大学计算机教育国外著名教材系列（影印版）

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MODERN SYSTEMS ANALYSIS AND DESIGN

THIRD EDITION

现代系统分析与设计

（第3版）

Jeffrey A. Hoffer
Joey F. George 著
Joseph S. Valacich

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出 版 说 明

进入 21 世纪，世界各国的经济、科技以及综合国力的竞争将更加激烈。竞争的中心无疑是对人才的竞争。谁拥有大量高素质的人才，谁就能在竞争中取得优势。高等教育，作为培养高素质人才的事业，必然受到高度重视。目前我国高等教育的教材更新较慢，为了加快教材的更新频率，教育部正在大力促进我国高校采用国外原版教材。

清华大学出版社从 1996 年开始，与国外著名出版公司合作，影印出版了“大学计算机教育丛书（影印版）”等一系列引进图书，受到了国内读者的欢迎和支持。跨入 21 世纪，我们本着为我国高等教育教材建设服务的初衷，在已有的基础上，进一步扩大选题内容，改变图书开本尺寸，一如既往地请有关专家挑选适用于我国高校本科及研究生计算机教育的国外经典教材或著名教材，组成本套“大学计算机教育国外著名教材系列（影印版）”，以飨读者。深切期盼读者及时将使用本系列教材的效果和意见反馈给我们。更希望国内专家、教授积极向我们推荐国外计算机教育的优秀教材，以利我们把“大学计算机教育国外著名教材系列（影印版）”做得更好，更适合高校师生的需要。

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Modern Systems Analysis and Design

THIRD EDITION

Technology Support

• **Package Options** Visible Analyst or Oracle8i can be packaged with this text to provide hands-on exposure to commercial software.

• **Companion Web site http://www.prenhall.com/hoffer** Features an Interactive Study Guide, Net Search Exercises, Destinations, PowerPoint slides, Full Glossary, Chat Facilities, and a secure, password-protected Instructor's Area.

Internet Coverage and Features

• **Coverage of Internet-based Systems** *Chapter 16* has been redesigned to address Internet-based application design topics not covered in the other chapters. Coverage includes Internet application design standards, how to maintain site consistency, security issues, and data warehousing, among other topics.

• **Pine Valley Furniture Web Store:** PVF, a furniture company founded in 1980, now, in the *Third Edition*, explores electronic commerce as an avenue to increase its market share.

• **Broadway Entertainment Company, Inc.:** BEC, a fictional video and record retailer, is a student project case that allows your students to study and develop a Web-based customer relationship management system.

• **Net Search Exercises:** Margin icons for Net Search exercises on the Web site can be found in every chapter. The icon signals when a topic in the text has a corresponding Net Search exercise on the Web site.

Three Illustrative Fictional Cases

• **Pine Valley Furniture (PVF):** Pine Valley Furniture is introduced in Chapter 5 and revisited throughout the book. As key system development life cycle concepts are presented, they are applied and illustrated with this illustrative case. A margin icon identifies the location of the case.

• **Hoosier Burger (HB):** Starting in Chapter 2, this case illustrates how analysts would develop and implement an automated food ordering system. Hoosier Burger is a fictional fast food restaurant in Bloomington, Indiana. A margin icon identifies the location of the case segments.

• **Broadway Entertainment Company, Inc. (BEC):** This fictional video rental and music company is used as an extended project case at the end of 15 out of 20 chapters, beginning with Chapter 4.

End-of-Chapter Material

Chapter Summary, Key Terms, Review Questions, Problems and Exercises, and Field Exercises

Supplements

• The Instructor's Resource CD-ROM features the Instructor's Manual, Test Item File, Windows PH Test Manager, PowerPoint Slides, and Image Library.

• Video Series

Preface

Description

Modern Systems Analysis and Design covers the concepts, skills, methodologies, techniques, tools, and perspectives essential for systems analysts to successfully develop information systems. The primary target audience is upper division undergraduates in a management information systems or computer information systems curriculum; a secondary target audience is MIS majors in MBA and M.S. programs. Although not explicitly written for the junior college and professional development markets, this book can also be used for these programs.

We have over 50 years of combined teaching experience in systems analysis and design and have used that experience to create this newest edition of *Modern Systems Analysis and Design.* We provide a clear presentation of the concepts, skills, and techniques students need to become effective systems analysts who work with others to create information systems for businesses. We use the Systems Development Life Cycle Model as an organizing tool throughout the book to provide students with a strong conceptual and systematic framework.

