As "Pottermania" reached epidemic proportions recently, it provided a good example of how a single business event can strain critical information systems in even the most advanced organizations. When each Harry Potter book was due for release, pre-orders for the book swamped bookstores and Internet booksellers. This demand had an impact on the supply chain, from the publisher who needed to predict how many copies to produce, to booksellers who accepted pre-orders at a record pace, to the Fedex drivers charged with getting books delivered on the official release date. As the fourth book neared release, Amazon.com received over 275,000 advance orders for the single volume, exceeding its previous record-setting preorder of 43,000 copies of John Grisham’s *The Brethren*.

This large number of orders challenged Amazon’s information systems in many ways. Although advance orders were accepted, for example, the book’s title was not made public until shortly before the release date, leaving Web developers scrambling to update the many Web screens on which *Harry Potter and the Goblet of Fire* needed to appear. Amazon also made careful arrangements with Fedex to ship the first 250,000 preordered copies on the announced delivery date, which happened to fall on a Saturday. Fedex scheduled 100 flights and 9,000 delivery specialists to meet the deadline.

But perhaps the biggest challenge of all fell to the Information Systems staff at Amazon.com. Because the orders were received weeks or even months ahead of time, data on each customer needed to be confirmed and stored for the future shipment. Billing information for the shipment had to be verified ahead of time, even though billing could not be completed until the shipment was released. Then the data was updated as each delivery was packaged and kept in a warehouse until Fedex shipped. These proved to be challenging data quality issues for Amazon. Each order was confirmed by sending e-mail to customers to make sure that delivery information was correct. Customer credit card charges were readied to enable billing as soon as legally possible on the Saturday of the shipment.1

Did it work? Well, Harry Potter fans around the world returned vicariously to Hogwarts on July 8. As the parent of a voracious Harry Potter fan, one of the authors of your text can attest that Amazon’s information system worked well in handling this highly publicized business event.

Many business professionals at Amazon.com had to work together to be able to plan and implement the successful Harry Potter release. They had to address Information Systems issues across several business processes as part of this effort. These business processes in organizations, including management, operations, and information functions, are assisted by—and sometimes operated by—large, complex enterprise systems that govern the collection and sharing of data by various groups. Sometimes business processes extend to business partners through the Internet, permitting electronic business relationships to flourish. In the case of Amazon.com, the Internet is not an alternative communications channel, but the lifeblood of its business. Amazon’s e-business systems had to be highly reliable even when faced with unprecedented levels of demand.

To be successful, business professionals must understand their roles and responsibilities in the context of the surrounding business processes and information technologies. In this text we help you to connect your business knowledge to business processes and information technologies to which professional activities are inextricably linked. This book will teach you to evaluate and understand what the impacts of technology are on your organization’s operations and success, and how new technologies may change your business and job performance in the future.

**Synopsis**

This chapter introduces Information Systems (IS) and describes its importance. Be sure to become comfortable with fundamental concepts in this chapter. Key among these are the components of information systems, business processes, and information qualities.

This chapter connects discussion of Information Systems to three themes having a major impact on modern business. These themes are enterprise systems—such as those sold by SAP, J. D. Edwards, Oracle, and PeopleSoft; e-business—including retail e-business such as Amazon.com and Business-to-Business (B2B) marketplaces such as Covisint.com (operated by auto manufacturers); and information technology—state-of-the-art hardware and software applications that keep an organization heading toward achievement of its objectives. We define these three themes in this chapter.

**LEARNING OBJECTIVES**

- To describe an information system’s integration with business processes and the organization
- To describe the business professional’s role in the current information technology-driven environment
- To illustrate the attributes of information and the importance of data quality
Introduction

This textbook asks you to focus on a set of elements broader than that introduced in a typical Information Systems course. Becoming comfortable in dealing with these elements can bring rewards in terms of professional success and the competitive edge you gain in the marketplace. An information system is a major part of the business processes of an organization performing the critical functions for it. The Information System function is doubly crucial to an organization’s success because it provides useful information for management and because it supports the organization’s strategic plan.

Some of the terms in this chapter may not be familiar. The text contains definitions and illustrations to facilitate your familiarization with these terms.

The Textbook’s Three Themes

This text revolves around the influence of three themes on contemporary business practices: (1) enterprise systems, (2) electronic business (e-business), and (3) information technology.

