Introduction to Accounting Information System

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ABSTRACT

In this study, we introduce you to the subject of accounting information systems (AIS), describe the importance of AIS to your future success, and layout some important terms and concepts that we will use throughout the text. We begin by presenting a view of the practice of accounting. You will see that accountants today are shifting their focus from being business accountants and auditors to being information management and business measurement professionals providing value-added services to their organizations and clients. This view, rooted in changes in information technology and changes in a volatile business environment, reflects the practice of accounting for those on the leading edge of their profession. Next, we define and explain AIS and its relationship to the organization. Then, we describe the qualities that information must possess to drive the organization and enable the performance of key management functions. Finally, we summarize the role of the accountant in today's business environment.

Throughout the text, we will present three themes to connect our discussions to topics that are currently of great interest to accountants. These themes are *ente1prise systems* and *enterprise resource planning (ERP) systems-such* as those sold by SAP®, Orade®, Sage™, and Microsoft®; *e-business,* including retail e-businesses such as Amawn.com®, the online segments of traditional retailers, such as Walmartcom, and wholesale electronic market-places such as ECEurope.com and EC21.com; and *internal control-those* business practices that keep an organization out of trouble and heading toward achieving its objectives. We introduced these in the Preface and discuss them further later in this chapter.

Introduction

At the start of this chapter, we introduced the impact of technology and how it will affect your role as an accountant, but the impact extends well beyond accounting. The *Occupational Outlook Handbook* suggests that technology improves information available for decision making-this means that *all* decision makers within an organization benefit from accounting technology-this is not limited to accountants.

For example, sales managers can make better decisions because the sales and collections information from the computerized accounting system is timelier. The ability to automate controls means that the data should be more reliable, which is another benefit for the entire organization.

Accountants with technology skills are using computers to reduce the mundane part of their work, which allows them to be more efficient in their work. This efficiency means these accountants have time to do more interesting work and at the same time be more valuable to their employers. Now that you understand the importance of technology within accounting, let's begin exploring AlS.

This chapter provides you with some basics that are used throughout the text. Our introduction to AIS continues with some background material and definitions. We define and describe AIS, depict it as a major part of business processes and of any organization, and describe the critical functions that AIS perform in an organization. Some of the terms in this chapter may not be familiar to you. Don't let that worry you at this point. We will define and illustrate these terms later in the book.

The Textbook's Three Themes

Before digging into the material, you should understand the importance of the three themes in this book and how they will be included in the discussions throughout this text. The three themes--enterprise systems, e-business, and internal control-were introduced and defined in the Preface. *Enterprise systems* integrate the business process and information from all of an organization's functional areas, such as marketing and sales, cash receipts, purchasing, cash disbursements, human resources, production and logistics, and business reporting (including financial reporting). *Enterprise resource planning (ERP) systems* are software packages that can be used for the core systems necessary to support enterprise systems. It is critical that accountants understand these systems because they will be members of the teams that will install and operate systems in their organizations. To install an enterprise system, the business processes of an organization must be understood and documented. If necessary, the business processes must be changed and then mapped to the enterprise system. A major part of the installation project is configuring the enterprise system to tailor it to the business processes. As consultants, business process owners, system users, or auditors, we must understand these systems and be able to install, use, and audit them. Enterprise systems are described more fully in Chapter 2 and are discussed 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 (i.e., internal) processes, such as distribution, manufacturing, and accounting; and front-office (i.e., external) processes, such as those that connect an organization to its customers and suppliers. 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, which changes how organizations identify customers and select vendors. It should change how they determine the costs of acquiring goods from a vendor and what price(s) they should charge their customers for their products. Obviously, accountants need to be aware of the opportunities and risks associated with this new way of doing business. E-business is explained more fully in Chapter 3 and discussed throughout the remainder of the book.

Internal control is a process-effected by an entity's board of directors, management, and other personnel-designed to provide reasonable assurance regarding achieving objectives in the following categories: efficiency and effectiveness of operations,

Reliability of reporting, and compliance with applicable laws and regulations. For example, controls ensure that an organization's products (its inventory) are not stolen and that the organization does not have too much inventory (perhaps a waste of resources) or too little inventory (leading, perhaps, to a lost opportunity to sell the product). Although management is responsible for an organization's system of internal control, the accountant and other business process owners are given the responsibility to affect the system of control. Therefore, it is incumbent on all managers and accountants to know how to use controls to ensure achievement of the organization's goals. In Chapter 7, we introduce internal control and then apply it throughout the remainder of the book.

Beyond **Debits and Credits**

Have your accounting studies to date convinced you that the most serious problem you may face in your career is that your trial balance doesn't balance? If so, here are a couple of examples that might persuade you otherwise. It wasn't too long ago that the procedures used to process credit card sales were completely manual. A sales clerk would prepare the credit card slip using a pen to write the amount by hand, run it through a machine to imprint your name and account number, and-to reduce the possibility of' credit card fraud-look up your credit card number in a book that listed stolen credit cards. But, this book was printed only periodically and could never be up to date. Soon a procedure was developed whereby clerks would call the credit card companies for approval of a purchase. Although this took longer, the selling merchants were able to assure themselves that the credit card had not been reported stolen and that sufficient credit was available on the customer's account. Finally, the system evolved to what we have today: approvals are obtained automatically by connecting directly (i.e., online) to the credit card company. This method is used to ensure that the merchant and the credit card company get paid for the sale. As you will learn in Chapter 10, an accountant can't book a sale unless it is likely that they will get paid for the sale.

Many of you are familiar with a different control problem that exists today-the purchase of items using credit cards on the Internet. You can read the statistics about individuals who do not want to buy on the Internet because they fear that their private information, especially their credit card number, is not secure. Controls have been put in place to protect the consumer, merchant, and Credit Card Company (you'll read about them in Chapters 3, 8, and 9). Still, fraudulent transactions occur and millions of dollars are lost. Again, controls are used to protect the assets of the organization and ensure the effectiveness of operations. After all, if customers aren't confident in the security of a merchant's Web site they will go elsewhere with their purchases.

Another example comes from a large multinational company in the health care industry. The company acquired a new, large division after having just installed an ERP system in all of its worldwide operations. After installing the ERP system in the new division, the data related to the previous year's purchases and sales for the entire company, including the new division, were exported from the ERP system into a separate database (i.e., a data warehouse, as will be explained in Chapter 5). The cost accountants were then asked to analyze the costs and selling prices for a line of products and to suggest a new pricing structure that would make sense in light of the incorporation of the products from the new division. To accomplish this task, the cost accountants needed to know how the data was defined and stored in the ERP-systems, how it had been exported, and finally how to get it out of the data warehouse in a form that they could use. What seemed like a simple analysis, one that would be performed all the time by a staff accountant, became something quite different!

These examples demonstrate that knowledge of traditional accounting concepts is not enough to succeed in today's business environment; the underlying technology is a critical part of any accountant's job. These examples indicate challenges for you, while offering opportunities to those who learn in this Course to be effective information management and business measurement professionals.

