

教育部高等教育司推荐  
国外优秀信息科学与技术系列教学用书

# 系统分析与设计 简明教程

(影印版)

## ESSENTIALS OF SYSTEMS ANALYSIS AND DESIGN

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



高等教育出版社  
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**Essentials of Systems Analysis and Design, First Edition**

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

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# 前 言

20 世纪末, 以计算机和通信技术为代表的信息科学和技术对世界经济、科技、军事、教育和文化等产生了深刻影响。信息科学技术的迅速普及和应用, 带动了世界范围信息产业的蓬勃发展, 为许多国家带来了丰厚的回报。

进入 21 世纪, 尤其随着我国加入 WTO, 信息产业的国际竞争将更加激烈。我国信息产业虽然在 20 世纪末取得了迅猛发展, 但与发达国家相比, 甚至与印度、爱尔兰等国家相比, 还有很大差距。国家信息化的发展速度和信息产业的国际竞争能力, 最终都将取决于信息科学技术人才的质量和数量。引进国外信息科学和技术优秀教材, 在有条件的学校推动开展英语授课或双语教学, 是教育部为加快培养大批高质量的信息技术人才采取的一项重要举措。

为此, 教育部要求由高等教育出版社首先开展信息科学和技术教材的引进试点工作。同时提出了两点要求, 一是要高水平, 二是要低价格。在高等教育出版社和信息科学技术引进教材专家组的努力下, 经过比较短的时间, 第一批引进的 20 多种教材已经陆续出版。这套教材出版后受到了广泛的好评, 其中有不少是世界信息科学技术领域著名专家、教授的经典之作和反映信息科学技术最新进展的优秀作品, 代表了目前世界信息科学技术教育的一流水平, 而且价格也是最优惠的, 与国内同类自编教材相当。

这项教材引进工作是在教育部高等教育司和高教社的共同组织下, 由国内信息科学技术领域的专家、教授广泛参与, 在对大量国外教材进行多次遴选的基础上, 参考了国内和国外著名大学相关专业的课程设置进行系统引进的。其中, John Wiley 公司出版的贝尔实验室信息科学研究中心副总裁 Silberschatz 教授的经典著作《操作系统概念》, 是我们经过反复谈判, 做了很多努力才得以引进的。William Stallings 先生曾编写了在美国深受欢迎的信息科学技术系列教材, 其中有多种教材获得过美国教材和学术著作者协会颁发的计算机科学与工程教材奖, 这批引进教材中就有他的两本著作。留美中国学者 Jiawei Han 先生的《数据挖掘》是该领域中具有里程碑意义的著作。由达特茅斯学院 Thomas Cormen 和麻省理工学院、哥伦比亚大学的几



位学者共同编著的经典著作《算法导论》，在经历了 11 年的锤炼之后于 2001 年出版了第二版。目前任教于美国 Massachusetts 大学的 James Kurose 教授，曾在美国三所高校先后 10 次获得杰出教师或杰出教学奖，由他主编的《计算机网络》出版后，以其体系新颖、内容先进而倍受欢迎。在努力降低引进教材售价方面，高等教育出版社做了大量和细致的工作。这套引进的教材体现了权威性、系统性、先进性和经济性等特点。

教育部也希望国内和国外的出版商积极参与此项工作，共同促进中国信息技术教育和信息产业的发展。我们在与外商的谈判工作中，不仅要坚定不移地引进国外最优秀的教材，而且还要千方百计地将版权转让费降下来，要让引进教材的价格与国内自编教材相当，让广大教师和学生负担得起。中国的教育市场巨大，外国出版公司和国内出版社要通过扩大发行数量取得效益。

在引进教材的同时，我们还应做好消化吸收，注意学习国外先进的教学思想和教学方法，提高自编教材的水平，使我们的教学和教材在内容体系上，在理论与实践的结合上，在培养学生的动手能力上能有较大的突破和创新。

目前，教育部正在全国 35 所高校推动示范性软件学院的建设和实施，这也是加快培养信息科学技术人才的重要举措之一。示范性软件学院要立足于培养具有国际竞争力的实用性软件人才，与国外知名高校或著名企业合作办学，以国内外著名 IT 企业为实践教学基地，聘请国内外知名教授和软件专家授课，还要率先使用引进教材开展教学。

我们希望通过这些举措，能在较短的时间，为我国培养一大批高质量的信息技术人才，提高我国软件人才的国际竞争力，促进我国信息产业的快速发展，加快推动国家信息化进程，进而带动整个国民经济的跨越式发展。