Enterprise systems are integrated software packages designed to provide complete integration of an organization’s business information processing systems and all related data. Data is shared across systems to support the operation and management of the organization. Modules within these packages are named for the functions that they support and include logistics (sales and distribution, procurement, inventory management), accounting (financial accounting, treasury, controlling), manufacturing (planning and scheduling, cost accounting, capacity planning), and human resources (payroll, employee tracking, tax compliance). It is critical that business professionals understand these systems because they are members of teams that install and operate them in their organizations, and they require access to information captured within these systems to be effective managers. Installing an enterprise system requires that the business processes of an organization be understood and documented. Sometimes, the business processes must be changed and then mapped to the enterprise system. A major part of installation is configuring the enterprise system to tailor it to the business processes. Consultants, business process owners, system users, and evaluators must understand these systems and be able to install, use, and assess them. Chapter 2 describes a tool set for diagramming business processes that will help us analyze those processes. Chapter 3 describes enterprise systems more fully and these systems in their business context appear throughout the remainder of the book.

E-business is the application of electronic networks (including the Internet) to undertake business processes between individuals and organizations. These processes include interaction between back-office processes (internal processes such as distribution, manufacturing, and accounting) and front-office processes (external processes such as those that connect an organization to its customers and suppliers). Electronic networks include the Internet and electronic data interchange (EDI), both described in Chapter 4. E-business has created entirely new ways of working within and across organizations. For example, organizations are buying and selling goods and services at virtual marketplaces, changing the way organizations identify customers and select vendors. E-business is also changing how to determine what it costs to acquire goods from a vendor.
and what price(s) to charge customers for products. Obviously, business professionals should be aware of the opportunities and risks associated with this new way of doing business. Chapter 4 explains e-business and a closely related concept, Internet commerce, more fully, and instances appear throughout the reminder of the text.\footnote{See Andrew Bartels, “The Difference Between E-Business and E-Commerce,” \textit{Computerworld} (October 30, 2000): 41, for a discussion of e-business and e-commerce.}

Information Technology, or simply, Technology, is the third theme reflected in the side panel icons. This concept is more broadly defined than the other two, as it encompasses any hardware, software, or communications technology that might be adopted by an organization to support or control a business process, enable management decisions, or provide a competitive advantage. The side-panel technology icons signal discussion of an electronic mechanism that is either in wide use, represents the state of the art, or may be adopted by business in the near future. Chapters 8 and 9 introduce the use of technology to provide security, privacy, or internal control of operations. Technology can be used to support enterprise systems and e-business applications as well. Business professionals need to be aware of the availability of new technologies, and be able to evaluate the costs, benefits, and usefulness of each.

Challenges and Opportunities for the Business Professional

Are you preparing yourself to be effective in the future? Will you be able to adapt to advances in technology? Are you equipped to take advantage of technology improvements? You should prepare yourself to use the available technology and to participate in planning for and growing with the technology. For example, Chapter 5 introduces business intelligence systems and explains why the use of such systems is a competitive imperative for many organizations. These are not conditions of the distant future; most of these changes are already underway. For example, the Radio Frequency ID tags described in Technology Insight 1.1 (page 6) will have a major impact on how material is acquired, warehoused, assembled into products, and distributed to customers. The people, activities, and technologies involved in all processes within the supply chain will change because of the impact of RFID.

Components of the Study of Information Systems

Figure 1.1 (page 7) depicts the elements central to our study of Information Systems (IS). Many may be familiar, and some have been introduced earlier in this chapter.

Hardware and Software The ability to plan and manage business operations depends partly on knowledge of the hardware and software available. For instance, is production manageable without knowledge of robotics? It goes without saying that technological developments have a profound effect on information systems; enterprise systems, e-business, databases, and business intelligence systems are but a few examples. Hardware and software technology provides the foundation on which IS and business operations rest.
Databases

Important to a complete understanding of IS are databases, both internal and external to the company; the quantity and type of data available in these databases; and methods of retrieving those data. To perform analysis or to prepare information for management decision making, a business professional must be able to access and use data from internal and external databases. Chapter 3 explores the design and use of an organization’s own databases.

Reporting

To design reports generated by an information system, the business professional must know what outputs are required or desirable. A user might prepare a report on an occasional basis using powerful report-generating tools or a database query language (discussed in Chapter 3). Scheduled reports appear periodically.

Radio Frequency ID Tags

Bar codes revolutionized the tracking of merchandise and shipments by including an easily readable label to identify a product or shipping container full of products. Bar codes dramatically cut the time needed to inventory packages, items within packages, and even truck-sized shipping containers. Because the codes were standardized, this technology also improved the accuracy with which products could be tracked and accounted for.

Now another technology is appearing that will take this revolution a step farther. Radio Frequency ID Tags (RFID) are intelligent chips that can be embedded in or attached to a product. These chips transmit descriptive data through packaging and shipping containers, so humans need not open and physically examine each item. The more advanced (and expensive) versions of RFID periodically send out signals identifying their location, reducing further the need for human intervention or time-consuming searches for particular products or shipments. They are also much faster to scan than their bar code equivalent, especially since an entire container’s contents can be assessed at once, in the same time a single bar code could be scanned manually.