The book is written assuming that students have taken an introductory course on computer systems and have experience designing programs in several programming languages. We review basic system principles for those students who have not been exposed to the material on which systems development methods are based. We also assume that students have a solid background in computing literacy and a general understanding of the core elements of a business, including basic terms associated with the production, marketing, finance, and accounting functions.

Modern Systems Analysis and Design is characterized by the following themes:

1. *Systems development is firmly rooted in an organizational context.* The successful systems analyst requires a broad understanding of organizations, organizational culture, and operation.
2. *Systems development is a practical field.* A coverage of current practices as well as accepted concepts and principles are essential in a textbook.
3. *Systems development is a profession.* Standards of practice, a sense of continuing personal development, ethics, and a respect for and collaboration with the work of others are general themes in the textbook.
4. *Systems development has significantly changed with the explosive growth in databases, data-driven architecture for systems, rapid application development, and the Internet.* Systems development and database management can be and possibly should be taught in a highly coordinated fashion. We show when rapid application development methods should and should not be applied. The Internet has rapidly become a common development platform for database driven electronic commerce systems. This text is compatible with the Hoffer, Prescott, and McFadden database text, *Modern Database Management,* Sixth Edition, also published by Prentice Hall. The proper linking of these two textbooks is a strategic opportunity to meet the needs of the IS academic field.

5. *Success in systems analysis and design requires not only skills in methodologies and techniques but also in the management of projects: time, resources, and risks.* Thus, learning systems analysis and design requires a thorough understanding of the process as well as the techniques and deliverables of the profession.

Given these themes, this textbook emphasizes the following:

- A business rather than a technology perspective.
- The role, responsibilities, and mindset of the systems analyst as well as the systems project manager rather than those of the programmer or business manager.
- The methods and principles of systems development rather than the specific tools or tool related skills of the field.

Distinctive Features

The following are some of the distinctive features of *Modern Systems Analysis and Design*:

1. This book is organized in parallel to the Hoffer, Prescott, and McFadden database text, *Modern Database Management*, Sixth Edition, which will facilitate consistency of frameworks, definitions, methods, examples, and notations to better support SA&D and database course adopting both texts. Even with the strategic compatibilities between this text and *Modern Database Management*, each of these books is designed to stand alone as a market leader.
2. The grounding of systems development in the typical architecture for systems in modern organizations, including database management and Web-based systems.
3. A clear linkage of all dimensions of systems description and modeling—process, decision, and data modeling—into a comprehensive and compatible set of systems analysis and design approaches. Such a broad coverage is necessary for students in order to understand the advanced capabilities of many systems development methodologies and tools that are automatically generating a large percentage of code from design specifications.
4. Extensive coverage of oral and written communication skills including systems documentation, project management, team management, and a variety of systems development and acquisition strategies (e.g., life cycle, prototyping, rapid application development, object orientation, joint application development, and systems reengineering).
5. Coverage of rules and principles of systems design, including decoupling, cohesion, modularity, and audits and controls.
6. Consideration of standards for the methodologies of systems analysis and the platforms on which systems are designed.
7. Discussion of systems development and implementation within the context of management of change, conversion strategies, and organizational factors in systems acceptance.
8. Careful attention to human factors in systems design that emphasize usability in both character-based and graphical user interface situations.
9. CASE technology is used throughout the text to illustrate typical systems analysis and design documents and CASE-based systems development is discussed; however, no specific CASE tool is assumed. A variety of CASE and visual development products are illustrated and the current limitations of CASE technologies are highlighted.

10. The text includes a separate chapter on systems maintenance. Given the type of job many graduates first accept and the large installed base of systems, this chapter covers an important and often neglected topic in SA&D texts.

