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

Modern Systems Analysis & Design

Second Edition

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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.

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 analysis 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 and data-driven architectures for systems.* Systems development and database management can be and possibly should be taught in a highly coordinated fashion; this means that this textbook and the McFadden, Hoffer, and Prescott database text, *Modern Database Management,* fifth edition, also published by Addison Wesley Longman, should be compatible. In fact, 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.
6. *Systems development is increasingly becoming both automated and more strategic.* Students must understand the capabilities and limitations of such technologies as visual development tools and computer-aided software engineering (CASE) as well as know how systems relate to IS planning, business process reengineering, and systems integration initiatives.

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.

OUTSTANDING FEATURES

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

1. This book is organized in parallel to the McFadden, Hoffer, and Prescott database text, *Modern Database Management*, Fifth Edition, which will facilitate consistency of frameworks, definitions, methods, examples, and notations to better support SA&D and database courses 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 using the standard chapters found in each book.
2. 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, participatory design, and systems reengineering).
3. A clear linkage of all dimensions of systems description and modeling—process, decision and temporal logic, 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. The grounding of systems development in the typical architecture for systems in modern organizations, including database management and distributed and client/server systems.
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. Chapter 2 highlights the talents that good systems analysts have (and previews the main themes of the text) and helps students identify important material throughout the text.
11. 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 SECOND EDITION

The second edition of *Modern Systems Analysis and Design* follows the same overall outline as that of the first edition. Within this successful organization, several important changes have been made:

- *The text has been streamlined* Systems analysis and design is a comprehensive field, so long texts are common. This second edition, in comparison to the first edition, has moved one chapter (on a sample systems development project case study) to the text's Web site, combined two chapters (on systems implementation) into one Chapter (Chapter 20), and eliminated all appendices (two have been moved to the text's Web site and two are now full chapters — Chapters 12 and 13).
- *Expanded coverage of automated tools for systems development* The coverage of CASE has been slightly reduced, and the role of visual and emerging development environments, which are playing an increasingly important role in systems development, has been included in the new Chapter 4.
- *Integration of business process reengineering into relevant chapters* The role of BPR in systems development is treated within the context of systems analysis, as part of Chapter 7 on requirements determination and Chapter 8 on process modeling.
- *Thorough coverage of object-orientation* Chapter 12 is devoted to object-oriented systems analysis and design. This chapter explains the most significant and commonly used OO modeling and design techniques based on the UML standards. The chapter is positioned between the analysis and design sections of the text, consistent with the way in which object-orientation integrates these systems development steps.
- *Expanded coverage of Rapid Application Development (RAD)* Chapter 13 is devoted to this family of methodologies for iterative systems development. This chapter presents the frameworks on which RAD is based and shows how techniques and tools described in detail in the rest of the text are used in combination for effective rapid development of systems. The topic of RAD is also positioned

between the analysis and design sections of the text to emphasize how these two systems development phases are blended together in RAD.

- *New coverage of enterprise resource planning packages as a system design strategy* Organizations of all sizes are adopting ERP packages such as R/3 from SAP America and Oracle Financials from Oracle Corporation. Chapter 11, which discusses selecting a systems design strategy at the end of the analysis phase of development, outlines the reasons for and hazards of the ERP approach to deploying systems.
- *New end-of-chapter review questions and new problems and exercises* All chapters have new questions and exercises, and many chapters have many new ones. Special attention has been given, where appropriate, to reordering problems and exercises in increasing order of difficulty.
- *CASE tool support for text significantly enhanced* All screen captures in the text have been updated to show the latest features of CASE and other automated tools. Many CASE tool screens are from Designer/2000, a leading CASE tool from Oracle Corporation.

THE ORACLE® CASE TOOLS EDITION

Modern Systems Analysis and Design, Second Edition, is the first systems analysis textbook on the market to offer students an outstanding CASE tools software package from Oracle Corporation. For a few dollars more than the price of the text alone, students will receive full editions of Designer/2000, release 2.1 for Microsoft® Windows 95; Developer 2000, release 2.1 for Microsoft Windows 95; and Personal Oracle7, release 7.3.4 for Microsoft Windows 95. We are proud to offer such a highly valued, powerful software package to students at such a low cost.

