

10e

ACCOUNTING INFORMATION SYSTEMS

An abstract painting with various colors and textures. The left side features warm tones like orange and yellow, with a prominent blue curved shape. The right side is dominated by cooler tones like purple, blue, and green, with a dark blue shape at the bottom. The overall style is expressive and textured.

GELINAS • DULL • WHEELER

ACCOUNTING
INFORMATION
SYSTEMS

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10e

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*We dedicate this tenth edition
to our wives, Roxanne, Susan, and
Kay, with grateful appreciation for their
patience and support throughout this project.*

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PREFACE

Welcome to the beginning of a journey through the dynamic field of accounting information systems. We are very pleased that you have chosen to become another member of our international community of students, accounting professionals, and educators who make this book an integral part of their library as a text and reference tool. We are committed to making the journey through this complex, challenging, and exciting topic as straightforward and pleasant as possible. These challenging topics are tackled in a conversational and relaxed tone, rather than pretentious, technical language. At the same time, the text fully explores the integrated nature of the topic with its foundations in information technology, business processes, strategic management, security, and internal control. Thank you for the opportunity to serve as your guide on this journey. Before beginning, let's discuss two key ideas that inspire the story in the text. First, the accountant is defined as an information management and business measurement professional. Second, information systems consist of integral parts working together to enable the organization to progress and move forward. These two philosophies are briefly described before addressing the most frequently asked questions (FAQs) by users of this book.

Accountant as an Information Management and Business Measurement Professional

There is no doubt that the long-standing image of the accountant as a conservative, green eye shaded, nonsocial employee who is tucked in the back room of an organization has been forever shattered. Today's accounting professional is relied on by owners and managers to identify and monitor enterprise risks (events that may cause an entity to fail to achieve its objectives); assure the reliability of information systems used to gather, store, and disseminate key information for decision making; and possess the essential general business knowledge, coupled with business process measurement and assessment skills, needed to evaluate the state of the business enterprise and its supporting operations. In a post-Enron/post-WorldCom era, a primary focus of organizations is on governance, both organizational and IT, and enterprise risk management (ERM). The accounting professional (as external auditor, internal auditor, corporate accountant, or manager) is increasingly expected to take the leadership role in enhancing organizational governance and identifying and mitigating enterprise risks.

Accordingly, the accounting professional must arrive on the job equipped with a solid understanding of (1) key information qualities, (2) critical information technologies that drive the information systems, (3) core business processes that allow an organization to operate effectively and efficiently, (4) common documentation tools used to diagram and assess business processes, and (5) vital organizational and IT governance and internal control concepts that can be applied to mitigate risks. Each of these fundamental knowledge requirements is addressed throughout this book.

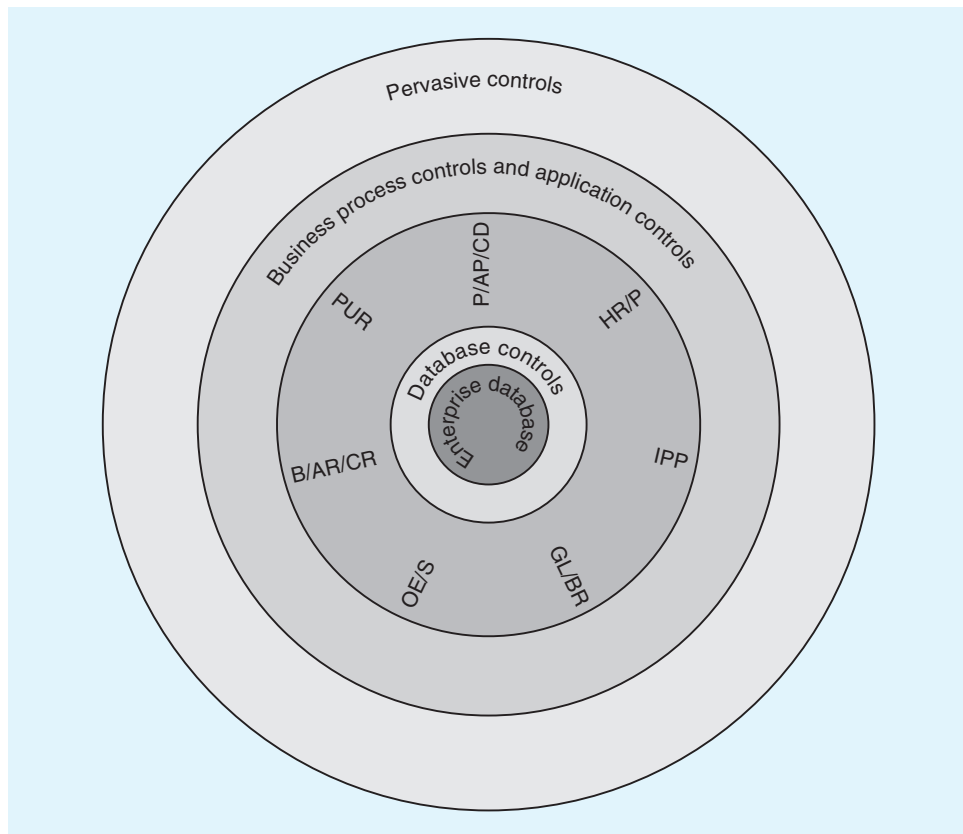
Information Systems: Integrated Elements Moving the Organization Forward

In today's IT-centric world, organizations clearly can neither operate nor survive—much less thrive—without information systems. The quality of the information systems and the reliability of the information available through such systems dictate, to a large degree, the effectiveness of decision making within the organization. Without good information, managers cannot make sound decisions. It is imperative that all pieces of the information system be in sync and operating effectively if the enterprise as a whole is to operate effectively and efficiently and move forward in a positive direction. **Figure P.1** shows the integrated nature of information systems components. These elements must be sound across all dimensions for the organization to safely, yet quickly, move forward. Any weakness in these elements puts successful outcomes at risk. The enterprise depends on safe and secure information systems that allow the organization to move forward in a controlled, yet competitive, manner.

Following are the five integral components of the information system:

- *An enterprise database* stores data related to an enterprise's activities and resources. This includes views of the database for each business process that supports effective decision making and allows the processes to operate effectively.
- *Database controls* that safeguard data in an enterprise database from illicit access, destruction, and corruption.

