The background of the cover is a complex network diagram. It consists of numerous nodes of various sizes and colors (blue, orange, purple, red, grey) connected by a dense web of thin grey lines. Some nodes are highlighted with larger, semi-transparent circles in the same colors. The overall effect is that of a digital or data network.

ACCOUNTING INFORMATION SYSTEMS

Tenth Edition

JAMES A. HALL

Accounting Information Systems

TENTH EDITION

JAMES A. HALL

*Peter E. Bennett Chair in
Business and Economics
Lehigh University*



Australia • Brazil • Mexico • Singapore • United Kingdom • United States

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Tenth Edition**

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DEDICATION

To my wife Eileen, and my children Elizabeth and Katie

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PREFACE

Welcome to the Tenth Edition

The tenth edition of *Accounting Information Systems* includes a range of new and revised homework assignments and up-to-date content changes, as well as several reorganized chapters. All of these changes add up to more student and instructor enhancements than ever before. As this preface makes clear, we have made these changes to keep students and instructors as current as possible on issues such as business processes, systems development methods, IT governance and strategy, security, internal controls, and relevant aspects of Sarbanes-Oxley legislation.

Focus and Flexibility in Designing Your AIS Course

Among accounting courses, accounting information systems (AIS) courses tend to be the least standardized. Often, the objectives, background, and orientation of the instructor, rather than adherence to a standard body of knowledge, determine the direction the AIS course takes. Therefore, we have designed this text for maximum flexibility:

- This textbook covers a **full range of AIS topics** to provide instructors with flexibility in setting the direction and intensity of their courses.
- At the same time, for those who desire a **structured model**, the first nine chapters of the text, along with the chapters on electronic commerce and general IT controls, provide what has proven to be a **successful template for developing an AIS course**.
- Previous editions of this book have been used successfully in **introductory-, advanced-, and graduate-level AIS courses**.
- The **topics in this book are presented from the perspective of the managers' and accountants' AIS-related responsibilities under the Sarbanes-Oxley Act**.
- Although this book was written primarily to meet the needs of accounting majors about to enter the modern business world, we have also developed it to be an **effective text for general business, industrial engineering, and computer science students who seek a thorough understanding of AIS and internal control issues as part of their professional education**.

Key Features

CONCEPTUAL FRAMEWORK

This book employs a conceptual framework to emphasize the professional and legal responsibility of accountants, auditors, and management for the design, operation, and control of AIS applications. This responsibility pertains to business events that are narrowly defined as financial transactions. Systems that process nonfinancial

transactions are not subject to the standards of internal control under Sarbanes-Oxley legislation. Supporting the information needs of all users in a modern organization, however, requires systems that integrate both accounting and nonaccounting functions. While providing the organization with unquestioned benefit, a potential consequence of such integration is a loss of control due to the blurring of the lines that traditionally separate AIS from non-AIS functions. **The conceptual framework presented in this book distinguishes AIS applications that are legally subject to specific internal control standards.**

EVOLUTIONARY APPROACH

Over the years, accounting information systems have been represented by a number of different approaches or models. Each new model evolved because of the shortcomings and limitations of its predecessor. An interesting feature in this evolution is that older models are not immediately replaced by the newest technique. Thus, at any point in time, various generations of legacy systems exist across different organizations and often coexist within a single enterprise. Modern accountants need to be familiar with the operational characteristics of all AIS approaches that they are likely to encounter. **Therefore, this book presents the salient aspects of legacy and state-of-the-art systems.**

EMPHASIS ON INTERNAL CONTROLS

The book presents a conceptual model for designing and assessing internal controls based on the Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework. We use the COSO model to explore control issues related to both the manual and the IT aspects of AIS. In addition to the classic controls designed to influence human behavior, such as segregation of duties, independent verification, and supervision, special emphasis is placed on controls that address the following IT risks and concerns:

- Computer application integrity
- Operating systems security
- Database management systems security
- Electronic data interchange (EDI)
- Electronic commerce and network security
- Enterprise resource planning (ERP) systems
- Systems development and program change procedures
- Organization of the corporate IT function
- IT outsourcing and cloud computing
- Data center security

EXPOSURE TO SYSTEMS DESIGN AND DOCUMENTATION TOOLS

IT professionals employ a number of documentation tools to communicate the key features of information systems. Among these tools are data flow diagrams (DFDs), systems flowcharts, entity relationship diagrams (ERDs), and program logic flowcharts. Modern accountants, whether in the conduct of an audit or the provision of advisory services, work closely with IT professionals and must master the use of IT documentation tools and techniques. This book contains numerous systems design

and documentation cases and assignments intended to develop students' competency in this area.

