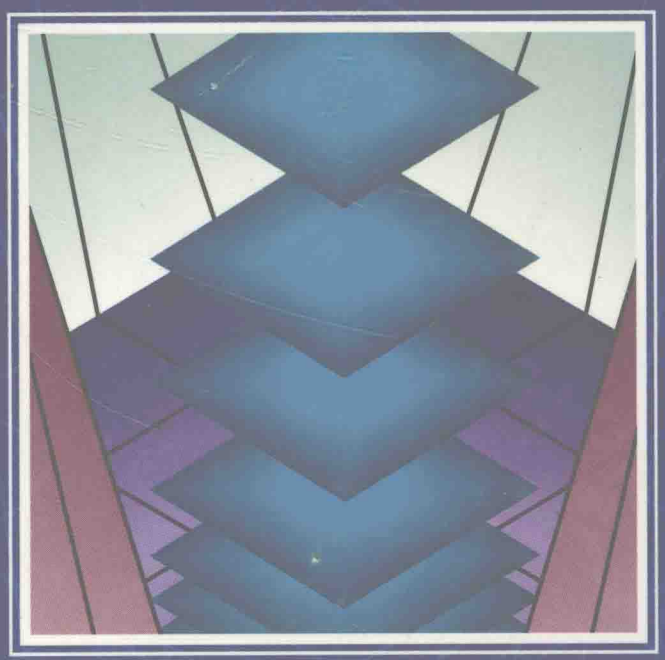
MODERN DATABASE MANAGEMENT

FOURTH EDITION



FRED R. McFADDEN ◆ JEFFREY A. HOFFER

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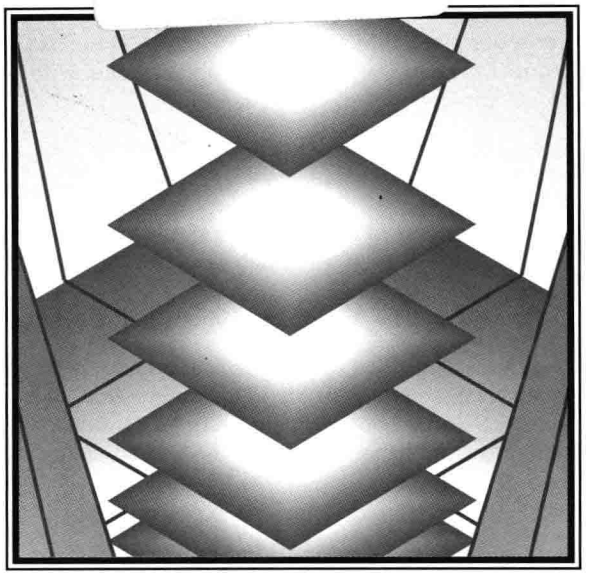

FRED R. McFADDEN • JEFFREY A. HOFFER

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MODERN DATABASE MANAGEMENT

Preface

This text is designed for an introductory course in database management. Such a course is usually required as part of an information systems curriculum in business schools, computer technology programs, and applied computer science departments. The Data Processing Management Association (DPMA), Association for Computing Machinery (ACM), and International Federation of Information Processing Societies (IFIPS) curriculum guidelines all outline this type of database management course. This book is an extensive revision of the third edition of *Database Management* by the same authors. *Database Management* has been used successfully for a decade at both the undergraduate and graduate levels, as well as in management and professional development programs.

NEW TO THIS EDITION

The fourth edition, *Modern Database Management*, updates and expands material in areas undergoing rapid change due to improved managerial practices, systems design methods and tools, and technology.

- **Client/server and other databases on computer networks:** A totally new chapter examining issues for peer-to-peer, client/server, and distributed databases. This discussion reflects the trends toward downsizing, redefining the role of mainframes, increased emphasis on local area networks, and end-user computing.
- **The object-oriented data model:** An entire chapter discusses how object-oriented constructs are used in the analysis and design of a database. This chapter parallels our coverage of the E-R model.
- **The entity-relationship data model:** A full chapter describes how the E-R data model is used to develop conceptual descriptions of enterprise and application area databases.
- **The Query-by-Example (QBE) language:** The text includes a chapter with a comprehensive overview of QBE, which has become a common interactive interface to databases. We use Paradox 4.0 to illustrate QBE.
- **Personal database systems:** A full chapter provides an overview of dBASE IV. In addition we include a second chapter on advanced PC database system

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topics of screen and report generation as well as developments in database systems for Microsoft® Windows.

- **The SQL relational database standard:** A complete chapter on the SQL language illustrates a wide variety of SQL concepts and commands and discusses the evolution of this international standard.

Modern Database Management puts considerable emphasis on the context in which databases are developed, showing the role of database analysis and design in the total systems development process. The book addresses information systems planning and the development of enterprise data models from planning matrices and other outputs of IS planning efforts. The framework for database development followed in this book parallels the typical development process used for information systems in general—from planning to analysis, design, implementation, and maintenance. To ensure that the database development process fits with the development of the total information system, we have coordinated our framework for database development in this text with that used to teach systems analysis and design text. Thus, students will be able to take both systems analysis and design and database courses using a common systems development framework.