FIGURE P.1 Information Systems-Integrated Elements



- *Business processes* (e.g., OE/S, B/AR/CR) that reflect the core activities undertaken by an organization in achieving its business objectives. These processes include such activities as selling goods or services, collecting payment, purchasing materials or inventory, paying for those items, hiring and retaining a quality set of employees, and producing goods or services for sale. All of the processes both use and generate data that is stored in the enterprise database.
- *Business process controls and application controls* are the procedures put in place within each business process to identify specific business risks, prevent identified risks from disrupting operations or corrupting data, detect failures that get past preventive measures, and correct detected errors and irregularities that slip past the control boundary.
- *Pervasive controls* represent the overall organizational governance structure and related control procedures that are designed to create a regulated organization that can face the challenges of the external business environment, keep the enterprise on track and moving forward in a controlled manner, as well as outperforming its competitors.

Each of these components is explored in detail throughout the book. After completing the study of the concepts presented in this text, you should have a strong grounding in the critical knowledge necessary to help an organization create and manage effective information systems that minimize related enterprise risks.

Frequently Asked Questions (FAQs)

When examining a book and considering how to most effectively acquire the information in which you are particularly interested, several questions may arise that need to be answered to help make this process more efficient. In the FAQ section of the preface, we will answer the questions most frequently asked by previous adopters and readers of this book. Hopefully, the answers to your most pressing questions can be found in the following paragraphs.

FAQ #1: What Are the Core Themes of This Book?

The book's focus is on providing the skills necessary for a foundation in enterprise risk management (ERM)—particularly as these risks pertain to business processes and their information systems components. Fundamental to an ERM orientation, from an information systems perspective, are the underlying enterprise systems, e-business systems, and controls for monitoring the operation of these systems. The emphasis on these core themes is apparent even by reviewing the table of contents. Chapters 2 and 3 immediately focus on enterprise systems and e-business in the introductory section of the text. Controls are the focus of Chapters 7, 8, and 9. More importantly, however, these themes are carried throughout the remainder of the text in the integrative fashion for which the previous nine editions have been written. Icons are included in the margins throughout the book to help emphasize the coverage of these core themes in their integrated state and to facilitate absorption of the material by the reader. Given the critical nature of these three themes, the following paragraphs provide brief explanations for each.

Enterprise Systems Enterprise systems integrate the business process functionality and information from all of an organization's functional areas, such as marketing and sales, cash receipts, purchasing, cash disbursements, human resources, production and logistics, and business reporting (including financial reporting). They enable the

coordinated operation of these functions and provide a central information resource for the organization. The concept of enterprise systems can be realized in various ways. For instance, an organization might develop its own separate business process systems and tie them together in an integrated manner. Or an organization could purchase an enterprise system from a vendor. Such externally acquired systems are commonly called enterprise resource planning (ERP) systems—software packages that can be the core systems necessary to support enterprise systems. A number of ERP systems are commercially available, with SAP® and Oracle® dominating the large- and medium-sized enterprise markets. The Microsoft® Dynamics™ line of products is a major player in the small- and medium-sized enterprise markets. Many organizations use a combination of ERP systems, externally purchased subsystems, and internally developed subsystems to create an overall enterprise system that best fits their needs.

E-Business E-business (electronic business) is the application of electronic networks (including the Internet) to exchange information and link business processes among organizations and individuals. These processes include interaction between back-office (i.e., internal) processes, such as distribution, manufacturing, and accounting, and front-office (i.e., external) processes, such as those that connect an organization to its customers and suppliers. Traditionally, e-business has been driven in business-to-business (B2B) environments through electronic data interchange (EDI). The most familiar form of e-business is the business-to-consumer (B2C) model where interactions are largely driven by browser-based applications on the Internet. This communication medium has spilled over into the B2B arena, replacing EDI in some cases, while also providing opportunities for new B2B interaction in this rapidly changing environment.

Controls Internal control is a process—effected by an entity’s board of directors, management, and other personnel—designed to provide reasonable assurance regarding the achievement of objectives in the following categories: effectiveness and efficiency of operations, reliability of reporting, and compliance with applicable laws and regulations. A strong system of internal controls is imperative for effective ERM and is of great interest to top management, auditors, and external stakeholders.

FAQ #2: How Does This Book Present Accounting Information Systems?

This book is organized into six parts. The following paragraphs discuss briefly each of the components of this book.

Part 1: Understanding Information Systems consists of three chapters. Chapter 1 provides an overview of basic information systems concepts and explores the critical characteristics of information that must be considered in systems design and evaluation. Chapter 2 introduces the concept of enterprise systems and the key role that these systems play in the successful and timely operation of contemporary enterprises. Chapter 3 addresses the extended enterprise environment, the e-business relationships that an organization forms when linking its organization with the individuals or other organizations that represent their customers and vendors, as well as other stakeholders.

Part 2: Organizing and Managing Information includes three chapters. Chapter 4 provides the basic tools necessary for diagrammatically documenting organizational data flows (data flow diagrams—DFDs) and business processes (systems

flowcharts). This chapter is divided into sections focusing first on reading documentation and then on creating documentation to meet the varied needs of our readers. Chapter 5 provides a more comprehensive exploration of data storage methods, the role of databases in data management, and the various business intelligence tools that are available for making sense out of the vast enterprise databases to enhance strategic decision making. Chapter 5 also includes sections on reading and understanding entity relationship (E-R) diagrams (used to model database structures). Chapter 6 takes a deeper look at modeling information systems using the Resources-Events-Agents (REA) method, creating E-R diagrams, mapping these diagrams to relational databases, and using SQL to manipulate and retrieve data from relational databases.

Part 3: Enterprise Risk Management consists of three chapters exploring the various dimensions of organizational governance and associated effective internal control systems. Chapter 7 contains an overview of internal control frameworks, including the new framework *Enterprise Risk Management—Integrated Framework*; general organizational governance guidelines; and the changes effected by the Sarbanes-Oxley Act of 2002. Chapter 8 begins with a discussion of pervasive controls that apply to both manual and IT environments. This is followed by sections designed around COBIT, an internationally recognized framework for IT control that focuses on the controls that address risks emanating from information systems and can put an enterprise in a condition of acute risk if not properly monitored and controlled. Chapter 9 focuses on the control procedures applicable to minimize such risks and presents a methodology for comprehensively evaluating the risks and controls within a defined business process. This framework is subsequently demonstrated and applied across the business processes presented in Chapters 10 through 14.

Part 4: Business Processes examines the various processes that are necessary for an enterprise to successfully operate. These six chapters focus on applications supported by ERP system implementations (including exhibits of screens from SAP® and Microsoft Dynamics GP® software), the key controls for maintaining successful business processes, and the application of the methodology for evaluating risks and controls within a given business process. The order-to-cash (revenue) flows are captured in Chapter 10 and 11. The purchase-to-pay (expense) flows are captured in Chapter 12 and 13. We round out coverage of the core business processes with Chapter 14, “The Human Resources (HR) Management and Payroll Processes,” and Chapter 15, “Integrated Production Processes (IPP).”