Significant Changes in the Tenth Edition

End-of-Chapter Material

The end-of-chapter material in the tenth edition has undergone significant revision. Most of the multiple-choice questions and problems, and all of the cases, have been revised or replaced. This important body of material is tailored to the chapters' contents, and the solutions provided in the solutions manual accurately reflect the problem requirements. In particular, great attention was given to internal control case solutions to ensure consistency in appearance and an accurate reflection of the cases in the text. All case solution flowcharts are numerically coded and cross-referenced to text that explains the internal control issues. This approach, which has been classroom tested, facilitates effective presentation of internal control case materials.

Chapter 8, “Financial Reporting and Management Reporting Systems”

A section on data analytics has been added to this chapter. Data analytics represents a significant departure from traditional structured reporting that constitutes the bulk of the chapter. The material in this section addresses management reporting techniques that produce information derived from large volumes of data, in unstructured formats, and from multiple sources that is needed on short notice. This section presents two data analytics approaches: small data analytics and big data analytics.

Chapter 13, “Systems Development and Program Change Activities”

This chapter has been revised to consolidate the ninth edition's Chapter 13 “Managing the Systems Development Life Cycle” and Chapter 14 “Construct, Deliver, and Maintain Systems Project” for an instructor-friendly experience.

MindTap

In the digital platform for this edition, students can easily access an interactive eBook, complete homework and study for tests. The MindTap platform encourages students to move beyond memorization and into mastery of the material.

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These helpful videos, embedded in the MindTap platform, walk students through the creation and flow of various charts to increase student comprehension and to provide students with another method of learning.

Organization and Content

PART I: OVERVIEW OF ACCOUNTING INFORMATION SYSTEMS

Chapter 1, “The Information System: An Accountant’s Perspective”

Chapter 1 places the subject of accounting information systems in perspective for accountants. It is divided into three major sections, each dealing with a different aspect of information systems.

- The first section explores the information environment of the firm. It identifies the types of information used in business, describes the flows of information through an organization, and presents a framework for viewing AIS in relation to other information systems components. The section concludes with a review of the key elements of the general model for AIS.
- The second section deals with the impact of organization structure on AIS. It presents the business organization as a system of interrelated functions. Extensive attention is given to the IT and accounting segments, which play collaborative roles as the purveyors of financial information for the rest of the organization.
- The third section discusses the role of accountants as designers and auditors of AIS. The nature of the responsibilities shared by accountants and computer professionals for developing AIS applications is examined.

Chapter 2, “Introduction to Transaction Processing”

Chapter 2 divides the treatment of transaction processing systems into six major sections.

- The first section provides an overview of transaction processing, showing its vital role as an information provider for financial reporting, internal management reporting, and the support of day-to-day operations. Three transaction cycles account for most of a firm’s economic activity: the revenue cycle, the expenditure cycle, and the conversion cycle.
- The second section describes the relationship among accounting records, both hard copy and digital, in forming an audit trail.
- The third section describes the key features of flat file and database structures used to store accounting data.
- The fourth section presents an overview of documentation techniques used to describe the key features of systems. This section presents several documentation techniques for representing manual procedures and computer operations. These include data flow diagrams, entity relationship diagrams, system flowcharts, program flowcharts, and record layout diagrams.
- The fifth section addresses alternative transaction processing approaches. It reviews the fundamental features of batch and real-time technologies, and their implication for transaction processing.
- The sixth section examines data coding schemes, their role in transaction processing and AIS as a means of coordinating and managing a firm’s transactions, and the advantages and disadvantages of the major types of numeric and alphabetic coding schemes.

Chapter 3, “Ethics, Fraud, and Internal Control”

Chapter 3 deals with the related topics of ethics, fraud, and internal control.

- The first section examines ethical issues related to business and specifically to computer systems. The questions raised are intended to stimulate class discussions.
- The second section deals with the subject of fraud and its implications for accountants. Although the term *fraud* is very familiar in today’s financial press, it is not always clear what constitutes fraud. This section distinguishes between management fraud and employee fraud. This section presents techniques for identifying unethical and dishonest management and for assessing the risk of management fraud. Employee fraud can be prevented and detected by a system of internal controls. The section discusses the results of a research study conducted by the Association of Certified Fraud Examiners.
- The final section describes the internal control structure and control activities specified in the COSO framework. The controls presented in this chapter, both physical and IT controls, are applied to specific applications in chapters that follow.

PART II: TRANSACTION CYCLES AND BUSINESS PROCESSES

Chapter 4, “The Revenue Cycle”; Chapter 5, “The Expenditure Cycle Part I: Purchases and Cash Disbursements Procedures”; and Chapter 6, “The Expenditure Cycle Part II: Payroll Processing and Fixed Asset Procedures”

The approach taken in these three chapters is similar. First, the respective cycle is reviewed conceptually using data flow diagrams to present key features and control

points of each major subsystem. We then examine physical systems with two objectives in mind: (1) illustrate how system functionality changes under different levels of technology and (2) demonstrate how the internal control focus shifts as the mix between technology and manual procedures changes. To accomplish this, we review examples of systems at different points on the technology continuum. The first examples are basic technology systems that use independent PCs, which function primarily as record keeping devices. We then move on to examples of advanced technologies that integrate key business functions.

