



# ACCOUNTING INFORMATION SYSTEMS

9E

JAMES A. HALL

# Accounting Information Systems

**NINTH EDITION**

**JAMES A. HALL**

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



---

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

This is an electronic version of the print textbook. Due to electronic rights restrictions, some third party content may be suppressed. Editorial review has deemed that any suppressed content does not materially affect the overall learning experience. The publisher reserves the right to remove content from this title at any time if subsequent rights restrictions require it. For valuable information on pricing, previous editions, changes to current editions, and alternate formats, please visit [www.cengage.com/highered](http://www.cengage.com/highered) to search by ISBN#, author, title, or keyword for materials in your areas of interest.

**Important Notice:** Media content referenced within the product description or the product text may not be available in the eBook version.

**Accounting Information Systems,  
Ninth Edition****James A. Hall**Vice President, General Manager, Social  
Science & Qualitative Business: Balraj Kalsi

Product Director: Mike Schenk

Senior Product Manager: Matt Filmonov

Content Developer: Ted Knight

Senior Product Assistant: Adele Scholtz

Senior Marketing Manager: Robin LeFevre

Manufacturing Planner: Doug Wilke

Art and Cover Direction, Production  
Management, and Composition: Lumina  
Datamatics, Inc.Cover Image: © Color Symphony/  
Shutterstock

Intellectual Property

Analyst: Christina Ciaramella

Project Manager: Betsy Hathaway

© 2016, 2013 Cengage Learning

WCN: 02-200-203

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced, transmitted, stored, or used in any form or by any means graphic, electronic, or mechanical, including but not limited to photocopying, recording, scanning, digitizing, taping, Web distribution, information networks, or information storage and retrieval systems, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without the prior written permission of the publisher.

For product information and technology assistance, contact us at  
**Cengage Learning Customer & Sales Support, 1-800-354-9706**

For permission to use material from this text or product,  
submit all requests online at **www.cengage.com/permissions**

Further permissions questions can be emailed to  
**permissionrequest@cengage.com**

Library of Congress Control Number: 2014954894

ISBN: 978-1-133-93440-0

**Cengage Learning**

20 Channel Center Street

Boston, MA 02210

USA

Cengage Learning is a leading provider of customized learning solutions with office locations around the globe, including Singapore, the United Kingdom, Australia, Mexico, Brazil, and Japan. Locate your local office at: **www.cengage.com/global**

Cengage Learning products are represented in Canada by Nelson Education, Ltd.

To learn more about Cengage Learning Solutions, visit  
**www.cengage.com**

Purchase any of our products at your local college store or at our preferred online store **www.cengagebrain.com**

Printed in the United States of America  
Print Number: 01      Print Year: 2014

# DEDICATION

*To my wife Eileen, and my children Elizabeth and Katie*



# BRIEF CONTENTS

	Preface	xix
	Acknowledgments	xxxi
Part I	Overview of Accounting Information Systems	I
Chapter 1	The Information System: An Accountant's Perspective	3
Chapter 2	Introduction to Transaction Processing	33
Chapter 3	Ethics, Fraud, and Internal Control	95
Part II	Transaction Cycles and Business Processes	145
Chapter 4	The Revenue Cycle	147
Chapter 5	The Expenditure Cycle Part I: Purchases and Cash Disbursements Procedures	209
Chapter 6	The Expenditure Cycle Part II: Payroll Processing and Fixed Asset Procedures	251
Chapter 7	The Conversion Cycle	291
Chapter 8	Financial Reporting and Management Reporting Systems	331

	<b>Part III</b>	<b>Advanced Technologies in Accounting Information</b>	<b>377</b>
Chapter 9		Database Management Systems	379
Chapter 10		The REA Approach to Database Modeling	441
Chapter 11		Enterprise Resource Planning Systems	471
Chapter 12		Electronic Commerce Systems	501
	<b>Part IV</b>	<b>Systems Development Activities</b>	<b>547</b>
Chapter 13		Managing the Systems Development Life Cycle	549
Chapter 14		Construct, Deliver, and Maintain Systems Project	581
	<b>Part V</b>	<b>Computer Controls and IT Auditing</b>	<b>641</b>
Chapter 15		Auditing IT Controls Part I: Sarbanes-Oxley and IT Governance	643
Chapter 16		Auditing IT Controls Part II: Security and Access	681
Chapter 17		Auditing IT Controls Part III: Systems Development, Program Changes, and Application Auditing	715
		Glossary	747
		Index	767