Modern Database Management provides sound, clear, and current coverage of the concepts, skills, and issues needed to cope with an expanding organizational data resource. Since public and private organizations are populated with a wide variety of mainframe, personal computer, and networked database technologies, this text presents a balanced coverage of the computer technology (from the legacy systems of IBM's IMS and systems that follow the CODASYL standard to emerging graphical user interface systems like Paradox for Windows and client/server systems such as Sybase and Oracle). We place the greatest emphasis on the dominant technology of today—relational.

SCOPE OF THE BOOK

Modern Database Management is designed to fit within a variety of curricula on the development of information systems in public and private organizations. Many excellent texts and reference books emphasize issues relevant in a computer science curriculum (like the design of database management systems or the theory of particular database technologies) or concentrate on one particular technology (like SQL, dBASE, or Paradox). In contrast, the goal of this text is to provide adequate technical detail while emphasizing the management and implementation issues pertinent in a business information systems curriculum. Thus, the book stresses the design and use of databases, and the role of technology in meeting business information needs.

With this goal in mind, *Modern Database Management*

- Emphasizes the concepts of information as a corporate resource and of managers as stewards of this resource.
- Compares dominant technologies in parallel, so that business managers and information systems professionals can make intelligent choices about the application of different database technologies.
- Provides a chapter on database development, with an emphasis on database planning.

- Emphasizes data administration in a separate chapter (Chapter 12), and deals with issues related to managing organizations and technology throughout the text.
- Integrates the coverage of the concepts and notations for modeling organizational data, with reference to the now widely used entity-relationship notation.
- Provides coverage of database design, including normalization and view integration.
- Covers the major database processing standards (SQL, QBE, and XBase), as well as database development tools available on mainframe, LAN, and personal computer platforms.
- Provides coverage of data integrity, security, and other issues of special concern in multiple-user, shared database environments.
- Discusses options for the design of distributed databases and describes unique issues of this increasingly important database processing environment.

ORGANIZATION

We encourage instructors to customize their use of this book to meet the needs of both their curriculum and student career paths. The modular nature of the text (five logically sequenced sections), its broad coverage, extensive illustrations, and inclusion of advanced topics and emerging issues make customization easy. The many references to current publications make it possible to develop supplemental reading lists or to expand lecture discussion beyond the material in the text. In addition, since it is not the intent of the book to cover any particular database technology in depth, an instructor may wish to supplement this text with a tutorial on the specific database management system that students will use in the database course.

The modular nature of the book permits the instructor not only to reorganize the sequence of chapters, but also to skip or use chapters in different ways. For example, portions of Chapter 2, which presents an example of database application, can be read at various times during the database course. Students lacking exposure to database systems in prior courses can gain an early overview of the direction of the course by scanning Chapter 2. This approach can be especially helpful to students conducting a database development project. Those who have had some hands-on training on a PC relational DBMS can work through some of the examples in Chapter 2 on their own, using a data files disk available to adopters of this text. Since Chapter 2 uses dBASE IV to illustrate the development of a database, this chapter can also be read along with Chapter 9 on XBase language systems.

We strongly recommend that Chapter 1 on the database environment be read first. It provides a background and overview for the text. Chapter 2 can be read at various points in a database course. Chapter 3 on the database development process formalizes the presentation in Chapter 2 and links database development into the total systems development process from planning to maintenance. This chapter would typically be read early in a database course. For a course that emphasizes database programming skill development, however, Chapter 3 could be eliminated or read later as a capstone topic. Chapters 4 and 5 address alternative approaches to data modeling and conceptual design—E-R and object-

oriented modeling, respectively. Due to the extensive use of E-R diagrams in practice and frequent reference to E-R diagrams in later chapters, we strongly recommend that students read Chapter 4. If the curriculum emphasizes object-oriented analysis and design principles, Chapter 5 provides a strong coverage of these principles in database development. Otherwise, this chapter may be scanned or skipped without loss of understanding in any subsequent part of the book.

Chapters 6 and 7 address logical and physical database design, respectively. Chapter 6 concentrates on the relational data model and data normalization. Thus, if students will design a relational database, they should read Chapter 6 before they try to create a database. Chapter 7 addresses database implementation issues that affect the performance and integrity of database processing. Issues raised in Chapter 7 are especially important in the development of shared databases, but are less critical for personal databases.

Another important modular feature of *Modern Database Management* is the concentrated coverage of each type of database technology in its own chapter. Thus, the instructor may choose to eliminate those technologies that do not match the educational objectives or time constraints of the course. The database technologies included follow:

Technology	Chapter
SQL	8
Xbase	9 (illustrated using dBASE IV)
QBE	10 (illustrated using Paradox 4.0)
Screen and report generators, as well as graphical user interfaces	11
Client/server and distributed databases	13
IMS	14
CODASYL systems	15

While Chapters 8–11 and 13–15 focus on specific database processing standards and environments, Chapter 12 covers administrative issues for data resources. This chapter addresses several advanced technical issues about organizational data. Parts of Chapter 12 can be read early in the course or immediately before any of the technology chapters (Chapters 8–11, and Chapters 13–15) to provide additional in-depth background on database technology.