Under each technology, the risks from errors and fraud are examined and the controls to mitigate risks are discussed. This approach provides the student with a solid understanding of the business tasks in each cycle and an awareness of how different technologies influence changes in the operation and control of the systems.

Chapter 7, “The Conversion Cycle”

Manufacturing systems represent a dynamic aspect of AIS. Chapter 7 discusses the technologies and techniques used in support of two alternative manufacturing environments: traditional mass production (batch) processing and lean manufacturing. These environments are driven by information technologies, such as materials requirements planning (MRP), manufacturing resources planning (MRP II), and enterprise resource planning (ERP). The chapter addresses the shortcomings of the traditional cost accounting model as it compares to two alternative models: activity-based costing (ABC) and value stream accounting.

Chapter 8, “Financial Reporting and Management Reporting Systems”

Chapter 8 examines an organization’s nondiscretionary and discretionary reporting systems.

- First, it focuses on the general ledger system (GLS) and on the files that constitute a GLS database.
- Next, it examines how financial statement information is provided to both external and internal users through a multistep reporting process. The emerging technology of Extensible Business Reporting Language (XBRL) is changing traditional financial reporting for many organizations. The key features of XBRL and the internal control implications of this technology are considered.
- The chapter then looks at discretionary reporting systems that constitute the management reporting system (MRS). Discretionary reporting is not subject to the professional guidelines and legal statutes that govern nondiscretionary financial reporting. Rather, it is driven by several factors, including management principles; management function, level, and decision type; problem structure; responsibility accounting; and behavioral considerations. The impact of each factor on the design of the management reporting system is investigated.

PART III: ADVANCED TECHNOLOGIES IN ACCOUNTING INFORMATION

Chapter 9, “Database Management Systems”

Chapter 9 addresses the design and management of an organization’s data resources.

- The first section demonstrates how problems associated with traditional flat-file systems are resolved under the database approach.

- The second section describes in detail the functions and relationships among four primary elements of the database environment: the users, the database management system (DBMS), the database administrator (DBA), and the physical database.
- The third section is devoted to an in-depth explanation of the characteristics of the relational database model.
- The fourth section examines database design topics including data modeling, deriving relational tables from ER diagrams, the creation of user views, and data normalization techniques.
- The chapter concludes with a discussion of distributed database issues. It examines three possible database configurations in a distributed environment: centralized, partitioned, and replicated databases.

Chapter 10, “The REA Approach to Database Modeling”

Chapter 10 presents the resources, events, and agents (REA) model as a means of specifying and designing accounting information systems that serve the needs of all users within an organization. The chapter is composed of three major sections.

- The chapter begins by defining the key elements of REA. The basic model employs a unique form of ER diagram called an REA diagram. The diagram consists of three entity types (resources, events, and agents) and a set of associations linking them.
- Next, the rules for developing an REA diagram are explained and illustrated in detail. An important aspect of the model is the concept of economic duality, which specifies that each economic event must be mirrored by an associated economic event in the opposite direction. The section illustrates the development of an REA database for a hypothetical firm, following a multistep process called view modeling. The result of this process is an REA diagram for a single organizational function.
- The chapter’s third section explains how multiple REA diagrams (revenue cycle, purchases, cash disbursements, and payroll) are integrated into a global or enterprise-wide model. The enterprise model is then implemented into a relational database structure, and user views are constructed. The section concludes with a discussion of how REA modeling can improve competitive advantage by allowing management to focus on the value-added activities of their operations.

Chapter 11, “Enterprise Resource Planning Systems”

Chapter 11 presents a number of issues related to the implementation of enterprise resource planning (ERP) systems. It is composed of five major sections.

- The first section outlines the key features of a generic ERP system by comparing the function and data storage techniques of a traditional flat-file or database system to that of an ERP.
- The second section describes various ERP configurations related to servers, databases, and bolt-on software.
- Data warehousing is the topic of the third section. A data warehouse is a relational or multidimensional database that supports online analytical processing (OLAP). Issues discussed include data modeling, data extraction from operational

databases, data cleansing, data transformation, and loading data into the warehouse.

- The fourth section examines risks associated with ERP implementation. These include “big bang” issues, opposition to change within the organization, choosing the wrong ERP model, choosing the wrong consultant, cost overrun issues, and disruptions to operations.
- The fifth section reviews several control and auditing issues related to ERPs. The discussion follows the COSO framework.

Chapter 12, “Electronic Commerce Systems”

Driven by the Internet revolution, electronic commerce is dramatically expanding and undergoing radical changes. Although electronic commerce has brought enormous opportunities for consumers and businesses, its effective control present challenges to organization management teams and accountants. To properly evaluate the potential exposures and risks in this environment, the modern accountant must be familiar with the technologies and techniques that underlie electronic commerce. Chapter 12 and its associated appendix deal with several aspects of electronic commerce.