教育部高等教育司

二〇〇二年三月

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*To Jackie, Jordan, James, and the rest of  
my family, your love and support are my  
greatest inspiration.*

*—Joe*

*To Karen, Evan, and Caitlin, for your  
love, support, and patience.*

*—Joey*

*To Patty, for her sacrifices, encouragement,  
and support. To my students, for being  
receptive and critical, and for challenging  
me to be a better teacher.*

*—Jeff*

# Preface

## Our Approach

In today's information and technology-driven business world, students need to be aware of three key factors. First, it is more crucial than ever to know how to organize and access information strategically. Second, success often depends on the ability to work as part of a team. Third, the Internet will play an important part in their work lives. We developed *Essentials of Systems Analysis and Design* to address these key factors.

We have over 40 years' combined teaching experience in systems analysis and design and have used that experience to create *Essentials of Systems Analysis and Design*, a text that emphasizes hands-on, experimental learning. 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.

Internet coverage is provided in each chapter via an integrated, extended illustrative case (Pine Valley WebStore), an end-of-chapter case (Broadway Entertainment Company, Inc.), and a margin feature (Net Search).

Many systems analysis and design courses involve lab work and outside reading. This means that lecture time can be limited. Based on market research and our own teaching experience, we understand the importance of using a book that combines depth of coverage with brevity. We have created a 10-chapter book that covers key systems analysis and design content without overwhelming students with unnecessary detail.

*Essentials of 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, and the Internet.* Systems development and database management can be and possibly should be taught in a highly coordinated fashion. The Internet has rapidly become a common development platform for database-driven electronic commerce systems.
5. *Success in systems analysis and design requires not only skills in methodologies and techniques but also in the management of 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:

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

## Audience

Many of you may be familiar with our other Prentice Hall book, *Modern Systems Analysis and Design*, Second Edition, which targets primarily upper-division undergraduates in Information Systems programs and majors in MS and MBA programs and provides a comprehensive examination of the systems analysis and design process. In this book, *Essentials of Systems Analysis and Design*, we provide a streamlined examination of the process, making this book useful for courses that either are more project based or take a more introductory focus.

The book is written assuming that students have taken an introductory course on computer systems and have experience writing programs in at least one programming language. 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.

## Organization

The outline of the book follows the systems development life cycle, which allows for a logical progression of topics.

- ❶ Part I, “Foundations for Systems Development,” gives an overview of systems development and previews the remainder of the book.
- ❷ Part II, “Systems Planning and Selection,” covers how to assess project feasibility and build the baseline project.
- ❸ Part III, “Systems Analysis,” covers determining system requirements, process modeling, conceptual modeling, and determining the best design.
- ❹ Part IV, “Systems Design,” covers how to design the human interface and databases.
- ❺ Part V, “System Implementation and Operation,” covers system implementation, operation, closedown, and system maintenance.

Appendix A, “Object-Oriented Analysis and Design” and Appendix B, “Rapid Application Development and CASE Tools,” can be skipped or treated as advanced topics at the end of the course.

## Distinctive Features

Some of the distinctive features of *Essentials of Systems Analysis and Design* are

1. The grounding of systems development in the typical architecture for systems in modern organizations, including database management and Web-based systems.
2. 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.
3. 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).
4. Coverage of rules and principles of systems design, including decoupling, cohesion, modularity, and audits and controls.



5. A discussion of systems development and implementation within the context of management of change, conversion strategies, and organizational factors in systems acceptance.
6. Careful attention to human factors in systems design that emphasize usability in both character-based and graphical user interface situations.

## Pedagogical Features

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

## SDLC Framework

Central to the development of an efficient information system is the systems development life cycle (SDLC). We highlight four key SDLC steps (Figure P-1):

