6.6 Career Opportunities in EUIS

The job market for individuals with a high level of computer competency, but not necessarily programming languages, is growing rapidly. Skills in Web development, knowledge management, desktop publishing, multimedia, and Help Desk operations, for example, are in high demand. Moreover, as the networking revolution continues to transform the business environment, the demand for business leaders who know how to transform work processes and manage change is growing rapidly.

Career steps for specialists in EUIS are not as clearly defined as the more traditional IS roles. A rapidly changing field, EUIS offers many opportunities, but risks also exist. Both IS and EUIS are still dependent upon technology development. Major new developments could alter the current directions quickly. Tugs-of-war between decentralized EUIS and centralized IS create politics and frustrations. The

Figure 1-11 Sampling of job titles for individuals with EUIS skills

High-Level Positions

1. Chief Information Officer (CIO)
2. Vice-President, Information Systems
3. Chief Knowledge Officer (CKO)
4. Web Master
5. Director of End-User Systems
6. Professor of Information Systems
7. President, Knowledge Management Consulting Firm
8. Training Director for Information Systems
9. Director, Reengineering
10. Help Desk Manager
11. Information Systems/Library Administrator

Mid- and Entry-Level Positions

1. Project Manager
2. EUIS Systems Analyst
3. Director, Desktop Systems
4. LAN Administrator
5. PC Software Application Developer
6. Web-Page Designer
7. Web Master
8. EUIS Programmer/Analyst
9. System Trainer/Instructional Designer
10. Computer-Based Training Author
11. Information Center Consultant
12. Office Environment Specialist
13. EUIS Business Analyst
14. EUIS Business Consultant
15. Product Support Manager
16. PC Support Specialist
17. PC Training Specialist
18. Desktop Publishing Manager
19. End-User Support Specialist

20. Vendor Sales Representative

organizational structure and management practices of enterprises also influence how end-user services are handled. Because of the similarity in technologies, lines between EUIS and other IS careers are fluid. Individuals who have strong technical skills and strong human relations skills commonly move back and forth between these two fields. A career path that has combined experience in both EIJIS and IS provides especially strong preparation for higher-level IS positions. The resulting breadth of experience provides the broad perspective required for high-level information systems management.

Careers in EUIS include PC application developers, systems analysts or business analysts, network administrators, Help Desk managers, EUIS project managers, Web developers, and a variety of others. Careers in EUIS require a combination of training and experience in computer skills, systems analysis, organizational development, and business knowledge. Courses appropriate for the student pursuing a career in EUIS include the following:

- PC productivity tools (spreadsheets, graphics, database, project management, word processing)
- Multimedia software
- Web development tools such as HTML, scripting, etc.
- Introduction to information systems
- Programming languages such as Visual Basic, C++, and Java
- Fourth-generation languages, such as FOCUS, Statistical Analysis System (SAS), APL, SQL, RPG-III, Nomad2, and others
- Telecommunications and networking
- Systems analysis
- Project management
- Business management
- Organizational development and change management
- Business communications
- End-user information systems
- Ergonomics or human factors (including user interface design)
- Training and instructional design

Figure 1-11 presents a sampling of technical job titles for individuals with EUIS skills.

1.7 SUMMARY

Chapter 1 provides an introduction to the field of end-user information systems (EUIS) and sets the stage for the rest of the text. Information is crucial to the operation of business and government enterprises. The hub of the enterprise that processes and provides that essential information is the business office. EUIS provide new ways to manage information and support business processes. Without these advanced systems, enterprises could not provide the diversity of products and services today's complex society demands.

As computers have become more. Powerful, less expensive, and easier to use, they have moved out of backroom technical environments into the workplace and onto desktops. The evolution of end-user information systems provides an excellent exam-pie of how technology evolves in response to specific needs to resolve problems. At the same time, people and organizations adapt and change in response to new technology.