New to the Third Edition

- *The text has been reorganized* Advanced chapters, "Rapid Application Development" and "Object-Oriented Analysis and Design," have been moved to the end of the text to form Part VI: Advanced Analysis and Design Methods. The physical database design chapter has been combined with the logical data modeling chapter to form Chapter 12. Both changes allow for a smoother flow of chapters.
- *Increased focus on make versus buy and systems integration* More and more systems development involves the use of packages in combination with legacy applications and new modules. Chapter 11 shows how companies deal with these issues.
- *Coverage of Internet-based systems* We have redesigned the distributed systems design chapter (now Chapter 16) to also address Internet-based application design topics not covered in the other chapters. We cover Internet application design standards, how to maintain site consistency, security issues, and data warehousing, among other topics. We believe that *Modern Systems Analysis and Design* now has one of the most extensive treatments of Internet application design among its competitors.
- *Integration of electronic commerce into the running cases* One of the three fictional running cases in the text, Pine Valley Furniture, is a furniture company founded in 1980, who now, in the Third Edition, has decided to explore electronic commerce as an avenue to increase its market share. Broadway Entertainment Company, Inc., BEC, a fictional video and record retailer, is a student project case that allows your students to study and develop a Web-based customer relationship management system.
- *Expanded and updated coverage of systems analysis as a profession* We have updated the coverage of codes of conduct and added new material on how systems professionals can approach business problems with ethical considerations. We have also updated information on career paths with the latest information gathered from professional societies.
- *Updated illustrations of technology* Screen captures have been updated throughout the text to show examples using the latest versions of CASE tools, programming and Internet development environments, and user interface designs. Many references to Websites are provided for students to stay current with technology trends that affect the analysis and design of information systems.
- *Expanded coverage of process modeling techniques* Chapter 8 now includes an introduction to business process modeling and functional hierarchy modeling as alternatives to data flow diagramming. These three process modeling techniques are compared so a student knows when to use each in practice.
- *Net Search Exercises* Search exercises on the Website can be found in every chapter. The icon signals when a topic in the text has a corresponding Net Search exercise on the Website. Students can access the exercise from http://www.prenhall.com/hoffer and email their findings to their instructors.

Pedagogical Features

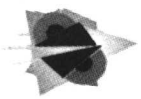
The pedagogical features of *Modern Systems Analysis and Design* reinforce and apply the key content of the book.

Three Illustrative Fictional Cases

Pine Valley Furniture (*PVF*): In addition to an electronic business-to-consumer shopping Website, several other systems development activities from Pine Valley Fur-

niture are used to illustrate key points. Pine Valley Furniture is introduced in Chapter 3 and revisited throughout the book. As key system development life cycle concepts are presented, they are applied and illustrated with this illustrative case. For example, in Chapter 6, we explore how PVF plans a development project for a customer tracking system. A margin icon identifies the location of the case.

Hoosier Burger (HB): This second illustrative case is introduced in Chapter 2 and revisited throughout the book. Hoosier Burger is a fictional fast food restaurant in Bloomington, Indiana. We use this case to illustrate how analysts would develop and implement an automated food ordering system. A margin icon identifies the location of the case segments.



Broadway Entertainment Company, Inc. (BEC): This fictional video rental and music company is used as an extended project case at the end of fifteen out of twenty chapters, beginning with Chapter 4. Designed to bring the chapter concepts to life, this case illustrates how a company initiates, plans, models, designs, and implements a web-based customer relationship management system. Discussion questions are included to promote critical thinking and class participation. Suggested solutions to the discussion questions are provided in the Instructor's Manual.

End-of-Chapter Material We developed an extensive selection of end-of-chapter material designed to accommodate various learning and teaching styles.

- *Chapter Summary* Reviews the major topics of the chapter and previews the connection of the current chapter to future chapters.
- *Key Terms* Designed as a self-test feature, students match each key term in the chapter with a definition.
- *Review Questions* Test students' understanding of key concepts.
- *Problems and Exercises* Test students' analytical skills and require them to apply key concepts.
- *Field Exercises* Give students the opportunity to explore the practice of SA&D in organizations.

Margin Term Definitions Each key term and its definition appear in the margin. Glossaries of terms and acronyms appear in the back of the book.

References Located at the end of each chapter, references together amount to over 100 books, journals, and Websites that can provide students and faculty with additional coverage of topics.

Using This Text

As stated earlier, the book is intended for mainstream SA&D courses. It may be used in a one semester course on SA&D or over two quarters (first in a systems analysis and then in a systems design course). Because of the consistency with *Modern Database Management,* chapters from this book and from *Modern Database Management* can be used in various sequences suitable for your curriculum. The book will be adopted typically in business schools or departments, not in computer science programs. Applied computer science or computer technology programs may adopt the book.