RFID is being used by the military to track shipments to war zones. It is also being investigated as a way to track radioactive or dangerous materials during transport. But the most widespread and commonplace applications of RFID will likely be in manufacturing and distribution, where the devices are being investigated to track everything from automobiles as they proceed through the assembly line to items of clothing in the stock room of a retail store.

RFID will improve a company’s ability to track inventory throughout all processes. Savings related to reduced need for humans to track inventory, less need for excess inventory, and better awareness of supplier and customer shipment location and times will propel more companies to investigate this emerging technology.

as part of normal IS function. Government agencies such as the Internal Revenue Service and the Securities and Exchange Commission require some reports. Other reports, such as sales analysis, are useful internally.

Control Traditionally, internal auditors and IS professionals have been charged with controlling business processes. However, this responsibility has expanded to others because of the difficulty of controlling modern, complex business processes. Today’s business process owners need to work with internal auditing and the IS staff, and also business process owners in partnering companies, to ensure that the activities in their business processes are secure and reliable. Chapters 8 and 9 discuss control, the means by which one assures that the intended actually happens. Business process Chapters 10 through 14 further demonstrate controls in action that facilitate development and implementation of well-controlled business processes.

The next three elements of Information Systems study, business operations, events processing, and management decision making, comprise a major focus of this text, business processes. A business process is a set of business events that together enable the creation and delivery of an organization’s products or services to its customers. It was the successful interaction among business processes that enabled Amazon.com to fill all those Harry Potter book orders during peak demand periods. Knowledge of these processes is essential for success as a technology user, consultant, business process owner, or Information Technology (IT) specialist.
Business Operations  Organizations engage in activities or operations, such as hiring employees, purchasing inventory, and collecting cash from customers. An IS operates in concert with these business operations. Many IS inputs are prepared by operating departments—the action or work centers of the organization—and many IS outputs are used to manage these operations. Managers must analyze an IS in light of the work the organization performs. For example, to advise management and to prepare reports for management decision making, a marketing manager must understand the organization’s product cycles.

Events Processing  As organizations undertake their business operations, events, such as sales and purchases, occur. Data about these events must be captured and recorded to mirror and monitor business operations. The events have operational, managerial, and IS aspects. To design and use the IS, the business professional must know what event data are needed and how they are processed.

Management Decision Making  The information used for a decision must be tailored to the type of decision under consideration. Furthermore, information is more useful if it recognizes the personal management styles and preferences of the decision maker. For example, the manager of Department A prefers to receive a monthly cash flow statement that groups receipts and payments into broad categories. The manager of Department B, on the other hand, wants to see more detailed information in the form of an analysis of payments by vendors. Chapter 5 examines decision making and the business intelligence systems that support it.

Systems Development and Operation  Information Systems that process business events and provide information for management decision making must be designed, implemented, and effectively operated. Business professionals often participate in systems development projects. They may be users or business process owners contributing requests for certain functions, or auditors advancing controls for the new system. Choosing the data for a report, designing that report, or configuring an enterprise system are examples of systems development tasks that can be accomplished by a business professional. Chapters 6 and 7 examine systems development and operation, and the business professional’s role in those processes.

Communications  To present the results of their endeavors effectively, business professionals must possess strong oral and written communication skills. Have your professors been drumming this message into you? If not, you’ll become acutely aware of its importance when you enter the job market. There are few easy answers in the study of IS. Professionals must evaluate alternatives, choose solutions, and defend their choices. Technical knowledge won’t be enough for the last task.

Business Principles  To design and operate the IS, a business professional must understand the use to which the information will be put. As an illustration, suppose you were designing an IS for the billing function at XYZ, Inc. Would you invoice customers at the time the customer’s purchase order was received, or would you wait until XYZ’s shipping department notified you that the goods had been shipped? You need to know the situations for which the former is normally correct (e.g., e-business retail sales) and for which the latter is correct (e.g., typical supply-chain operations for businesses).
What Is an Information System?

This section provides a definition for Information Systems (IS) and defines related terms to establish a background for later study. The section concludes by discussing how the business professional interacts with the IS and with the current business environment.

Systems and Subsystems

A **system** is a set of interdependent elements that together accomplish specific objectives. A system must have organization, interrelationships, integration, and central objectives. Figure 1.2a depicts a system consisting of four *interrelated* parts that have come together, or *integrated*, as a single system, named “system 1.0.” Each part of a system—in this case, parts 1.1, 1.2, 1.3, and 1.4—is known as a **subsystem**. Within limits, any subsystem can be further divided into its component parts or subsystems.

**Review Question**

Are the terms *system* and *subsystem* synonymous? Explain your answer.