# CONTENTS

Preface xix

Acknowledgments xxxi

## Part I Overview of Accounting Information Systems I

---

### Chapter 1 The Information System: An Accountant's Perspective 3

---

THE INFORMATION ENVIRONMENT 4

Information Objectives 5

An Information Systems Framework 5

AIS Subsystems 8

A General Model for AIS 9

ORGANIZATIONAL STRUCTURE AND AIS 13

Functional Segmentation 13

The Accounting Function 16

Information Technology 17

THE ROLE OF ACCOUNTANTS IN AIS 20

Accountants as System Designers 20

Accountants as System Auditors 21

Summary 23

### Chapter 2 Introduction to Transaction Processing 33

---

AN OVERVIEW OF TRANSACTION PROCESSING 34

Transaction Cycles 34

ACCOUNTING RECORDS 36

Manual Systems 36

The Audit Trail 42

Digital Accounting Records 44

FILE STRUCTURES 45

The Flat-File Model 46

The Database Model 48

DOCUMENTATION TECHNIQUES 49

Data Flow Diagrams and Entity Relationship Diagrams	49
System Flowcharts	52
Program Flowcharts	60
Record Layout Diagrams	62
<b>TRANSACTION PROCESSING MODELS</b>	<b>63</b>
Differences Between Batch and Real-Time Systems	63
Updating Master Files from Transactions	64
Batch Processing Using Real-Time Data Collection	65
Real-Time Processing	67
<b>DATA CODING SCHEMES</b>	<b>69</b>
A System without Codes	69
A System with Codes	69
Numeric and Alphabetic Coding Schemes	70
Summary	73
Appendix	73

## Chapter 3 **Ethics, Fraud, and Internal Control 95**

---

<b>ETHICAL ISSUES IN BUSINESS</b>	<b>96</b>
Business Ethics	96
Computer Ethics	96
Sarbanes-Oxley Act and Ethical Issues	100
<b>FRAUD AND ACCOUNTANTS</b>	<b>101</b>
Definitions of Fraud	101
The Fraud Triangle	102
Financial Losses from Fraud	103
The Perpetrators of Frauds	104
Fraud Schemes	106
<b>INTERNAL CONTROL CONCEPTS AND TECHNIQUES</b>	<b>112</b>
COSO Internal Control Framework	116
IT Application Controls	122
GFS Backup Technique	127
Backup Process in Batch System Using Direct Access Files	128
Backup of Master Files in a Real-Time System	128
Output Controls	129
Summary	132

## Part II **Transaction Cycles and Business Processes 145**

---

### Chapter 4 **The Revenue Cycle 147**

---

<b>THE CONCEPTUAL SYSTEM</b>	<b>148</b>
Overview of Revenue Cycle Activities	148

<b>PHYSICAL SYSTEMS</b>	<b>160</b>
Basic Technology Revenue Cycle	161
Basic Technology Sales Order Processing System	161
Basic Technology Cash Receipts System	165
Advanced Technology Revenue Cycle	165
Integrated Sales Order Processing System	165
Integrated Cash Receipts System	168
Revenue Cycle Risks and Internal Controls	170
Point-of-Sale (POS) Systems	177
Daily Procedures	178
End-of-Day Procedures	178
Point-of-Sale Control Issues	179
Reengineering Using EDI	179
Reengineering Using the Internet	180
Summary	180
Appendix	181

## Chapter 5 **The Expenditure Cycle Part I: Purchases and Cash Disbursements Procedures 209**

---

<b>THE CONCEPTUAL SYSTEM</b>	<b>210</b>
Overview of Purchases and Cash Disbursements Activities	210
<b>PHYSICAL SYSTEMS</b>	<b>218</b>
Basic Technology Expenditure Cycle	220
Advanced Technology Expenditure Cycle	223
Integrated Purchases Processing System	223
Integrated Cash Disbursements System	227
Expenditure Cycle Risks and Internal Controls	228
Reengineering Using EDI	234
Summary	235