Legal Issues Impacting Accountants

Inherent in the work of accountants, and therefore in the study of accounting and information systems, is the compliance with laws and regulations. One such law, the Sarbanes-Oxley Act of 2002 (SOX), has dramatically changed the daily work of financial accountants, auditors, and many others as well.

The Sarbanes-Oxley Act of 2002

At this point in your academic career, you have probably studied the Sarbanes-Oxley Act (SOX) and the impact on publicly traded companies.[2] Because of your prior knowledge, the discussion at this point is limited to Sections 404 and 409 and their applicability to the study of AlS.

Section 404 of SOX, and PCAOB Auditing Standard No. 5,3 has meant changes for both auditors and the companies that they audit. To comply with SOX, management must identify, document, and evaluate significant internal controls. Auditors must, as part of an integrated audit of the financial statements, report on the effectiveness of the organizations' system of internal control. These requirements represent significant expansions of the internal control-related roles of management and auditors. These responsibilities are increasing at the same time that computer-based systems are becoming more sophisticated, thus adding to the complexity of the systems of internal control. It is important that you understand the systems to comply with SOX.

Section 409 of SOX requires disclosure to the public on a "rapid and current basis" of material changes in an organization's financial condition. Compliance with this section requires the application of legal, financial, and technical expertise to ensure that the organization's AlS are able to produce financial data in a timely and accurate manner. Who else but the accountant, armed with the latest knowledge of accounting and information technology, can ensure compliance with these provisions of SOX?

Challenges and Opportunities for the Accountant. Are you preparing yourself to be effective in the future? Will you be able to adapt to advances in technology, and will you look ahead and prepare yourself to take advantage of technology improvements? Could you perform the analysis of the cost and price data described in the previous section? Could you help assess the risks and benefits related to an organization's e-business and develop the controls necessary to ensure a secure and reliable Web presence? Could you consult with management to help them comply with SOX Section 404 or audit management's internal control system? What do your technology abilities mean to you personally? Possibly, your abilities may mean more job opportunities and money. One recent article suggests some organizations are quadrupling their staffs of IT auditors. Additionally, salary increases are from 7 percent (for entry-level auditors) to as much as 30 percent when an experienced IT auditor changes jobs!4 We intend to help you

prepare to use the available technology and to participate in planning for and growing with the technology.

Management accountants and internal auditors find themselves buying, using, and evaluating complex computer-based information systems. Financial accountants must be sure that their AIS can produce financial statements to comply with SOX Section 409. The management accountant must be sure that a new information system has the necessary features, such as controls and the ability to access data and to trace data from input to output. Also, these information systems must be protected from fraud and other abuses. How effectively you use technology to perform these functions will determine how well you can do your job, which may determine the very survival of your company in a competitive, international marketplace.

Technology is also influencing public accounting firms. The business-consulting units of the Big Four public accounting firms have accounted for a significant percentage of the firms' business and were growing faster than the accounting, auditing, and tax portions of their businesses. The consulting units of three of these firms have been split off from the "accounting" portions of the firms (Ernst & Young Consulting was acquired by Capgemini™, KPMG Consulting became BearingPoint™, and the consulting division of PricewaterhouseCoopers was sold to IBM@). Still, the growth portion of the remaining "accounting" firms will remain in their value-added, business ~ advising lines. For example, a major line of business for these firms has been to assist their clients in complying with SOX Section 404.[5] You should not be surprised to find the need for strong technology skills continuing in these firms. The consulting firm also recruits personnel with accounting and technology skills. If you aspire to a career in public accounting, your success in the consulting segment of public practice will depend on your knowledge and experience in relatively technical areas that, at first glance, are far from the practice of accounting.

Independent auditors are faced with deciding on the "reasonableness" of financial statements produced from data contained in the information system. As an auditor, you will be asked to execute your audit tasks and to provide additional "value-added" service to the client. You will, for example, provide your client with advice on improving operations and reducing risks. Successful public accounting firms provide cost-effective audits along with broader, high-quality service to the client.

These conclusions were confirmed by the report of a project sponsored by the American Accounting Association, the American Institute of Certified Public Accountants, the Institute of Management Accountants, and the Big Five (there were five at the time) public accounting firms. Practitioners surveyed reported that accounting graduates would need to be able to provide services in the areas of financial analysis, financial planning, financial reporting, strategic consulting, and systems consulting.

Historically, the accountant has performed an attest function to determine the reliability of financial information presented in printed financial statements. This role is expanding to include the following:

- Nonfinancial information (e.g., accountants might help determine occupancy rates for hotels or apartment complexes)
- Use of information technology to create or summarize information from databases
- Information interpretation to determine the quality and relevance of information to be used for decision making (e.g., evaluating information for the assessment of risk)

The Assurance Services Executive Committee of the American Institute of Certified Public Accountants (AlCPA) identifies, develops, and promotes nonaudit assurance services that can be offered by accountants.[7] These services include the following:

- Risk assessment (CPA Risk Advisory Services)
- Business performance measurement (CPA Performance View)
- Information systems reliability (SysTrust, see Chapters 3 and 8)
- Electronic commerce (WebTrust, see Chapter 8)
- PrimePlus Services (Financial care of the elderly)

Development of these services has been a joint effort between the AlCPA and the Canadian Institute of Chartered Accountants (CICA). In addition to the development of these assurance services, the AlCPA has, in cooperation with CPAs across the United States and other professional organizations, proposed a vision of the profession's future called the CPA Vision Project.[8] Three of the five core services proposed in the project involve information technology. They include "assurance and information integrity," "management consulting and performance measurement," and "technology services." Among the core competencies that will be required of those performing these services are "interpretation of converging information" (able to interpret and provide a broader context using financial and nonfinancial information) and "technology adept" (able to use and leverage technology in ways that add value to clients, customers, and employers).

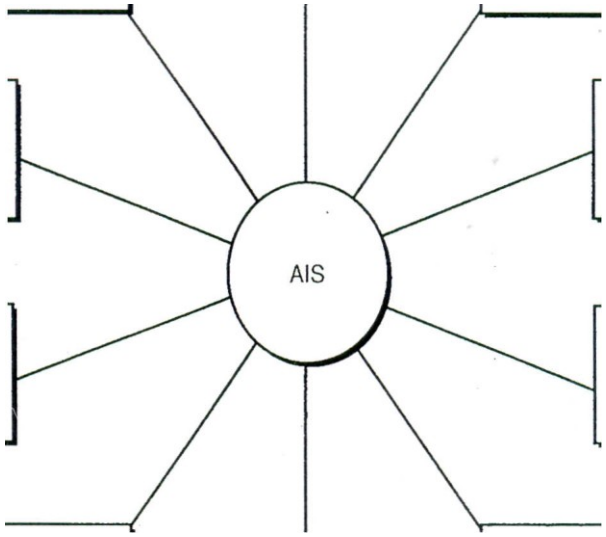
Finally, the AlCPA has created a credential, the certified information technology professional (CITP), to recognize CPAs who can provide skilled advice on using IT to implement business strategy.9 Skills necessary to obtain this accreditation include (chapter coverage in this text is shown in parentheses) the following:

- An understanding of project management (Chapter 17)
- Familiarity with IT and business processes (IT throughout the text, business processes in Chapters 10 through 16)
- Competence in technology (throughout the text)

Components of the Study of AIS

Figure 1.1 (pg. 8) depicts the elements central to our study of AlS. Many should be familiar to you, and many have been introduced earlier in this chapter. We will briefly discuss each element, with special emphasis on how the accountant is affected. Before beginning, you should understand two things. First, the study of AIS is our broad view, and the accounting information system itself is our narrow view. Second, you shouldn't assign any meaning to the placement of the elements in Figure 1.1. The figure just tells you that there are 10 elements.