**Figure 1.2** Systems and Subsystems

(a) System: 1.0  
Subsystems: 1.1, 1.2, 1.3, 1.4  
Interrelationships: A, B, C, D, E

(b) System: 1.2  
Subsystems: 1.2.1, 1.2.2, 1.2.3  
Interrelationships: F, G, H

(c) System 1.0 organization
Figure 1.2b depicts subsystem 1.2 as a system consisting of three subsystems. Notice that we use the term system (versus subsystem) to describe the area of immediate focus. For example, in a typical university, the College of Business and the College of Engineering are subsystems of the university system, and the Operations Management and Marketing Departments are subsystems of the College of Business system.

In Figure 1.2, parts a and b depict the interrelationships (A through H) in a system; part c depicts the hierarchical organization structure inherent in any system. Again, picture system 1.0 as a university and system 1.2 as the College of Business. Interrelationship F might be a finance student being sent by the Finance Department (1.2.1) to the Department of Accountancy (1.2.2) for a minor in accounting.

A system’s basic objectives depend on its type—natural, biological, or human-made—and on the particular system. For example, the human circulatory system is a biological system (a subsystem of the human body) whose purpose is to carry blood containing oxygen and carbon dioxide to and from the organs and extremities of the body.

Determination of the purpose of man-made systems—such as governments, schools, and business organizations—is necessary to understanding how best to create and evaluate the processes that comprise each system. Business organizations usually have relatively straightforward purposes that are normally related to the “bottom line.” Many businesses, however, establish goals other than financial return to the owners. For example, a business might strive to improve the quality of life of its employees, or to use its natural resources responsibly. Here is our own bottom line: We must know a business organization’s objectives to understand that business as a system and to understand the actions and interactions of that business’s components or subsystems. This is a central theme of the study of IS.

The Information System

An Information System is a man-made system that consists of an integrated set of computer-based and manual components established to facilitate an organization’s operational functions and to support management decision making by providing information that managers can use to plan and control the activities of the firm. Figure 1.3 depicts the functional components of an Information System. Imagine a simple IS used to maintain inventory balances for a shoe store. The inputs for such a system might be receipts of new shoes or sales of shoes; the process might be to update (in storage) the inventory records for the particular shoe; and the output might be a listing of all the various kinds and sizes of shoes and their respective recorded balances.

Assume that, while entering data about shoe sales, we also enter data about who purchased the shoes, how they paid for the shoes, and why they decided to buy their shoes at our store. We might store those data and then periodically print reports useful in making decisions about advertising effectiveness. Or, we might decide, on the basis of analysis of our sales data, to engage in joint advertising campaigns with a credit card company whose cards are often used in the store.

The shoe store example shows that an IS often divides into components based on the organizational function being supported. For example, the IS in the shoe store supports inventory control (a logistics function) by maintaining records for each shoe stocked in the store. The shoe store IS also supports a sales and marketing function by analyzing sales in a variety of ways. Other typical IS components include personnel, production, finance, and accounting. As discussed in Chapter 3, however, integrated computer processing has blurred the distinctions among these separate systems.
Now consider the technology components of the IS model in Figure 1.3. **Input data** are data received by the Information System from the external environment or from another area within the Information System. Data input includes *capturing* data (for example, scanning a bar code on a sales item at a grocery store) and, if necessary, *conversion* of the data to *machine-readable form*. Input data are normally recorded in **business event data stores**. These business events comprise the activities of the organization, such as purchasing goods from vendors and collecting cash from customers. Business event data are used often as a key source of data to *update* various master data. A **master data update** is an information processing activity whose function is to incorporate new business event data into existing master data. Updating includes adding, deleting, and replacing master data and/or records. For example, the sales event data are used to update the accounts receivable master data by adding new accounts receivable records.

Master data updates are recorded on master data stores. **Master data stores** are repositories of relatively permanent data maintained over an extended period of time. **Master data** contain data related to *entities*—persons (e.g., employees, customers), places (e.g., buildings), and things (e.g., inventory). Master data include such data as the accounts receivable master data, the customer master data, and the inventory master data.

Two types of updates can be made to master data: information processing and data maintenance. **Information processing** includes data processing functions related to economic events such as financial events, and internal operations such as manufacturing. **Data maintenance**, on the other hand, includes activities related to adding,

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3 Business event data and master data represent the relevant portions (or *views*) of the *corporate-wide database* being used for a particular application.

4 See note 3.
deleting, or replacing the standing data portions of master data. Master data standing data include relatively permanent portions of master data, such as the credit limit on customer master data and the selling price and warehouse location on inventory master data. This textbook emphasizes information processing, and analysis of internal controls related to master data updates is restricted to master data updates from information processing. There are references however, to controls related to data maintenance at appropriate points in the text.