- The body of the chapter examines Internet commerce including business-to-consumer and business-to-business relationships. It presents the risks associated with electronic commerce, including hardware failures, software errors, unauthorized access from remote locations, and denial of service attacks that can prevent an organization from conducting business.
- The chapter also reviews security and assurance techniques to reduce risk and promote trust.
- The chapter concludes with a discussion of how Internet commerce impacts the accounting and auditing profession.
- The internal usage of networks to support distributed data processing and traditional business-to-business transactions conducted via EDI systems are presented in the appendix.

PART IV: SYSTEMS DEVELOPMENT ACTIVITIES

Chapter 13, “Systems Development and Program Change Activities”

Chapter 13 examines the accountant’s role in the systems development process.

- The chapter examines the systems development life cycle (SDLC) by which organizations design, acquire, and implement their information systems. The chapter begins by describing the roles of the participants involved in systems development, including systems professionals, users, and stakeholders. It then outlines the key tasks associated with the SDLC, which consists of two primary sets of activities: new systems development and program change procedures (maintenance). The former includes systems planning, systems analysis, conceptual design, system selection, detailed design, system programming and testing, and system implementation. This multistage process guides organization management through the development and/or purchase of information systems.
- The chapter also addresses the important activities associated with systems maintenance and the associated risks that are of concern to managers, accountants,

and auditors. Upon implementation, new systems enter the systems maintenance phase of the SDLC, where they undergo various degrees of modifications to keep them current until they are eventually replaced. The systems maintenance process ensures that only legitimate changes are made to applications and that those changes are also tested before being implemented.

- The chapter concludes by reviewing the role of accountants in managing the SDLC. Most system failures are due to poor designs and improper implementation. As a major stakeholder in all financial systems, accountants offer expertise at various points in SDLC to guide and shape the finished system. Specifically, this involvement includes providing technical expertise regarding accounting procedures, rules, and conventions that need to be incorporated into the system. Accountants are also involved in specifying documentation standards and control requirements.
- Several comprehensive cases designed as team-based systems development projects are available online at www.cengagebrain.com. These cases have been used effectively by groups of three or four students working as a design team. Each case has sufficient details to allow analysis of user needs, preparation of a conceptual solution, and the development of a detailed design, including user views (input and output), processes, and databases.

PART V: COMPUTER CONTROLS AND IT AUDITING

Chapter 14, “Auditing IT Controls Part I: Sarbanes-Oxley and IT Governance”

Chapter 14 opens with an overview of IT auditing in which the key components of an audit are discussed including auditing standards, the structure of an audit, management assertions, and the audit risk model. Next, the chapter examines management and auditor responsibilities under Sections 302 and 404 of the Sarbanes-Oxley Act (SOX). The design, implementation, and assessment of IT controls form the central theme for this chapter and the two chapters that follow. This chapter presents risks, controls, and tests of controls related to IT governance, including organizing the IT function, controlling computer center operations, designing an adequate disaster recovery plan, and IT outsourcing.

Chapter 15, “Auditing IT Controls Part II: Security and Access”

Chapter 15 continues the treatment of IT controls as described by the COSO control framework. The focus of the chapter is on SOX compliance regarding the security and control of operating systems, database management systems, and communication networks. The chapter examines the risks, controls, audit objectives, and tests of controls that may be performed to satisfy either compliance or attest responsibilities.

Chapter 16, “Auditing IT Controls Part III: Systems Development, Program Changes, and Application Auditing”

Chapter 16 concludes the examination of general IT controls as outlined in the COSO control framework. The chapter focuses on SOX compliance regarding systems development and program change procedures. It examines the risks, controls, audit objectives, and tests of controls that may be performed to satisfy compliance or attest responsibilities. The chapter also examines several computer-assisted audit

tools and techniques (CAATTs) for testing IT application controls and for performing substantive tests.

SUPPLEMENTS

Product Website

Additional teaching and learning resources, including access to additional internal control and systems development cases, are available for download from the book's website at www.cengagebrain.com.

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Solutions Manual

The *Solutions Manual* contains solutions to all end-of-chapter problems and cases. Adopting instructors may download the *Solutions Manual* under password protection at the Instructor's Resource page of the book's website.

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Overview of Accounting Information Systems

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The Information System: An Accountant's Perspective

Unlike many other accounting subjects, such as intermediate accounting, **accounting information systems (AIS)** lacks a well-defined body of knowledge. Much controversy exists among college faculty as to what should and should not be covered in the AIS course. To some extent, however, the controversy is being resolved through legislation. The Sarbanes-Oxley Act (SOX) of 2002 established new corporate governance regulations and standards for public companies registered with the Securities and Exchange Commission (SEC). This wide-sweeping legislation impacts public companies, their management, and their auditors. Of particular importance to AIS students is the impact of SOX on internal control standards and related auditing procedures. Although SOX does not define the entire content of the AIS course, it does identify critical areas of study that need to be included. These topics and more are covered in the chapters of this text.