Part 5: Reporting includes Chapter 16, which deals with the reporting process, in which information from core business processes is developed into financial reports for internal and external usage. This chapter includes basics, such as information flows related to the process, as well current technologies, such as ERPs and XBRL.

Part 6: Acquiring an AIS consists of Chapter 17, which provides an overview of the selection of accounting information systems, including the choices related to the buy-versus-build decision. With extensive use of off-the-shelf software, including ERP software that can be modified to fit the business needs of an enterprise, Chapter 17 provides details that should be considered when selecting the appropriate software. The chapter also provides information to help interpret the proper use of internal and external sources. The chapter includes topics such as AIS acquisitions from third parties and the systems development life cycle (analysis, selection and design, implementation, and operation phases).

FAQ #3: Where Can I Find Information About the Sarbanes-Oxley (SOX) Act of 2002, Especially SOX Section 404?

To help you find information regarding the Sarbanes-Oxley Act of 2002, we have added SOX icons in the margins where the topic is covered. Chapter 1 provides an overview of Sections 404 and 409 of SOX, including the overall implications for the accountant as an information management and business measurement professional. Chapter 4 discusses preparing documentation of business processes, a first step in a SOX 404 review. Chapter 7 describes the effect of SOX Sections 210, 302, and 404 on organizational governance, IT governance, and ERM. Chapters 7 through 9 describe the requirements of SOX 404 and PCAOB Auditing Standard No. 5 regarding the “effectiveness of design of internal controls” (leaving the “effectiveness of operations of internal controls” for the auditing courses and texts). Chapters 7 through 14 also introduce and use the control matrix, a tool used by systems designers and auditors to assess the effectiveness of control design and by auditors to design tests for effectiveness of operations of internal control. Finally, Chapter 16 discusses the effect on internal control reporting and financial reporting as the requirements in SOX Sections 302, 401, 404, and 409.

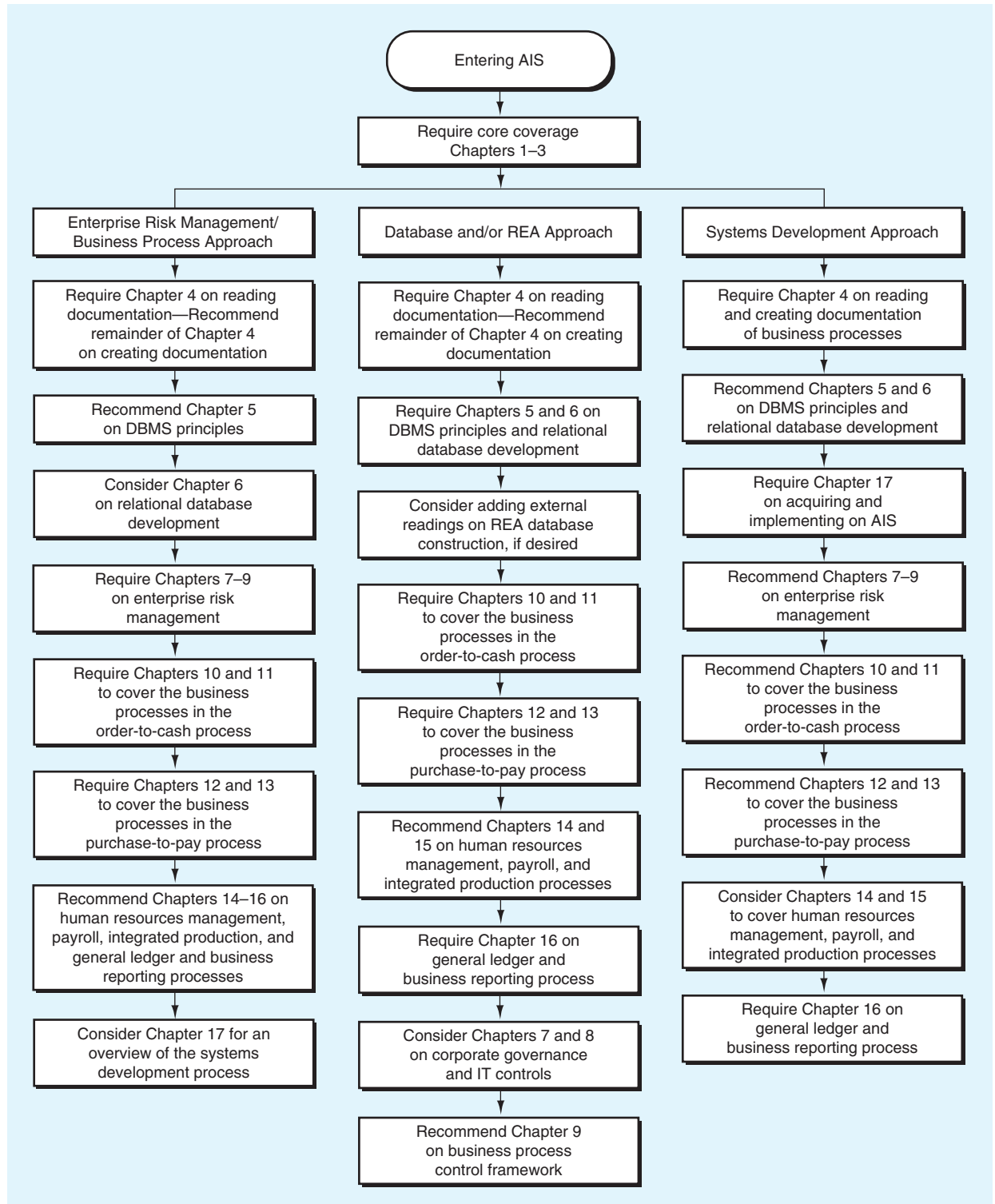
FAQ #4: How Can This Book Be Adapted to Meet a User’s Desired Content Coverage?

*Learning from an enterprise risk management (ERM) approach,*¹ a user should focus on three key components of the text: (1) documentation tools for diagramming and analyzing business processes, (2) ERM and component internal control concepts, and (3) core business processes enabling enterprises to successfully complete order-to-cash (revenue) and purchase-to-pay (expenditure) activities. An ERM focus also necessitates the consideration of enterprise systems and e-business concepts. But, given that these are fundamental threads running throughout the text, they should be covered with any approach. Coverage of ancillary topics related to database management systems and other key business processes is recommended (e.g., human resources management and payroll processes, integrated production processes, and the general ledger and business reporting process). Depending on a user’s interests, exploring relational databases in detail or covering only the foundations of the systems development process may be necessary. Recommendations and options are depicted in **Figure P.2** to assist in the decision process.