To take full advantage of new information technologies, organizations must change old ways of doing things. Change must be a learning process that enables individuals to assimilate new technologies. Change disturbs the way people work and disrupts accustomed behavior patterns. New opportunities associated with technology often are not immediately evident.

EUIS is defined as the application of information technologies that support business processes and individual performance with the objective of improving overall organizational effectiveness in direct support of business goals and objectives. Today's end-user information systems make it possible to eliminate or integrate routine tasks, formerly delegated to support personnel, with other business activities. It introduces many new possibilities for helping individuals and groups effectively manage and use information.

End-user, or knowledge work, environments are characterized by variability specialization, deadline pressures, widely dispersed operations, autonomy, customization, and loosely structured activities. The nature of information processing performed by professional, technical, and managerial personnel is aligned closely to the functional areas in which they work.

EUIS technologies should not be viewed as a magic answer to improving productivity. The potential offered by these tools may be realized only when EUIS technologies are implemented as part of a carefully planned program for increased productivity Adequate attention must be given to business requirements, work processes, and job design in addition to technology~ In and of itself, technology does not make people more productive.

The EUIS project management, introduced here and explained later in the text, provides a framework for managing both the technical and organizational aspects of EUIS projects. Roles and responsibilities for EUIS within an enterprise depend on how the IS function is organized. Although EUIS and IS originated as separate functions, most enterprises appear to be merging them under a single IS organization. The EUIS field provides many challenges for individuals interested in this specialized area of information systems.

The next chapter provides a more in-depth look at the changing nature of today's networked organizations. It presents key technology trends important to EUIS professionals with an emphasis on the implications for individual, group, and organizational performance.

KEY TERMS

- Applications
- Business process (re)design
- Business system
- Chief information officer (CIO)
- Digital Age

- End users
- End-user computing (EUC)
- End-user information systems (EUIS)
- Executive information systems (EIS)
- Information Age
- Information technology infra structure
- Information processing.
- Knowledge workers
- Knowledge work systems (KWS)
- Management information (MIS)
- Primary functions
- Support functions
- Transaction processing systems(TPS)
- Work flow analysis

DISCUSSION QUESTIONS

1. What are EUIS? How are EUIS different from IS?
2. Who is the end user? How have developments in EUIS been directed to the end user?
3. List six categories of EUIS tools used in offices today.
4. What is the focus of EUIS? How do EUIS facilitate knowledge work?
5. Summarize the relationship between productivity and EUIS.
6. How has the introduction of PCs changed jobs in the knowledge work environment?
7. List characteristics of the end-user environment. How do these characteristics affect the design and implementation of EUIS?
8. What is an office? What role do offices fulfill in the organizational structure of an enterprise?
9. What is work group computing? Why has some of the focus of end-user information systems shifted from individuals to work groups?
10. How do EUIS fit into the overall IS organizational structure?
11. What is a Help Desk? What purpose do Help Desks serve? How do they fit into the typical IS organization?

APPLICATION EXERCISES

1. Pretent that you have just been appointed as manager of an information systems department in a medium-size enterprise. The department is now organized into just two groups: data center operations and IS applications development. However, the department has been growing rapidly and has outgrown its current organization chart. Desktop systems, local area networks, group tools, and the Internet require a growing proportion of time and effort. Using the information in this chapter, draw a new organization chart for the department showing how you would reorganize responsibility for all the major information systems functions. Compare your chart with others in the class and discuss some of the different approaches.

2. Task workflow restructure activity. Take a manual document preparation task—restructure w/networked PC's with outlook or lotus notes.
3. Visit an information systems department in a large enterprise or interview someone who is responsible for EUIS. How are responsibilities for EUIS organized? Where does it fit into the IS organization? How many staff support EUIS? What are their titles? What responsibilities do they have? Who are their clients? How many devices are distributed on office desktops? What technologies and services are provided? What is (are) the name(s) of the department(s) that supports EUIS? Share your findings with others in the class.

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