- Technology. Your ability to plan and manage business operations depends partly on your knowledge of the technology available. For instance, can we manage production without knowledge of robotics? It goes without saying that technological developments have a profound effect on information systems; enterprise systems, ERP systems, e-business, databases, and intelligent systems are but a few examples. Technology provides the foundation on which AIS and business operations rest, and knowledge of technology is critically important to your complete understanding of



Communications

the AlS discipline. Exhibit 1.1 describes the 10 most important teclmological challenges and opportunities facing CPAs in 2008. These technologies were selected by a group of CPAs and other professionals recognized as technology leaders. The AlCPA's Information Technology Center sponsored this group and published the results. The exhibit indicates where these technologies are discussed in this text.

- Databases. Your other accounting courses have emphasized accounting as a reporting function. The full accounting cycle, however, includes data collection and storage, and these aspects must become part of your knowledge base. In addition, important to a complete understanding of AlS are the variety of databases, both private and public; the quantity and type of data available in these databases; and methods of retrieving those data. To perform analysis, to prepare information for management decision making, and to audit a firm's financial records, an accountant must be able to access and use data from public and private databases. Chapters 5 and 6 explore the design and use of an organization's own databases.
- Reporting. To design reports generated by an information system, the accountant must know what outputs are required or are desirable. Often, the user will prepare a report on an ad hoc basis using powerful report-generating tools or a database query language (discussed in Chapters 5 and 6). These reports often support management decisions as well as fulfill certain reporting obligations. GAAP-based financial statements are but one example of reporting that will be considered in our study of AlS.

1. Information Security Management. The development and implementation of a comprehensive security framework encompassing people, processes, and IT systems that safeguards critical systems and information, protecting them from internal and external threats. Information security rnanagement is accomplished by analyzing and evaluating risks; selecting appropriate risk treatment options (avoidance, acceptance, transference, and reduction); implementing controls (administrative, procedural, personnel, and technological); and then constantly monitoring overall performance. (Discussed throughout the text but especially in Chapters 7 through 16.)
2. **IT** Governance. IT governance is a structure of relationships and processes to direct and control the enterprise in order to achieve the enterprise's goals by adding value, while still balancing risk versus return over IT and its processes. (Discussed in Chapters 7 and 8.)
3. Business Continuity Management (BCM) and Disaster Recovery Planning (DRP). BCM is a comprehensive management process that identifies potential threats to an organization and the impact those threats may have on the business. DRP is the development and testing of a plan to restore an organizations' infrastructure after a disaster or major failure. Threats to an organization's resources may include theft, virus infestation, weather damage, accidents, or other malicious destruction. (Discussed in Chapter 8.)
4. Privacy Management. Privacy encompasses the rights and obligations of individuals and organizations with respect to the collection, use, disclosure, and retention of personal information. As more information and processes are being converted to a digital format, this information must be protected from unauthorized users and from unauthorized usage by those with access to the data. This includes complying with local, state, national, and international laws. (Discussed in Chapters 3 and 8.)
5. Business Process Improvement (BPI), Workflow and Process Exception Alerts. Methods used to enhance business and transaction processing through a continuous cycle of modeling, execution, monitoring, and improvement. BPI employs real-time monitoring tools that provide exception alerts to automate business processes on triggered events, identify problems or new opportunities in a transaction before a transaction is complete, or better control quality issues by catching problems more quickly, allowing improvements to the way an organization does business. (Discussed in Chapters 7 through 17.)
6. Identity and Access Management. The hardware, software, and processes to ensure users are who they say they are, and then provide users with appropriate access to systems and data based upon pre-established rights or interaction with automatic provisioning systems. Identity-Management may utilize one, two, or three factors of authentication , including passwords, tokens, dongles, key fobs, biometrics, and other emerging technologies. (Discussed in Chapters 8, 9, and 16.)
7. Conforming to Assurance and Compliance Standards. The creation of formalized strategies, systems, and training programs to address organizational goals and statutory requirements, including Statement on Auditing Standard Nos. 104-111. It includes the tools to assist in the documentation, assessment, testing, and reporting on compliance with specific controls or regulations. (Discussed in Chapter 7.)
8. Business Intelligence (BI). The applications and technologies used for gathering, providing access and visibility to, and analyzing data to help business owners and manager make informed business decisions improving the timeliness and quality of information. (Discussed in Chapter 5.)
9. Mobile and Remote Computing. Technologies that enable users to securely connect to key resources anywhere, anytime, regardless of physical location. Supporting technologies include server-based applications, VPNs, remote control software, laptops, PDAs, Smart Phones, VoIP and wireless technologies, such as 3G (EVDo/EDGE), WiFi, and WiMax. (Discussed in Chapters 3 and 8.)
10. Document, Forms, Content, and Knowledge Management. The process of capturing, indexing, storing, protecting, searching, retrieving, managing, and controlling information electronically. This also includes scanning, forms recognition, optical character recognition (OCR), centralized data repositories, and management of PDFs and other document formats. Knowledge management then brings structure and control to this information, allowing organizations to hamess the intellectual capital contained in the underlying data. (Discussed in Chapters 3 and 5.)

- Control. Traditionally, accountants have been experts on controlling business processes. As a practicing accountant, you will probably spend much of your time providing such expertise. Consider how much more difficult it will be to control modem, complex business processes. You must develop an understanding of control that is specific to the situation at hand, yet is adaptable for the future. Control-the means by which we make sure the intended actually happens-will be introduced in Chapter 7 and explored in detail in Chapters 8 and 9 and in the business process chapters, Chapters 10 through 16.

The next three elements-business operations, events processing, and management decision making-comprise a major focus of this text, *business processes.* The logical components of business processes are described later in this chapter. Knowledge of these processes is essential for success as an accountant, consultant, business process owner, or IT specialist.