PEDAGOGY

Several elements in the design and implementation of the text and its supplements make it readable and practical, holding the reader's attention, and assisting the instructor in delivering a better course.

1. Fifteen of the twenty-one chapters include a running case study, Broadway Entertainment Company. This hypothetical, high-technology company provides a rich arena for bringing the concepts, skills, techniques, and tools explained in the chapter to life. Discussion questions for the case are provided in the *Instructor's Manual.*
2. Videotapes are available that will show practicing systems professionals engaged in meetings, interviews, and other tasks during the development of information systems. This series of videotapes also includes discussions by systems professionals on the critical success factors for systems developers and for the management of systems projects.
3. There are three case situations used throughout the book (several of these match cases used in the McFadden, Hoffer, and Prescott *Modern Database Management* text) to illustrate methods, notations, and design techniques.
4. End-of-chapter review questions and problems and exercises test students' knowledge of the material. An innovative addition is a set of field exercises

that give students an opportunity to explore the practice of SA&D in organizations.

5. Chapter objectives introduce each chapter to help the student identify the main topics within each chapter.
6. A comprehensive *Instructor's Manual* provides answers to all the review questions and problems and exercises from the text, plus teaching suggestions and selected questions and problems which may be used in tests or as supplemental exercises.
7. A comprehensive test bank of over 1,600 objective and short answer questions.
8. A Web site that provides extensive resources and links for both students and instructors. See the description of this site in the section on Supplements.

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 most 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 seven 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), 16 (logical data modeling), and 17 (physical 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. Chapter 12 (object-oriented analysis and design) and Chapter 13 (RAD) can be skipped or treated as advanced topics at the end of the course. Finally, Chapter 21 (maintenance and reengineering) 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 16 (logical data modeling) can be taught before Chapters 14 (output design) and 15 (interface design), but Chapters 14 and 15 should be taught in sequence.

SUPPLEMENTS

Instructor's Manual
by Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich, and Lisa Miller
The Instructor's Manual accompanying *Modern Systems Analysis and Design* provides teaching suggestions as well as answers to all text review questions, problems, and exercises. It is available electronically on the Instructor's Resource Disk (described below).

Test Bank
by Lisa Miller, University of Central Oklahoma
The Test Bank includes 40-60 multiple choice, 15 matching, and 5 essay questions per chapter. It is available in a computerized version on the Instructor's Resource Disk (described below). As an additional service to professors using the Hoffer/George/Valacich text, FastFax Testing is available through the Glenview Software Products Services Group. This group will create tests based on instructions from the professor via fax or mail. To receive more information or forms for requesting tests, please contact your local Addison Wesley Longman sales representative.

Instructor's Resource Disk
The Instructor's Resource Disk contains an electronic version of the Instructor's Manual, a computerized version of the Test Bank, and a PowerPoint Presentation. The Instructor's Manual is available in Word 97 for Windows. The computerized version of the Test Bank uses test generator software (TestGen-EQ with QuizMaster-EQ for Windows 95) which is fully networkable. TestGen-EQ's friendly graphical interface enables instructors to easily view, edit, and add questions; transfer questions to tests; and print tests in a variety of fonts and forms. Search-and-sort features let the instructor quickly locate questions and arrange them in a preferred order. QuizMaster-EQ automatically grades the exams, stores results on disk, and allows the instructor to view or print a variety of reports. The PowerPoint Presentation, consisting of key illustrations from the text, is available in PowerPoint 8 for Windows. Professors can customize the presentation by adding their own slides, or editing the existing ones. They can also print the slides out for distribution to the students.

Web Site
The web site accompanying *Modern Systems Analysis and Design*, Second Edition includes material on a sample systems development project case study (Pine Valley Furniture), appendixes on types of information systems and advanced topics in conceptual data modeling, and other useful resources and links for students and instructors. Visit the site at http://hepg.awl.com and use the keyword Hoffer.

