# ACCOUNTING AND INFORMATION SYSTEMS

FOURTH EDITION

JOHN PAGE
PAUL HOOPER

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**Dedication**

*To Maria, James, and David*
*Pam, Lisa, and Jody*

**Acknowledgment**

*We wish to thank Gail Lynn Cook for her special contributions to the preparation of this book.*

# Preface

The application of information systems concepts to the accounting process and accounting models is relatively new. However, because of the increasing applications of information systems and computers, these areas have become an essential part of the business curriculum.

Courses in accounting information systems now exist in virtually every business school. Most textbooks written for these courses fall into one of two categories. Books attempting to survey the field are usually so general that the student does not learn how to implement the ideas presented, while books that claim a comprehensive coverage require a technical sophistication beyond the background, interests, and needs of most users. Also, without a firm foothold in basic accounting concepts, books on information systems can serve to isolate accounting information systems from other accounting courses.

Our approach is to integrate information systems concepts into the basic accounting process and extend traditional accounting models to include the systems approach. This integration and extension provides the link that students search for in relating their work in this area to other accounting studies. Without this link, it is difficult for students to appreciate where accounting systems fit into the big picture of accounting study and practice. Our integrative approach works not only for accounting students, but also for business, computer science, and engineering students who are interested in systems work and management consulting but have had only an introductory exposure to accounting.

## Overview of the Fourth Edition

The fourth edition of this book offers balanced coverage of technical aspects, computer applications, and systems development. This organization encourages the instructor to decide where to place the emphasis.



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Part One establishes the accounting context for the study of information systems. Information systems concepts are introduced only after the student is firmly grounded in the components of accounting systems. Individual chapters discuss the role of accounting, the basic business cycles and documents, system flowcharting, internal control fundamentals, and the additional internal control needed for computer-based business data processing. Such a background is fundamental to understanding and applying the ideas that follow in the text.

Part Two discusses the most important aspects of computer, information system, and communication technology that form the basis for today's and tomorrow's accounting information systems. Individual chapters discuss data files and data bases, relational data bases and structured query language, data communication and networks, and decision support and expert systems.

Part Three synthesizes the concepts of accounting systems and information systems in a computer context. An overview chapter surveys computer-based accounting information systems. Individual chapters discuss the major components of a typical system, including the manufacturing environment. A chapter on microcomputer-based systems applies the large system concepts of the preceding chapters to the personal computer.

Part Four illustrates the system development life cycle by applying system analysis tools to the development of computer-based information systems. Individual chapters provide an overview of system development and a detailed treatment of system analysis and design, system implementation and evaluation, and EDP auditing.

Of special use to the beginning student are two appendices that review the fundamental concepts and relationships underlying financial statements and the processing of accounting transactions. A third appendix presents a sample company with comprehensive supporting documents and demonstrates the application of many of the principles explained throughout this book with a complete system analysis and system development for the company.

## New Features of the Fourth Edition

The fourth edition is a major revision that adds important new topics, brings all material completely up to date, and treats many topics in greater depth, while continuing the accounting-based approach of the previous three editions. The new features include:

1. *Compact treatment of introductory material.* Most of the material appearing in Chapters 1 through 8 of the third edition is now presented in the first five chapters of the fourth edition. This allows movement into the core systems material more quickly and facilitates further, in-depth treatment of important topics, particularly relational data bases, the Structured Query Language, data communications and networking, decision support systems, and expert systems.
2. *Incorporation of microcomputer-based systems throughout the book.* Topics covered include connections with a mainframe system, internal control, data base management systems, data communications and networking, decision support systems, accounting information system applications, and system development. This coverage is important because students are likely to use mostly microcomputers during their professional lives.