- Business operations. Organizations engage in activities or operations, such as hiring employees, purchasing inventory, and collecting cash from customers. An AIS operates in concert with these business operations. Many AIS inputs are prepared by operating departments-the *action* or *work* centers of the organization-and many AIS outputs are used to manage these operations. Therefore, we must analyze and manage AIS in light of the work being performed by the organization. For example, to advise management and to prepare reports for management decision making, a management accountant must understand the organization's business. .
- 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 the business operations. The events have operational and AIS aspects (i.e., some do not have a direct accounting impact, and some are accountin'g "transactions" that result in entries in the general ledger). To design and use the AIS, an accountant must know what event data are processed 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, the information is more useful if it recognizes the personal management styles and preferences of the decision maker. For instance, 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. Beyond the information available to managers, many decision makers now use *intelligent systems* to help them make decisions. Later in this chapter, we introduce management decision making and then discuss management's use of the data collected by each business process (Chapters 10 through 16). In Chapter 5, we examine intelligent systems.
- Systems development and operation. The information systems that process business events and provide information for management decision making must be designed, implemented, and effectively operated. An accountant often participates in systems development projects as a user or business process owner contributing requests for certain functions or an auditor advancing controls for the new system. Choosing the data for a report, designing that report, and configuring an enterprise system are examples of systems development tasks that can be accomplished by an accountant. In Chapter 8, we describe the controls related to the systems development process, and, in Chapter 17, we examine systems development and-operation and the accountant's role in those processes.
- Communications. To present the results of their endeavors effectively, accountants 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. Unlike in other accounting courses, there are few right or wrong answers in the study of AlS. Throughout this course, you will be required to evaluate alternatives, to choose a solution, and to defend your choice. Technical knowledge won't be enough for the last task.

- Accounting and auditing principles. To design and operate the accounting system, an accountant must know the proper accounting procedures and must understand the audits to which the accounting information will be subjected. As an illustration, suppose you were designing an AlS for the billing function at XYZ, Inc. Would you invoice a customer 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? The answer is, it depends, and we must have knowledge of business operations and the related accounting process to properly synchronize the two.

What Is **an Accounting** Information System?

In this section, we suggest a definition for AIS (this is our *narrow view* of AlS) and discuss related terms to help you understand the subject matter of this textbook. Because these definitions establish a background for later study, you should read this section carefully. The section begins with a definition of a system and then we have discussion of it. The section concludes with an explanation of how the accountant interacts with the AlS and with the current business environment.

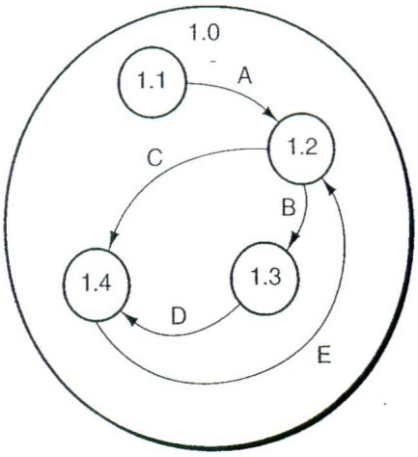
Systems and Subsystems

A system is a set of interdependent elements that together accomplish specific objectives. A system must have organization, interrelationships, integration, and central objectives. Figure 1.2(a) (pg. 12) depicts a system consisting of four *interrelated* parts that have come together, or *integrated,* as a single system, which we have named System 1.0. Each part of a system-in this case, parts 1.1, 1.2, 1.3, -is known as a subsystem. Within limits, any subsystem can be further divided into its component parts or subsystems. Figure 1.2(b) 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 current interest. For example, in a typical university, the College of Business and the College of Engineering are subsystems of the university system, whereas the School/Department of Accountancy and the Marketing Department are subsystems of the College of Business system.

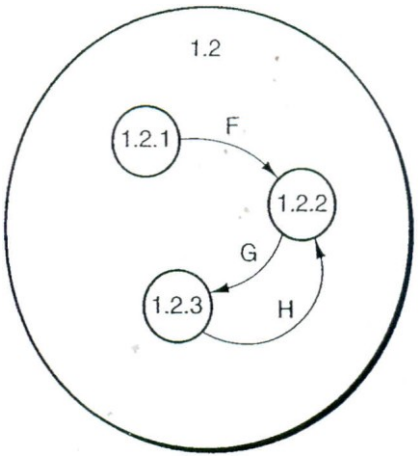
In Figure 1.2, parts (a) and (b) depict the *interrelationships* (A through H) in a system; part (c) depicts the hierarchical *organization* structure inherent in any system. Again, picture System 1.0 as a university and System 1.2 as the College of Business. Interrelationship F might be a finance student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

A system's *central objectives* depend on its type-natural, biological, or man-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.

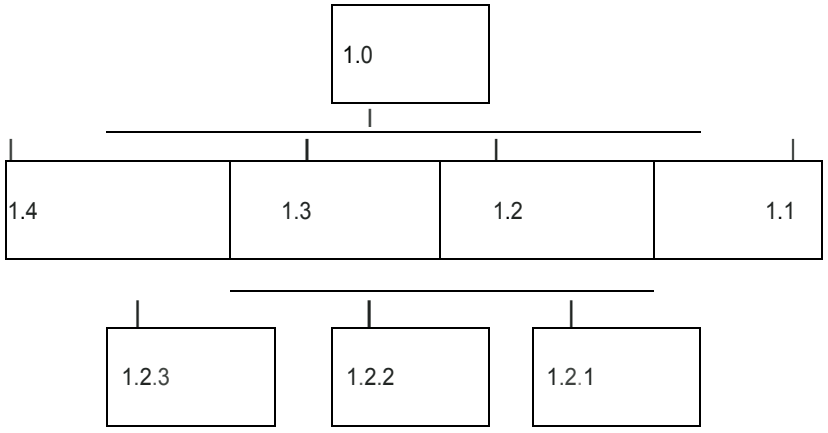
Determining the purpose of man-made systems-such as governments, schools, and business organizations-is a matter we must discuss and understand. Disagreement over the basic functions of the government of the United States has always led to spirited debate among political parties. For example, is the U.S. government the "employer of last resort" and therefore responsible for providing jobs for every citizen? Even when we agree on what the objectives should be, we may disagree on how they should be attained. For example, we might all agree that the objective of a municipal school system is to



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



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

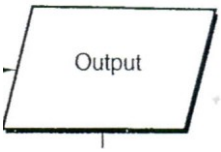


"educate the young citizens of the city." However, if you attend a meeting of a local school board, you probably won't discover consensus over how to meet that objective.

Business organizations usually have more straightforward purposes that are normally related to the "bottom line." However, many businesses 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 the bottom line: You 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 this study of AIS.

The Information System (IS)

An information system (IS) (or management information system [MIS]) is a manmade system that generally consists of an integrated set of computer-based components and manual components established to collect, store, and manage data and to provide output information to users. Figure 1.3 depicts the functional components of an IS. Imagine a simple IS used to maintain inventory balances for a shoe store. The inputs for



NOTE:
System outputs result in user actions. Some actions (Le., feedback) in turn become subsequent system inputs.

such a system might be receipts of new shoes or sales of shoes; the processing might be to update (in storage) the inventory records for the particular shoe; and the output might be a listing of all the kinds and sizes of shoes and their respective recorded balances. That is, a simple IS is directed at the processing of business events.