Logical Components of a Business Process

A business process has three component processes that work together to support its logical activities. The IS supports all three processes in that it frequently embodies many of the policies and procedures that help define each process.

The information process is that portion of the overall IS related to a particular business process. The information process plays a critical role in the way all three processes work together.

An operations process is a human-made system consisting of the people, equipment, organization, policies, and procedures whose objective is to accomplish the work of the organization. Operations processes typically include distribution, manufacturing, human resources, and their sub-processes.

The management process is a human-made system consisting of the people, authority, organization, policies, and procedures whose objective is to plan and control the operations of the organization. The three most prominent management activities are planning, controlling, and decision making. These are discussed in Chapter 5.

These processes work together to accomplish the objectives of the business process—and therefore the organization. In order to accept and fill a customer order for a Harry Potter book from Amazon.com, all three processes engage in a set of activities, as shown in Figure 1.4. The activity numbers refer to the labeled flows in Figure 1.4. Flows are numbered in the order that activities occur.

The management process:

1. hires personnel and establishes the means for accomplishing the work of the organization. For example, management designs the procedures used to warehouse inventory and then to ship those goods to the customers.
2. establishes broad marketing objectives and assigns specific sales quotas by which progress toward the long-run objectives can be measured. Also designs the information processes’ procedures for facilitating operations, such as the procedures used to pick and ship goods to the customer.

The information process:

3. receives a customer’s order over the Internet for a Harry Potter book.
4. prepares an invoice and sends it electronically to the credit card company/bank.
5. receives an electronic payment acknowledgement from the credit card company/bank.

Review Question

What are three logical components of a business process? Define the functions of each. How do the components interact with one another?
(6) acknowledges the customer's order by sending an e-mail message to the customer.
(7) sends to the warehouse a request to ship a Harry Potter book to the customer. This request identifies the book and its location in the warehouse. Also sends a packing slip to be attached to the book.

The operations process:

(8) attaches to the shipment a document (i.e., a packing slip) identifying the customer and the book and ships the book to the customer.
(9) reports to the IS that the book has been shipped.

The information process:

(10) sends a shipping acknowledgement to the customer via e-mail.
(11) sends management a report comparing actual sales to previously established sales quotas.

These 11 activities highlight several important concepts.

- The information process facilitates operations by maintaining inventory and customer data and by providing electronic signals (such as those used in automated warehouses) and paper documents with which to execute business events, such as shipments to customers.
- The information process provides the means by which management monitors the operations process. For example, management learns sales results only from the sales report.
- Management designs the operations and information processes and establishes these processes by providing people, equipment, other physical components, and policies.
- Information process users include operations personnel, management, and people outside the organization, such as the customer.

Figure 1.5 represents data flows related to the processing of business events. In this figure, the top three layers represent the management process. The bottom layer represents the organization’s operations processes. The information process supports all layers through horizontal and vertical information flows.\(^5\) By studying these flows more

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**Figure 1.5** Information System Output Flow and Users

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\(^5\) Because Figure 1.5 depicts data from business events, the vertical information flows upward. Other data, such as budgets, would flow downward.
closely, we can improve our understanding of the Information System and its relationships with the operations and the management processes. At the level of operations and business events processing, the flows are horizontal as the information moves through operational units such as sales, the warehouse, and accounting. In the sales example above, the operational documents and records are the outputs of these horizontal flows.

The data captured at the operations and business event processing level constitute the foundation for the vertical information flows that service a multilevel management function. At the operations management level, personnel such as supervisors use information to monitor the daily functioning of their operating units. The vertical information useful to operations management is a summarized and tailored version of the information that flows horizontally. For example, horizontal flows relate to specific business events, such as one shipment, or to individual inventory items. On the other hand, information useful to operations management personnel is often an aggregate of data related to several business events. For example, a report summarizing shipments made each day might be useful to the shipping manager.

At the tactical management level, middle managers such as a warehousing or distribution manager, might want information about the timeliness of shipments each month. Such information is more summarized and broader in scope than is the information used by operations management.

Finally, at the strategic management level, senior managers such as division managers, chief financial officers (CFOs), and chief executive officers (CEOs), require information that is even more summarized and broader in scope than is the information used by tactical management. For these managers information must relate to longer time periods, be sufficiently broad in scope, and be summarized to provide a means for judging the long-term effectiveness of management policies. External financial statements, annual sales reports, and division income statements are but a few examples of strategic-level information. Note, however, that information technology facilitates access to detailed data at all management levels.

How does the IS support the multiple information uses suggested by the preceding discussion? For example, how does the IS support such users as the organization’s operations units, the organization’s management, and people outside the organization? How does the IS supply the information needed by three levels of management? One key component enabling the IS to meet the needs of this diverse constituency is the entitywide database. The entitywide database is the central repository for all of the data used by the organization. Information processes, such as order entry, billing, and inventory, update the database. Output can be obtained by other information processes and by other users such as management. When processes or other users access the entitywide database, they get a view of the database appropriate for their needs. For example, when entering the customer order in the earlier example, the information process had access to that portion of the database that was required, such as the applicable customer and inventory data.