Learning from a database or REA approach, a user would want to focus on two key components of the text: (1) documentation and modeling skills for relational databases and (2) core business processes that must be integrated in enterprise-level databases. Additionally, the user would want to confer with appropriate external support specifically focused on REA modeling techniques if extended coverage is desired. A database approach can be used with the text without these additional materials if REA models are not necessarily a preference. Again, a database approach also would necessitate the consideration of enterprise systems concepts, which are fundamental threads running throughout the text. A database approach may focus on only a limited core set of chapters combined with an outside database software text or may be

¹This approach also might be called the *business process approach*, *the accounting applications approach*, or *the accounting cycles approach*.

FIGURE P.2 Selecting Chapters to Meet Selected Pedagogical Objectives



supplemented with other key AIS topics, additional business processes, corporate governance, and IT controls. Our recommendations and options are depicted in Figure P.2 to assist in the decision process.

Learning from a systems development approach, a user would want to focus on three key components of the text: (1) documentation tools for diagramming and analyzing business processes, (2) structured systems analysis and design (Chapter 17), and (3) core business processes enabling enterprises to successfully complete order-to-cash (revenue) and purchase-to-pay (expenditure) activities. A systems development approach also necessitates the consideration of enterprise systems—a fundamental thread running throughout the text. Coverage is recommended of ancillary topics related to database management systems, ERM, and general ledger and business reporting. Depending on a user's interests, it may be necessary to explore relational databases in detail and to cover human resources management and payroll and integrated production processes. Recommendations and options for this approach are also depicted in Figure P.2.

FAQ #5: Does the Book Fit the Core Competencies Guidelines of the AICPA Vision Project?

Several professional bodies across the globe have undertaken projects to better understand how the environment of professional accounting is changing and how these changes impact the required competencies for skilled professionals. Although responding to all of the reports around the globe is not possible in this preface, we will briefly review how the text facilitates the preparation of new professionals based on the results of one such report—the American Institute of Certified Public Accountants (AICPA) CPA Vision Project. Let's take a look at how this book supports the knowledge prerequisites for attaining each of the AICPA CPA Vision Project's five identified core competencies:

- *Communication and Leadership Skills*: Development of communication and leadership comes largely through practice. The study of AIS provides great opportunities for students to participate in written and oral presentations about the analysis of problems. Throughout the text, a host of documentation tools are covered and applied, including flowcharts, data flow diagrams, narratives, entity-relationship diagrams, and control matrices. Chapter 17 describes a variety of reports used in the systems analysis and design process. Mastery of these tools can facilitate effective synthesis and communication of complex information in an easily explained form.
- *Strategic and Critical Thinking Skills*: The documentation tools noted under the communication section further enhance a student's ability to link data, knowledge, and insight related to information technology, internal control, and business processes to solve complex problems. Numerous short and long cases along with concise problems are presented throughout the book to provide ample opportunity to practice the critical and strategic skills necessary to relate to business environments.
- *Focus on the Customer, Client, and Market*: The early segments of the book are oriented toward assembling a set of foundational skills related to documentation, systems environments, enterprise systems, e-business, and internal control assessment.

The later chapters bring all the information together to analyze the business processes of an entity. This analysis integrates the information for management

decision making; the aggregation and processing of information, key controls, and business process objectives allows a student to better understand the full scope of an organization's business processes, not just the accounting aspects. This prepares students for entering different business environments, analyzing business activities, and identifying areas for strategic improvement.

- *Interpretation of Converging Information:* As noted under the prior competency statement on customers, clients, and markets, the core chapters of this text address the integration of financial and nonfinancial information to solve problems. Consideration of nonfinancial information is usually the weakest point for accounting graduates, and the strategies used in the text should help counteract this weakness.
- *Technologically Adept:* Throughout the text, emerging technologies that are reshaping the business environment are described and demonstrated within the context of a business process. The focus on emerging technologies helps the student to understand how new technologies can be used to improve business efficiency and effectiveness and to leverage competitive advantage.

FAQ #6: How Does the Text Help Prepare Students for the U.S. CPA Exam?

In the United States, the CPA Examination is of interest for those about to enter the accounting profession. Recent changes in the exam have not significantly affected this book because the philosophy has long been consistent with the exam's evolving content. Students need to have a broad understanding of the business environment, how information is used by business decision makers, and the organizational control structures that should be in place to minimize risk to the enterprise. Thus, this book continues to be an excellent source for helping students prepare for the testing methods and exam content. The exam testing methods require the use of certain software tools but also use a host of case studies, called "simulations," to provide information that must be critically examined and synthesized. The extensive use of small and large cases in this book should help students prepare for these simulation problems. The book's approach emphasizes several skills being tested by the current exam: communication, research, analysis, judgments, and comprehension.

As for content on the exam, this book is also well positioned to help. The auditing and attestation section of the exam requires examinees to have an understanding of enterprise-level controls and the technology-based environments in which auditing is conducted. This book emphasizes enterprise systems, e-business, database environments, control frameworks, IT controls, and business process environments—all of which will be helpful in the exam environment. Technology concepts are even more critical in preparing for the business environment and concepts portion of the exam. That section of the exam not only includes technology but also covers business structure (an item addressed within the context of each business process in the text), measurement (i.e., managerial), and general business environments and concepts. As to this latter section, the detailed business process chapters (Chapters 10 through 16) describe the overall business context and how information flows from the transaction side through to be used by key management decision makers. This presentation should aid in understanding how contemporary organizations operate. The focus in the book on enterprise systems and e-business should further aid in preparing for exam coverage of state-of-the-art technologically enabled business environments.

Instructors may also assign end-of-chapter questions and problems that are targeted to specific content standards of the CPA exam. See the *Instructional Supplements* section below, which describes the classification matrices in the *Solutions Manual*. These matrices identify where each end-of-chapter question/problem covers specific expectations of education, from the perspectives of the authors, based on the AICPA's content standards for the CPA Exam.

FAQ #7: Does the Book Provide a Foundation for ISACA's CISA Exam?

Another question that frequently arises is whether the foundation-level skills for the Information Systems Audit and Control Association's (ISACA) Certified Information Systems Auditor (CISA) Exam are covered. Foundation-level skills are also commonly required for several other global accounting organizations' certification processes for IT specialization.