The IS facilitates these operational functions and supports management decision making by providing information that managers can use to plan and control the activities of the firm. The IS may have advanced elements, such as a database for storage, and can use decision models to present output information for decision making. For example, assume that, while entering data about shoe sales, you also enter data about who purchased the shoes, how they paid for the shoes, and why they decided to buy their shoes at your store. You might store those data and periodically print reports useful in making decisions about advertising effectiveness. Or you might decide, on the basis of analysis of the sales data, to engage in joint advertising campaigns with a credit card company whose cards are often used in the store.

The Accounting Information System (AIS)

The IS used in the shoe store might have components designed specifically for 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. However, integrated IS processing, such as that in an *enterprise system,* has allowed the distinctions among these separate systems to become blurred.[10]

So historically, an IS incorporated a separate accounting information system (AJS), which is a specialized subsystem of the IS. The purpose of these separate AIS was to collect, process, and report information related to the financial aspects of business events. For example, the input to your AIS might be a sale, such as the shoe sale in the earlier example. You process the sale by recording the sales data in the sales journal, classifying the data using a chart of accounts, and posting the data to the general ledger. Periodically, the AIS will output trial balances and financial statements. However, given the integrated nature of information systems today, seldom is an AIS distinguished separately from the IS.

This textbook studies the discipline of AIS and takes the view that the AIS often cannot be distinguished from the IS. This view is consistent with our assertion that contemporary accountants are information management and business measurement professionals. Our coverage of AIS is based on the 10 elements of Figure 1.1 (pg. 8). We cover these elements because, as an accountant, your skills must go beyond the processing of financial data. You must understand the technology and the operating goals of the organizational functions for which the financial data are processed. For example, supermarket checkout scanners simultaneously collect accounting and operational sales data. Therefore, you must understand sales and marketing goals and the technology used in operations if you are to effectively operate, analyze, or audit a supermarket's AIS. These skills become even more critical as organizations evolve toward highly integrated information systems, such as *enterprise systems.* In summary, a complete study of the AIS should consider all 10 elements of Figure 1.1.

Finally, just as an IS can be divided into its functional components, the AIS may be divided into components based on the operational functions supported. In the sales example, the sales data might originate in the billing/accounts receivable/cash receipts subsystem. We call these AIS components the AIS *business processes* or AlS *subsystems.* In this text, we subdivide the AIS into these processes to facilitate the discussions and your understanding of the elements of the AIS. These business processes are described in
Chapters 10 through 16.

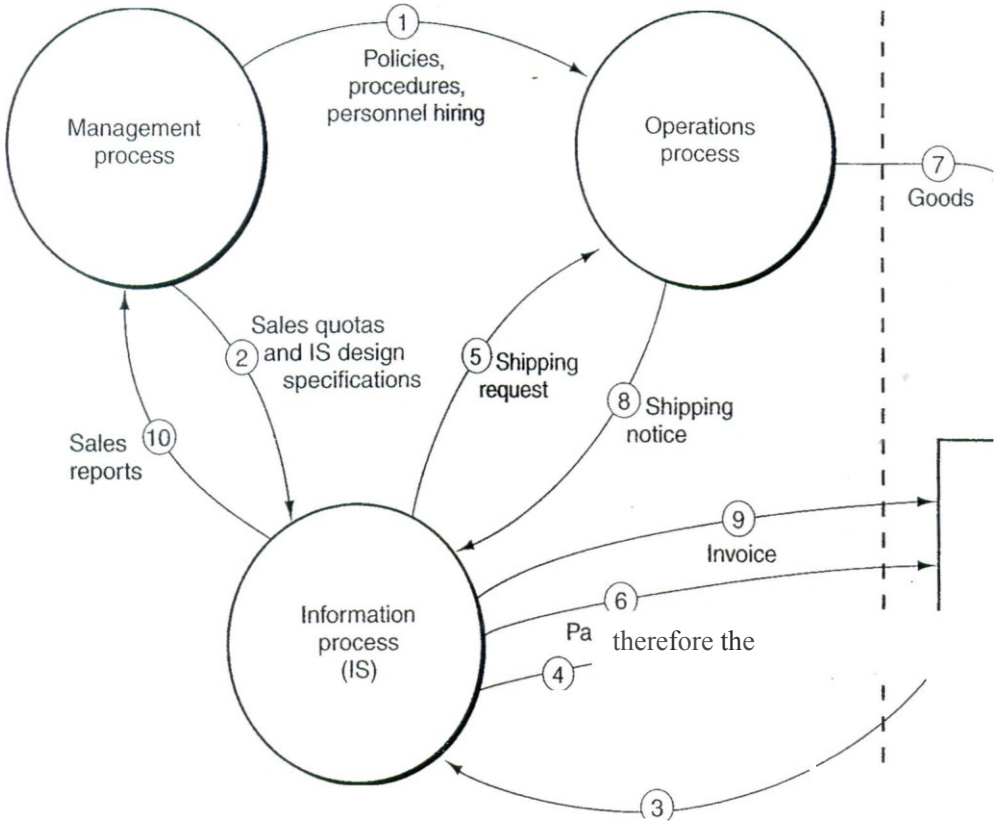
Logical Components of a Business Process

Figure 1.4 depicts the three logical components of a business process; the information process is that portion of the overall IS (introduced earlier and depicted in Figure 1.3 on pg. 13) related to a particular business process. In this section, we define the other two processes, describe how the three processes work together, and emphasize the critical role that the management information process plays.

The operations process is a man-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 production, personnel, marketing and sales, accounting, finance, warehousing, and distribution.

The management process is a man-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, which are discussed in the next section of this chapter.

If you follow the flows connecting the three processes of Figure 1.4, you can understand how these processes work together to accomplish the business process's-and



organization's-objectives. To focus the discussion, we chose a customer order/sales event to illustrate Figure 1.4. We will discuss each of the numbered flows in the figure.

- Flow 1. Management hires personnel and establishes the means for accomplishing the work of the organization. For example, management would design the procedures used to warehouse inventory and then to ship those goods to the customers.
- Flow 2. Management establishes broad marketing objectives and assigns specific sales quotas by which progress toward the long-run objectives can be measured. In addition, management designs the IS's procedures for facilitating operations, such as the procedures used to pick and ship goods to the customer.
- Flow 3. Normal operations begin with the IS receiving a customer's order to purchase goods.
- Flow 4. The IS acknowledges the customer's purchase order.

- Flow 5. The IS sends a request to the warehouse to ship goods to the customer. This request identifies the goods and their location in the warehouse.
- Flow 6. A document (i.e., a packing slip) identifying the customer and the goods is attached to the goods.
- Flow 7. The goods are shipped to the customer.[12]
- Flow 8. The shipping department reports to the IS that the goods have been shipped.
- Flow 9. The IS prepares an invoice and sends it to the customer.
- Flow 10. The IS sends management a report comparing actual sales to previously established sales quotas.