EDS Video Series
by Electronic Data Systems Corporation (EDS)
This video series, prepared by EDS specifically to accompany *Modern Systems Analysis and Design*, consists of four video segments each approximately 15 minutes in length, that focus on systems analysis and design. Each includes an introduction and prologue from Professors Hoffer, George, and Valacich. A new video, in addition to this EDS Series, will be available with the second edition.*

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 rejuvenated us during periods of waning energy for this project.

We would like to recognize the efforts of the many faculty and practicing systems analysts who have been reviewers of the several drafts of our manuscript. 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 in this book), all reviewers made us stop and think carefully about what and how we were writing. The reviewers were: Barbara Allen (Douglas College), Jay E. Aronson (University of Georgia), Susan Athey (Colorado State University), Penny Brunner (University of North Carolina, Asheville), Pedro Cabrejos (Champlain College), Donald Chand (Bentley College), Amir Dabirian (California State University, Fullerton), Mark Dishaw (University of Wisconsin at Oshkosh), Jerry Dubyk (Northern Alberta Institute of Technology), Barry Frew (Naval Post-Graduate School), Jim Gifford (University of Wisconsin), Mike Godfrey (California State University, Long Beach), Dale Gust (Central Michigan University), Alexander Hars (University of Southern California), Ellen Hoadley (Loyola College-Baltimore), Monica Holmes (Central Michigan University), Robert Jackson (Brigham Young University), Murray Jennex (University of Phoenix), Len Jessup (Indiana University), Robert Keim (Arizona State University), Mat Klempa (California State University at Los Angeles), Ned Kock (Temple University), Rebecca Koop (Wright State University), Sophie Lee (University of Massachusetts at Boston), Chang-Yang Lin (Eastern Kentucky University), Nancy Martin (USA Group, Indianapolis, Indiana), Roger McHaney (Kansas State University), Nancy Melone (University of Oregon), G. Premkumar (Iowa State University), Mary Prescott (University of South Florida), Terence Ryan (Southern Illinois University), Eugene Stafford (Iona College), Bob Tucker (Antares Alliance, Plano, Texas), Cheryl Welch (Ashland University), Connie Wells (Nicholls State University), Chris Westland (University of Southern California), Charles Winton (University of North Florida), and Terry Zuechow (EDS Corporation, Plano, Texas). All of the reviewers provided honest and helpful comments.

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* The ancillary package is available to qualified domestic adopters and in some cases may not be available to international adopters because of legal and other restrictions.

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.

We are most grateful to Oracle Corporation for making available their powerful modeling and development tools, Designer/2000, release 2.1 for Microsoft® Windows 95; Developer 2000, release 2.1 for Microsoft Windows 95; and Personal Oracle7, release 7.3.4 for Microsoft Windows 95, for students' use with this new edition of *Modern Systems Analysis and Design*. We believe that students will greatly benefit from having such easy access to these important CASE tools. We particularly thank Rene Bonvanie and Randy Baker of Oracle Corporation, as well as Maureen Dorhety, Diane Shorts, Marie Schmitt, Susan Andolsek, and other Oracle employees who worked behind the scenes to make this happen.

We also give special recognition to Pam Carter at Florida State University, who prepared all the Oracle Designer/2000 and Developer/2000 screens. Her work was timely and careful.

One unique supplement to this text is a series of four videotapes which 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 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.

We want to thank Lisa Miller from the University of Central Oklahoma who has prepared an extensive test bank and revised the Instructor's Manual for this text. We are also grateful to USA Group, Inc., Allison Engine Company, Cambridge Technology Partners (particularly Harold Gubnitsky, Elizabeth Brewer, and Kelly Wright), IVI Publishing, and Albertson's, Inc. for their valuable contributions in the construction of the case studies that open each part of this book.

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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 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 who have been committed to the preparation and production of this book.

Jeffrey A. Hoffer (Dayton, Ohio)
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