Preface

Welcome to the Sixth Edition

The sixth edition of *Accounting Information Systems* includes a full range of new and revised homework assignments, 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, determines 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 computer controls, provide what has proven to be a **successful template for developing an AIS course**.
- Earlier 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.**
- While the 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 and industrial engineering 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 new 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 past 50 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. The modern accountant needs to be familiar with the operational characteristics of all AIS approaches that he or she is likely to encounter. **Therefore, this book presents the salient aspects of five models that relate to both legacy and state-of-the-art systems:**

1. manual processes
2. flat-file systems
3. the database approach
4. the resources, events, and agents (REA) model
5. enterprise resource planning (ERP) systems

Emphasis on Internal Controls

The book presents a **conceptual model for internal control** based on COSO and Statement on Auditing Standards (SAS) No. 78. This model is used to discuss control issues for both manual processes and computer-based information systems (CBIS). **Three chapters (Chapters 15, 16 and 17) are devoted to the control of CBIS.** Special emphasis is given to the following areas:

- computer operating systems
- database management systems
- electronic data interchange (EDI)
- electronic commerce systems
- ERP systems
- systems development and program change processes
- the organization of the computer function
- the security of data processing centers
- verifying computer application integrity

Exposure to Systems Design and Documentation Tools

The book examines various approaches and methodologies used in **systems analysis and design,** including the following:

- structured design
- object-oriented design
- computer-aided software engineering (CASE)
- prototyping

In conjunction with these general approaches, professional systems analysts and programmers use a number of documentation techniques to specify the key features of systems. The modern auditor works closely with systems professionals during IT audits and must learn to communicate in their language. **The book deals extensively with documentation techniques such as data flow diagrams (DFDs), entity relationship diagrams (ERDs), as well as system, program, and document flowcharts.** The book contains **numerous systems design and documentation cases and assignments** intended to develop the students' competency with these tools.

Significant Changes in the Sixth Edition

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

The end-of-chapter material to these chapters has been significantly revised. This entailed the creation of many new multiple-choice questions and problems. In particular, great attention was given to internal control case solutions to ensure that they were consistent in appearance and accurately reflect the cases in the text. In the 6th edition 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 7, "The Conversion Cycle"

This chapter has been completely rewritten to include issues, techniques, and technologies pertinent to the popular philosophy of lean manufacturing. The revised chapter presents the key features of two alternative cost accounting models: (1) activity-based costing (ABC) and (2) value stream accounting. The latter is gaining acceptance as a superior accounting technique for lean manufacturing companies.

Chapter 9, "Database Management Systems"

The body of this chapter has been revised to better integrate traditional data modeling techniques with REA modeling, which is discussed in Chapter 10. This integration

facilitates distinguishing the modeling techniques that are unique to each approach while avoiding redundant treatment of issues that they have in common. The chapter appendix provides a new and easy-to-understand, business-based data normalization example.

Chapter 10, "The REA Approach to Database Modeling"

This is an entirely new chapter on REA data modeling. The chapter begins by presenting the theoretical REA model, which is based on an economic exchange. This model is then developed step by step into functional databases for revenue and expenditure cycle applications.

Chapter 11, "Enterprise Resource Planning Systems"

The significant change to this chapter is a revised appendix that presents the key features of the leading large-scale, midsized, and small business ERP systems.

Chapter 12, "Electronic Commerce Systems"

This chapter was revised to emphasize the growing and changing threats from denial of service Dos attacks. While such attacks can be aimed at any type of website, they are particularly devastating to business entities that are prevented from receiving and processing business transactions from their customers. Three common types of DOS attacks—SYN flood, smurf, and distributed denial of service (DDOS)—are discussed.

Organization and Content

Part I: Overview of Accounting Information Systems

Chapter 1, "The Information System: An Accountant's Perspective"

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

- The first section explores the *information environment of the firm*. It introduces basic systems concepts, identifies the types of information used in business, and describes the flows of information through an enterprise. This section also presents a framework for viewing accounting information systems in relation to other information systems components.
- The second section of the chapter deals with the *impact of organizational structure on AIS*. The centralized and distributed models are used to illustrate extreme cases in point.
- The third section reviews the evolution of *information systems models*. Accounting information systems have been represented by a number of different approaches or models. *Five dominant models* are examined: manual processes; flat-file systems; the database approach; the resources, events, agents (REA) model; and enterprise resource planning (ERP) systems.

