

Accounting Information Systems

Third Edition

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ACCOUNTING INFORMATION SYSTEMS, THIRD EDITION

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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

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.

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.

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.

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.

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.

A look at this chapter

A look back

A look ahead

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.



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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

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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

“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 Modelling 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.

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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.”

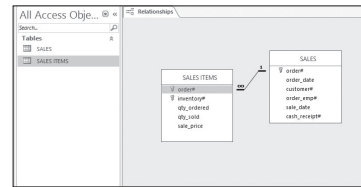
—Marcia Watson, Mississippi State University

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 first period, in this case the first calendar quarter, 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

- How will Data Analytics change the external audit?
- 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/SFILE/EYARC-brochure.pdf, accessed January 23, 2019.

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.

Progress Check

1. How would documentation help accountants perform some of the roles listed in Table 2.1?
2. From your own experience, describe how models (or pictures or maps) have helped you understand a complex issue.

LO 2-4
Articulate the characteristics of activity models.

TYPES OF BUSINESS MODELS

This textbook will focus on three different elements of business process models. To be complete, concise, and useful, business process models need to describe process activity, data structures, and the business rules that constrain and guide process operations (see Figure 2.1). This chapter focuses on activity models, and Chapter 3 introduces data models.

“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.

Chapter Three

Data Modeling

A look at this chapter

Today’s accountants must understand how business processes generate data and how those data are structured, interrelated, and stored in a database system. To ensure that business processes and the database systems are documented and to participate in improvements to processes and systems, accountants must understand and be able to model such systems. This chapter describes data modeling. It explains how data models support database-driven systems. It introduces basic data modeling tools to guide the student’s development of modeling skills. Finally, it discusses business rules and how the identification of relevant business rules supports both process and data modeling.

“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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- **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.
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- **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:

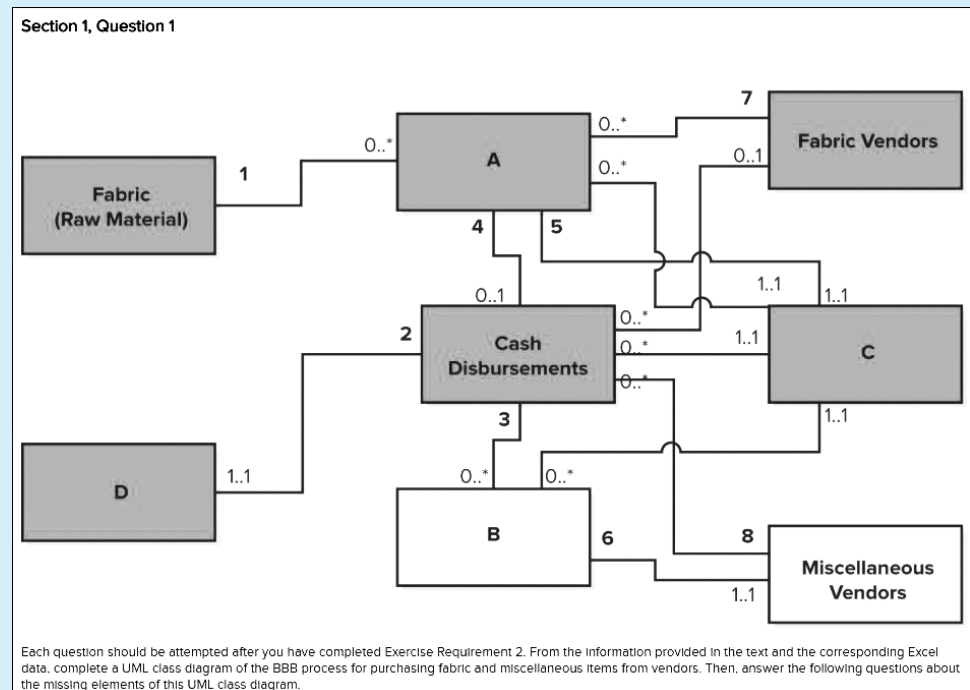
Using the Cash table below, show the output for the following SQL query: **(Using the dropdowns, identify which rows and columns would be included in the SQL query output shown below. Select "Not Included" for rows and columns that would not be included in the output.)**

```
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

- **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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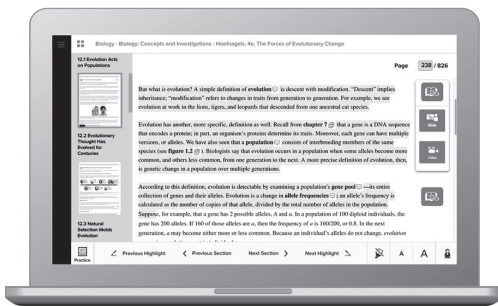
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- Jordan Cunningham,
Eastern Washington University



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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

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