The purpose of this chapter is to place the subject of AIS in perspective for accountants. Toward this end, the chapter is divided into three major sections, each dealing with a different aspect of information systems. The first section explores the information environment of the firm. It identifies the types of information used in business, describes the flow of information through an organization, and presents a framework for viewing AIS in relation to other information systems components. The section concludes with a review of the key elements of the general model for AIS. The second section of the chapter deals with the impact of organizational structure on AIS. Here we examine the business organization as a system of interrelated functions. Extensive attention is given to the IT and accounting segments, which play collaborative roles as the purveyors of financial information for the rest of the

Learning Objectives

After studying this chapter, you should:

- Recognize the primary information flows within the business environment.
- Understand the difference between accounting information systems and management information systems.
- Understand the difference between financial transactions and nonfinancial transactions.
- Know the principal features of the general model for information systems.
- Understand the organizational structure and functional areas of a business.
- Be able to distinguish between external auditing, internal auditing, and advisory services as they relate to accounting information systems.

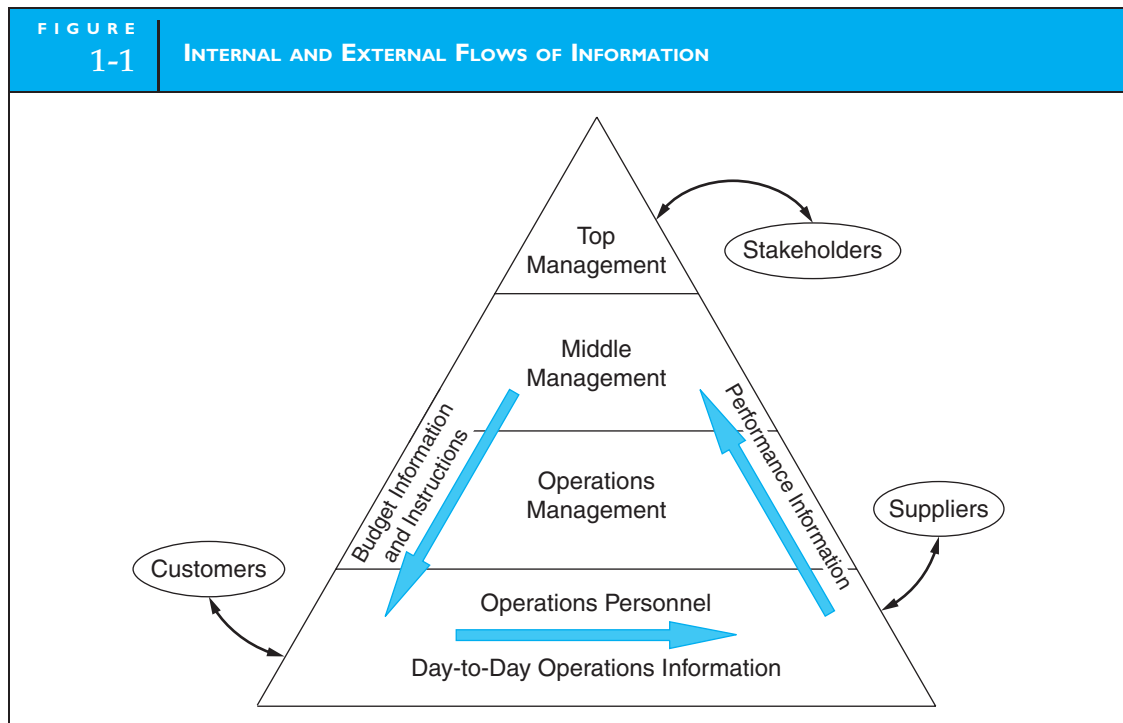
organization. The final section discusses the unique responsibility of accountants as domain experts in the design of AIS and as auditors of AIS.

The Information Environment

We begin the study of AIS with the recognition that information is a business resource. Like other business resources such as raw materials, capital, and labor, information is vital to the survival of the contemporary business organization. Every business day, vast quantities of information flow to decision makers and other users to meet a variety of internal needs. In addition, information flows out from the organization to external users, such as customers, suppliers, and stakeholders, who have an interest in the firm. Figure 1-1 presents an overview of these internal and external information flows.

The pyramid in Figure 1-1 shows the business organization divided horizontally into several levels of activity. Business operations form the base of the pyramid. These activities consist of the product-oriented work of the organization, such as manufacturing, sales, distribution, billing, and cash receipts. Above the base level, the organization is divided into three management tiers: operations management, middle management, and top management. Operations management is directly responsible for controlling day-to-day operations. Middle management is accountable for the short-term planning and coordination of activities necessary to accomplish organizational objectives. Top management is responsible for longer-term planning and setting organizational objectives. Every individual in the organization, from business operations to top management, needs information to accomplish his or her tasks.