- The final section discusses the *role of accountants as users, designers, and auditors of AIS*. The nature of the responsibilities shared by accountants and computer professionals for developing AIS applications are examined.

Chapter 2, "Introduction to Transaction Processing"

The second chapter expands on the subject of transaction cycles introduced in Chapter 1. While the operational details of specific transaction cycles are covered in subsequent chapters, this chapter presents material that is common to all cycles. Topics covered include:

- the relationship between source documents, journals, ledgers, and financial statements in both manual and computer-based systems;
- system documentation techniques, such as data flow diagrams, entity relationship (ER) diagrams, document systems, and program flowcharts; and
- data processing techniques, including batch and real-time processing.

The techniques and approaches presented in this chapter are applied to specific business cycle applications in later chapters. The chapter is supported by material in the appendix and on the website.

Chapter 3, "Ethics, Fraud, and Internal Control"

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

- The chapter first examines ethical issues related to business and specifically to computer systems. The questions raised are intended to stimulate class discussions.
- The chapter then addresses the subject of fraud. There is perhaps no area of greater controversy for accountants than their responsibility to detect fraud. Part of the problem stems from confusion about what constitutes fraud. This section distinguishes between management fraud and employee fraud. The chapter 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 several fraud techniques that have been perpetrated in both manual and computer-based environments. The results of a research study conducted by the Association of Certified Fraud Examiners as well as the provisions of the Sarbanes-Oxley Act are presented.
- The final section of the chapter describes the internal control structure and control activities specified in SAS 78 and the COSO framework. The control concepts discussed in this chapter are applied to specific applications in chapters that follow.

Part II: Transaction Cycles and Business Processes

Chapters 4, 5, and 6, The Revenue and Expenditure Cycles

The approach taken in all three chapters is similar. First, the business cycle is reviewed conceptually using data flow diagrams to present key features and control points of each major subsystem. At this point the reader has the choice of either continuing within the

context of a manual environment or moving directly to computer-based examples. Each system is examined under two alternative technological approaches:

- First examined is automation, which preserves the basic functionality by replacing manual processes with computer programs.
- Next, each system is reengineered to incorporate real-time technology.

Under each technology, the effects on operational efficiency and internal controls are examined. 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
- 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 begins with a review of data coding techniques used in transaction processing systems and for general ledger design. It explores several coding schemes and their respective advantages and disadvantages. Next it examines the objectives, operational features, and control issues of three related systems: the general ledger system (GLS), the financial reporting system (FRS), and the management reporting system (MRS). The emphasis is on operational controls and the use of advanced computer technology to enhance efficiency in each of these systems. The chapter distinguishes the MRS from the FRS in one key respect: financial reporting is *mandatory* and management reporting is *discretionary*. Management reporting information is needed for planning and controlling business activities. Organization management implements MRS applications at their discretion, based on internal user needs.

The chapter examines a number of factors that influence and shape information needs. These include management principles, decision type and management level, problem structure, reports and reporting methods, responsibility reporting, and behavioral issues pertaining to reporting.

Part III: Advanced Technologies in Accounting Information

Chapter 9, "Database Management Systems"

Chapter 9 deals with the design and management of an organization's data resources.

- It begins by demonstrating 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 model. A number of database design topics are covered, including data modeling, deriving relational tables from ER diagrams, the creation of user views, and data normalization techniques.
- The fourth section concludes the chapter 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 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 the following major sections.

- It begins by defining the key elements of REA. The basic model employs a unique form of ER diagram called an REA diagram that 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 chapter goes on to illustrate 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 next section in the chapter 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 chapter 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"

This chapter 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). A number of issues are discussed, including 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 SAS 78 framework.
- The chapter appendix provides a review of the leading ERP software products including SAP, Oracle E-Business Suite, Oracle | PeopleSoft, JD Edwards, EnterpriseOne, SoftBrands, MAS 500, and Microsoft Dynamics.

