THIRD EDITION

Accounting Information Systems

RICHARDSON | CHANG | SMITH

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Third Edition

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Mc Graw Hill

ACCOUNTING INFORMATION SYSTEMS, THIRD EDITION

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This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 LWI 24 23 22 21 20

ISBN 978-1-259-96953-9 (bound edition)
MHID 1-259-96953-3 (bound edition)
ISBN 978-1-260-70377-1 (loose-leaf edition)
MHID 1-260-70377-0 (loose-leaf edition)

Portfolio Manager: *Steve Schuetz*
Product Developers: *Sarah Wood/Allie Kukla*
Marketing Manager: *Michelle Williams*
Content Project Managers: *Fran Simon/Angela Norris*
Buyer: *Susan K. Culbertson*
Design: *Egzon Shaqiri*
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Cover Image: *Woman: Dean Drobot/Shutterstock; Cheese Shop: mariakray/Shutterstock*
Compositor: *SPi Global*
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Library of Congress Cataloging-in-Publication Data

Names: Richardson, Vernon J., author. | Chang, C. Janie, author. | Smith, Rodney (Business writer), author.
Title: Accounting information systems / Vernon J. Richardson, University of Arkansas, Xi'an Jiatong Liverpool University, C. Janie Chang, San Diego State University, Rodney Smith, California State University, Long Beach.
Description: Third edition. | New York, NY: McGraw-Hill Education, [2021] | Includes index.
Identifiers: LCCN 2019029487 | ISBN 9781259969539 (paperback)
Subjects: LCSH: Accounting–Data processing. | Information storage and retrieval systems–Accounting.
Classification: LCC HF5679 .R53 2021 | DDC 657.0285–dc23
LC record available at https://lccn.loc.gov/2019029487

The Internet addresses listed in the text were accurate at the time of publication. The inclusion of a website does not indicate an endorsement by the authors or McGraw-Hill Education, and McGraw-Hill Education does not guarantee the accuracy of the information presented at these sites.

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Dr. Smith has published research in the *Accounting Review, Journal of Information Systems, Journal of Management Accounting Research, Journal of Accounting and Public Policy,* and *International Journal of Accounting Information Systems.* He is a certified public accountant (retired), certified management accountant, chartered global management accountant, and retired captain in the U.S. Coast Guard.

His research interests include use of financial and nonfinancial measures to assess organizational performance; accounting information systems, enterprise systems, business processes, and business value; design science; and systems dynamics and business process simulation.

Preface

Whether accountants work in public accounting or in industry, they use a variety of technology tools. The International Federation of Accountants (IFAC) describes four roles for accountants with respect to information technology: **(1) *users* of technology and information systems, (2) *managers* of users of technology and related information systems, (3) *designers* of information systems, and (4) *evaluators* of information systems.** As users, managers, designers, and evaluators of technology and technology-driven business processes, accountants must understand the organization and how organizational processes generate information important to management. To ensure that processes and systems are documented—and to participate in improvements to processes and systems—accountants must be business analysts.

This text aims to provide students with a variety of technology and business analysis concepts and skills. It is intended for use in the first Accounting Information Systems course at both the undergraduate and graduate levels. Ongoing changes in business technology—such as the move to internet-based systems, Big Data and Data Analytics, software as a service, and mobile access to enterprise information, as well as increased security and control requirements—make technological skills more important than ever for accounting graduates. This text also aims to show how current changes in accounting and technology affect each of these roles. For example, the Sarbanes-Oxley Act affects financial reporting system controls, and XBRL changes system requirements and affects how companies develop and report financial information. We also consider the role of Big Data and Data Analytics and how they are used in financial accounting, managerial accounting, and auditing. Additionally, we consider both the COBIT and COSO frameworks to describe how organizations deal with risk management. In their roles as managers, designers, and evaluators, accountants must know how those frameworks affect their accounting and related information systems.

The core competencies of the American Institute of Certified Public Accountants (AICPA) emphasize accounting skills over content. This text emphasizes examples, problems, and projects through which students can develop the technological skills they need for their accounting careers. It uses real-world companies such as **Starbucks**, **Walmart**, **Google**, and **Amazon** that students can relate to. It takes a broad view of accounting information systems that emphasizes the accountants' roles in the use, management, design, and evaluation of the systems and the management information that they produce. To assist accounting students in experiencing the benefit of learning information technology/information services (IT/IS) concepts and using IT/IS skills in accounting, we focus on business processes, business requirements, how information technology supports those requirements, and how accountants contribute. In particular, this text helps students:

- **Design business processes and represent them with standard documentation tools.** The role of the accounting function has evolved from stewardship and reporting to full partnership, supporting management decisions throughout the organization. As business analysts, accountants must be able to document business processes, identify potential improvements, and design and implement new business processes. Thus, this text helps develop business process modeling skills.
- **Design and implement well-structured databases to enable business processes.** Accountants must also understand how business processes generate data and how such data are structured, interrelated, and stored in a database system. To ensure that business processes and the database systems are documented and to help make

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improvements to processes and systems, accountants must understand and be able to model such systems. Thus, this text helps develop data modeling and database implementation skills.

- **Query databases to provide insights about the performance of business operations.** Most organizational information resides in databases. To support management decisions throughout the organization, accountants must understand how those data are structured and how to retrieve information to support business management decisions. Thus, this text develops skills on the use of Microsoft Access and databases in general. This text also develops Data Analytics tools through the use of Microsoft Excel and Tableau.
- **Evaluate internal control systems and apply business rules to implement controls and mitigate information systems risks.** Recent federal legislation—for example, the Sarbanes-Oxley Act of 2002 and COSO and COBIT guidance—emphasizes the importance of risk mitigation in modern organizations. Internal control systems must constantly evolve to meet a changing risk environment. Accountants are often the internal control experts and must, therefore, understand how internal controls should be implemented in business processes as part of the organization's overall risk mitigation and governance framework. Thus, this text presents specific material on internal control and accounting information systems, as well as general information about computer fraud and security. It also describes how to monitor and audit accounting information systems.
- **Apply Data Analytics and understand the basic concepts of blockchain and artificial intelligence. This includes using three different data analytics tools: Excel, Tableau, and Power BI.** The use of technology is rapidly changing the accounting profession. The CPA exam now includes material on Data Analytics. Interest in, and use of, blockchain is exploding. Increased computing power and availability of data is driving advances in artificial intelligence. Today's accountant must be familiar with all these topics and able to use prominent tools.