LEARNING AIDS

To assist the student and instructor, *Modern Database Management* includes the following learning aids:

- Realistic **Case Examples** illustrate important concepts throughout the text. Pine Valley Furniture Company shows a typical manufacturing company, and Mountain View Community Hospital highlights a service-sector organization. Illustrations from these situations address production, marketing, accounting, customer service, and human resource management information needs. To provide variety and to illustrate points not inherent in the two primary case situations, three additional situations—Lakewood College, Va-

cation Property Rentals, and Hy-Tek Corporation—are included to a lesser degree. Case examples are identified by margin symbols.

Pine Valley Furniture

Mountain View Community Hospital

Lakewood College

Vacation Property Rentals

Hy-Tek Corporation

- **Part Openers** appear at the beginning of each of the five sections of the text to preview the chapters in the parts. Each part opener describes an application in a real-world company. The following companies are described in the part openers: Sears, Roebuck and Co. (Leveraging the Value of Data), IBM Canada (Real-Time Process Monitoring and Control), Taco Bell (Managing Information Overload), Apple Computer (Distributed Databases), and McDonnell Douglas (Manufacturing Support with IMS).
- **Learning Objectives** appear at the beginning of each chapter to preview the major concepts and skills the student will gain after studying the chapter. The learning objectives are also a great study tool in preparing for assignments and examinations, as they reflect the major points of the text.
- A **Summary** at the end of each chapter encapsulates the main concepts of the chapter and links the chapter to related chapters.
- The **Chapter Review** tests student's knowledge. The list of **Key Terms** summarizes new concepts introduced in the chapter. The **Review Questions** check the student's grasp of important concepts, basic facts, and significant issues. **Problems and Exercises** require students to apply their knowledge to realistic situations and, in some cases, to extend this knowledge to new circumstances. These require discussion of issues, distinguishing key concepts, and practice of skills developed in the chapter.
- A **Glossary of Terms** is included in two convenient forms. First, the definition of each key term is placed in the page margin near where the term is defined or fully discussed in the text. Second, all the key terms are collected into a comprehensive glossary. In addition, the book index highlights glossary terms by showing in italics the page number where the matching margin glossary appears. Also included is a **Glossary of Acronyms** for abbreviations commonly used in database management.

SUPPLEMENTS

The text is a part of a complete educational package designed to provide a high level of support to the instructor.

- **Instructor's Guide:** A comprehensive supplement containing numerous instructional resources:

  Teaching Suggestions: These include lecture suggestions, teaching hints, and student project ideas that make use of the chapter content.

  Solutions: Sample answers are provided for all Review Questions, and Problems and Exercises.

  Multiple-Choice Questions: 300 multiple-choice questions (approximately 20 per chapter with answers).

  Examination Questions: 20 examination problems (similar to the Problems and Exercises from the text) with solutions. The Multiple-Choice and Examination questions form a test bank that can be used for in-class or take-home assignments, quizzes, or examinations.

  Transparency Masters: A set of masters for overhead transparencies of enlarged illustrations and tables from the text help the instructor tie lectures and class discussion to material in the text.

- **Data Disk:** Contains dBASE IV, Paradox, and ASCII files for databases illustrated in the text. All data files, screens, and reports shown in Chapter 2 are included on this diskette. The data files are provided in ASCII format for importing into any PC-DBMS that is used in the database course.
- **Case Book for Modern Database Management** (written by Donald A. Carpenter): A totally new Case Book containing a wide variety of realistic cases for course projects. Most of the cases are taken from actual company situations. The case solutions and implementations can be worked out using almost any DBMS. Solutions for these cases, including implementations in several popular packages, are available from the publisher.
- Because *Modern Database Management* does not teach any specific database system in depth, you may want to supplement this text with a tutorial book on the software students will use in the database course. Several excellent DBMS tutorial guides are listed below:

Projects for dBASE III+ 30838	Marianne Fox/Larry Metzelaar
Projects for Paradox for Windows 34240	Ahmer Karim
Projects for Paradox 3.5 32967	Marianne Fox/Larry Metzelaar
Projects for dBASE IV 30834	Marianne Fox/Larry Metzelaar

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We are very grateful to numerous individuals who contributed to the preparation of *Modern Database Management*. First, we wish to thank our reviewers for their detailed reviews and many suggestions, characteristic of their thoughtful teaching style. Because of the extensive development of this text from prior editions of *Database Management*, analysis of topics and depth of coverage provided by the reviewers were crucial.

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Fred R. McFadden
Jeffrey A. Hoffer

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LEVERAGING THE VALUE OF DATA

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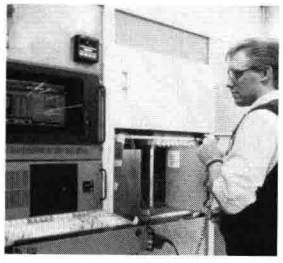

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