Chapter 12, "Electronic Commerce Systems"

Driven by the Internet revolution, electronic commerce is dramatically expanding and undergoing radical changes. While electronic commerce promises enormous opportunities for consumers and businesses, its effective implementation and control are urgent challenges facing organization management 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. **This chapter and the 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 and reviews security and assurance techniques used to reduce risk and to 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, "Managing the Systems Development Life Cycle" and Chapter 14, "Construct, Deliver, and Maintain Systems Projects"

These chapters examine the accountant's role in the systems development process.

- **Chapter 13** begins with an overview to the systems development life cycle (SDLC). This multistage process guides organization management through the development and/or purchase of information systems.
- Next, Chapter 13 presents the key issues pertaining to developing a systems strategy, including its relationship to the strategic business plan, the current legacy situation,

and feedback from the user community. The chapter provides a methodology for assessing the feasibility of proposed projects and for selecting individual projects to go forward for construction and delivery to their users. The chapter concludes by reviewing the role of accountants in managing the SDLC.

- **Chapter 14** covers the many activities associated with in-house development, which fall conceptually into two categories: (1) construct the system and (2) deliver the system. Through these activities, systems selected in the project initiation phase (discussed in Chapter 13) are designed in detail and implemented. This involves creating input screen formats, output report layouts, database structures, and application logic. Finally, the completed system is tested, documented, and rolled out to the user.
- Chapter 14 then examines the increasingly important option of using commercial software packages. Conceptually, the commercial software approach also consists of construct and delivery activities. In this section we examine the pros, cons, and issues involved in selecting off-the-shelf systems.
- Chapter 14 also addresses the important activities associated with systems maintenance and the associated risks that are important to management, accountants, and auditors.
- **Several comprehensive cases designed as team-based systems development projects are available on the website.** 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 Auditing

Chapter 15, "IT Controls Part I: Sarbanes-Oxley and IT Governance"

This chapter provides an overview of management and auditor responsibilities under Sections 302 and 404 of the Sarbanes-Oxley Act (SOX). The design, implementation, and assessment of internal control over the financial reporting process form the central theme for this chapter and the two chapters that follow. This treatment of internal control complies with the Committee of Sponsoring Organizations of the Treadway Commission (COSO) control framework. Under COSO, IT controls are divided into application controls and general controls. Chapter 15 presents risks, controls, and tests of controls related to IT governance including organizing the IT function, controlling computer center operations, and designing an adequate disaster recovery plan.

Chapter 16, "IT Controls Part II: Security and Access"

Chapter 16 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. This chapter examines the risks, controls, audit objectives, and tests of controls that may be performed to satisfy either compliance or attest responsibilities.

Chapter 17, "IT Controls Part III: Systems Development, Program Changes, and Application Controls"

This chapter concludes our treatment of IT controls as outlined in the COSO control framework. The focus of the chapter is on SOX compliance regarding systems development, program changes, and applications controls. This chapter examines the risks, controls, audit objectives, and tests of controls that may be performed to satisfy compliance or attest responsibilities. The chapter examines **five computer-assisted audit tools and techniques** (CAATT) for testing application controls:

- the test data method
- base case system evaluation
- tracing
- integrated test facility
- parallel simulation

It also reviews two substantive testing techniques: embedded audit modules and generalized audit software.

Supplements

Product Website

Additional teaching and learning resources, including access to additional **internal control and systems development** cases, are available by download from the book's website at **http://academic.cengage.com.**

PowerPoint® Slides

The PowerPoint® slides, prepared and completely updated by Patrick Wheeler of the University of Missouri, provide colorful lecture outlines of each chapter of the text, incorporating text graphics and flowcharts where needed. The PPT is available for download from the text website.

Test Bank

The *Test Bank*, available in Word and written and updated by the text author, contains true/false, multiple-choice, short answer, and essay questions. The files are available for download from the text website.

Solutions Manual

The *Solutions Manual*, written by the author, 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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Dedication

To my wife Eileen, and my children Elizabeth and Katie