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AIS 3e Content Updates

General Updates for the 3rd Edition

- Added an additional chapter on Data Analytics (now two chapters, Chapters 10 and 11), and an additional chapter on Blockchain and Artificial intelligence (all-new Chapter 12).
- Introduced to Tableau and Power BI for data analysis.
- Added additional end-of-chapter Multiple Choice Questions and Problems throughout the text.
- Significantly revised many end-of-chapter Problems for availability and auto-grading within Connect.
- Revised and added many new Discussion Questions in most chapters.
- Updated integrated projects.

Chapter by Chapter Updates

Specific chapter changes for *Accounting Information Systems,* 3rd Edition, are as follows:

Chapter 1

- Updated the opening vignette, highlighting the use of **Starbucks** Clover coffee machines.
- Updated real-world references with current examples.

Chapter 2

- Increased introductory coverage of BPMN.
- Added discussion of flow object types, including gateway and event types.
- Introduced repeating activities.
- Added introduction to data objects, data stores, and associations.

Chapter 3

- Updated discussion of how the multiplicities for associations indicate where foreign keys are posted in relational tables.
- Added discussion of business rules, decision requirements, and decision tables.

Chapter 4

- Updated the section, Using Microsoft Access to Implement a Relational Database. Figures 4.6 through 4.17 were updated using Microsoft Access 2019.
- Updated Appendix A. Figures 4.A1 through 4.A9 were updated using Microsoft Access 2019.

Chapter 5

- Added additional figures related to sales activity models.
- Updated the Chapter 5 Comprehensive Exercise.

Chapter 6

- Updated the Chapter 6 Comprehensive Exercise.

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Chapter 7

- Updated BPMN diagrams to include revisions to Chapter 2.

Chapter 8

- Revised both integrated projects to accommodate various class schedules and to allow instructors to rotate projects.
- The first of the two integrated projects is a more challenging project that includes issues related to managing inventory levels and internal inventory transfers. Other topics covered include multiple sales types, including internet, wholesale, and retail sales, where customers can pay by cash, check, or credit card.
- The second of the two integrated projects is shorter and less challenging and focuses on wholesale sales from multiple distribution centers.

Chapter 9

- Reordered chapter to emphasize importance of reporting processes.
- Updated opening vignette.
- Updated discussion on the uses of XBRL.

Chapter 10

- Introduced the AMPS model for Data Analytics.
- Introduced four types of analyses, including descriptive, diagnostic, predictive, and prescriptive analytics.
- Added four labs (one for each type of analysis) with two data sets, each illustrating Data Analytics in both Excel and Tableau.
- Added additional problems to the end of the chapter.

Chapter 11

- All-new chapter on Data Analytics.
- Provides some hands-on introduction to Data Analytics tools.
- Guides students through the use of Excel for Data Analytics.
- Guides students through the use of Tableau for Data Analytics.
- Guides students through the use of Power BI for Data Analytics.

Chapter 12

- A new chapter to introduce emerging technologies on blockchain and artificial intelligence and their impact on accounting and auditing.

Chapter 13

- Added the new components and principles of COSO ERM 2017 framework regarding enterprise risk management.
- Updated the COBIT framework using COBIT 2019.
- Updated the Appendix on ERP and control issues.

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Chapter 14

- Introduced the AICPA attestation guide on cybersecurity risk management.
- Introduced General Data Protection Regulation (GDPR) on privacy protection.
- Updated computer fraud schemes.

Chapter 15

- Updated the opening vignette.
- Added information on continuous monitoring in AIS.

Chapter 16

- Added discussion of the business model canvas as a business model development and communication tool.

Chapter 17

- Added an all-new opening vignette, highlighting Gerri Martin-Flickinger as the **Starbucks** chief technology officer and Starbucks' relationship with **Microsoft**.

Chapter 18

- Updated the opening vignette highlighting technology used at **Walmart**.
- Updated Figure 18.2 with recent information technology project outcomes.
- Added additional problems.

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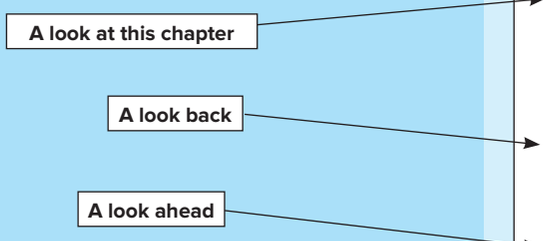
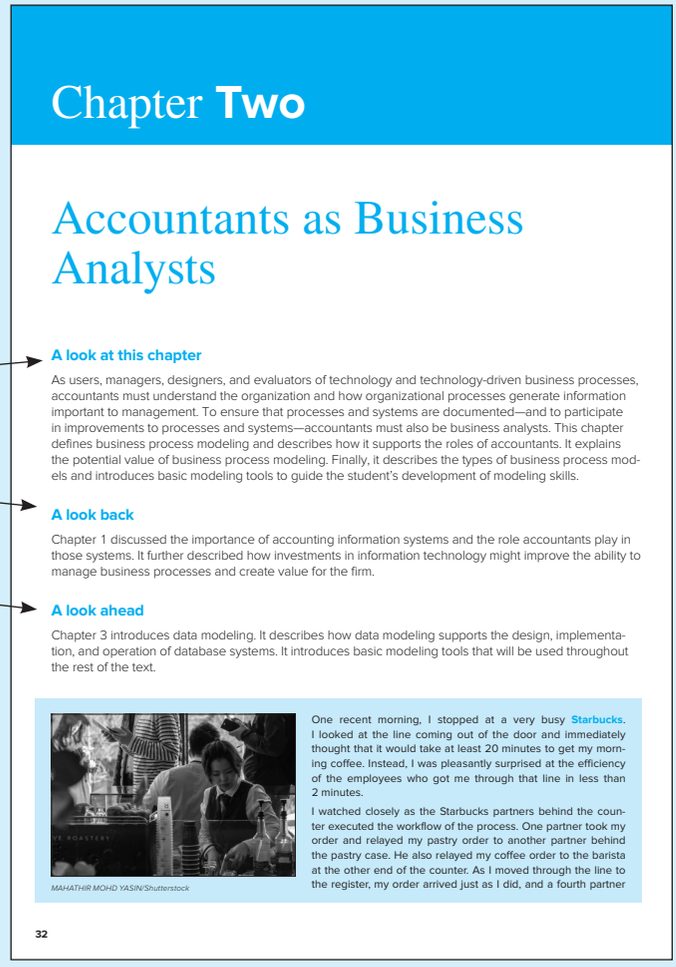
Main Features