## Chapter 6 **The Expenditure Cycle Part II: Payroll Processing and Fixed Asset Procedures 251**

---

<b>THE CONCEPTUAL PAYROLL SYSTEM</b>	<b>251</b>
Update General Ledger	260
<b>THE PHYSICAL PAYROLL SYSTEM</b>	<b>260</b>
Basic Technology Payroll System	260
Advanced Technology Payroll System	260
Payroll System Risks and Internal Controls	265
<b>THE CONCEPTUAL FIXED ASSET SYSTEM</b>	<b>269</b>
The Logic of a Fixed Asset System	269
The Physical Fixed Asset System	271
Fixed Asset System Risks and Controls	274
Summary	276

## Chapter 7 **The Conversion Cycle 291**

---

THE TRADITIONAL MANUFACTURING ENVIRONMENT	292
Batch Processing System	293
Controls in the Traditional Environment	303
WORLD-CLASS COMPANIES AND LEAN MANUFACTURING	306
What Is a World-Class Company?	306
Principles of Lean Manufacturing	306
TECHNIQUES AND TECHNOLOGIES THAT PROMOTE LEAN MANUFACTURING	308
Physical Reorganization of the Production Facilities	308
Automation of the Manufacturing Process	308
ACCOUNTING IN A LEAN MANUFACTURING ENVIRONMENT	312
What's Wrong with Traditional Accounting Information?	313
Activity-Based Costing (ABC)	314
Value Stream Accounting	315
INFORMATION SYSTEMS THAT SUPPORT LEAN MANUFACTURING	317
Materials Requirement Planning (MRP)	317
Manufacturing Resource Planning (MRP II)	318
Enterprise Resource Planning (ERP) Systems	320
Summary	320

## Chapter 8 **Financial Reporting and Management Reporting Systems 331**

---

THE GENERAL LEDGER SYSTEM	332
The Journal Voucher	332
The GLS Database	332
GLS Procedures	334
Sophisticated Users with Homogeneous Information Needs	334
Financial Reporting Procedures	334
XBRL—REENGINEERING FINANCIAL REPORTING	337
XML	337
XBRL	338
The Current State of XBRL Reporting	343
CONTROLLING THE GL/FRS	344
COSO Control Issues	344
Internal Control Implications of XBRL	346
THE MANAGEMENT REPORTING SYSTEM	347
Management Principles	347
Management Function, Level, and Decision Type	350
Strategic Planning Decisions	350

Problem Structure	352
Types of Management Reports	354
Responsibility Accounting	356
Behavioral Considerations	360
Inappropriate Performance Measures	361
Summary	362

## Part III **Advanced Technologies in Accounting Information 377**

---

### Chapter 9 **Database Management Systems 379**

---

#### OVERVIEW OF THE FLAT-FILE VERSUS DATABASE APPROACH 379

Data Storage	380
Data Updating	380
Currency of Information	381
Task-Data Dependency	381
The Database Approach	381
Flat-File Problems Solved	382
Controlling Access to the Database	382
The Database Management System	382
Three Conceptual Models	383

#### ELEMENTS OF THE DATABASE ENVIRONMENT 383

Users	383
The Database Management System	383
The Database Administrator	387
The Physical Database	389

#### THE RELATIONAL DATABASE MODEL 389

Data Modeling Concepts	391
Anomalies, Structural Dependencies, and Data Normalization	397
Represent the View as a Single Table	399
Remove Repeating Group Data	401
Remove Partial Dependencies	402
Remove Transitive Dependencies	403
Linking the Normalized Tables	403

#### TOP-DOWN APPROACH TO DESIGNING RELATIONAL DATABASES 406

Identify the Views to be Modeled	407
Normalize Data Model and Add Primary Keys	408
Determine Cardinalities and Add Foreign Keys	410
Construct the Physical Database	411
Prepare the Physical User Views	411
Commercial Database System	413