These 10 flows 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.
- Operations-related processes and accounting-related processes are integrated. For example, the shipping notice triggers the accounting process of updating the sales and accounts receivable data in conjunction with preparing the invoice, which is an operational activity.
- 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.

Our discussion of Figure 1.4 should make it clear that the IS can be crucial to an organization's success by facilitating the day-to-day operations processes and by providing useful information for the organization's management. Let's examine the attributes that make information useful to a decision maker and how management can make use of that information to drive the organization toward achieving its strategic objectives.

Management Uses of Information

An IS serves two important functions within an organization. First, the IS mirrors and monitors actions in the operations system 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.

The second major function of the IS is to support managerial activities, 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 inventories are being produced or acquired each day to meet expected demand. Managers' second use of information is to help measure and report results for their stakeholders (e.g., customers, stockholders). For example, information can measure

attainment of goals regarding product quality, timely deliveries, cash flow, and operating income. Finally, managers use the IS 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, we must understand these activities, including decision making, to understand the required design features of good information systems. In this section, we discuss, in general terms, management uses of information.

Data versus Information

Our definitions of *data* and *information* are a bit circular. 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. Figure 1.5 (pg. 18) illustrates the transformation process. Notice that part (a) repeats the functional model of an IS that we saw in Figure 1.3 (pg. 13), whereas part (b) uses the same symbols with different labels. Might you conclude, then, that the function of the information system is to capture and transform data into information? Absolutely.

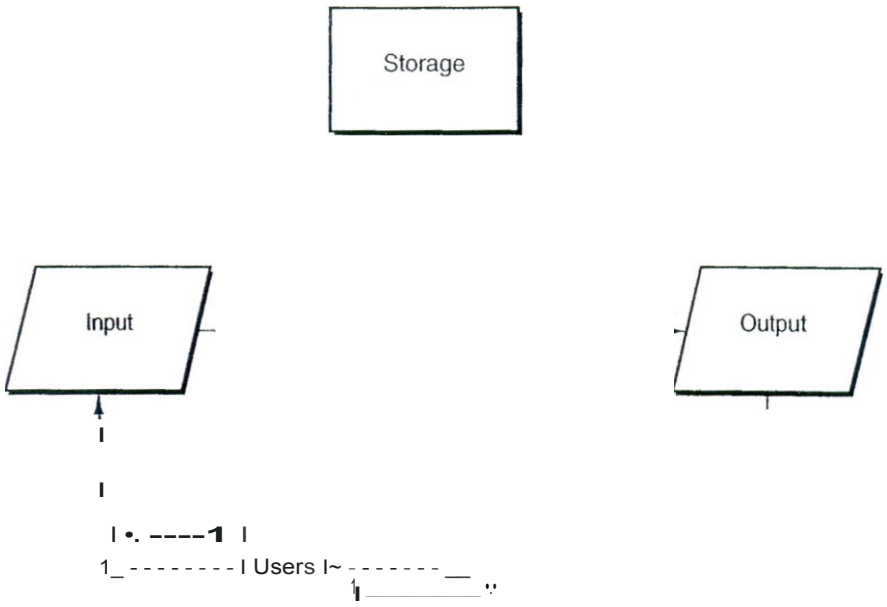
We said, however, that information must be useful in decision making. What attributes give information its utility value? Let's answer this question next.

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. In this section, we examine some of the elements of information quality that allow you to design and control the collection and processing of data. Exhibit 1.2 (pg. 19) describes qualities of information that, if attained, will help an organization achieve its business objectives. Figure 1.6 (pg. 20) presents an overview of information qualities depicted as a hierarchy. In the following paragraphs, we discuss and expand upon these various information qualities.

You can see from the exhibit that the *effectiveness* quality overlaps with other qualities because 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. Effective information is information that is useful for the decision to be made. 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 superior factors in Figure 1.6, such as "users of information" and "overall quality (decision usefulness)," provide additional emphasis for these points. The examples should make these points clear. 14

Understandability enables users to perceive the information's significance. Valued from the user's point of view, understandable information is presented in a form that



(a) Functional model of an information system

permits its application by the user in the decision-making situation at hand. 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 those used in physics or computer science. Also, information that makes excessive use of codes and acronyms may not be understandable to some decision makers.

Information has relevance when it is capable of making a difference in a decision making situation by reducing uncertainty or increasing knowledge for that particular decision. 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 1.2 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. If the decision must be made without the information, the credit history becomes irrelevant. Exhibit 1.2 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 because knowledge of the outcomes of actions already taken will generally improve a decision maker's abilities to predict the results of similar future actions. A buyer for a retail store might use a sales forecast-a prediction-to establish inventory levels. The buyer continues to use these sales forecasts and reviews past inventory shortages and overages-feed back-to 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. In accounting, we initially record assets at their historical cost because evidence of the assets' cost will permit independent people to arrive at a similar estimate of the book value of the asset.

Neutrality or freedom from bias means that the information is objective. Bias is the tendency of information to fall more often on one side than on the other of the object or event that it represents. For example, an accounts receivable balance that is usually higher than what can be collected is biased. Notice that verifiability addresses the reliability of the measurement method (e.g., historical cost, market value), and neutrality addresses the reliability of the person doing-the measuring.

Comparability is the information quality that enables users to identify similarities and differences in two pieces of information. If you can compare information about two

similar objects or events, the information is comparable. For example, in either your financial or managerial accounting course, you probably studied ratio analysis of financial statements. You also learned that one of the "yardsticks" against which you might evaluate the ratios of company A would be similar ratios for competitor company B or for the industry as a whole. But how good is your comparison of two companies if one uses FIFO (first in, first our) inventory costing and the other uses LIFO (last in, first out) costing? Generally accepted accounting principles strive to make accounting information as comparable as possible across firms by establishing common practices for accounting for inventory, fixed assets, leases, and so on.

If, on the other hand, you can compare information about the same object or event collected at two points in time, the information is consistent. Again, in doing ratio analysis, you probably performed horizontal or trend analysis for two or more years for one company.

As noted in Exhibit 1.2 (pg. 19), *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 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, you would have inaccurate information if the quantity on hand in an inventory report was reported as 51 units, when the actual physical quantity on hand was 15 units (note the transposition). Inaccurate information also would result if, for instance, 15 units were actually on hand, yet the inventory report indicated only 10 units.

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 example, in Chapter 7, you will learn that an accountant must ensure that an accounting system captures and records all *valid* accounting event data; otherwise, the accounting database is not complete. For instance, suppose the shipping department prepared 50 shipping notices for 50 actual shipments made for the day. Two of the notices were accidentally blown to the floor and were discarded with the trash. As a result, the billing department prepared customer invoices for only 48 shipments, not 50.

In summary, the *effectiveness* of information can be measured in many ways. Those previously discussed and included in Exhibit 1.2 and Figure 1.6 include *understandability, relevance* (or *reliability), timeliness* (or *availability), predictive value, feedback value, verifiability, neutrality* (or *freedom from bias), comparability, consistency,* and *integrity* (or *validity, accuracy,* and *completeness).* You will see these qualities again, in addition to those not discussed here *(efficiency, confidentiality,* and *compliance),* in subsequent chapters.

