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Object-Oriented Systems Analysis And Design

Second Edition

面向对象系统分析与设计

（第2版）

Joey George
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著

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Object-Oriented Systems Analysis and Design

SECOND EDITION

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。

清华大学出版社

PREFACE

OUR APPROACH

Today's business environment is dynamic, turbulent, and global. Information systems have moved from back-office technologies understood by only a few to pervasive, essential support technologies that touch all aspects of business and all players in the game. As the role of information technology in business has changed, so have the underlying technologies and the manner in which systems are developed. Long predicted to be the next big thing, object orientation has finally arrived. The adoption of object orientation has not resulted in the dramatic paradigm shift that also was predicted for so long. Instead, we are witnessing the emergence of a hybrid approach to systems and their development—an approach that encompasses some aspects of traditional systems development and some aspects of object orientation. Although this book focuses on object-oriented systems analysis and design and it adheres to UML standards, it contains elements from other approaches, such as elements of relational database system design, that remain a part of systems development in business organizations today.

Among the four of us, we have more than 80 years of combined teaching experience in systems analysis and design, including teaching database management and object-oriented approaches. We have used that experience to create *Object-Oriented Systems Analysis and Design*, Second Edition. As was true in the first edition, 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 continue to use a systems development 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) and an end-of-chapter case (Broadway Entertainment Company, Inc.).

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 14-chapter book that covers key object-oriented systems analysis and design (OOSAD) content without overwhelming students with unnecessary detail. The book is a compromise between briefer approaches to OOSAD and larger, more comprehensive volumes.

Object-Oriented Systems Analysis and Design, Second Edition is characterized by the following themes:

1. **Systems development is firmly rooted in an organizational context.** The successful systems analyst needs a broad understanding of organizations, organizational culture, and operation.
2. **Systems development is a practical field.** Coverage of current practices as well as accepted concepts and principles is 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. These principles are constant, regardless of the technical approach to development.

4. **Systems development has changed significantly with the explosive growth in the adoption of object-oriented approaches to systems development.** In many organizations, traditional tools that support systems development, such as data flow diagrams, have been replaced with object-oriented tools such as use-case diagrams, sequence diagrams, and analysis class diagrams. Pure relational database management approaches have been replaced with object-relational approaches. Our approach in this book focuses exclusively on diagrams and techniques associated with OOSAD.
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. Our approach to process emphasizes a systems development cycle as an organizing principle and the focus on development iterations prevalent in object-oriented analysis and design.

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.

New to the Second Edition

1. **UML 2 compliant:** The text is now UML 2 compliant throughout. Coverage of each UML diagram has been improved. Adequate coverage of UML diagrams is important for prospective systems analysts. A recent study shows that systems developers routinely rely on these diagrams in their work (Lang, 2006). Almost all, 97 percent, use screen prototypes, with the proportions using other analysis and design diagrams as follows: 95 percent use activity diagrams; 74 percent use entity relationship diagrams; 72 percent rely on use-case diagrams; 62 percent use class diagrams; and 50 percent use state diagrams. All of these diagram types are covered in the book.
2. **Agile methodologies:** While the first edition included limited coverage of eXtreme programming, the text now contains much more extensive treatment of agile methodologies, including but not limited to eXtreme programming. Coverage extends across several chapters, including Chapters 1, 5, and 14.
3. **Use cases:** Chapter 6 now features a more extensive treatment of use cases and of differing levels of perspective from which use cases can be written.
4. **OCL:** The object constraint language (OCL) is introduced to express business rules in Chapter 9.
5. **Patterns:** In Chapter 12, patterns are used to convert sequence diagrams from the analysis to the design stage.
6. **BEC case:** The Broadway Entertainment Company case has been updated and improved, both to be more current, in business terms, and to feature more object-oriented systems analysis and design in the case.