## DATABASES IN A DISTRIBUTED ENVIRONMENT 413

Centralized Databases 413

Distributed Databases 415

Summary 419

Appendix 419

## Chapter 10 The REA Approach to Database Modeling 441

---

### THE REA APPROACH 442

The REA Model 442

### DEVELOPING AN REA MODEL 445

Differences Between ER and REA Diagrams 445

View Modeling: Creating an Individual REA Diagram 446

### VIEW INTEGRATION: CREATING AN ENTERPRISE-WIDE REA MODEL 453

Step 1. Consolidate the Individual Models 453

Step 2. Define Primary Keys, Foreign Keys, and Attributes 456

Step 3. Construct the Physical Database and Produce User

Views 460

REA and Value Chain Analysis 462

REA Compromises in Practice 464

Summary 464

## Chapter 11 Enterprise Resource Planning Systems 471

---

### WHAT IS AN ERP? 472

ERP Core Applications 473

Online Analytical Processing 474

### ERP SYSTEM CONFIGURATIONS 474

Server Configurations 474

OLTP versus OLAP Servers 475

Database Configuration 478

Bolt-On Software 478

### DATA WAREHOUSING 479

Modeling Data for the Data Warehouse 479

Extracting Data from Operational Databases 480

Cleansing Extracted Data 480

Transforming Data into the Warehouse Model 482

Loading the Data into the Data Warehouse Database 483

Decisions Supported by the Data Warehouse 483

Supporting Supply Chain Decisions from the Data Warehouse 484

### RISKS ASSOCIATED WITH ERP IMPLEMENTATION 485

Big Bang versus Phased-In Implementation 485

Opposition to Changes in the Business's Culture 486

Choosing the Wrong ERP	486
Choosing the Wrong Consultant	487
High Cost and Cost Overruns	488
Disruptions to Operations	489

#### IMPLICATIONS FOR INTERNAL CONTROL AND AUDITING 489

Transaction Authorization	489
Segregation of Duties	489
Supervision	490
Accounting Records	490
Independent Verification	490
Access Controls	490
Internal Control Issues Related to ERP Roles	492
Contingency Planning	493
Summary	494

## Chapter 12 Electronic Commerce Systems 501

#### INTRA-ORGANIZATIONAL NETWORKS AND EDI 502

#### INTERNET COMMERCE 502

Internet Technologies	502
Protocols	505
Internet Protocols	506
Internet Business Models	508
Cloud Computing	508

#### RISKS ASSOCIATED WITH ELECTRONIC COMMERCE 512

Intranet Risks	512
Internet Risks	513
Risks to Consumers	513

#### SECURITY, ASSURANCE, AND TRUST 518

Encryption	518
Digital Authentication	519
Firewalls	521
Seals of Assurance	521
TRUSTe	522

#### IMPLICATIONS FOR THE ACCOUNTING PROFESSION 523

Privacy Violation	523
Continuous Auditing	524
Electronic Audit Trails	524
Confidentiality of Data	524
Authentication	524
Nonrepudiation	524
Data Integrity	525
Access Controls	525
A Changing Legal Environment	525
Summary	525

Appendix	526
----------	-----

## Part IV Systems Development Activities 547

### Chapter 13 Managing the Systems Development Life Cycle 549

THE SYSTEMS DEVELOPMENT LIFE CYCLE	549
Participants in Systems Development	551
SYSTEMS STRATEGY	552
Assess Strategic Information Needs	552
Strategic Business Needs	552
Legacy Systems	553
User Feedback	554
Develop a Strategic Systems Plan	556
Create an Action Plan	556
The Learning and Growth Perspective	557
The Internal Business Process Perspective	558
The Customer Perspective	558
The Financial Perspective	558
Balanced Scorecard Applied to IT Projects	558
PROJECT INITIATION	559
Systems Analysis	559
The Survey Step	559
The Analysis Step	561
Conceptualization of Alternative Designs	563
How Much Design Detail Is Needed?	563
SYSTEMS EVALUATION AND SELECTION	565
Perform a Detailed Feasibility Study	565
Perform Cost-Benefit Analysis	566
Prepare Systems Selection Report	571
Announcing the New System Project	572
User Feedback	573
THE ACCOUNTANT'S ROLE IN MANAGING THE SDLC	573
How Are Accountants Involved with SDLC?	573
The Accountant's Role in Systems Strategy	573
The Accountant's Role in Conceptual Design	573
The Accountant's Role in Systems Selection	574
Summary	574

### Chapter 14 Construct, Deliver, and Maintain Systems Project 581

IN-HOUSE SYSTEMS DEVELOPMENT	582
Tools for Improving Systems Development	582
Construct the System	585



