Support systems support the decision-making needs of strategic (top) management, tactical (middle) management, and operating (supervisory) management. Operations support systems support the information processing requirements of the day-to-day operations of a business, as well as some lower-level operations management functions.

Providing information and support for management decision making by all levels of management (from top executives to middle managers to supervisors) is a complex task. Conceptually, several major types of information systems are needed to support a variety of managerial end user responsibilities: (1) management information systems, (2) decision support systems, and (3) executive information systems. Figure 2.17 illustrates some of the resources needed and information products produced by several types of management support systems.

Management information systems (MIS) are the most common form of management support systems. They provide managerial end users with information products that support much of their day-to-day decision-making needs. Management information systems provide a variety of reports and displays to management. The content of these information products are specified in advance by managers so that they contain information that managers need. Management information systems retrieve information about internal operations from databases that have been updated by transaction processing systems. They also obtain data about the business environment from external sources.

Information products provided to managers include displays and reports that can be furnished (1) on demand, (2) periodically, according to a predetermined schedule, or (3) whenever exceptional conditions occur. For example, sales managers could receive: (1) instantaneous visual displays at their workstations in response to requests for information about the sales of a particular product; (2)
weekly sales analysis reports evaluating sales results by product, salesperson, and sales territory; or (3) reports produced automatically whenever a salesperson fails to produce sales results during a specified period. We will discuss management information systems further in Chapter 10.

**Decision Support Systems**

Decision support systems (DSS) are a natural progression from management information systems and transaction processing systems. Decision support systems are interactive, computer-based information systems that use decision models and specialized databases to assist the decision-making processes of managerial and uses. Thus, they are different from transaction processing systems, which focus on processing the data generated by business transactions and operations, though they extract data from corporate databases maintained by TPS. They also differ from management information systems, which focus on providing managers with prespecified information (reports) that can be used to help them make more effective, structured types of decisions.

Instead, decision support systems provide managerial end users with information in an interactive session on an ad hoc (as needed) basis. A DSS provides managers with analytical modeling, data retrieval, and information presentation capabilities. Managers generate the information they need for more unstructured types of decisions in an interactive, computer-based process. For example, electronic spreadsheets and other decision support software allow a managerial end user to pose a series of what-if questions and receive interactive responses to such ad hoc requests for information.

Thus, information from a DSS differs from the prespecified responses generated by management information systems. When using a DSS, managers are exploring possible alternatives and receiving tentative information based on alternative sets of assumptions. Therefore, managerial end users do not have to specify their information needs in advance. Instead, a DSS interactively helps them find the information they need. Decision support systems are discussed further in Chapter 10.

**Executive Information Systems**

Executive information systems (EIS) are management support systems tailored to the strategic information needs of top and middle management. Top executives get the information they need from many sources, including letters, memos, periodicals, and reports produced manually as well as by computer systems. Other sources of executive information are meetings, telephone calls, and social activities. Thus, much of a top executive's information comes from noncomputer sources. Computer-generated information has not played a primary role in meeting many top executives' information needs.

The goal of computer-based executive information systems is to provide top and middle management with immediate and easy access to selective information about key factors that are critical to accomplishing a firm's strategic objectives. Therefore, EIS are easy to operate and understand. Graphics displays are used extensively, and immediate access to internal and external databases is provided. An EIS provides information about the current status and projected trends for key factors selected by top executives. EIS have become so popular in recent years that their use is spreading into the ranks of middle management. Executive information systems are discussed again in Chapter 10. See Figure 2.18.
Several other categories of information systems provide more unique or broad classifications than those we have just mentioned. That's because these information systems can support either operations or management applications. For example, **expert systems** can provide expert advice for operational chores like equipment diagnostics or for managerial decisions such as loan portfolio management. Another example is **end user computing systems**, which provide direct hands-on support of end users for either operational or managerial applications. Finally, information systems which focus on operational and managerial applications in support of basic business functions such as accounting or marketing are known as **business information systems**.

The frontiers of information systems are being affected by developments in **artificial intelligence** (AI). Artificial intelligence is an area of computer science whose long-range goal is to develop computers that can think, as well as see, hear, walk, talk, and feel. For example, AI projects involve developing natural computer interfaces, advanced industrial robots, and intelligent computer software. A major thrust is the development of computer functions normally associated with human intelligence, such as reasoning, learning, and problem-solving. One of the most practical applications of AI is the development of **expert systems** (ES). An expert system is a **knowledge-based information system**; that is, it uses its knowledge about a specific area to act as an expert consultant to users. The components of an expert system are a knowledge base and software modules that perform inferences on the knowledge and offer answers to a user's questions. Expert systems are being used in many different fields, including medicine, engineering, the physical sciences, and business. For example, expert systems now help diagnose illnesses, search for minerals, analyze compounds, recommend repairs, and do financial planning. Expert systems can support either operations or management activities. We will discuss artificial intelligence and expert systems further in Chapter 12.