3. *A new chapter on relational data base management systems (RDBMS) and the Structured Query Language (SQL).* Data of all kinds, including accounting data, are increasingly stored in RDBMS because of the power and flexibility such a system provides. SQL is often used to access these data, both for interactive queries and to draw the data into spreadsheets for further analysis. Eventually, all accountants will become familiar with both RDBMS and SQL. Chapter 6 covers RDBMS operations, data normalization, trends in relational systems, SQL, and Query-by-Example.
4. *A new chapter on data communications and networking.* Accounting data are now being used far from the point where they are accumulated and accounting transactions depend on access to data bases stored far from where the transactions are originated. Data communications and networking are critical components of virtually all new accounting information systems. Chapter 7 includes mainframe, minicomputer, and microcomputer approaches to, and current trends in, data communication and networking.
5. *A new chapter on decision support systems and expert systems.* Decision support systems and, to a lesser extent, expert systems have become important tools for accountants. Chapter 8 contains a discussion of the most important end-user tools, including spreadsheets. These tools allow users to analyze accounting data without having to write special-purpose computer programs. It is these end-user tools that have driven much of the demand for microcomputers.
6. *Overview of computer-based accounting information systems.* Chapter 9 has been reworked to preview the detailed coverage of cash receipts and disbursements, sales and purchases, financial accounting, manufacturing, and microcomputer systems presented in Chapters 10 through 13. This overview chapter can be covered independently of the detailed chapters that follow in Part Three.
7. *Applications update to the IBM AS/400.* Applications Chapters 10, 11, and 12 use the new AS/400 system in place of the System/38 used in the third edition. The AS/400 has been the most successful new system for IBM since the System/360 of the early 1960s.
8. *A new applications chapter on financial and manufacturing information systems.* In recognition of a new awareness of the importance of manufacturing management in the economy, Chapter 12 incorporates manufacturing accounting applications. The treatment of manufacturing is also integrated into the applications overview in Chapter 9 together with the other components of the accounting information system.
9. *A new software package.* Bedford Integrated Accounting is used in Chapter 13 on microcomputer applications to provide an extended treatment of microcomputer-based accounting information systems. Bedford is widely available and well-suited for student and university use. Unlike most accounting packages, Bedford will create a company's data on a floppy disk—an important and convenient feature for the typical university computer laboratory.
10. *Overview of system development.* A new Chapter 14 surveys the role and value of information systems, the management of information systems, and the role of system development. This overview can be covered independently of the detailed chapters on system development that follow in Part Four.
11. *Extended treatment of data flow diagrams and entity-relationship models.* Chapter 15 on system analysis and design presents these important tools for conceptualizing new systems without the necessity for the detail of a complete system flowchart.
12. *Condensed and integrated presentation of system development.* System development material covered in three chapters in the third edition is now covered in Chapters 15 and 16 of the fourth edition.
13. *A new appendix on financial statements.* Appendix A allows optional coverage and review of basic financial statement relationships. The need for this review

usually depends on the placement of the course in the curriculum and the background of the students.

14. *A new appendix presenting a complete basic systems case.* Appendix C can be treated as a chapter (with all necessary end-of-chapter material provided) or used as a reference source, either throughout the course or in conjunction with a term project outside of class. This appendix simulates the reports and correspondence that an analyst would prepare in a system analysis and system development.
15. *Extensive new end-of-chapter problem and case material.* Complete and thoroughly tested solutions to all end-of-chapter material are available in the *Instructor's Manual With Solutions.*

## Supplements to the Fourth Edition

- Greatly expanded *Instructor's Manual With Solutions.* This includes suggestions for several alternative paths through the book (each with an appropriate sample syllabus) and transparency masters for coverage of the material in class. Solutions to all end-of-chapter material are also presented. In addition, the Monticello case from the third edition has been moved to the *Instructor's Manual With Solutions* for optional use.
- A new *Test Bank.* The fourth edition *Test Bank* contains both objective and problem material for instructor use.
- *Study Guide.* New with this edition of the text, the *Study Guide,* by Gail L. Cook, contains comprehensive review outlines and self-tests for each chapter with fully explained answers providing immediate student feedback and reinforcement.
- *Paradox®: A Student Tutorial with Cases.* Offered for the first time with this edition of the text, this self-paced tutorial by Eric L. Denna, Michael P. Briggs, and Jeff G. Gibbs teaches full utilization of the number-one rated relational data base management software.

## Acknowledgments

This edition has benefited from the many suggestions of reviewers and users of previous editions from around the country, especially Robert Cooper, Keith Martin, Ross Quarles, Anwar Salimi, and Steve Sutton. Critical to the development of this fourth edition has been the work of Gail Lynn Cook. Gail was instrumental in making this edition a significant advance over earlier editions and we are proud to acknowledge her contributions. Also important in the development of this edition were the efforts and talents of Susan Seuling, our Prentice Hall development editor, whose ever-present interest and suggestions had a remarkably positive impact on the book. Finally, special recognition is given to Brian Hatch, our production editor, for his work on this edition; Joe Heider, our acquisition editor; and Frederic Easter, whose experience, guidance, and wisdom helped to turn a set of ideas into a book fifteen years ago.

The authors sincerely welcome comments, suggestions, and tactfully-stated criticisms from the users of this edition and from others who may come into contact with the book.