The Structured Design Approach	586
The Object-Oriented Design Approach	586
System Design	591
Data Modeling, Conceptual Views, and Normalized Tables	591
Design Physical User Views	591
Design the System Process	598
Design System Controls	601
Perform a System Design Walk-Through	601
Program Application Software	602
Software Testing	603
Deliver the System	604
Testing the Entire System	604
Documenting the System	604
Converting the Databases	606
Converting to the New System	607
Post-Implementation Review	608
The Role of Accountants	609
<b>COMMERCIAL PACKAGES</b>	<b>609</b>
Trends in Commercial Packages	610
Advantages of Commercial Packages	611
Disadvantages of Commercial Packages	611
Choosing a Package	612
<b>MAINTENANCE AND SUPPORT</b>	<b>615</b>
User Support	616
Knowledge Management and Group Memory	616
Summary	616
Appendix	617

## Part V Computer Controls and IT Auditing 641

### Chapter 15 Auditing IT Controls Part I: Sarbanes-Oxley and IT Governance 643

<b>OVERVIEW OF AUDITING</b>	<b>643</b>
<b>FINANCIAL AUDIT COMPONENTS</b>	<b>644</b>
Auditing Standards	645
<b>STRUCTURE OF AN AUDIT</b>	<b>645</b>
Audit Planning	645
Management Assertions	646
Audit Risk	647
<b>OVERVIEW OF SOX SECTIONS 302 AND 404</b>	<b>649</b>
Relationship Between IT Controls and Financial Reporting	650
Audit Implications of Sections 302 and 404	651

IT GOVERNANCE CONTROLS	655
ORGANIZATIONAL STRUCTURE CONTROLS	655
Segregation of Duties within the Centralized Firm	656
The Distributed Model	658
Creating a Corporate IT Function	660
Audit Objectives Relating to Organizational Structure	662
Audit Procedures Relating to Organizational Structure	662
COMPUTER CENTER SECURITY AND CONTROLS	662
Computer Center Controls	663
DISASTER RECOVERY PLANNING	665
Providing Second-Site Backup	665
Identifying Critical Applications	666
Performing Backup and Off-Site Storage Procedures	667
Creating a Disaster Recovery Team	668
Testing the DRP	669
Audit Objective: Assessing Disaster Recovery Planning	669
Audit Procedures for Assessing Disaster Recovery Planning	669
OUTSOURCING THE IT FUNCTION	669
Risks Inherent to IT Outsourcing	670
Loss of Strategic Advantage	671
Audit Implications of IT Outsourcing	672
SSAE 16 Report Contents	672
Summary	674
<b>Chapter 16 Auditing IT Controls Part II: Security and Access</b>	<b>681</b>
CONTROLLING THE OPERATING SYSTEM	681
Operating System Objectives	681
Operating System Security	682
Threats to Operating System Integrity	683
Operating System Controls and Tests of Controls	683
CONTROLLING DATABASE MANAGEMENT SYSTEMS	688
Access Controls	688
Backup Controls	690
CONTROLLING NETWORKS	692
Controlling Risks from Subversive Threats	692
Controlling Risks from Equipment Failure	700
ELECTRONIC DATA INTERCHANGE (EDI) CONTROLS	701
Transaction Authorization and Validation	702
Access Control	703
EDI Audit Trail	703
Summary	705
Appendix	705

## Chapter 17 Auditing IT Controls Part III: Systems Development, Program Changes, and Application Auditing 715

---

SYSTEMS DEVELOPMENT CONTROLS	716
Controlling Systems Development Activities	716
Controlling Program Change Activities	718
Source Program Library Controls	718
The Worst-Case Situation: No Controls	719
A Controlled SPL Environment	720
IT APPLICATION CONTROL TESTING AND SUBSTANTIVE TESTING	723
Designing Tests of Application Controls	724
INTERNAL CONTROL TESTING TECHNIQUES	728
Black Box Approach	728
Through-the-Computer Approaches	729
The Integrated Test Facility	731
Parallel Simulation	732
SUBSTANTIVE TESTING TECHNIQUES	734
The Embedded Audit Module	734
Generalized Audit Software	735
Summary	738
Glossary	747
Index	767



# PREFACE

## Welcome to the Ninth Edition

The ninth 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 Ninth Edition

### End-of-Chapter Material

The end-of-chapter material in the ninth 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 3, “Ethics, Fraud, and Internal Control”

This chapter has been revised to include the most recent research results published by the Association of Certified Fraud Examiners (ACFE). The ACFE study provides estimates of losses due to fraud, categorizes fraud by various factors, and creates a profile of fraud perpetrators.