Management Uses of Information

An IS serves two important functions within an organization. First, the IS mirrors and monitors actions in the operations process by processing, recording, and reporting business events. For example, the IS processes customer orders; records sales to customers by updating sales, accounts receivable, and inventory data; and produces
invoices and sales event summaries. This event-based, operations-oriented function is depicted by the horizontal information flows shown along the bottom of Figure 1.5.

The vertical information flows shown in Figure 1.5 highlight the second major function of the IS: to support managerial activities in the management process, including management decision making. How do managers use this information? First, they monitor current operations to keep their ship on course. For example, managers need to know if enough inventory is being produced each day to meet expected demand. Managers’ second use of information is to help them achieve satisfactory results for all of their stakeholders (e.g., customers, stockholders). For example, information can measure attainment of goals regarding product quality, timely deliveries, and cash flow. Finally, managers use the information system to recognize and adapt in a timely manner to trends in the organization’s environment. For example, managers need answers to questions such as: “How does the time it takes us to introduce a new product compare to our competitors?” “Does our unit cost to manufacture compare to our competitors?”

Because information systems provide critical support to such management activities, one must understand these activities, including decision making, to understand the features of good information systems.

**Data versus Information**

*Information* is data presented in a form that is useful in a decision-making activity. The information has value to the decision maker because it reduces uncertainty and increases knowledge about a particular area of concern. *Data* are facts or figures in raw form. Data represent the measurements or observations of objects and events. To become useful to a decision maker, data must be transformed into information. The most basic function of an IS, then, is to transform data into information that is *useful* in decision making. What attributes give information its utility value?

**Qualities of Information**

To provide output useful for assisting managers and other users of information, an IS must collect data and convert them into information that possesses important qualities. Exhibit 1.1 describes qualities of information that, if attained, will help an organization achieve its business objectives. Figure 1.6 (page 18) presents an overview of information qualities depicted as a hierarchy.

You can see that *effectiveness* overlaps with other qualities as it includes such measures as “timely” (i.e., availability) and “correct” (i.e., integrity). The effectiveness of information must be evaluated in relation to the purpose to be served—decision making. Effectiveness, then, is a function of the decisions to be made, the method of decision making to be used, the information already possessed by the decision maker, and the decision maker’s capacity to process information. The higher level factors in Figure 1.6, such as “users of information” and “overall quality (decision usefulness),” provide additional emphasis for these points.

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7. The descriptions of many of these terms are adapted from *Statement of Financial Accounting Concepts No. 2: Qualitative Characteristics of Accounting Information*, Financial Accounting Standards Board (FASB), May 1980.
Understandability enables users to perceive the information’s significance. For example, information must be in a language understood by the decision maker. By language, we mean native language, such as English or French, as well as technical language, such as one that might be used in physics or computer science. Information that makes excessive use of codes and acronyms may not be understandable by some decision makers.

Information capable of making a difference in a decision-making situation by reducing uncertainty or increasing knowledge has relevance. For example, a credit manager making a decision about whether to grant credit to a customer might use the customer’s financial statements and credit history because that information could be relevant to the credit-granting decision. The customer’s organization chart would not be relevant. The description of reliability of information in Exhibit 1.1 uses the term “appropriate.” Relevance is a primary component of appropriateness.

Information that is available to a decision maker before it loses its capacity to influence a decision has timeliness. Lack of timeliness can make information irrelevant. For example, the credit manager must receive the customer’s credit history before making the credit-granting decision. Otherwise, if the decision must be made without the information, the credit history becomes irrelevant. Exhibit 1.1 describes availability as “being available when required.” Thus, availability can increase timeliness.

Predictive value and feedback value improve a decision maker’s capacity to predict, confirm, or correct earlier expectations. Information can have both types of value. A buyer for a retail store might use a sales forecast—a prediction—to establish inventory levels. As the buyer continues to use these sales forecasts and to review past inventory shortages and overages—feedback—he or she can refine decision making concerning inventory.

If there is a high degree of consensus about the information among independent measurers using the same measurement methods, the information has verifiability. Real estate assets are recorded in financial records at their purchase price. Why? Because the evidence of the assets’ cost provides an objective valuation for the property at that point.
Figure 1.6  A Hierarchy of Information Qualities

Neutrality or freedom from bias means that the information is reliably represented. For example, the number of current members of a professional association may be overstated due to member deaths, career changers who don’t bother to quit, or members listed twice because of misspellings or address changes. Notice that verifiability addresses the reliability of the measurement method (e.g., purchase price vs. current value) and neutrality addresses the reliability of the entity doing the measuring.