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# Contents

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PART III COMPUTER-BASED ACCOUNTING APPLICATIONS

copying rather than developing, these replacement machines are much smaller and less expensive than the IBM equivalent. These companies then use IBM software for their machines, but they must provide maintenance. Operation is essentially the same level of difficulty as that of the replaced equipment.

***Minicomputer Manufacturers.*** These companies make computers that are primarily used for small- to medium-scale transaction processing, such as an inventory system which must be continually updated by sale and purchase transactions as they occur. The main minicomputer manufacturers are Digital Equipment Corporation (DEC is its common acronym) and IBM. These companies also provide software and maintenance, as do the mainframe manufacturers. Operation is not as complex, and a separate operations staff is generally not required.

***Microcomputer Manufacturers.*** These companies make complete, but small, data processing systems that are designed under the philosophy of a one-person system. The microcomputer can be important in business applications, especially for individual-level data processing, such as calculations of budgets, time scheduling, and word processing. The microcomputer is also effective for small, stand-alone transaction processing, such as in a small business accounting system. Primary microcomputer manufacturers are IBM and Apple. They provide software available for separate purchase, and maintenance is usually handled by maintenance contract similar to that for typewriters and other office equipment. Microcomputers are sold through retailers, directly to the purchaser by the manufacturer, and through mail order.

***Value-Added Resellers (VARs).*** These systems packagers buy different components directly from factories and then put together a complete computer system. Many microcomputers and minicomputers for business uses are purchased from a VAR. The packager generally provides three services for the customer:

1. The assembly of a compatible collection of equipment that functions together.
2. A package of software to help accomplish the user's goals.
3. One entity where the user can go for assistance in case of hardware or software problems.

If a business is in a specialized field, such as an insurance agency or dentist's office, but is not technically expert in computer systems, the VAR can be a useful resource. Operation is the responsibility of the user, but the packager helps keep the operation as simple as possible.

***Service Bureaus.*** These companies take input from their customers, process the data, and then return the results. Thus, the **service bureau** buys the equipment (hardware), develops the software, and has the burden of maintenance and operation of the computer. The user need only prepare the data for input. Generally, the service bureau receives the data, processes it overnight, and then returns the resulting output. Service bureaus are used most often for

applications like payroll, where the service bureau will pick up time cards and then return payroll checks, a payroll register, and the necessary government forms like W-2s. The user is relieved of the burdens of computer ownership and operation, at the cost of reduced flexibility and timeliness of information. Most communities have several local service bureaus available.

***Computer Leasing Companies.*** Many computer users want a large system but do not wish to (or cannot) purchase a system. The manufacturer will lease the computer system to the user, but the charges are high. Instead, the computer leasing company buys the computer system from the manufacturer and then leases it to the user at a charge reduced from the manufacturer's charge. The leasing company can reduce the price by requiring a lower return on equity than the manufacturer and by locking the user into a longer-term lease and reducing his flexibility in changing machines.

***Used Computer Brokers.*** These firms, such as American Used Computer Corporation, buy used computers from companies getting new equipment and then resell the used equipment to others. Computer manufacturers help their customers contact potential purchasers of the equipment they have when they acquire new equipment. However, manufacturers generally do not accept old equipment as a "trade in." The used computer broker thus provides an important service in buying surplus equipment. Used computers are most important as a backup for other equipment a company already has. Purchase of used equipment should not be attempted by the novice computer user because parts and service are often hard to find.

***Peripheral Equipment Manufacturers.*** Peripheral equipment manufacturers make substitutes for the peripherals available from the computer manufacturers that simply plug in as replacements. Because of lower overhead and less needed development, these companies can offer peripherals which are less expensive and give as good or better performance. The primary difficulty with these products is that, in a mixed vendor environment, if anything goes wrong, the "fingerpointing" starts and each vendor points to another as the source of difficulty.

***Facilities Management Firms.*** The operation of a large-scale computer installation can be a complicated and often tedious task. Employees of widely varying capabilities must be hired and fired, supplies must be purchased, and deadlines must be met. Additionally, in organizations like city and state governments with fixed salary scales, it may be almost impossible to attract qualified people. As a result, **facilities management** firms operate the computer installation for their customer. The customer owns the equipment; the facilities management firm operates it. Also, in situations with detailed and specialized programming requirements, such as hospitals, the facility management firm provides appropriate software.

***Computer Consultants.*** Computer systems are so new to many users that computer consultants are often valuable. Consulting firms range from small independent consultants to international CPA firms employing several thou-

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