Documenting Information Qualities

One of the challenges when working with an IS is ensuring that desired information qualities exist within that system. Processes and controls are required to make sure the information qualities are present; ideally, those processes and controls are embedded in the system to keep you from having to constantly manually verify the information;. The technique used to document which processes are associated with which information quality is a matrix. Generally, a matrix is a tool designed to help you analyze a situation and relate processes to desired results. Figure 1.7 (pg. 22) shows how you can use a matrix to match processes with qualities of information to provide

Information qualities				
Accuracy	Completeness	Validity	Effectiveness (timeliness)	Processes (with controls)
		.I	.I	Process 1
.I	.I			Process 2
		.I		Process 3
.I			.I	Process n

reasonable assurance that, if the processes are effective, your goals for the information qualities will be achieved.

Conflicts among the Information Qualities

Simultaneously achieving a *maximum* level for all the qualities of information is virtually impossible. In fact, for some of the qualities, an increased level of one requires a reduced~ level of another. In 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 posted.

Let's look at another example. To obtain *accurate* information, you may carefully and methodically prepare the information, thus sacrificing the *timeliness* of the information. For example, 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 the supervisor also has checked the invoice for accuracy. These procedures certainly delay the mailing of the invoice.

Management Decision Making

We have asserted that the purpose of an IS is to facilitate an organization's business processes and to support management *decision making* by providing information that managers can use to plan and control the activities of the firm. Let's pursue the meaning and importance of decision making. Very simply, decision making is the process of making choices, which is the central activity of all management. Managers make decisions or choices that include what products to sell, in which markets to sell those products, what organizational structure to use, and how to direct and motivate employees. Herbert A. Simon, a Nobel-prize-winning economist, described decision making as a three-step process:

1. Intelligence. Searching the environment for conditions calling for a decision.
2. Design. Inventing, developing, and analyzing possible courses of action.
3. Choice. Selecting a course of action. IS

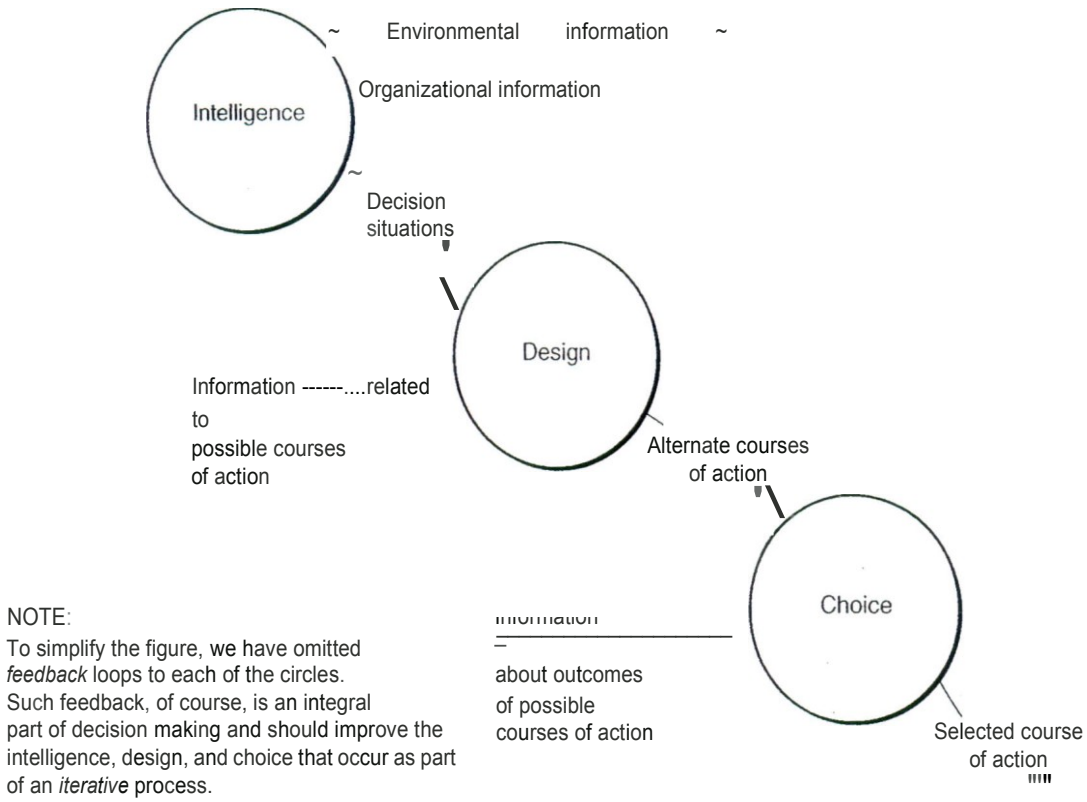
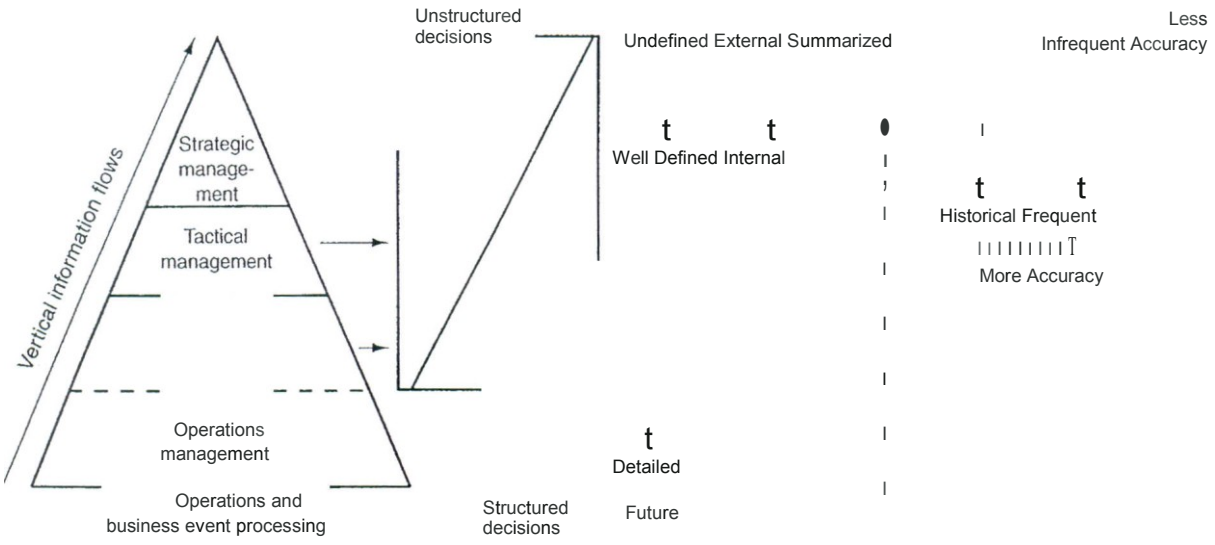


Figure 1.8 depicts these three steps. Analyze the figure to see what information is required for each step. Information from and about the environment and the organization is needed to recognize situations or problems requiring decisions. For example, information about economic trends, marketing intelligence, and likely competitor actions should help management recognize opportunities for new markets and products .