The typical faculty member who will find this book most interesting is someone

- with a practical, rather than technical or theoretical, orientation
- with an understanding of databases and systems that use databases
- who uses practical projects and exercises in the course.

More specifically, academic programs that are trying to better relate their SA&D and database courses as part of a comprehensive understanding of systems development will be especially attracted to this book.

The outline of the book generally follows the systems development life cycle, which allows for a logical progression of topics. However, the book emphasizes that various approaches (e.g., prototyping and iterative development) are also used, so what appears to be a logical progression often is a more cyclic process. Part I of the book provides an overview of systems development and previews the remainder of the book. Part I also covers those skills and concepts that are applied throughout systems development, including systems concepts, project management, and CASE and other automated development technologies. The remaining five sections provide thorough coverage of the six phases of a generic systems development life cycle, interspersing coverage of alternatives to the SDLC as appropriate. Some chapters may be skipped depending on the orientation of the instructor or the students' background. For example, Chapters 1 (environment of SA&D) and 2 (critical success factors for SA&D) cover topics that are emphasized in some introductory MIS courses. Chapter 5 (project identification and selection) can be skipped if the instructor wants to emphasize systems development once projects are identified or if there are fewer than 15 weeks available for the course. Chapters 10 (conceptual data modeling) and 12 (database design) can be skipped or quickly scanned (as a refresher) if students have already had a thorough coverage of these topics in a previous database or data structures course. Finally, Chapter 18 (maintenance) can be skipped if these topics are beyond the scope of your course.

Because the material is presented within the flow of a systems development project, it is not recommended that you attempt to use the chapters out of sequence, with a few exceptions: Chapters 8 (process modeling), 9 (logic modeling), and 10 (conceptual data modeling) can be taught in any sequence; and Chapter 12 (database design) can be taught after Chapters 13 (output design) and 14 (interface design), but Chapters 13 and 14 should be taught in sequence.

Software Packaging Options

- Visible Analyst
- Oracle8i

To enhance the hands-on learning process, Prentice Hall can package this text with Visible Analyst or Oracle8i software. Your Prentice Hall sales representative can provide you with additional information on pricing and ordering.

The Supplement Package

A comprehensive and flexible technology support package is available to enhance the teaching experience:

Instructor's Resource CD-ROM The Instructor's Resource CD features the following:

- *Instructor's Resource Manual*, by Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich, and Lisa Miller, with teaching suggestions and answers to all text review questions, problems, and exercises. Lecture notes on how to use the video series (described below) are also included. The Instructor's Resource Manual is also available in print and from the faculty area of the text's Website.
- *Test Item File and Windows PH Test Manager*, by Lisa Miller, University of Central Oklahoma, includes over 3,000 test questions including multiple choice, true/false, completion, and essay questions. The Test Item File is available in Microsoft Word and as the computerized Prentice Hall Test Manager, which is a comprehensive suite of tools for testing and assessment. Test Manager allows

instructors to easily create and distribute tests for their courses, either by printing and distributing through traditional methods or by on-line delivery via a Local Area Network (LAN) server. Test Manager features Screen Wizards to assist you as you move through the program, and the software is backed with full technical support.

- *PowerPoint Presentation Slides* feature lecture notes that highlight key text terms and concepts. Professors can customize the presentation by adding their own slides, or editing the existing ones.
- *Image Library* is a collection of the text art organized by chapter. This includes all figures, tables, and screenshots, as permission allows.

Companion Website (http://prenhall.com/hoffer) The Companion Website accompanying *Modern Systems Analysis and Design* includes

1. An interactive study guide with multiple choice, true/false, and essay questions. Students receive automatic feedback to their answers. Responses to the essay questions, and results from the multiple choice and true/false questions can be emailed to the instructor after a student finishes a quiz.
2. Web-based exploratory exercises, referenced in the text margin as "Net Search" features are developed on the site.
3. Destinations module (links) includes many useful Web links to help students explore systems analysis and design, CASE tools, and information systems on the Web.
4. PowerPoint presentations for each chapter are available in the student area of the site.
5. A full glossary is available both alphabetically and by chapter, along with a glossary of acronyms.
6. Chat facilities include Message Board and Live Chat. Message Board allows users to post messages and check back periodically for responses. Live Chat allows users to discuss course topics in real-time, and enables professors to host on-line classes.
7. A secure, password-protected Instructor's area features downloads of the Instructor's Resource Manual and data sets to accompany the text case studies.