Audience

Object-Oriented Systems Analysis and Design is written with the assumption that students have taken an introductory course on computer systems and have experience writing programs in at least one programming language, preferably an object-

oriented 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 overall organization of the book is the same as it was in the first edition. The outline of the book begins with basic foundational material and then follows a systems development cycle, which allows for a logical progression of topics. This cycle is designed to be high level and consists of four steps: planning, analysis, design, and implementation. The book, then, has five parts:

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

Distinctive Features

Some of the distinctive features of the second edition of *Object-Oriented Systems Analysis and Design* are:

1. **System Development Cycle (SDC) Framework**—A systems development methodology is central in the development of an information system. The generic methodology used here is a four-step systems development cycle. Each chapter, except Chapter 2, opens with an SDC figure and shows how each step of the SDC builds on the previous step.
2. **Object-Oriented (OO) definitions chapter**—Chapter 2 is devoted to definitions of key OO terms and examples of them. The chapter serves as a key reference as students progress through the book.
3. **Standard Unified Modeling Language (UML) terminology and diagrams**—All of the terminology and diagrams are UML compliant. Diagrams include use case, sequence, state transition, and so on.
4. **Running case: The Pine Valley Furniture WebStore case**—The PVF case is used throughout the text as an example of OOSAD development. The case shows how a team of analysts work together to develop, propose, implement, and maintain Internet-based applications.
5. **Broadway Entertainment Company, Inc.**—This end-of-chapter case illustrates how a fictional video and record retailer develops an object-oriented application. This case first appears at the end of Chapter 2 and concludes at the end of Chapter 14.
6. **Communication**—The book includes extensive coverage of oral and written communication skills including systems documentation, project management, team management, and a variety of systems development and acquisition strategies.

7. **Managerial focus**—Throughout the book, the treatment of systems development and implementation is always within the context of management of change, conversion strategies, and organizational factors in systems acceptance.
8. **Database approach**—Unique approach to data using object-relational database management systems (DBMSs) featuring Oracle10g.
9. **Diagrams**—The diagrams used throughout the text were developed using the Rational Rose CASE tool, Microsoft's Visio, and Microsoft's Project.

Illustrative Fictional Cases

Pine Valley Furniture (PVF) This case is introduced in Chapter 4 and revisited throughout the book. As key systems development cycle and object-oriented concepts are presented, they are applied and illustrated with this case. A margin icon identifies the location of the case. PVF is a furniture company, founded in 1980, and management has decided to explore electronic commerce as an avenue to increase its market share. A case problem related to PVF is included in the end-of-chapter material for many of the chapters.

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 using an object-oriented systems development approach. Discussion questions are included to promote critical thinking and class participation. Suggested solutions to the discussion questions are provided in the Instructor's Resource Manual located in the Faculty area of the Website: http://www.prenhall.com/george.

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 questions test students' understanding of key concepts.

Problems and Exercises These problems and exercises test students' analytical skills and require them to apply key concepts.

Discussion Questions These questions promote class participation and discussion.

Case Problems These problems require students to apply the concepts of the chapter to three fictional cases from various industries. The illustrative case from the book—Pine Valley Furniture—is revisited. Other cases are from various fields such as medicine, agriculture, and technology. Solutions are provided in the Instructor's Manual located in the Faculty area of the Website: http://www.prenhall.com/george.

Margin Term Definitions Each of the key terms and their definitions appear in the margins. A glossary of terms appears at the back of the book.

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

Software Packaging Options

- Visible Analyst
- Microsoft Visio
- Microsoft Project
- Oracle10g

To enhance the hands-on learning process, Prentice Hall offers the option to package this text with a choice of Visible Analyst, Microsoft Visio, Microsoft Project, or Oracle10g software. Your Prentice Hall sales representative can provide additional information on pricing and ordering.

Instructor's Resource Center

The Instructor's Resource Center found on the catalog page is a password protected Faculty site that contains instructor supplements for download.

1. ***PowerPoint presentation slides*** *feature lecture notes that highlight key text terms and concepts.*
2. *The* ***Instructor's Resource Manual*** *is secured in the password-protected Faculty area. It contains teaching suggestions and answers to all text review questions, problems, exercises, and case problems.*
3. *The* ***Test Item File*** *also is secured in the Faculty area. It is available in Microsoft Word, converted WebCT, and BlackBoard files.*
4. *An* ***Image Library*** *is provided in the Faculty area. This is a collection of figures and tables from the text to enhance class lectures and PowerPoint slides.*

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 served as reviewers for this book. 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:

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The writing of this text has involved thousands of hours of time from the authors and from all of the aforementioned people. 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.

About the Authors

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 many 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, computer-mediated deceptive communication, and group support systems.