Information about inefficient or overworked processes in the organization should focus management's attention on problems in the organization. Managers use information from inside and outside the organization to design courses of action. For example, information about personnel resources, production capacity, and available distribution channels should help management develop alternative methods for producing and distributing a new product. Finally, a manager requires information about the possible outcomes from alternative courses of action. For example, to choose among alternative production options, a manager needs information about the costs and benefits of the alternatives or about the probability of success of each option.

The pyramid on the left side of Figure 1.9 (pg. 24) represents data flows related to the processing of business events. It emphasizes that operations and information flows are both horizontal and vertical and that there are several levels of management. 16 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 of Figure 1.4 (pg. 15), the operational documents and records are the outputs of these horizontal flows.



For example, horizontal flows relate to specific business events, such as one shipment, or to individual inventory items. This information is narrow in scope, detailed: accurate, and comes largely from within the organization. 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.

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 operations management level, supervisors use this type of information to monitor 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.

Tactical management requires information that focuses on relevant operational units and is more summarized, broader in scope, and need not be as accurate as the information used by operations management. Some external information may be required. For example, a warehousing and distribution manager might want information about the timeliness of shipments each month.

Finally, strategic management requires information to assess the environment and to project future events and conditions. Information is even more summarized, broader in scope, and comes from outside the organization more than does the information used by tactical management. To be useful to division managers, chief financial officers (CFOs), and chief executive officers (CEOs), 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. We should note, however, that current computer technology facilitates access to detailed data at all management levels.

The decision's structure, or lack thereof, also heavily influences the kind of information required to make a decision. *Structure* is the degree of repetition and routine in the decision. Structure implies that you have seen this very decision before and have

developed procedures for making the decision. You can use the degree of structure inherent in each decision-making step to categorize the decisions as structured or unstructured. Structured decisions are those for which all three decision phases (intelligence, design, and choice) are relatively routine or repetitive. In fact, some decisions are so routine that a computer can be programmed to make them. For example, many organizations have automated the decision of when and how much credit to grant a customer when an order is received. At the time the customer's order is entered, the computer compares the amount of the order to the customer's credit limit, credit history, and outstanding balances. Using this information, the computer may grant credit, deny credit, or suggest a review by the credit department. These procedures are described in more detail in Chapter 10.

Consider, on the other hand, a manager's decision-making process when choosing what research and development projects to undertake in the next year. This is only one example of an unstructured decision, one for which none of the decision phases (intelligence, design, or choice) are routine or repetitive.

Look again at Figure 1.9 and see that it summarizes several concepts introduced in this section and also helps explain the nature of the characteristics associated with information used by the three levels of management for decision making. Further, this figure indicates the proportion of structured and unstructured decisions handled by the three management levels.

Information Qualities and Decision-Making Level

The level of the decision maker and the type of decision to be made determine the preeminence of certain information qualities. For example, strategic management may require information that is high in predictive value. Information used for strategic planning should help managers "see" the future and thereby assist them in formulating long-term plans. The strategic manager may not be as concerned with timeliness or accuracy and would therefore prefer a quarterly sales report to a daily report. Operations management must make frequent decisions, with shorter lead times, and may therefore require a daily sales report to be able to react in a timely manner to changes in sales patterns. Operations management may require timely and accurate information and may not be concerned about the predictive value of the information.

Conclusions about Management Decision Making

From Figures 1.8 and 1.9 (pp. 23-24) and their related discussions, you can see that information needed for decision making can differ in degree of aggregation and detail, in source, and in fundamental character. You have also seen that the required qualities of information differ by decision type and level of management.

Within the organization, managers can secure inputs to their decisions directly from the environment or from direct observation of business processes. Managers can also receive information indirectly through the IS, which retrieves and presents operational and environmental information. As you understand more about the decisions to be made and can better anticipate the data needed to make those decisions, the IS can be designed to provide more of the required information. For example, in ever-increasing numbers, organizations' ISs are obtaining information about economic trends and indicators that is available in public databases. Because data requirements for structured decisions are well defined, we strive to improve our understanding of decisions so that we can make more structured decisions, anticipate the data needed for those decisions, and regularly provide those data through the IS.

As internal and external auditors, accountants *audit* the AlS or provide the assurance *seroices* mentioned earlier in this chapter. Auditors are interested in the reliability of the accounting data and of the reports produced by the system. They may test the system's controls, assess the system's efficiency and effectiveness, and participate in the system design process. To be effective, the auditor must possess knowledge of systems development techniques, of controls, of the technology used in the IS, and of the design and operation of the AlS.

Conclusion

Over the years, the International Federation of Accountants has published many documents emphasizing the importance of technology in accounting. In October 2007, they published the International Education Practice Statement (IEPS) 2, *Information Technology for Professional Accountants,17* "to assist IFAC member bodies in the implementation of generally accepted good practice in the education and development of professional accountants" (pg. 4). IEPS 2 describes in detail the technology competencies required by audit professionals, systems designers, systems evaluators, and managers of information systems. If there is still doubt on your part of the importance of the topic, in response to an earlier IF AC document (Education Guideline 11), in 1996, the largest member body of IFAC, the American Institute of Certified Public Accountants (AlCPA), published the report, *Information Technology Competencies in the Accounting Profession: AICPA Implementation Strategies for IFAC International Education Guideline No. 11,18* to encourage implementation of the guideline in the United States. Although now nearly 15 years old, the words of this document still ring true. Several passages in the AICPA report serve to emphasize the importance of the AIS course in your studies, as well as validate the approach that we take in presenting the AIS material to you.

Regarding the importance of information technology to an accounting career, the AICPA concludes, " ... professional accounting has merged and developed with IT to such an extent that one can hardly conceive of accounting independent from IT" (pg. 5). The AlCPA goes on to describe three important challenges currently facing the accounting profession. Information technologies are (1) affecting the way in which organizations operate, (2) changing the nature and economies of accounting activity, and (3) changing the competitive environment in which accountants operate (pg.6).

In discussing the teaching of technology concepts, the AICPA report reads" ... it is important to emphasize the need for strategic, conceptual understanding of information technology as a resource to enable achievement of business objectives. A *strategic, conceptual understanding* of information technology focuses on the functions of each information component, the objectives of technology achievements for each information technology component, the potential business impact of new technology ... understanding the concepts behind the technology helps students to learn to use, evaluate, and control technology more effectively encourages students and professionals to concentrate on applying and using technology to achieve business purposes.

When you have completed your journey through AIS, we hope that you will confirm that we have followed that philosophy in this text. Further, we firmly believe that years from now, you will conclude that the knowledge and skills developed in the AIS course were central to your career success.

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