Let's take a brief look at the six content areas covered by the CISA Exam (as of the June 2011 exam):

- *Content Area 1—IS Audit Process (10% of the exam)*: Chapters 7 through 9 provide the foundation for understanding how to assess the risks that must be considered in contemporary risk-based audit approaches. Chapters 7 through 14 describe control objectives and controls related to information systems.
- *Content Area 2—IT Governance (15%)*: Chapters 7 and 8 introduce organizational and IT governance frameworks and discuss related issues such as IT organizational structures, IT strategy, and risk management. Chapters 7 and 8 also give extensive coverage to the COSO, ERM, and COBIT control frameworks.
- *Content Area 3—Systems and Infrastructure Life Cycle (16%)*: Chapters 8 and 17 describe best practices for project governance and systems development, including requirements analysis, systems acquisition, and change controls. Chapters 9 through 14 give extensive coverage to control objectives and techniques for IT systems applications/business processes. Finally, Chapters 2 and 3 describe enterprise architectures for data, applications, and technology, including enterprise systems, Web services, and Web-based applications. These are further discussed in the context of specific business processes in Chapters 10 through 14.
- *Content Area 4—IT Service Delivery and Support (14%)*: Chapters 2 and 3 introduce IT infrastructures and discuss how these can support organization objectives. These issues are further discussed in the context of specific business processes in Chapters 10 through 14. Chapter 8 introduces best practices for the management of IT operations. Chapters 5 and 6 describe database management systems.
- *Content Area 5—Protection of Information Assets (31%)*: Chapters 7 through 9 focus on the control structures that should be in place at the environmental, physical, and logical levels to provide both pervasive and specific controls over IT systems. These controls include logical and physical access to IT assets, encryption and public-key cryptography, and environmental protection.
- *Content Area 6—Business Continuity and Disaster Recovery (14%)*: Chapter 8 provides an overview of the core concepts underlying disaster recovery and business continuity in business environments. Although the knowledge is at a foundational level, the concepts are easily extended because the business process environments are explored later in the text.

Instructors may also assign end-of-chapter questions and problems that are targeted to specific content areas of the CISA exam. See the *Instructional Supplements* section below, which describes the classification matrices in the *Solutions Manual*. These matrices identify where each end-of-chapter question/problem covers specific expectations of education from the perspectives of the authors, based on the AICPA's content standards for the CPA Exam.

Instructional Supplements

This book includes the following supplemental materials to assist the instructor:²

- The *Test Bank* presents a variety of questions, including true/false, multiple-choice, completion, problems, and essays. The *Test Bank* can be found on the text Web site at www.cengagebrain.com.
- The *Solutions Manual* (available on the text Web site), provides answers to Discussion Questions, Short Problems, and Problems in the text's end-of-chapter material. Included in the *Solutions Manual* is a matrix identifying where each question covers specific expectations of education, from the perspectives of ISACA, the AACSB, and the AICPA.
- *Note to Instructors*: The *Solutions Manual* provides instructors with ways to tailor how problems are assigned and how solutions are provided to students, for a more engaging learning experience. For example, instructors can provide a partially completed control matrix, asking students to complete the problem based on their studies. Alternatively, based on a completed flowchart, students can analyze the system to recommend improvements or generate a control matrix.
- PowerPoint slides (available on the text Web site) cover all major concepts and key terms and are presented in an appealing way designed to hold the student's interest and effectively communicate lecture material.
- The Bentley Term Project, (available on the text Web site) is an updated version of a term project that has been used for more than 25 years with this text at Bentley University. The term project is designed to incorporate the concepts taught in the text into a comprehensive, cohesive project. The learning objectives of the project are to help the student examine an actual business process, document the process, analyze process controls, and recommend changes to improve operational and information process effectiveness.

Student Supplements

This book includes the following supplemental materials to assist students:

- A student Web site is available for the 10th edition of *Accounting Information Systems* which houses ample study resources that are free to students. Visit www.cengagebrain.com to access the Web site. Here you will have access to all student resources, including chapter-by-chapter quizzes, flashcards, crossword puzzles and a list of key terms.

²Many text adopters use these materials for graded assignments and exams. In consideration of these adopters, we ask that you not post any of these materials to an open Web site.

- Many chapters of the text include Microsoft Access[®], Excel[®], and new Microsoft Visio[®] exercises, enabling students to develop greater database and spreadsheet software skills. These exercises can be found in the Short Problems or Problems at the end of each chapter and are identified with Access, Excel, and Visio icons.

Accessing CengageBrain

- Use your browser to go to www.cengagebrain.com.
- 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.)
- Once you have registered and logged in for the first time, go to the Search 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. 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 after you log in.

New to this Edition

- Chapter 3 now includes discussion of "EDI over the Internet," expanding on the Methods for Conducting E-Business topic.
- New discussions in chapters 5 and 6: "Computer Forensics and Accounting - eDISCOVERY," and "Computer Forensics and Accounting - Business Intelligence, Business Analytics, and Fraud."
- Chapter 6 now includes discussion of "Big Data, BI and Analytics," expanding on the topic of Business Intelligence (BI).
- New section in Chapter 8 discussing the COBIT 5 framework, ISACAs most recent IT internal control framework and one radically different from the prior COBIT 4.1.
- Chapter 9 now includes discussion of "Secure Sockets Layer (SSL) Encryption," expanding on the topic of Public Key Cryptography and Digital Signatures.
- New discussion of 3D printing technology in chapter 15 expands coverage of Integrated Production Processes/Manufacturing.
- New section in chapter 17 discussing "Financial Reporting Fraud" added to Technology-Enabled Initiatives and the Reporting Environment topic.
- Updated Technology Summaries and Technology Applications. Updated topics include SAP Netweaver, Business Process Management (BPM), 2012 ACFE Report to the Nation on Occupational Fraud and Abuse, COSO on Fraudulent Financial Reporting From 1998 to 2007, Applications of Data Mining, Accelerating Cash Receipts, Supply-Chain Operations Reference-Model (SCOR), B2B Marketplaces and Web Commerce Tools for the Purchasing process, and Business Process Outsourcing (BPO).
- Many chapter-opening vignettes have been rewritten to offer the most up-to-date examples when introducing chapter topics, providing important context from the very start of each chapter.
- Several new end-of-chapter problems, marked with icons, which can be completed with Microsoft Visio[®] or other appropriate documentation software.