Accounting Information Systems, 3rd Edition, focuses on the accountant's role as business analyst in solving business problems by database modeling, database design, and business process modeling.

Chapter Maps

Chapter Maps provide a handy guide at the start of every chapter. These remind students what they have learned in previous chapters, what they can expect to learn in the current chapter, and how the topics will build on each other in chapters to come. This allows them to stay more focused and organized along the way.





Chapter **Two**

Accountants as Business Analysts

A look at this chapter

As users, managers, designers, and evaluators of technology and technology-driven business processes, accountants must understand the organization and how organizational processes generate information important to management. To ensure that processes and systems are documented—and to participate in improvements to processes and systems—accountants must also be business analysts. This chapter defines business process modeling and describes how it supports the roles of accountants. It explains the potential value of business process modeling. Finally, it describes the types of business process models and introduces basic modeling tools to guide the student's development of modeling skills.

A look back

Chapter 1 discussed the importance of accounting information systems and the role accountants play in those systems. It further described how investments in information technology might improve the ability to manage business processes and create value for the firm.

A look ahead

Chapter 3 introduces data modeling. It describes how data modeling supports the design, implementation, and operation of database systems. It introduces basic modeling tools that will be used throughout the rest of the text.

MAHATHIR MOHD YASIN/Shutterstock

One recent morning, I stopped at a very busy Starbucks. I looked at the line coming out of the door and immediately thought that it would take at least 20 minutes to get my morning coffee. Instead, I was pleasantly surprised at the efficiency of the employees who got me through that line in less than 2 minutes.

I watched closely as the Starbucks partners behind the counter executed the workflow of the process. One partner took my order and relayed my pastry order to another partner behind the pastry case. He also relayed my coffee order to the barista at the other end of the counter. As I moved through the line to the register, my order arrived just as I did, and a fourth partner

32

Chapter-Opening Vignettes

Do your students sometimes wonder how the course connects with their future? Each chapter opens with a vignette, which sets the stage for the rest of the chapter and encourages students to think of concepts in a business context.

"I like how it relates many of the concepts to real companies, like Starbucks."

—Linda Wallace, Virginia Tech

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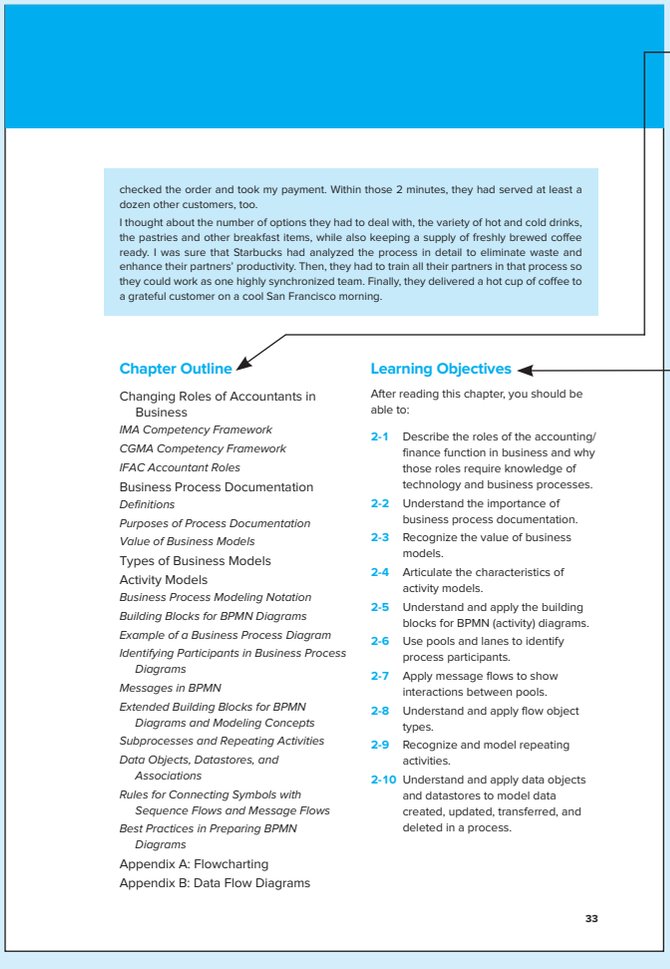
"I believe that the sequence of topics follows a logical pattern by moving from introducing the general concepts of AIS to students to internal controls and a need to automate them, to design of the DB—'backbone' of the IT system—and then to specific accounting cycles, and to general IT-related issues."

—Dmitriy Shaltayev, Christopher Newport University



checked the order and took my payment. Within those 2 minutes, they had served at least a dozen other customers, too.