Comparability is the quality that enables users to identify similarities and differences in two pieces of information. If we can compare information about two similar objects or events, the information is comparable. Comparing vendor pricing estimates where one vendor gives a per unit price, and another a price per case is problematic in choosing a low-cost vendor.

If, on the other hand, we can compare information about the same object or event collected at two points in time, the information is consistent. Analyzing sales growth, for example, might require horizontal or trend analysis for two or more years for one company.

As noted in Exhibit 1.1, integrity is an information quality that can be expanded into three very important qualities: validity, accuracy, and completeness. In Figure 1.6 these are components of reliability. Information about actual events and actual objects has validity. For example, suppose that the IS records a sale and an account receivable for a shipment that didn’t actually occur. The recorded information describes a fictitious event; therefore, the information lacks validity.

Accuracy is the correspondence or agreement between the information and the actual events or objects that the information represents. For example, if the quantity on hand indicated on an inventory report was 51 units, when the actual physical quantity on hand was 15 units whether the cause was a transposed number or an erroneous count, the information is inaccurate.

Completeness is the degree to which information includes data about every relevant object or event necessary to make a decision. We use relevant in the sense of all objects or events that we intended to include. For instance, suppose that a shipping department prepared 50 shipping notices for 50 actual shipments made for the day. Two of the notices fell to the floor and were discarded with the trash. As a result, the billing department prepared customer invoices for only 48 shipments, not for 50.

In summary, there are many ways to measure the effectiveness of information. Those discussed above and included in Exhibit 1.1 and Figure 1.6 include: understandability, relevance (or reliability), timeliness (or availability), predictive value, feedback value, verifiability, neutrality (or freedom from bias), comparability, consistency, integrity (or validity, accuracy, and completeness). These qualities appear again, in addition to some not discussed here (efficiency, confidentiality, and compliance), in subsequent chapters.

Costs and Benefits of Information We often hear people say that, before an action is undertaken, the estimated benefits of that action should exceed the estimated costs. This is a basic expectation, as basic as the American assumption that truth, justice, and the American way will prevail. In business, we make an assumption that there is a cost associated with each improvement in the quality of information. For example, the information reflected in an inventory data store could be improved if it were checked against a physical count of inventory each week. But imagine how costly that would be! Many companies use perpetual inventory balances for most of the year, or estimate their inventory balances based on sales or past years’ levels.
In practice, the benefits and sometimes the costs of information are often hard to measure. Chapter 6 provides some ideas for measuring the costs and benefits of an information system.

**Conflicts Among Information Qualities** It is virtually impossible to achieve a maximum level for all of the qualities of information simultaneously. In fact, for some qualities, an increased level of one requires a reduced level of another. As one instance, obtaining complete information for a decision may require delaying use of the information until all events related to the decision have taken place. That delay may sacrifice the timeliness of the information. For example, to determine all the merchandise shipments made in November, an organization may have to wait until several days into December to make sure that all shipments get recorded.

As another example, to obtain accurate information, we may carefully and methodically prepare the information, thus sacrificing its **timeliness**. To ensure the accuracy of a customer invoice, billing clerks might check the invoice for accuracy several times and then get their supervisor to initial the invoice, indicating that she also has checked the invoice for accuracy. Though ensuring accuracy, these procedures certainly hurt timeliness.

**Prioritizing Information Qualities** In cases where there are conflicts between qualities of information, defining a hierarchy establishes the relative importance of each quality. We could decide that accuracy is more important than any other quality. Or we could insist that timeliness be achieved even if that means that accuracy is sacrificed. For example, a marketing manager wanting to know quickly the impact of a new advertising campaign might check sales in just a few regions to get an early indication. The information may be timely, but it might be collected so hastily that it has limited reliability.

In some situations, managers choose to sacrifice maximum attainment of individual goals or values for achievement of a higher goal. For many decision makers, relevance of information is the key quality when choosing among many viable options. Maximizing one objective, rather than obtaining the highest possible levels for individual subordinate values, is a strategic choice. Later chapters revisit these information qualities and their role in the design, control, and use of various business processes.

**The Role of the Business Professional**

In relation to an Information System, the business professional may assume one or more of three roles: designer, user, and evaluator.

As a **designer** of an IS, the business professional brings a knowledge of business, information systems techniques, and systems development methods. In designing the IS, the business professional might answer such questions as:

- What will be recorded (i.e., what is a recordable business event)?
- How will the event be recorded (i.e., what data stores will be used)?
- When will the event be recorded (i.e., before or after occurrence)?
- What controls will be necessary to provide valid, accurate, and complete records; to protect assets; and to ensure that the IS can be audited?
What reports will be produced, and when will they be produced?