Acknowledgements

In closing, we must acknowledge that the pronoun “we” as used in this text extends far beyond the three authors. Over the years, there have been countless adopters, reviewers, students, and colleagues who have provided us with comments and suggestions that have cumulatively made a positive impact on this edition. We are most grateful to all of them for their dedication to the field of AIS and this text.

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Accounting Education: an International Journal, *Issues in Accounting Education*, *Journal of Accountancy*, *CPA Journal*, and *Personal Financial Planning*. He has made frequent conference and continuing education presentations in local, national, and international venues on topics including continuous auditing and assurance, accounting information systems, and accounting education. He recently taught a graduate forensic/fraud accounting course for Reykjavik University in Iceland. Professor Dull is a member of the American Accounting Association, American Institute of CPAs, Association of Certified Fraud Examiners, AIS Educator Association and ISACA. His professional activities have included serving on the AICPA's Assurance Services Executive Committee and serving as the President of the AAA's Artificial Intelligence/Emerging Technologies Section. He recently served the AICPA as a member of BEC Subcommittee and currently serves as an Editor for *Journal of Information Systems*, an Associate Editor for *Accounting Education: an International Journal*, and as an Editorial Advisor for the *Journal of Accountancy*. Professor Dull was a recipient of a Fulbright Award in 2008, spending a semester lecturing and researching in Croatia. In addition to his work, he enjoys spending time with his family and church, as well as traveling and woodworking.

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Understanding Information Systems

CHAPTER 1

Introduction to Accounting Information Systems 2

CHAPTER 2

Enterprise Systems 33

CHAPTER 3

Electronic Business (E-Business) Systems 61

Introduction to Accounting Information Systems

Learning Objectives

After reading this chapter, you should be able to:

- Appreciate the complex, dynamic environment in which accounting is practiced.
- Know the relationship between the AIS and the organization's business processes.
- Know the attributes of information.
- Recognize how information is used for different types of decisions and at various levels in the organization.
- Recognize how the information system supports the management function.
- Recognize the accountant's role in relation to the current environment for the AIS.
- Understand how to use this textbook effectively to learn AIS.

At the beginning of your journey to acquire knowledge about accounting information systems (AISs), you should be aware of the importance of the topic to you personally and to your long-term success as an accountant. Consider the following responsibilities of accountants, from the Accountants and Auditors section of the *Occupational Outlook Handbook*¹:

- Examine financial statements to be sure that they are accurate and comply with laws and regulations
- Compute taxes owed, prepare tax returns, and ensure that taxes are paid properly and on time
- Inspect account books and accounting systems for efficiency and use of accepted accounting procedures
- Organize and maintain financial records
- Assess financial operations and make best-practices recommendations to management
- Suggest ways to reduce costs, enhance revenues, and improve profits

¹Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2012–13 Edition*, Accountants and Auditors, on the Internet at <http://www.bls.gov/ooh/business-and-financial/accountants-and-auditors.htm> (accessed September 22, 2013). Many other countries produce documents indicating similar expectations.

These items can be expected whether you are an auditor, corporate accountant, forensic accountant, management consultant, or computer consultant, for example. Can you imagine doing any of these tasks without using technology? For example, consider ExxonMobil, Walmart, or Toyota. The sizes of these companies are such that it would be impossible to maintain the records, examine the financial statements, compute taxes, or look for inefficiencies or anomalies without the use of technology. Today's businesses cannot exist in their current form without technology.

Technology is making information available to improve decisions for all decision makers—at the same time making the job of an accountant more interesting and challenging, as well as providing new opportunities for you. There is little doubt that the things you can learn from this book should help you increase your knowledge of information systems and take advantage of these new opportunities.

This chapter introduces the concept of technology applied to accounting. The material presented here, as well as throughout the text, is *essential* to your success as an accountant. Invariably, when we see students after they graduate and have been working for a few years, comments start flowing that reinforce the topics covered in this text. “I use the information from your class constantly in my job.” “I actually draw data flow diagrams as part of our systems documentation.” “I was in a meeting with my manager and was the only person who understood the technology concepts being discussed.” Why do you think we repeatedly hear these and many similar comments? Technology and accounting cannot be separated in today's businesses. Read on to prepare for your successful accounting career.

Synopsis

In this chapter, we introduce you to the subject of AISs, describe the importance of the AIS in your future success, and lay out some important terms and concepts that we will use throughout the text. We begin by presenting a view of the practice of accounting. You will see that accountants today are shifting their focus from being business accountants and auditors to being information management and business measurement professionals providing value-added services to their organizations and clients. This view, rooted in changes in information technology and changes in a volatile business environment, reflects the practice of accounting for those on the leading edge of their profession. Next, we define and explain AIS and its relationship with the organization. Then, we describe the qualities that information must possess to drive the organization and enable the performance of key management functions. Finally, we summarize the role of the accountant in today's business environment.

Throughout the text, we will present three themes to connect our discussions to topics that are currently of great interest to accountants. These themes are *enterprise systems* and *enterprise resource planning (ERP) systems*—such as those sold by SAP[®], Oracle[®], Sage[™], and Microsoft[®]; *e-business*, including retail e-businesses such as Amazon.com[®]; the online segments of traditional retailers, such as Walmart.com; and *internal control*—those business practices that keep an organization out of trouble and heading toward achieving its objectives. We introduced these three themes in the Preface and will explore them further in this chapter.

Introduction

At the start of this chapter, we discussed the impact of technology and how it will affect your role as an accountant, but the impact extends well beyond accounting. Technology improves information available for decision making—this means that *all* decision makers within an organization benefit from accounting technology, not just accountants. For example, sales managers can make better decisions because computerized accounting systems provide more timely sales and collections information than manual systems. The ability to automate controls means that the data should be more reliable, which is another benefit for the entire organization.

Accountants with technology skills are using computers to reduce the mundane part of their work, enabling them to be more efficient in their work. This efficiency increase means these accountants have time to do more challenging work and at the same time be more valuable to their employers. Odds are that you want to have a challenging job and be valuable to your employer, so let's begin exploring AIS.

This chapter provides you with some basics that are used throughout the text. Our introduction to AIS continues with some background material and definitions. We define and describe AIS, depict it as a major part of business processes of any organization, and describe the critical functions that AIS perform within an organization. Some of the terms in this chapter may not be familiar to you. Don't let that concern you at this point. We will define and illustrate these terms later in the book.