I thought about the number of options they had to deal with, the variety of hot and cold drinks, the pastries and other breakfast items, while also keeping a supply of freshly brewed coffee ready. I was sure that Starbucks had analyzed the process in detail to eliminate waste and enhance their partners' productivity. Then, they had to train all their partners in that process so they could work as one highly synchronized team. Finally, they delivered a hot cup of coffee to a grateful customer on a cool San Francisco morning.

Chapter Outline

Changing Roles of Accountants in Business
IMA Competency Framework
CGMA Competency Framework
IFAC Accountant Roles
Business Process Documentation
Definitions
Purposes of Process Documentation
Value of Business Models
Types of Business Models
Activity Models
Business Process Modeling Notation
Building Blocks for BPMN Diagrams
Example of a Business Process Diagram
Identifying Participants in Business Process Diagrams
Messages in BPMN
Extended Building Blocks for BPMN Diagrams and Modeling Concepts
Subprocesses and Repeating Activities
Data Objects, Datastores, and Associations
Rules for Connecting Symbols with Sequence Flows and Message Flows
Best Practices in Preparing BPMN Diagrams
Appendix A: Flowcharting
Appendix B: Data Flow Diagrams

Learning Objectives

After reading this chapter, you should be able to:

2-1 Describe the roles of the accounting/finance function in business and why those roles require knowledge of technology and business processes.
2-2 Understand the importance of business process documentation.
2-3 Recognize the value of business models.
2-4 Articulate the characteristics of activity models.
2-5 Understand and apply the building blocks for BPMN (activity) diagrams.
2-6 Use pools and lanes to identify process participants.
2-7 Apply message flows to show interactions between pools.
2-8 Understand and apply flow object types.
2-9 Recognize and model repeating activities.
2-10 Understand and apply data objects and datastores to model data created, updated, transferred, and deleted in a process.

33

Chapter Outline

Each chapter opens with an Outline that provides direction to the students about the topics they can expect to learn throughout the chapter.

Learning Objectives

Learning Objectives are featured at the beginning of each chapter. The objectives provide students with an overview of the concepts they should understand after reading the chapter. These Learning Objectives are repeated in the margin of the text where they apply.

"Well-written with great examples. Students should like reading this book."

—Marcia Watson, Mississippi State University

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Integrated Project

Projects can generate classroom discussion, foster good teamwork, and prepare students for their accounting careers. Chapter 8 provides guidance to students on how to approach a systems project; related material provides information and data for the projects. There are now two different projects, so instructors can select the project level of difficulty to match the time available or the sophistication of their students. Both integrated projects require students to apply the different techniques they have learned in Chapters 5, 6, and 7 to a realistic situation. One project focuses on inventory management in a small business with multiple retail stores and a central warehouse. The second project also involves a small wholesale distribution business with multiple stores but without inventory management complications. Students use Microsoft Access to implement their data models and prepare financial reports in both projects.

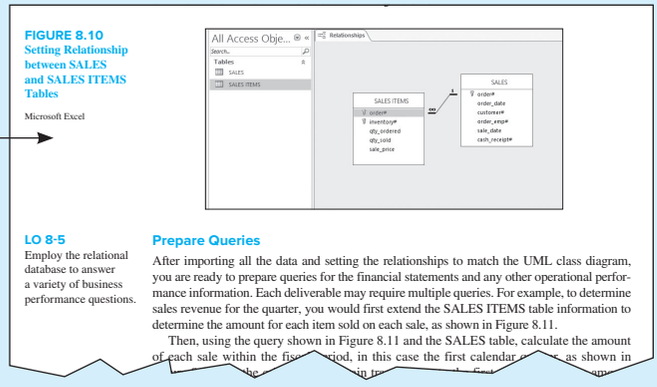

FIGURE 8.10
Setting Relationship between SALES and SALES ITEMS Tables

Microsoft Excel

LO 8-5
Employ the relational database to answer a variety of business performance questions.

Prepare Queries

After importing all the data and setting the relationships to match the UML class diagram, you are ready to prepare queries for the financial statements and any other operational performance information. Each deliverable may require multiple queries. For example, to determine sales revenue for the quarter, you would first extend the SALES ITEMS table information to determine the amount for each item sold on each sale, as shown in Figure 8.11.

Then, using the query shown in Figure 8.11 and the SALES table, calculate the amount of each sale within the fis[illegible]riod, in this case the first calendar [illegible]er as shown in

"I like comprehensive problems that extend across multiple chapters so students can see how different components of a problem fit together."

—Janice Benson, University of Wyoming

Data Analytics

Due to its importance and popularity, we have expanded coverage on Data Analytics. Chapter 10 introduces the importance and impact of Data Analytics in the business world, specifically in the accounting profession. It introduces a framework to facilitate the Data Analytics process, suggesting the AMPS model (i.e., ask the question, master the data, perform the analysis, share the story). We illustrate the AMPS model specifically by highlighting the types of questions asked; the types of data that are available; and four types of analyses, including descriptive, diagnostic, predictive, and prescriptive analysis. Chapter 11 continues the discussion and introduces students to using tools such as Excel, Tableau, and Power BI to help with reporting and visualizations.

Data Analytics brings forth significant and exciting changes to the audit profession. Auditors who adapt early to these changes will have a significant advantage over slow movers because the harnessing of Data Analytics will provide notable benefits in the upcoming years.

Progress Check

6. How will Data Analytics change the external audit?
7. How can Data Analytics allow an accountant or auditor to assess the probability of a goodwill write-down, warranty claims, or the collectability of bad debts?

LO 10-5
Describe how the AMPS model explains the data analytics process.

THE DATA ANALYTICS PROCESS: THE AMPS MODEL

Recall the analytics mindset proposed by **EY** (from the opening chapter vignette) that all of their accounting professionals will ultimately need. Figure 10.2 details the components of the analytics mindset.

Closely related to the analytics mindset, in what we consider to be an effective approach to thinking about

- Ask the right questions.
- Extract, transform, and load relevant data.
- Apply appropriate data analytic techniques.
- Interpret and share the results with stakeholders.