How much detail will the reports include?

The business professional is also a user of the IS to perform functions. The business professional’s effectiveness depends on how well she knows the IS and the technology used to implement it. For instance, to analyze financial information, a financial analyst must know what data are stored in the IS, how to access those data, what analysis tools exist and how to use them, and how to present the information using available report-writing facilities.

As a user, the business professional may also be called on to participate in the IS design process. In fact, an Information System user should insist on being involved to make sure that a new system contains required features. To be effective in the design process, the user must know how systems are developed, the techniques used to develop a system, and the technology that will be used in a new system.

As business process owners, business professionals are evaluators of the IS. They may stipulate the system’s controls, assess the system’s efficiency and effectiveness, and participate in the system design process. To be effective, the evaluator must possess knowledge of systems development techniques, of controls, of the technology used in the Information Systems, and of the design and operation of the IS.

Conclusions

Companies survive or fail these days based in large part on how well they conduct their business processes. In the business world, information technology and Information Systems play a pivotal role in how effectively and efficiently companies perform. It is not sufficient to have a flashy Web site or the cheapest product line. Customers expect quality service, accurate and timely delivery of orders, and a well-run organization behind the flashy Web site. This textbook is written to give you the background you need to understand how to succeed as a business professional in providing high-quality products and services while collecting and managing the data a profitable organization needs to plan, organize and control its people, processes, and systems.

Business professionals can no longer hide in a functional silo within a company. Companies do not separate product development and manufacturing into well-defined pieces; the accountants need to talk to the product development team, who need to connect with marketing people, who need to understand production cycles. All business professionals must share common information, information that is collected centrally and made available via integrated Information Systems to all company users. Since these users need to share the output of their Information Systems, they will also have to coordinate the systems’ design and control to make sure all users have access to the highest quality information possible.

As you read each chapter of this book, take with you an understanding of how topics fit together as the pieces of a puzzle whose objective is to create the best possible structure in which to run a business. The challenge of this puzzle, however, is that the pieces keep changing, and the shape of the puzzle does, too. These changes are what will make your career both challenging and rewarding. The more you know about working with interchangeable pieces, the better prepared you will be to succeed as a business professional.
Part I  Business Processes and Information Systems Foundations

REVIEW QUESTIONS

RQ1-1  What 10 elements are included in the study of IS?
RQ1-2  Are the terms system and subsystem synonymous? Explain your answer.
RQ1-3  A system must have organization, interrelationships, integration, and central objectives. Why must each of these four components be present in a system?
RQ1-4  What are three logical components of a business process? Define the functions of each. How do the components interact with one another?
RQ1-5  Why is the Information System important to the organization?
RQ1-6  What factors distinguish data from information?
RQ1-7  Refer to Figure 1.5 (page 14). Characterize the horizontal information flows and the vertical information flows.
RQ1-8  What are the qualities of information presented in this chapter? Explain each quality in your own words and give an example of each.
RQ1-9  What three roles can a business professional fill in relation to the IS? Describe them.

DISCUSSION QUESTIONS

DQ1-1  “I don’t want to learn about technology; I just want to be good at my job.” Comment.
DQ1-2  Examine Figure 1.1 (page 7). Based on your college education to date, with which elements are you most comfortable? With which are you least comfortable? Discuss your answers.
DQ1-3  Examine Figure 1.1. Based on any practical experience that you have had, with which elements are you most comfortable? With which are you least comfortable? Discuss your answers.
DQ1-4  Why might we have more trouble assessing the success of a federal government entitlement program than we would have judging the success of a business organization?
DQ1-5  Why must we have knowledge of a system’s objectives to study that system?
DQ1-6  Can one person be a member of all three business process components: information, management, and operations? Discuss your answer.
Where do you see your role(s) as a business professional—in the information, management, or operations processes? Discuss your answer.

Examine Figure 1.5 (page 14). Discuss the relative importance of horizontal information flows and vertical information flows to the business professional.

“When we computerize an IS, we merely change how the data are processed; we don’t change what tasks are performed.” Do you agree? Give examples to support your position.

Assume that a manager can obtain information from the organization’s computer in three ways: by direct inquiry using his laptop connected to the enterprise system, by a daily paper report, and by a monthly report. Using the qualities of information discussed in this chapter (understandability, relevance, timeliness, predictive value/feedback value, neutrality/freedom from bias, comparability, consistency, validity, accuracy and completeness), compare and contrast these three sources of information.

Give several examples not mentioned in the chapter of potential conflicts between pairs of information qualities.

What information quality is most important for decision making—relevance or reliability? Discuss your answer.

Which information qualities are most important to Amazon.com’s ability to fill advance orders for books? Explain your answer.