Video Series

Four of the five clips on this video were prepared by Electronic Data Systems Corporation (EDS) and cover topics such as joint application design and application engineering; the fifth clip covers the application of object-oriented analysis and design in a municipal government agency. Each clip is approximately 15 minutes in length and includes an introduction and prologue from the text authors. Lecture notes and suggestions on how to use the videos are included in the Instructor's Resource Manual.

Acknowledgments

The authors have been blessed by considerable assistance from many people on all aspects of preparation of this text and its supplements. We are, of course, responsible for what eventually appears between the covers, but the insights, corrections, contributions, and proddings of others have greatly improved our manuscript. The people we recognize here all have a strong commitment to students, to the IS field, and to excellence. Their contributions have stimulated us, and frequently stimulated the inclusion of new topics and innovative pedagogy.

We would like to recognize the efforts of the many faculty and practicing systems analysts who have been reviewers of this and its associated text, *Essentials of Systems Analysis and Design*. We have tried to deal with each reviewer comment, and although we did not always agree with specific points (within the approach we wanted to take with this book), all reviewers made us stop and think carefully about what and how we were writing. The reviewers were:

Bonnie C. Glassberg, *University of Buffalo*
Gene Klawikowski, *Nicolet Area Technical College*
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Lisa Miller from the University of Central Oklahoma has worked with us on several projects and has once again provided us with thoughtful and timely content that

has improved the pedagogy of our book. Lisa prepared an extensive test bank, and revised the Instructor's Manual for this text. Meikin Clark (a graduate of the University of Dayton), Melissa Koenig (a graduate of Indiana University), and Sara DiMaio (University of Dayton) contributed the solutions for the Broadway Entertainment Company student project case studies.

We also wish to thank Atish Sinha of the University of Wisconsin-Milwaukee for writing the original version of Chapter 20 on object-oriented analysis and design. Dr. Sinha, who has been teaching this topic for several years to both undergraduates and MBA students, executed a challenging assignment with creativity and cooperation.

We are also indebted to our undergraduate and MBA students at the University of Dayton, Florida State University, and Washington State University, who have given us many helpful comments as they worked with drafts of this text.

Our unique supplement to this text is a series of five videotapes that illustrate common activities and situations encountered by systems analysts. We are very excited about the pedagogical value of these tapes, and compliment EDS Corporation for the sizable commitment of human and financial resources to develop and produce four of these tapes for exclusive use with our book. Specifically, we thank Stu Bailey, Michael Cummings, Vern Olsen, Chris Ryan, and Terry Zuechow of EDS, Bob Tucker of Antares Alliance, and Bill Satterwhite of Whitecap Productions for all of their work on this project. The fifth tape was scripted and produced by the Center for Business and Economics Research at the University of Dayton, and addresses the analysis of needs for a new information system using object-oriented principles. We thank Mike Kurtz and the rest of the CBER staff for their outstanding work.

Thanks also go to Fred McFadden (University of Colorado, Colorado Springs) and Mary Prescott (University of South Florida) for their assistance in coordinating this text with its companion book, *Modern Database Management*, also by Prentice Hall.

Finally, we have been fortunate to work with a large number of creative and insightful people at Prentice Hall, who have added much to the development, format, and production of this text. We have been thoroughly impressed with their commitment to this text and to the IS education market. These people include: Bob Horan (Executive Editor), Lori Cerreto (Associate Editor), Mike Reynolds (Production Editor), Cheryl Asherman (Senior Designer), Erika Rusnak (Editorial Assistant), Sharon Turkovich (Marketing Manager), and Jason Smith (Marketing Assistant).

The writing of this text has involved thousands of hours of time from the authors and from all of the people listed above. Although our names will be visibly associated with this book, we know that much of the credit goes to the individuals and organizations listed here for any success this book might achieve. It is important for the reader to recognize all the individuals and organizations that have been committed to the preparation and production of this book.

Jeffrey A. Hoffer, Dayton, Ohio
Joey F. George, Tallahassee, Florida
Joseph S. Valacich, Pullman, Washington

Brief Contents

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