FIGURE 10.2
The Analytics Mindset

Source: EY, https://www.ey.com/Publication/vwLUAssets/EY_Academic_Resource_Center/$FILE/EYARC-brochure.pdf, accessed January, 23, 2019.

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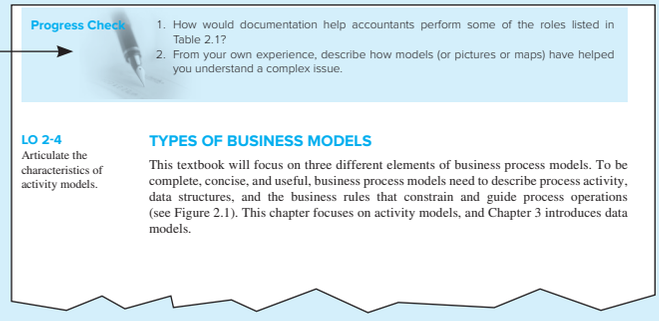
Progress Checks

These self-test questions and problems in the body of the chapter enable the student to determine whether he or she has understood the preceding material and to reinforce that understanding before reading further. Detailed solutions to these questions are found at the end of each chapter.

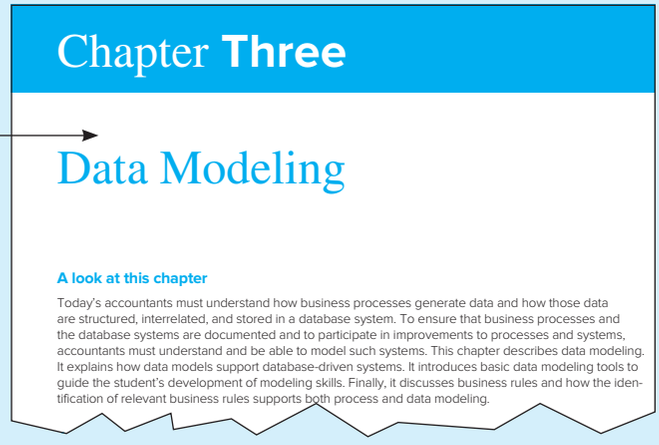


"I really like the Progress Check box. It is a great tool for students' self-assessment."

—Chih-Chen Lee, Northern Illinois University

Data Modeling and Microsoft Access

Chapter 3 describes how data modeling supports the design, implementation, and operation of database systems. Basic modeling tools are used throughout the rest of the text.



"This textbook would be good when using the database approach. It provides the information needed to develop and use a database without getting into the details of transaction processing (activities, documents, and internal control)."

—Janice Benson, University of Wyoming

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The 3rd Edition of *Accounting Information Systems* has a full Connect package, with the following features available for instructors and students.

- **SmartBook 2.0®** A personalized and adaptive learning tool used to maximize the learning experience by helping students study more efficiently and effectively. Smartbook 2.0 highlights where in the chapter to focus, asks review questions on the materials covered and tracks the most challenging content for later review recharge. Smartbook 2.0 is available both online and offline.
- **Multiple Choice Questions.** The multiple choice questions from the end-of-chapter materials are assignable in Connect, providing students with instant feedback on their answers.
- **Problems.** Select problems from the text are available for assignment in Connect to ensure students are building an analytical skill set.

Example of End-of-Chapter Problem

Problem 4-1 [LO 4-3]

Required:
Using the Cash table below, show the output for the following SQL query: **(Using the dropdowns, identify which rows and columns would included in the SQL query output shown below. Select "Not included" for rows and columns that would not be included in the output.)**

SELECT Account#, Balance
FROM Cash
WHERE Balance < 50000;

Cash				
	Account #	Type	Bank	Balance
	BA-6	Checking	Boston 5	253
	BA-7	Checking	Shawmut	48,000
	BA-8	Draft	Shawmut	75,000
	BA-9	Checking	Boston5	950

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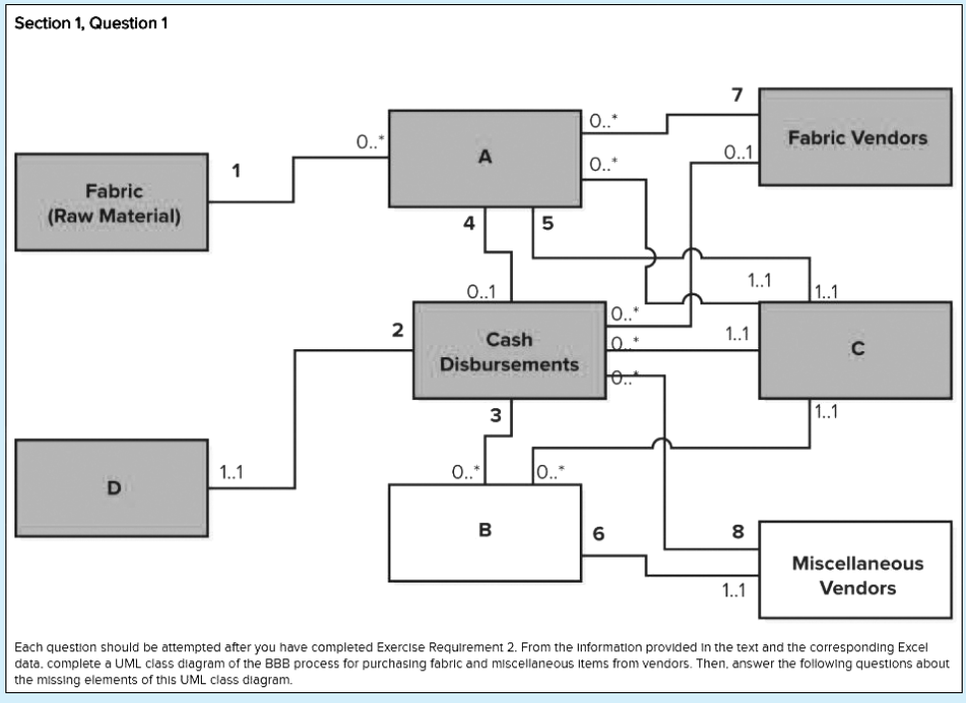
- **Comprehensive Exercises and Integrated Project.** The setup information for the Comprehensive Exercises for Chapters 5 and 6 and the Integrated Project in Chapter 8 have been added to Connect, along with the ability for students to upload their submission files for their instructors to grade.
- **Test Bank:** The Test Bank for each chapter has been updated and significantly expanded for the 3rd Edition to stay current with new and revised chapter material, with all questions available for assignment through Connect. Instructors can also create tests and quizzes from the Test Bank through our TestGen software.
- The Instructor and Student Resources have been updated for the 3rd edition and are available in the Connect Instructor Resources page. Available resources include Solutions Manuals, Comprehensive Exercise and Integrated Project setup and solutions files, PowerPoint presentations, Test Bank files, and other ancillary materials. All applicable Student Resources will be available in a convenient file that can be distributed to students for classes either directly, through Connect, or via courseware.