The Textbook's Three Themes

Enterprise Systems

Before digging into the material, you should understand the importance of the three themes of this book and how they will be included in the discussions throughout this text. The three themes—enterprise systems, e-business, and internal control—were introduced and defined in the Preface. *Enterprise systems* integrate the business processes and information from all of an organization's functional areas, such as marketing and sales, cash receipts, purchasing, cash disbursements, human resources, production and logistics, and business reporting (including financial reporting). *Enterprise resource planning (ERP) systems* are software packages that can be used for the core systems necessary to support enterprise systems. It is critical that accountants understand these systems because at some point in their careers, they will likely be members of teams that install and operate systems in their organizations. To install an enterprise system, the business processes of an organization must be understood and documented. If necessary, the business processes must be changed and then mapped to the enterprise system. A major part of the installation project is configuring the enterprise system to tailor it to the business processes. As consultants, business process owners, system users, or auditors, we must understand these systems and be able to install, use, and audit them. Enterprise systems are described more fully in Chapter 2 and are discussed throughout the remainder of the book.

E-Business

E-business is the application of electronic networks (including the Internet) to undertake business processes between individuals and organizations. These processes include interaction between back-office (i.e., internal) processes, such as distribution, manufacturing, and accounting, and front-office (i.e., external) processes, such as those that connect an organization to its customers and suppliers. E-business has created entirely new ways of working within and across organizations. For example, organizations are buying and selling goods and services at virtual marketplaces,

which changes how organizations identify customers and select vendors. It should also change how they determine the costs of acquiring goods from a vendor and what price(s) they should charge their customers for their products. Obviously, accountants need to be aware of the opportunities and risks associated with this new way of doing business. E-business is explained more fully in Chapter 3 and is discussed throughout the remainder of the book.

Controls

Internal control is a process—effected by an entity’s board of directors, management, and other personnel—designed to provide reasonable assurance regarding achieving objectives in the following categories: efficiency and effectiveness of operations, reliability of reporting, and compliance with applicable laws and regulations. For example, controls ensure that an organization’s inventories (or other assets) are not stolen and that the organization does not have too much inventory (perhaps a waste of resources by incurring unnecessary storage costs) or too little inventory (leading, perhaps, to a lost opportunity to sell the product). Although top management is responsible for an organization’s system of internal control, the accountant and other business process owners are given the authority to implement and operate the system of control. Therefore, it is incumbent on all managers and accountants to know how to use controls to ensure achievement of the organization’s goals. In Chapter 7, we introduce internal control and then apply it throughout the remainder of the book.

Beyond Debits and Credits

Controls

Have your accounting studies to date convinced you that the most serious problem you may face in your career is that your trial balance doesn’t balance? If so, here are a couple of examples that might persuade you otherwise. It wasn’t too long ago that the procedures used to process credit card sales were completely manual. A sales clerk would prepare a paper credit card slip using a pen to write the amount by hand, run it through a device to imprint your name and account number, and—to reduce the possibility of credit card fraud—look up the credit card number in a book that listed stolen credit cards. But this book was printed only periodically and could never be up to date. As credit card usage increased, a procedure was developed where clerks would call the credit card companies for approval of a purchase. Although this took longer, the selling merchants were able to assure themselves that the credit card had not been reported stolen and that sufficient credit was available on the customer’s account. The system has continued to evolve into what we have today: Approvals are obtained automatically by connecting directly (i.e., online) from the checkout to the credit card company. This method is used to ensure that the merchant and the credit card company get paid for the sale. And, as you know from previous accounting courses, an organization can’t record a sale unless it is likely that they will get paid for that sale.

E-Business

Many of you are familiar with a different control problem that exists today—the purchase of items using credit cards on the Internet. You can read the statistics about individuals who do not want to buy on the Internet because they fear that their private information, especially their credit card number, is not secure. Controls have been put in place to protect the consumer, merchant, and credit card company (you’ll read about these controls in Chapters 3, 8, and 9). Still, fraudulent transactions occur and millions of dollars are lost every year. Again, controls are used to protect the assets of the organization and ensure the effectiveness of operations. After all, if customers are not confident in the security of a merchant’s Web site they will go elsewhere with their purchases.

Enterprise
Systems

Consider this example from a large multinational company in the health care industry. The company acquired a new, large division after having just installed an ERP system in all of its worldwide operations. After installing the ERP system in the new division, the data related to the previous year's purchases and sales for the entire company, including the new division, were exported from the ERP system into a separate database (i.e., a data warehouse, as will be explained in Chapter 5). The cost accountants then had the tasks to analyze the costs and selling prices for a line of products and to suggest a new pricing structure that would make sense in light of the incorporation of the products from the new division. To accomplish this task, the cost accountants needed to know how the data was defined and stored in the ERP systems, how it had been exported, and finally how to get it out of the data warehouse in a form that they could use. What seemed like a simple analysis, one that would be performed all the time by a staff accountant, became possible only with the use of technology!

Are you beginning to see that knowledge of traditional accounting concepts is not enough to succeed in today's business environment? The underlying technology is a critical part of *every* accountant's job. These examples indicate challenges for you, while offering opportunities to those who learn to be effective information management and business measurement professionals. We want to help you learn so you can become one of these successful professionals!

Legal Issues Impacting Accountants

Inherent in the work of accountants, and therefore in the study of accounting and information systems, is compliance with laws and regulations. One such law, the Sarbanes-Oxley Act of 2002 (SOX), has dramatically changed the daily work of financial accountants, auditors, and many others as well.

The Sarbanes-Oxley Act of 2002

SOX

At this point in your academic career, you have probably studied the Sarbanes-Oxley Act (SOX) and the impact that it has had on publicly traded companies.² Because of your prior knowledge, the discussion at this point is limited to Sections 404 and 409 and their applicability to the study of AIS.

Section 404 of SOX and PCAOB Auditing Standard No. 5³ have meant changes for both auditors and the companies that they audit. To comply with SOX, management must identify, document, and evaluate significant internal controls. Auditors must, as part of an integrated audit of financial statements, report on the effectiveness of the organization's system of internal control. These requirements represent significant expansions of the internal control-related roles of management and auditors. These responsibilities are increasing at the same time that computer-based systems are becoming more sophisticated, thus adding to the complexity of the systems of internal control. It is important that you understand the systems in order to comply with SOX.

Section 409 of SOX requires disclosure to the public on a "rapid and current basis" of material changes in an organization's financial condition. Compliance with this

²For the full text of the Sarbanes-Oxley Act of 2002, see www.sec.gov/about/laws/soa2002.pdf (accessed September 22, 2013).

³Auditing Standard No. 5, "An Audit of Internal Control over Financial Reporting That Is Integrated with an Audit of Financial Statements," *PCAOB*, July 12, 2007.

section requires the application of legal, financial, and technical expertise to ensure that the organization's AIS is able to produce financial data in a timely and accurate manner. Who else but the accountant, armed with the latest knowledge of accounting and information technology, can ensure compliance with these provisions of SOX?