**Other Classifications of Information Systems**

**Expert Systems**
End User Computing Systems

End user computing systems are computer-based information systems that directly support both the operational and managerial applications of end users. You should think of end user computing primarily as the direct, hands-on use of computers by end users, instead of the indirect use provided by the hardware, software, and professional resources of an organization's information services department. In end user computing systems, end users typically use microcomputer workstations and a variety of software packages and databases for personal productivity, information retrieval, decision support, and applications development. For example, users may do word processing, send electronic mail, retrieve information from a database, manipulate an analytical model, or develop a new business application. We will discuss end user computing systems in Chapter 8.

Strategic Information Systems

The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace. This creates strategic information systems, information systems that support or shape the competitive position and strategies of an enterprise. So a strategic information system can be any kind of information system (TPS, MIS, DSS, etc.) that helps an organization gain a competitive advantage, reduce a competitive disadvantage, or meet other strategic enterprise objectives. For example, as we saw in Chapter 1, online package tracking systems helped Federal Express gain market dominance, customer cash management account systems helped Merrill Lynch seize market leadership, and portable computer-based applications helped Navistar significantly increase their market share. We will discuss strategic information systems in detail in Chapter 11.

Business Information Systems

As a future managerial end user, it is important for you to realize that information systems directly support both operations and management activities in the business functions of accounting, finance, human resource management, marketing, and operations management. Such business information systems are needed by all business functions.

For example, marketing managers need information about sales performance and trends provided by marketing information systems. Financial managers need information concerning financing costs and investment returns provided by financial information systems. Production managers need information analyzing resource requirements and worker productivity provided by a variety of manufacturing information systems. Personnel managers need the information concerning employee compensation and professional development provided by human resource information systems. Thus, business information systems provide managers with a variety of information products to support their decision-making responsibilities in each of the functional areas of business. We will discuss these systems in more detail in Chapter 9.

Integrated Information Systems

It is also important to realize that information systems in the real world are, typically, integrated combinations of several types of information systems we have just mentioned. That's because conceptual classifications of information systems are designed to emphasize the many different roles of information systems. In practice, these roles are integrated into composite or cross-functional information systems that provide a variety of functions. Thus, most information systems are designed to produce information and support decision making for various levels of management and business functions, as well as do record-keeping and transaction processing chores.
Operations support systems process data generated by business operations. Major categories are:

- **Transaction processing systems** process data resulting from business transactions, update operational databases, and produce business documents.
- **Process control systems** monitor and control industrial processes.
- **Office automation systems** automate office procedures and enhance office communications and productivity.

**Management support systems** provide information and support needed for effective decision making by managers. Major categories are:

- **Management information systems** provide information in the form of prespecified reports and displays to managers.
- **Decision support systems** provide interactive ad hoc support for the decision-making process of managers.
- **Executive information systems** provide critical information tailored to the information needs of executives.

Other categories of information systems can support either operations, management, or strategic applications:

- **Expert systems** are knowledge-based systems that provide expert advice and act as expert consultants to users.
- **End user computing systems** support the direct, hands-on use of computers by end users for operational and managerial applications.
- **Business information systems** support the operational and managerial applications of the basic business functions of a firm.
- **Strategic information systems** provide a firm with strategic products, services, and capabilities for competitive advantage.

For example, a payroll system that processes employee time cards and produces employee paychecks is an operations support system. An information system that uses payroll data to produce labor analysis reports showing variances and trends in labor costs is a human resource management information system. However, in most cases, these functions are combined in an integrated payroll/labor analysis system.

Another example involves sales order/transaction processing, which is an operations support system, and sales analysis, which is a marketing management information system. However, these two systems are typically integrated in a business. Thus, a sales order processing system would collect and record sales transaction data and provide input to a sales analysis system, which produces reports for sales managers concerning sales performance.

So whenever you analyze a business information system, you will probably see that it provides information for a variety of managerial levels and business functions. Figure 2.19 summarizes the major categories of information systems we have discussed in this section.