Example of End-of-Chapter Problem



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Acknowledgments

Throughout the development of this book, we were privileged to have the candid and valuable advice of our contributors, reviewers, and survey and focus group participants. These instructors provided us with priceless suggestions, feedback, and constructive criticism. The depth and sincerity of their reviews indicate that they are a devoted group of teacher-scholars. The content of the book over various versions and editions was greatly enhanced because of their efforts.

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Dedications

To my eldest son, Hyrum, for his love and loyalty.

—Vern Richardson

To my students and my family who have inspired and supported me.

—Janie Chang

To my wife, Gayla.

—Rod Smith

Brief Contents

Preface vii

PART ONE AIS and the Business

1 Accounting Information Systems and Firm Value 2

2 Accountants as Business Analysts 32

3 Data Modeling 66

4 Relational Databases and Enterprise Systems 88

PART TWO Business Processes

5 Sales and Collections Business Process 132

6 Purchases and Payments Business Process 168

7 Conversion Business Process 194

8 Integrated Project 216

9 Reporting Processes and eXtensible Business Reporting Language (XBRL) 226

PART THREE Data Analytics and Emerging Technologies in AIS

10 Data Analytics in Accounting: Concepts and the AMPS Model 248

11 Data Analytics in Accounting: Tools and Practice 296

12 Emerging Technologies: Blockchain and AI Automation 330

PART FOUR Managing and Evaluating AIS

13 Accounting Information Systems and Internal Controls 362

14 Information Security and Computer Fraud 396

15 Monitoring and Auditing AIS 424

PART FIVE Optional AIS Topics

16 The Balanced Scorecard, Business Model Canvas, and Business Value of Information Technology 444

17 Evaluating AIS Investments 468

18 Systems Development and Project Management for AIS 488

GLOSSARY OF MODELS 510

GLOSSARY 524

INDEX 534

ric69533_fm_i-xxix.indd xxiii 10/03/19 04:49 PM

Contents

About the Authors v

Preface vii

PART ONE AIS and the Business

Chapter 1
Accounting Information Systems and Firm Value 2

Introduction 4
Accountants as Business Analysts 4
Definition of Accounting Information Systems 5
A Simple Information System 5
Attributes of Useful Information 6
Data versus Information 7
Discretionary versus Mandatory Information 8
Role of Accountants in Accounting Information Systems 9
Specific Accounting Roles 9
Certifications in Accounting Information Systems 10
The Value Chain and Accounting Information Systems 11
AIS and Internal Business Processes 14
AIS and External Business Processes 15
The Supply Chain 15
Customer Relationship Management 17
AIS, Firm Profitability, and Stock Prices 18
AIS and Firm Profitability 18
AIS and Stock Prices 19
Summary 20
Key Words 20
Answers to Progress Checks 22
Multiple Choice Questions 23
Discussion Questions 25
Problems 26

Chapter 2
Accountants as Business Analysts 32

Changing Roles of Accountants in Business 34
IMA Competency Framework 35
CGMA Competency Framework 35
IFAC Accountant Roles 36
Business Process Documentation 36
Definitions 36
Purposes of Documentation 36
Value of Business Models 38
Types of Business Models 38
Activity Models 39
Business Process Modeling Notation 39
Basic Building Blocks for BPMN Diagrams 40
Example of a Business Process Diagram 41
Identifying Participants in Business Process Diagrams 42
Messages in BPMN 42
Extended Building Blocks for BPMN Diagrams and Modeling Concepts 43
Subprocesses and Repeating Activities 47
Data Objects, Datastores, and Associations 48
Rules for Connecting Symbols with Sequence Flows and Message Flows 49
Best Practices in Preparing BPMN Diagrams 50
Summary 50
Key Words 51
Appendix A: Flowcharting 51
Appendix B: Data Flow Diagrams 56
Answers to Progress Checks 58
Multiple Choice Questions 58
Discussion Questions 61
Problems 62

Chapter 3
Data Modeling 66

Structure Models 68
Unified Modeling Language Class Diagrams 68
Building Blocks for UML Class Diagrams 68
Best Practices in Preparing Class Diagrams 72
UML Class Models for Relational Database Design 72
Decision Requirements and Business Rules 75
Business Rules and Decision Tables 76
Summary 77
Key Words 78
Appendix A: Entity-Relationship Diagrams 79
Answers to Progress Checks 81
Multiple Choice Questions 82
Discussion Questions 86
Problems 86

ric69533_fm_i-xxix.indd xxiv 10/03/19 04:49 PM

Final PDF to printer

Chapter 4
Relational Databases and Enterprise Systems 88

Introduction 90
Definitions for Databases 90
Fundamentals of Relational Databases 91
Entities and Attributes 91
Keys and Relationships 91
Basic Requirements of Tables 93
Using Microsoft Access to Implement a Relational Database 93
Introduction to Microsoft Access 93
Steve's Stylin' Sunglasses 94
A Data Model and Attributes for Steve's Stylin' Sunglasses' Sales Process 94
Multiplicities in Steve's Stylin' Sunglasses' Data Model 95
Using Access to Implement a Simple Database for Steve's Stylin' Sunglasses 97
Structured Query Language (SQL) 104
Enterprise Systems 110
Challenges of Enterprise System Implementation 111
Enterprise Systems Computing in the Cloud 112
Summary 113
Key Words 113
Answers to Progress Checks 114
Appendix A: Creating a Form for Data Entry and Display 115
Multiple Choice Questions 122
Discussion Questions 125
Problems 125