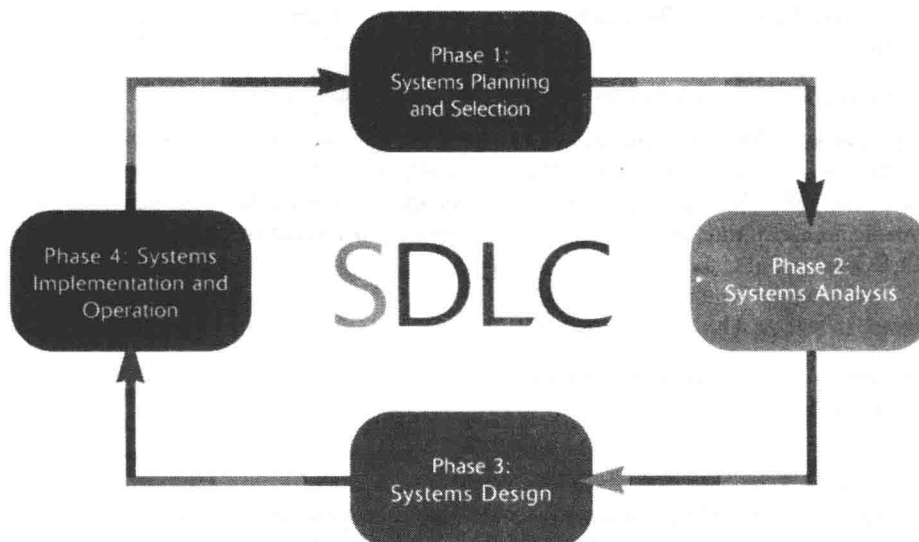
- Planning and selection
- Analysis
- Design
- Implementation and operation

We use the SDLC to frame the part and chapter organization of our book. Each chapter opens with an SDLC figure with various parts highlighted to show students how each chapter, and each step of the SDLC, systematically builds on the previous one.

## Internet Coverage and Features

*Pine Valley Furniture WebStore.* A furniture company founded in 1980 has decided to explore electronic commerce as an avenue to increase its market share. Should this company sell its products on-line? How would a team of analysts work together to develop, propose, and implement a plan? Beginning in Chapter 3, we explore the step-by-step process.

*Broadway Entertainment Company, Inc.* This end-of-chapter fictional case illustrates how a video and music retailer develops a Web-based customer relationship management system. This case first appears at the end of Chapter 2 and concludes at the end of Chapter 10.



**FIGURE P-1**  
**SYSTEMS DEVELOPMENT LIFE CYCLE (SDLC)**

Project management occurs throughout the systems development life cycle (SDLC).



*Net Search.* Each chapter includes a margin feature entitled “Net Search.” Students can access <http://www.prenhall.com/valacich> to link to a specific site related to the topic within the chapter and complete an exercise.

### Three Illustrative Fictional Cases



*Pine Valley Furniture (PVF).* This case is introduced in Chapter 2 and revisited throughout the book. As key systems development life cycle concepts are presented, they are applied and illustrated with this illustrative case. For example, in Chapter 2, we explore how PVF implements the purchasing fulfillment system, and in Chapter 3, we explore how PVF implements a customer tracking system. A margin icon identifies the location of the case. A case problem related to PVF is included in the end-of-chapter material.



*Hoosier Burger (HB).* This second illustrative case is introduced in Chapter 5 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 these case segments. A case problem related to HB is included in the end-of-chapter material.



*Broadway Entertainment Company, Inc. (BEC).* This fictional video rental and music company is used as an extended case at the end of each chapter, beginning with Chapter 2. 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 Resource CD-ROM.

### End-of-Chapter Material

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

*Key Points Review.* This repeats the learning objectives that appear at the opening of the chapter and summarizes the key points related to the objectives.

*Key Terms Checkpoint* This is designed as a self-test feature. Students match each key term in the chapter with its definition.

*Review Questions.* These test students’ understanding of key concepts.

*Problems and Exercises.* These test students’ analytical skills and require them to apply key concepts.

*Discussion Questions.* These promote class participation and discussion.

*Case Problems.* These require students to apply the concepts of the chapter to three fictional cases from various industries. The two illustrative cases from the chapters are revisited—Pine Valley Furniture and Hoosier Burger. Other cases are from various fields such as medicine, agriculture, and technology. Solutions are provided on the Instructor’s Resource CD-ROM.

### Margin Term Definitions

Each key term and its definition appears in the margin. A glossary of terms appears at the back of the book.

### References

Located at the end of the text, references organized by chapter list over 100 books and journals that can provide students and faculty with additional coverage of topics.

## Software Packaging Options

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- ❶ Visible Analyst
- ❷ Oracle 8i

To enhance the hands-on learning process, Prentice Hall is planning to package this text with a choice of Visible Analyst or Oracle 8i software. Your Prentice Hall sales representative can provide additional information on pricing and ordering.

## The Supplement Package

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

### Instructor's Resource CD-ROM

The Instructor's Resource CD-ROM features four key components:

- ❶ *Instructor's Resource Manual*, by Joseph S. Valacich, Joey F. George, Jeffrey A. Hoffer, 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.
- ❷ *Prentice Hall Test Manager*, by Lisa Miller (University of Central Oklahoma), includes 1,500 test questions including multiple choice, matching, and essay questions. This computerized test bank 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.
- ❸ PowerPoint presentation slides, created by John Russo of the Wentworth Institute of Technology, 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.
- ❹ Image Library, features all of the art from the text, organized by chapter.