Challenges and Opportunities for the Accountant. Are you preparing yourself to be effective in the future? Will you be able to adapt to advances in technology, and will you look ahead and prepare yourself to take advantage of such advancements? Could you perform an analysis of cost and price data by extracting and evaluating information from an information system? Could you help assess the risks and benefits related to an organization's e-business and develop the controls necessary to ensure a secure and reliable Web presence? Could you consult with management to help them comply with SOX Section 404 or evaluate management's internal control system? What do your technology abilities mean to you personally? Those abilities may mean more job opportunities, money, and job satisfaction. We intend to help you prepare and plan for the future by helping you grow with current and emerging technologies.

Management accountants and internal auditors find themselves buying, using, and evaluating complex computer-based information systems. Financial accountants must be sure that their AIS can produce financial statements to comply with SOX and other regulations. Management accountants must be sure that a new information system has the necessary features, such as controls and the ability to access data and to trace data from input to output. Forensic accountants must be able to use available technology to analyze information and identify problems. Information systems must also be protected from fraud and other abuses. How effectively you use technology to perform these functions will determine how well you can do your job, which may determine the very survival of your company in a competitive, international marketplace.

Technology is also influencing public accounting firms. The business-consulting or advisory services units of large and small public accounting firms have accounted for a significant percentage of the firms' business and were growing faster than the accounting, auditing, and tax portions of their businesses. The consulting units of many of these firms have been split off from the accounting segments of the firms. Still, the growth portion of the remaining accounting-focused firms will remain in their value-added, business advising lines. For example, a major line of business for these firms has been to assist their clients in complying with SOX Section 404.⁴ You should not be surprised to find the need for strong technology skills continuing in these firms. Most large firms (and many smaller firms) have also developed strong forensic practices that may be international in scope. Technology is a major focus within these practices. The consulting firms also actively recruit personnel with both accounting and technology skills. If you aspire to a career in public accounting, or in a related consulting area, your success will depend on your knowledge and experience in relatively technical areas that, at first glance, are far from the practice of accounting.

Independent auditors are faced with deciding on the reasonableness of financial statements produced from data contained in the information system. As an auditor, you will be asked to execute your audit tasks and to provide additional value-added service to the client. You will, for example, provide your client with advice on improving operations and reducing risks. Successful public accounting firms provide cost-effective audits along with broader, high-quality service to the client.

⁴The type of service that can be performed depends on whether the work is performed for an audit client.

The variety of opportunities within accounting were confirmed by the report of a project sponsored by the American Accounting Association (AAA), the American Institute of Certified Public Accountants (AICPA), the Institute of Management Accountants (IMA), and the Big Five (there were five at the time) public accounting firms. Practitioners surveyed reported that accounting graduates would need to be able to provide services in the areas of financial analysis, financial planning, financial reporting, strategic consulting, and systems consulting.⁵

Historically, the auditor has performed an attest function to determine the reliability of financial information presented in printed financial statements. This role is expanding to include the following:

- Nonfinancial information (i.e., information not measured in monetary units; e.g., accountants might help determine occupancy rates for hotels or apartment complexes)
- Use of information technology to create or summarize information from databases
- Information interpretation to determine the quality and relevance of information to be used for decision making (e.g., evaluating information for the assessment of risk)

The Assurance Services Executive Committee (ASEC) of the AICPA identifies, develops, and promotes nonaudit assurance services that can be offered by accountants.⁶ The technology-related services include the following:

- Information systems reliability (SysTrust; Chapter 8)
- Electronic commerce (WebTrust; Chapters 3 and 8)

Historically, the development of these services has been a joint effort between the AICPA and the Canadian Institute of Chartered Accountants (CICA). The ASEC currently has task forces in place to consider assurance issues related to XBRL (eXtensible Business Reporting Language) (see Chapter 16 for a discussion of XBRL) and Trust Services/Data Integrity. In addition to the development of assurance services, the AICPA has been looking to the future on a broad basis, resulting in the CPA Horizons 2025 report. Relative to technology, the report suggests the following importance of technology:

1. CPAs must stay current with, embrace, and exploit technology for their benefit for increased efficiency and expansion of services.
2. The profession must find solutions to offer investors and stakeholders up-to-date, real-time financial information and to increase transparency.
3. CPAs must embrace mobile technologies and social media to modernize and enhance interaction and collaboration with clients and colleagues.
4. Fraud may be easier to commit and more difficult to prevent and detect. CPAs must continue to be vigilant in ensuring data are captured and managed properly and protected from malfeasance.⁷

Finally, the AICPA has created a credential, the certified information technology professional (CITP), to recognize CPAs who can provide skilled advice on using IT

⁵W. Steve Albrecht and Robert J. Sack, *Accounting Education: Charting the Course Through a Perilous Future* (Sarasota, FL: American Accounting Association, 2000): 15.

⁶See www.aicpa.org/ for a description of the assurance services and other services being defined by the AICPA. See www.cica.ca/ for those services being defined by the Canadian Institute of Chartered Accountants (CICA).

⁷<http://www.aicpa.org/Research/CPAHorizons2025/DownloadableDocuments/cpa-horizons-report-web.pdf>. (accessed September 22, 2013).

to implement business strategy.⁸ Skills necessary to obtain this accreditation include the following (chapter coverage in this text is shown in parentheses):

- An understanding of project management (Chapter 17)
- Familiarity with IT and business processes (IT throughout the text, business processes in Chapters 10 through 16)
- Competence in technology (throughout the text)

Components of the Study of AIS

Figure 1.1 depicts the elements central to our study of AIS. Many are probably familiar to you, and many have been introduced earlier in this chapter. We will briefly discuss each element, with special emphasis on how the accountant is affected. Before beginning, you should understand two things. First, the study of AIS is our broad view, and the AIS itself is our narrow view. Second, you shouldn't assign any meaning to the placement of the elements in Figure 1.1. The figure just tells you that there are 10 elements.

- **Technology.** Your ability to plan and manage business operations depends partly on your knowledge of the technology available. For instance, can we manage production without knowledge of robotics? Obviously, technological developments have a profound effect on information systems; enterprise systems, ERP systems, e-business, databases, and intelligent systems are but a few examples. Technology provides the foundation on which AIS and business operations

FIGURE 1.1 Elements in the Study of Accounting Information Systems



⁸See <http://infotech.aicpa.org/> for a description of the CITP designation.