PART TWO Business Processes

Chapter 5
Sales and Collections Business Process 132

Sales and Collection Process 134
Sunset Graphics Example 134
Company Overview 134
Sunset Graphics' Sales and Collection Process Description 135
Sunset Graphics' Activity Models 135
Basic Sales Activity Model 135
Refining the Model to Show Collaboration 136
Refining the Model to Consider Exceptions 137
Basic Internet Sales Activity Model 138
Business Rules and Sunset Graphics' Sales and Collection Process Controls 139
Application Controls 140
Sunset Graphics' Structure Models 145
UML Class Model for Quotes 145
UML Class Model for Adding Orders 145
UML Class Model for Adding Cash Receipts 146
UML Class Model for Adding Categorical Information 147
UML Class Model for Supporting Relational Database Planning 148
Sunset Graphics' Relational Database 150
Relational Database Planning for Attributes 150
Create the Database and Define Tables 151
Set Relationships 153
Comprehensive Exercise: Baer Belly Bikinis' Sales to Retailers 154
Summary 156
Key Words 156
Appendix A: Generic REA Model with Multiplicities for the Sales and Collection Process 157
Answers to Progress Checks 158
Multiple Choice Questions 159
Discussion Questions 164
Problems 164

Chapter 6
Purchases and Payments Business Process 168

Purchases and Payments Process 170
Sunset Graphics Example 170
Company Overview 170
Sunset Graphics' Purchases and Payments Process Description 170
Sunset Graphics' Activity Models 171
Basic Purchases Activity Model 171
Refining the Model to Show Collaboration 171
Refining the Model for Credit Card Payments 173
Business Rules and Sunset Graphics' Purchases and Payments Process Controls 174
Sunset Graphics' Structure Models 175
Basic UML Class Diagram for Purchases and Payments 176
Refining the UML Class Diagram for Purchases and Payments 177

Final PDF to printer

Sunset Graphics' Relational Database 178
Relational Database Planning for Attributes 178
Creating the Database and Defining the Tables 179
Comprehensive Exercise: Baer Belly Bikinis' Purchases of Fabric 180
Summary 182
Key Words 182
Appendix A: Generic REA Model with Multiplicities for the Purchases and Payments Process 183
Answers to Progress Checks 184
Multiple Choice Questions 185
Discussion Questions 189
Problems 190

Chapter 7
Conversion Business Process 194

Conversion Process 196
Sunset Graphics Example 196
Company Overview 196
Sunset Graphics' Conversion Process Description 196
Sunset Graphics' Activity Models 198
Basic Conversion Activity Model 198
Refining the Model 198
Business Rules and Sunset Graphics' Conversion Process Controls 201
Sunset Graphics' Structure Models 202
Basic UML Class Diagram for Conversion 202
Refining the UML Class Diagram for Sunset's Conversion Process 203
Sunset Graphics' Relational Database 204
Relational Database Planning for Attributes 204
Creating the Database and Defining the Tables 204
Summary 206
Key Words 206
Answers to Progress Checks 207
Multiple Choice Questions 207
Discussion Questions 212
Problems 212

Chapter 8
Integrated Project 216

Project Planning 218
Define Business Requirements 218
Prepare Activity Models Using BPMN 218
Prepare Structure Diagram 222
Import Data into Access, Create Efficient Tables, and Set Relationships 222
Prepare Queries 224
Using Queries to Develop Financial Statement Information 225
Summary 225

Chapter 9
Reporting Processes and eXtensible Business Reporting Language (XBRL) 226

Introduction 228
Data Warehouses and Data Marts 228
Business Intelligence 230
Digital Dashboards 232
Financial Reporting and XBRL 233
History and Development of XBRL 234
How XBRL Works 234
XBRL Assurance 236
XBRL GL 237
Summary 238
Key Words 238
Answers to Progress Checks 239
Multiple Choice Questions 239
Discussion Questions 241
Problems 242

PART THREE Data Analytics and Emerging Technologies in AIS

Chapter 10
Data Analytics in Accounting: Concepts and the AMPS Model 248

Big Data and Data Analytics 250
The Benefits and Costs of the Use of Data Analytics on Business and Accounting 251
The Impact of Data Analytics on Business 252
The Impact of Data Analytics on Accounting 253
Financial Reporting 253
Auditing 254
The Data Analytics Process: The AMPS Model 255
The Cyclical, Recursive Nature of the AMPS Model 256
The AMPS Model: Ask the Question 257
The AMPS Model: Master the Data 257
The AMPS Model: Perform the Analysis 261
The AMPS Model: Share the Story 263
Demonstrating Data Analysis with Excel Following the AMPS Model 263
Demonstrating Descriptive Data Analysis: Accounts Receivable Aging (Lab 1) 263

Final PDF to printer

Demonstrating Diagnostic Data Analysis: Segregation of Duties (Lab 2) 270
Demonstrating Predictive Data Analysis: Predicting Bankruptcy (Lab 3) 273
Demonstrating Prescriptive Data Analysis: Estimating the Breakeven Point (Lab 4) 280
Summary 284
Key Words 284
Answers to Progress Checks 285
Multiple Choice Questions 286
Discussion Questions 288
Problems 288