### 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”; Chapter 7, “The Conversion Cycle”; and Chapter 8, “Financial Reporting and Management Reporting Systems”

These chapters have been significantly revised to reflect a risk-based approach to AIS design and audit. The approach taken in each chapter is to examine the risks from errors and fraud that are inherent to the particular cycle being studied. Based on the risk analysis, and the level of technology in place, specific physical and IT controls are described to mitigate the risks. Since the purpose of internal controls is to mitigate risk, this risk-based approach fits more logically into a classroom discussion. Furthermore, challenging students to think about what can go wrong encourages classroom discussion and supports the notion of brainstorming as recommended by Statement on Auditing Standards (SAS) 109.

### Chapter 9, “Database Management Systems”

At one time, an accountant in the conduct of an audit could pull an invoice from a filing cabinet. Today that invoice is most likely stored in various pieces on several normalized database tables and accessing it requires an understanding of relational database structures. The chapter has been extensively rewritten to address this

growing need for modern accountants to have a working understanding of data modeling techniques. The chapter begins with an overview of database technology and describes in detail the functions and relationship between its primary elements. It then presents the key characteristics of the relational database model including data modeling, deriving relational tables from entity relationship (ER) diagrams, the creation of user views, and data normalization techniques. The chapter concludes with a discussion of distributed database issues.

## Chapter 15, “Auditing IT Controls Part I: Sarbanes-Oxley and IT Governance”

This chapter was revised to provide an introduction to IT auditing. It opens with an overview of auditing in which the key components of an audit are discussed. Topics in this revised section include auditing standards, the structure of an audit, management assertions, and the audit risk model. Next, the chapter turns to internal control and audit issues related to Sections 302 and 404 of SOX including IT control and computer fraud issues. The body of the chapter is basically unchanged from the eighth edition, which deals with the risks and controls related to IT governance including the structure of the IT function within an organization, computer center threats, and key elements of a disaster recovery planning. The final section of the chapter has been revised to examine the current issues surrounding the growing trend toward IT outsourcing. In particular, it reviews the theories underlying outsourcing and the expected benefits. IT outsourcing is also associated with significant risks, which are addressed. The chapter concludes with a discussion of audit issues related to outsourcing including the Statement on Standards for Attestation Engagements (SSAE) 16 reporting standard.

# 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 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 final 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: 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, “Managing the Systems Development Life Cycle,” and Chapter 14, “Construct, Deliver, and Maintain Systems Projects”

The chapters in Part IV 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) constructing the system and (2) delivering 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.
- The chapter then examines the increasingly important option of using commercial software packages. Conceptually, the commercial software approach also consists of construct and delivery activities. The chapter examines the pros, cons, and issues involved in selecting off-the-shelf systems.
- The chapter also addresses the important activities associated with systems maintenance and the associated risks that are important to managers, accountants, and auditors.

Several comprehensive cases designed as team-based systems development projects are available online at [www.cengagebrain.com](http://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 15, “Auditing IT Controls Part I: Sarbanes-Oxley and IT Governance”

**Chapter 15** 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 16, “Auditing 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, “Auditing IT Controls Part III: Systems Development, Program Changes, and Application Auditing”

**Chapter 17** 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 by download from the book’s website at [www.cengagebrain.com](http://www.cengagebrain.com).

#### Accessing CengageBrain

1. Use your browser to go to [www.CengageBrain.com](http://www.CengageBrain.com).
2. The first time you go to the site, you will need to register. It’s free. Click on “Sign Up” in the top right corner of the page and fill out the registration information. (After you have signed in once, whenever you return to CengageBrain, you will enter the user name and password you have chosen and you will be taken directly to the companion site for your book.)
3. Once you have registered and logged in for the first time, go to the “Search for Books or Materials” bar and enter the author or ISBN for your textbook. When the title of your text appears, click on it and you will be taken to the companion site. There you can choose among the various folders provided on the Student side of the site. **NOTE:** If you are currently using more than one Cengage textbook, the same user name and password will give you access to all the companion sites for your Cengage titles. After you have entered the information for each title, all the titles you are using will appear listed in the pull-down menu in the “Search for Books or Materials” bar. Whenever you return to CengageBrain, you can click on the title of the site you wish to visit and go directly there.

### PowerPoint® Slides

Completely updated PowerPoint® slides provide colorful lecture outlines of each chapter of the text, incorporating text graphics and flowcharts where needed. The PowerPoint® presentation is available for download from the text website.