### Web Site (<http://www.prenhall.com/valacich>)

The Companion Web site to *Essentials of 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 e-mailed 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*, data sets to accompany the text case studies, and references by chapter.

## Electronic Data Systems Corporation Video Series

This video series, prepared by Electronic Data Systems (EDS) Corporation, consists of four video segments, each approximately fifteen minutes in length, that focus on systems analysis and design. Each 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 rejuvenated us during periods of waning energy for this project.

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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 four 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 its 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.

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## About the Authors

**Joseph S. Valacich** is The George and Carolyn Hubman Distinguished Professor in Information Systems for the College of Business and Economics at Washington State University, Pullman. He received a B.S. degree in computer science and M.B.A. from the University of Montana, and a Ph.D. degree in management information systems from the University of Arizona. He is a member of the Institute for Operations Research and Management Sciences (INFORMS), the Association for Computing Machinery (ACM), and is a charter member of the Association for Information Systems (AIS). He was awarded the Outstanding Faculty Service Award from the Washington State University College of Business and Economics in 1997.

Prior to his academic career, Dr. Valacich worked in the information systems field as a programmer, systems analyst, and technical product manager. He has conducted numerous corporate training and executive development programs for organizations, including AT&T, Dow Chemical, EDS, Exxon, FedEx, General Motors, and Xerox.

Dr. Valacich serves on the editorial board of *Small Group Research* and was formerly an associate editor for *MIS Quarterly*. His research has appeared in publications such as *MIS Quarterly*, *Information Systems Research*, *Management Science*, and *Academy of Management Journal*. With Leonard M. Jessup, he coedited the book *Group Support Systems: New Perspectives* for Macmillan in 1993 and coauthored *Information Systems Foundations* for QUE Education and Training in 1999. Dr. Valacich is a coauthor with Jeffery A. Hoffer and Joey F. George of the best-selling *Modern Systems Analysis and Design*, 2nd Edition, published by Addison-Wesley.



Joey F. George is professor and Thomas L. Williams Jr. Eminent Scholar in Information Systems in the College of Business at Florida State University. Dr. George earned his bachelor's degree at Stanford University in 1979 and his Ph.D. in management at the University of California at Irvine in 1986. He was previously the Edward G. Schlieder Chair of Information Systems in the E. J. Ourso College of Business Administration at Louisiana State University. He also served at Florida State University as Chair of the Department of Information and Management Sciences from 1995 to 1998.

Dr. George has published over thirty articles in such journals as *Information Systems Research*, *Communications of the ACM*, *MIS Quarterly*, *Journal of MIS*, and *Communication Research*. His research interests focus on the use of information systems in the workplace, including computer-based monitoring, desktop computing, and group support systems.

Dr. George is coauthor of the textbook *Modern Systems Analysis and Design*, 2nd Edition, published in 1999 by Addison-Wesley. He currently serves as an associate editor for *Information Systems Research*, a position he has held since 1996. He also served as an associate editor for *MIS Quarterly* from 1992 through 1997. He is a member of the editorial boards for *Information Technology and People* (since 1990), *Internet Research* (since 1998), and is senior editor for the new journal *eServices Quarterly*. Dr. George was the vice chair of the Program Committee for the 1999 International Conference on Information Systems (ICIS), and he is currently the conference cochair for the 2001 ICIS, to be held in New Orleans, Louisiana.

Jeffrey Alan Hoffer is professor and chair of the Department of MIS and Decision Sciences in the School of Business Administration at University of Dayton. He also taught at Indiana University and Case Western Reserve University. Dr. Hoffer earned his A.B. from Miami University in 1969 and his Ph.D. from Cornell University in 1975.

Dr. Hoffer has published three college textbooks: *Modern Systems Analysis and Design*, 2nd Edition, with George and Valacich by Addison-Wesley; *Information Technology for Managers: What Managers Need to Know*, with DeHayes, Martin, and Perkins by Macmillan; and *Modern Database Management*, with McFadden and Prescott by Addison-Wesley. His research articles have appeared in numerous journals, including the *Journal of Database Management*, *Small Group Research*, *Communications of the ACM*, and *Sloan Management Review*. He has received research grants from IBM Corporation and the U.S. Department of the Navy.

Dr. Hoffer is cofounder of the International Conference on Information Systems and has served as a guest lecturer at Catholic University of Chile, Santiago, and the Helsinki School of Economics and Business in Mikkeli, Finland.

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

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