Notice in Figure 1-1 how information flows in two directions within the organization: horizontally and vertically. The horizontal flow supports operations-level tasks with highly detailed information about the many business transactions affecting the firm. This includes information about events such as the sale and shipment of goods, the use of labor and materials in the production process, and internal transfers of resources from one department to another. The vertical flow



distributes information downward from senior managers to junior managers and operations personnel in the form of instructions, quotas, and budgets. In addition, summarized information pertaining to operations and other activities flows upward to managers at all levels. Management uses this information to support its various planning and control functions.

A third flow of information depicted in Figure 1-1 represents exchanges between the organization and users in the external environment. External users fall into two groups: **trading partners** and **stakeholders**. Exchanges with trading partners include customer sales and billing information, purchase information for suppliers, and inventory receipts information. Stakeholders are external entities with a direct or indirect interest in the firm. Stockholders, financial institutions, and government agencies are examples of external stakeholders. Information exchanges with these groups include financial statements, tax returns, and stock transaction information.

INFORMATION OBJECTIVES

Specific information objectives will differ from firm to firm as specific user needs vary. Three fundamental objectives are, however, common to all organizations:

1. *To support the firm's day-to-day operations.* Operations personnel use information to assist them in the efficient and effective discharge of their daily tasks.
2. *To support management decision making.* Managers use information to assist them in planning and control decisions related to their areas of responsibility.
3. *To support the stewardship function of management.* Stewardship refers to managers' responsibility to properly manage the resources of the firm and to report on their activities. External users receive stewardship information through traditional financial statements and other mandated reports. Internally, managers receive stewardship information from various responsibility reports.

These objectives call for information sets that are diverse in their level of detail and nature. For example, managers cannot effectively employ the finely detailed information needed to support day-to-day operations. Management decision information tends to be highly summarized and oriented toward reporting on overall performance and trends rather than routine tasks. Similarly, accrual-based financial statement information, which is prepared for stakeholders, is unsuitable for most internal uses. The information needed to satisfy these diverse needs is the product of the information system.

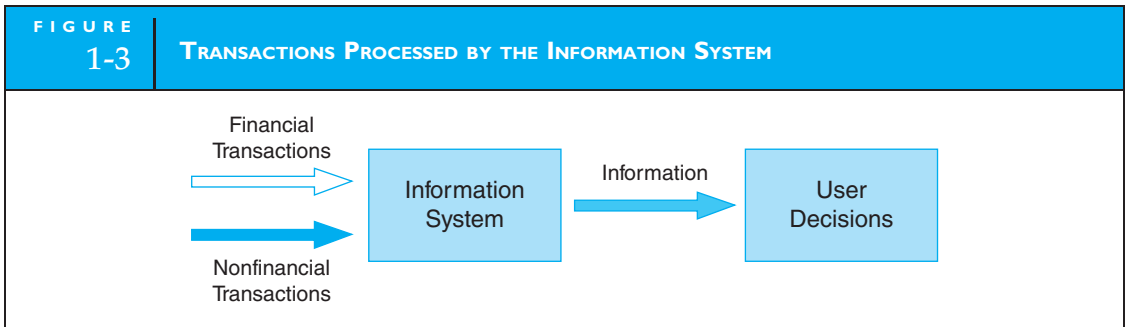
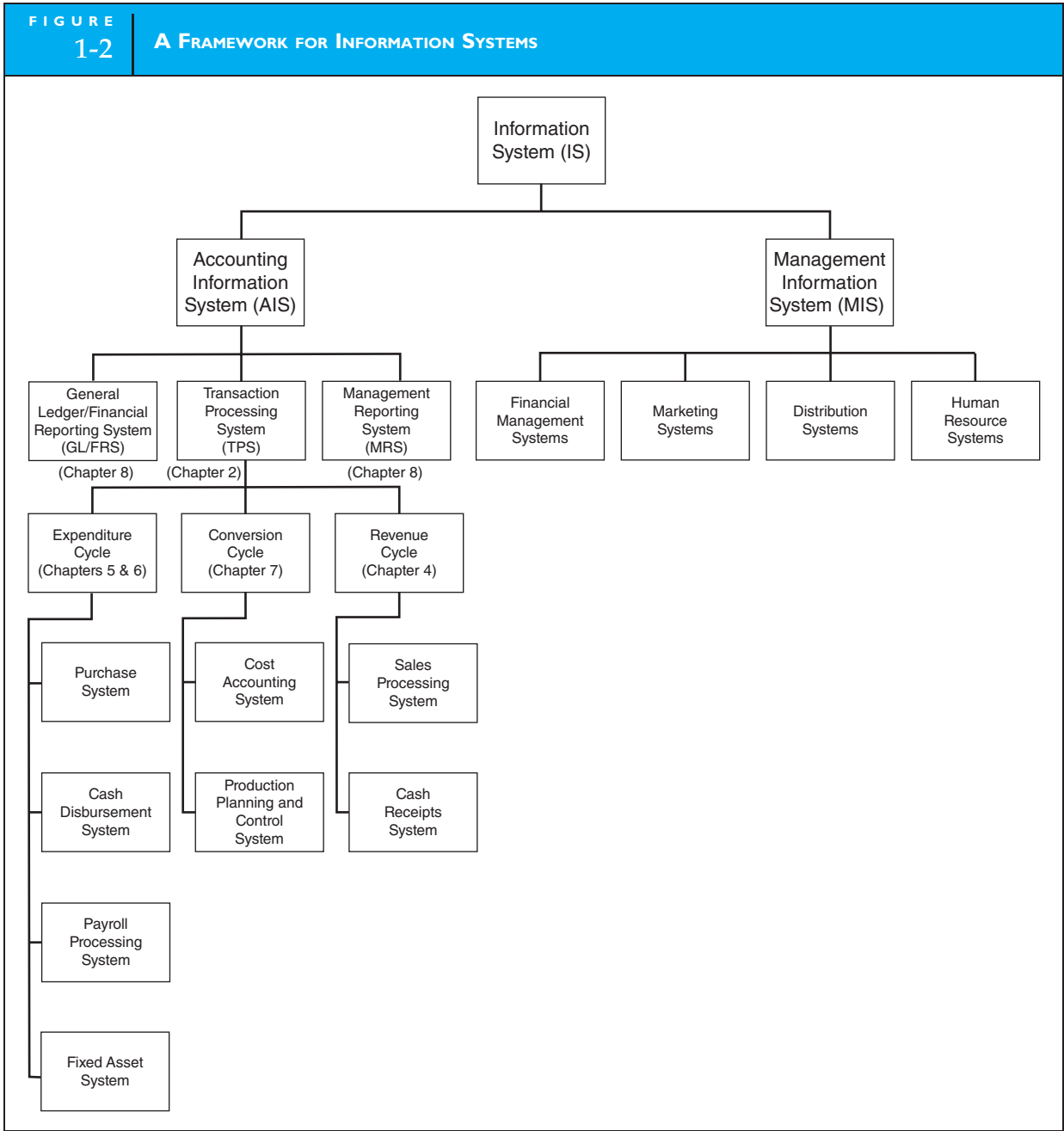
AN INFORMATION SYSTEMS FRAMEWORK