Dr. George, along with Joseph Valacich and Jeffrey Hoffer, is coauthor of the textbooks *Modern Systems Analysis and Design*, fifth edition, published in 2007 by Prentice Hall, and *Essentials of Systems Analysis and Design*, third edition, copyright 2006 by Prentice Hall. He is also the editor of *Computers and Society: Privacy, Ethics, and the Internet*, copyright 2004 by Prentice Hall. Dr. George is currently the Editor-in-Chief for the journal *Communications of the AIS*. In the past, he has served as a senior editor and an associate editor for the journal *MIS Quarterly* and an associate editor for the journal *Information Systems Research*. He has also served on various other journal editorial boards. Dr. George was the conference co-chair for the 2001 ICIS, held in New Orleans, Louisiana, and he was the co-chair of the doctoral consortium for the 2003 ICIS, held in Seattle, Washington.

Dinesh Batra is professor at the Department of Decision Sciences and Information Systems in the College of Business Administration at the Florida International University. He earned his B.Tech. from the Indian Institute of Technology at Delhi in 1979, M.B.A. from Southern Illinois University at Carbondale in 1985, and Ph.D. from Indiana University at Bloomington in 1989. After his bachelor's degree and during the period 1979–1983, he worked for four years in a consulting company conducting process and design of large engineering projects.

Dr. Batra has published over 25 articles in such journals as *Management Science, Communication of the ACM, Journal of MIS, International Journal of Human Computer Studies, Data Base, European Journal of Information Systems, Journal of Database Management, Communications of the AIS, Decision Support Systems, Computers and OR,* and *Information & Management*. His research interests focus on usability issues in systems and database analysis and design. He has served as an associate editor in the journal Data Base, and is on the editorial board of the *Journal of Database Management* and *Information Systems Management*. He has also served as the director of the MS in MIS program at the Florida International University. He is currently the president of the AIS Special Interest Group on Systems Analysis & Design (SIGSAND).

Joseph S. Valacich, The George and Carolyn Hubman Distinguished Professor in MIS and the inaugural Marian E. Smith Presidential Endowed Chair, joined the faculty at Washington State University in 1996. He was previously an associate professor with tenure (early) at Indiana University, Bloomington, and was named the Sanjay Subhedar Faculty Fellow. He has had visiting faculty appointments at the University of Arizona, City University of Hong Kong, Buskerud College (Norway), Riga Technical University (Latvia), and the Helsinki School of Economics and Business. He received the Ph.D. degree from the University of Arizona (MIS), and the M.B.A. and B.S. (computer science) degrees from the University of Montana. His teaching interests include systems analysis and design, collaborative computing, project management, and management of information systems. Professor Valacich served on the national task forces to design *IS '97* and *2002: The Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems,* as well as *MSIS 2000* and *2006: The Master of Science in Information Systems Model Curriculum*. He also served on the Executive Committee, funded by the National Science Foundation, to define the *IS Program Accreditation Standards* and on the Board of Directors for CSAB (formally, the Computing Sciences Accreditation Board), representing the Association for Information Systems (AIS). He was the general conference co-chair for the 2003 International Conference on Information Systems (ICIS) in Seattle and was the vice-chair of ICIS 1999 in Charlotte, NC.

Jeffrey A. Hoffer is the Sherman-Standard Register Professor of Data Management in the Department of MIS, Operations Management, and Decision Sciences in the School of Business Administration at the 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 four other college textbooks: *Modern Systems Analysis and Design*, fifth edition, with Joey George and Joseph Valacich; *Essentials of Systems Analysis and Design*, third edition, with Joseph Valacich and Joey George; *Modern*

Database Design, eighth edition, with Mary Prescott and Fred McFadden; and *Information Technology for Managers: What Managers Need to Know*, fourth edition, with Carol Brown, Daniel DeHayes, E. Wainright Martin, and William Perkins, all published by Prentice Hall. His research articles have appeared in numerous journals, including *MIS Quarterly Executive*, *Journal of Database Management*, *Small Group Research*, *Communications of the ACM*, and *Sloan Management Review*. He has received research and equipment grants from IBM Corporation, U.S. Department of the Navy, and NCR Teradata division.

Dr. Hoffer is cofounder of the International Conference on Information Systems and the Association for Information Systems. He has served as a guest lecturer at Catholic University of Chile, Santiago, and the Helsinki School of Economics and Business in Mikkeli, Finland. Dr. Hoffer is currently an associate director of the Teradata University Network.

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