Chapter 11
Data Analytics in Accounting: Tools and Practice 296

Data Visualization Concepts 298
Common Elements of Performing and Sharing Data Analysis 299
Using Excel for Data Analysis 300
Preparing the Excel Data 300
Get Data 300
Set Relationships among Tables 300
Select Attributes for Visualizations 302
Select and Modify the Visualization 306
Using Tableau for Data Analysis 309
Get Data 309
Set Relationships among Tables 310
Select Attributes for Visualizations 312
Select Modify the Visualization 312
Using Power BI for Data Analysis 315
Get Data 315
Set Relationships among Tables 317
Select Attributes for Visualizations 317
Select and Modify the Visualization 319
Summary 322
Key Words 322
Appendix A: Sample Charts and Their Uses 322
Answers to Progress Checks 324
Multiple Choice Questions 324
Discussion Questions 326
Problems 327

Chapter 12
Emerging Technologies: Blockchain and AI Automation 330

Blockchain 332
A Brief History of Blockchain 332
What Is Blockchain? 332
When Is Blockchain Useful? 334
How Does Blockchain Work? 335
Popular Cryptocurrency Applications 337
Types of Blockchain 339
Platforms Using Blockchain Technology 340
Blockchain Applications 342
Blockchain Use Cases 342
Current Challenges with Adopting Blockchain Technology 344
The Impact of Blockchain on Audit and Assurance 344
Getting Started with Blockchain 346
Artificial Intelligence 346
Introduction to Artificial Intelligence 346
Assessing Performance 351
AI Applications Important to Accounting 352
Natural Language Processing 352
Robotic Process Automation 352
Summary 353
Key Words 354
Answers to Progress Checks 355
Multiple Choice Questions 356
Discussion Questions 360

PART FOUR Managing and Evaluating AIS

Chapter 13
Accounting Information Systems and Internal Controls 362

Introduction 364
Ethics, the Sarbanes-Oxley Act of 2002, and Corporate Governance 364
The Need for a Code of Ethics 364
Corporate Governance as Addressed by Sarbanes-Oxley 364
Control and Governance Frameworks 366
Overview of Control Concepts 366
Commonly Used Frameworks 366
COSO Internal Control Framework 367
COSO ERM Framework 370
COBIT Framework 379
Information Technology Infrastructure Library 381
ISO 27000 Series 382
Comparing Control/Governance Frameworks 384
Summary 384
Key Words 384
Answers to Progress Checks 386
Appendix: ERP Architecture and Control Issues 386

Final PDF to printer

Multiple Choice Questions 388
Discussion Questions 390
Problems 391

Chapter 14
Information Security and Computer Fraud 396

Introduction 398
Information Security and Systems Integrity 398
Information Security Risks and Attacks 398
Encryption and Authentication 399
Cybersecurity Risk Management Framework by AICPA 403
Computer Fraud and Abuse 403
Computer Fraud Risk Assessment 404
Computer Fraud Schemes 405
Computer Fraud Prevention and Detection 407
General Data Protection Regulation 408
Vulnerability Assessment and Management 408
Types of Vulnerabilities 409
An Overall Framework for Vulnerability Assessment and Management 410
System Availability 411
Disaster Recovery Planning and Business Continuity Management 412
Summary 413
Key Words 414
Answers to Progress Checks 415
Multiple Choice Questions 416
Discussion Questions 420
Problems 420

Chapter 15
Monitoring and Auditing AIS 424

Introduction 426
Computer Hardware and Software 426
The Operating System 426
Database Systems 427
LANs and WANs 428
Wireless Networks 431
Computer-Assisted Audit Techniques 432
Continuous Monitoring and Continuous Auditing 434
Summary 437
Key Words 437
Answers to Progress Checks 438
Multiple Choice Questions 438
Discussion Questions 441
Problems 442

PART FIVE Optional AIS Topics

Chapter 16
The Balanced Scorecard, Business Model Canvas, and Business Value of Information Technology 444

Balanced Scorecard Framework 446
Learning and Growth Perspective 447
Process Perspective 447
Customer Perspective 448
Financial Perspective 448
Framework Integrating Strategy, Operations, And IT Investment 449
Role of AIS/IT in a Balanced Scorecard Framework 449
Using a Balanced Scorecard Management Process 451
Role of AIS/IT in the Balanced Scorecard Management Process 452
IT Governance Institute Val IT Framework 453
Implementing Val IT Governance 454
Business Model Canvas 455
Elements of the Business Model Canvas 455
Impact of Information Technology 458
Similarities with Strategy Maps 458
Summary 459
Key Words 460
Multiple Choice Questions 461
Discussion Questions 466
Problems 466

Chapter 17
Evaluating AIS Investments 468

Large IT Projects Require Economic Justification 470
The Business Case for IT Initiatives 470
Assessing Business Requirements for IT Initiatives 471
Estimating Benefits 472
Estimating Costs 473
Acquisition Costs 473
Operating Costs 474
Assessing Risks 474
Developing the Value Proposition 476
Test the Sensitivity of Estimates to Changes in Assumptions 478
Prepare the Value Proposition 478
Summary 478
Key Words 479
Answers to Progress Checks 480

Final PDF to printer

Multiple Choice Questions 480
Discussion Questions 482
Problems 483

Chapter 18
Systems Development and Project Management for AIS 488

Introduction 490
Description of the Systems Development Life Cycle 490
Effective Information Technology Planning 492
Projects, Project Management, and Project Sponsors 493
Challenges of IT Project Management 494
Constraining Factors of IT Projects 495
Scope 496
Cost 496
Time 496
The 15-15 Rule 496
Project Management Tools 497
Will the System Be Used, and Will It Be Useful? 499
Addressing Perceived Usefulness 500
Addressing Perceived Ease of Use 500
Summary 501
Key Words 502
Answers to Progress Checks 503
Multiple Choice Questions 504
Discussion Questions 506
Problems 506

GLOSSARY OF MODELS 510
Structure Models Using the REA Framework 510
Activity Models Using BPMN 519

GLOSSARY 524

INDEX 534