The **information system** is the set of formal procedures by which data are collected, stored, processed into information, and distributed to users.

Figure 1-2 shows the information system of a hypothetical manufacturing firm decomposed into its elemental subsystems. Notice that two broad classes of systems emerge from the decomposition: the AIS and the **management information system (MIS)**. We will use this framework to identify the domain of AIS and distinguish it from MIS. Keep in mind that Figure 1-2 is a conceptual view; physical information systems are not typically organized into such discrete packages. More often, MIS and AIS functions are integrated within physical systems to achieve operational efficiency.

The distinction between AIS and MIS centers on the concept of a transaction, as illustrated by Figure 1-3. The information system accepts inputs, called transactions, which are converted through various processes into output information that goes to users. Transactions fall into two classes: financial transactions and nonfinancial transactions. Before exploring this distinction, let's first define the term *transaction*:

*A **transaction** is an event that affects or is of interest to the organization and is processed by its information system as a unit of work.*



This definition encompasses both financial and nonfinancial events. Because financial transactions are of particular importance to the accountant's understanding of information systems, we need a precise definition for this class of transaction:

*A **financial transaction** is an economic event that affects the assets and equities of the organization, is reflected in its accounts, and is measured in monetary terms.*

Sales of products to customers, purchases of inventory from vendors, and cash disbursements and receipts are examples of financial transactions. Every business organization is legally bound to correctly process these types of transactions.

Nonfinancial transactions are events that do not meet the narrow definition of a financial transaction. For example, adding a new supplier of raw materials to the list of valid suppliers is an event that may be processed by the enterprise's information system as a transaction. Important as this information obviously is, it is not a financial transaction, and the firm has no legal obligation to process it correctly—or at all.

Financial transactions and nonfinancial transactions are closely related and are often processed by the same physical system. For example, consider a financial portfolio management system that collects and tracks stock prices (nonfinancial transactions). When the stocks reach a threshold price, the system places an automatic buy or sell order (financial transaction). Buying high and selling low is bad for business, but it is not against the law. Therefore, no law requires company management to design optimal buy-and-sell rules into its system. Once the order is placed, however, the processing of this financial transaction must comply with legal and professional guidelines.

The Accounting Information System

AIS subsystems process financial transactions and nonfinancial transactions that directly affect the processing of financial transactions. For example, changes to customers' names and addresses are processed by the AIS to keep the customer file current. Although not technically financial transactions, these changes provide vital information for processing future sales to the customer.

The AIS is composed of three major subsystems: (1) the **transaction processing system (TPS)**, which supports daily business operations with numerous reports, documents, and messages for users throughout the organization; (2) the **general ledger/financial reporting system (GL/FRS)**, which produces the traditional financial statements, such as the income statement, balance sheet, statement of cash flows, tax returns, and other reports required by law; and (3) the **management reporting system (MRS)**, which provides internal management with special-purpose financial reports and information needed for decision making such as budgets, variance reports, and responsibility reports. We examine each of these subsystems in later sections of this chapter.

The Management Information System

Management often requires information that goes beyond the domain of AIS. As organizations grow in size and complexity, specialized functional areas emerge, requiring additional information for production planning and control, sales forecasting, inventory warehouse planning, market research, and so on. The MIS processes nonfinancial transactions that are not normally processed by traditional AIS. Table 1-1 gives examples of typical MIS applications related to functional areas of a firm.

The Need to Distinguish between AIS and MIS

SOX legislation requires that corporate management design and implement internal controls over the entire financial reporting process. This includes the FRS, the GLS, and the TPS that supply the data for financial reporting. SOX further requires that management certify these controls and that the external auditors express an opinion on control effectiveness. Because of the highly integrative nature of modern information systems, management and auditors need a conceptual view

TABLE 1-1		EXAMPLES OF MIS APPLICATIONS IN FUNCTIONAL AREAS
Function	Examples of MIS Applications	
Finance	Portfolio management systems Capital budgeting systems	
Marketing	Market analysis New product development Product analysis	
Distribution	Warehouse organization and scheduling Delivery scheduling Vehicle loading and allocation models	
Personnel	Human resource management systems <ul style="list-style-type: none"> ■ Job skill tracking system ■ Employee benefits system 	

of the information system that clearly distinguishes key processes and areas of risk and legal responsibility from other (nonlegally binding) aspects of the system. Without such a model, mandated management and audit responsibilities under SOX may not be efficiently or adequately met.

AIS SUBSYSTEMS

We devote separate chapters to an in-depth study of each AIS subsystem depicted in Figure 1-2. At this point, we briefly outline the role of each subsystem.

Transaction Processing System

The TPS is central to the overall function of the information system. It converts economic events into financial transactions, records financial transactions in the accounting records (journals and ledgers), and distributes essential financial information to operations personnel to support their daily operations.

The TPS deals with business events that occur frequently. In a given day, a firm may process thousands of transactions. To deal efficiently with such volume, similar types of transactions are grouped into transaction cycles. The TPS consists of three transaction cycles: the revenue cycle, the expenditure cycle, and the conversion cycle. Each cycle captures and processes different types of financial transactions. Chapter 2 of this text provides an overview of transaction processing. Chapters 4, 5, 6, and 7 examine in detail the revenue, expenditure, and conversion cycles.

General Ledger/Financial Reporting Systems

The GLS and the FRS are two closely related subsystems. Because of their operational interdependency, however, they are generally viewed as a single integrated system—the GL/FRS. The bulk of the input to the GL portion of the system comes from transaction cycle subsystems. Summaries of transaction activity are processed by the GLS to update the general ledger control accounts. Other, less common and infrequent, events such as stock transactions, mergers, and lawsuit settlements, for which there may be no formal processing cycle in place, enter the GLS through alternate sources. The FRS measures the status of financial resources and the changes in those resources and communicates this information to external users. This type of reporting is called **nondiscretionary reporting** because the organization has few or no choices in the information it provides. Much of this information consists of traditional financial statements, tax returns, and other reports demanded by law.

Management Reporting System

Managers must respond rapidly to many day-to-day business problems as well as plan and control their operations. The MRS provides the internal financial information needed to manage a business. Typical reports produced by the MRS include budgets, variance reports, cost-volume-profit analyses, and reports using current (rather than historical) cost data. This type of reporting is called **discretionary reporting** because the organization can choose what information to report and how to present it.

A GENERAL MODEL FOR AIS

Figure 1-4 presents the **general model for AIS**. This is a *general* model because it applies to all AIS, regardless of their underlying technologies. The model depicts the relationship between the key elements that constitute an AIS application: end users, data sources, data collection, data processing, database management, information generation, and feedback. Each of these is discussed next.

End Users

End users fall into two general groups: external and internal. **External users** include creditors, stockholders, potential investors, regulatory agencies, tax authorities, suppliers, and customers. **Internal users** include management at all levels of the organization as well as operations personnel. In contrast to their more structured external reporting responsibilities, organizations have a great deal of latitude when it comes to internal reporting, which is driven by what best gets the job done. Internal reporting is, however, characterized by frequent changes in the information needs of internal users. This volatility poses a significant challenge to system designers who must balance the information requests and needs of internal users against legal, economic, internal control, and security issues. Frequent changes in information requirements necessitate information system changes, which, in turn, expose systems to material errors and, as we shall see later in this text, the potential for fraud.

