GLOBAL EDITION

Essentials of Systems Analysis and Design

SIXTH EDITION

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

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To my mother, Mary Valacich.

—Joe

To Karen, Evan, and Caitlin.

—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

Brief Contents

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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. *Essentials of Systems Analysis and Design*, *Sixth Edition*, addresses these key factors.

More than 50 years' combined teaching experience in systems analysis and design have gone into creating *Essentials of Systems Analysis and Design*, *Sixth Edition*, 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 a strong conceptual and systematic framework.

Electronic commerce coverage is provided in each chapter via an integrated, extended illustrative case (Pine Valley Furniture WebStore) and an end-of-chapter case (Petrie's Electronics).

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

New to the Sixth Edition

The following features are new to the Sixth Edition:

- *Expanded coverage of business processes.* Process modeling is at the heart of systems analysis and design. Data-flow diagrams have been a staple of this book since its first edition, but now they are framed in the context of business process diagramming. The beginning of Chapter 6 has been rewritten to show how data-flow diagrams are just one of many common methods for modeling business processes. Business processes are defined and illustrated before the discussion of data-flow diagrams begins.
- *Updates to the WebStore running case.* Since the advent of electronic commerce, this book has featured an end-of-chapter Pine Valley Furniture (PVF) case focused on the WebStore, an e-commerce application for PVF. In the current edition, the WebStore case has been expanded to include the analysis, design, and testing of a new mobile app for PVF. Development of the e-commerce application and the mobile app now go hand-in-hand in the revised case.
- *Updated illustrations of technology.* Screen captures have been updated throughout the text to show examples using the latest versions of programming and Internet development environments, and user interface designs.
- *Updated content.* Throughout the book, the content in each chapter has been updated where appropriate.

Themes

Essentials of Systems Analysis and Design, Sixth Edition, is characterized by the following themes:

- *Systems development is firmly rooted in an organizational context.* The successful systems analyst requires a broad understanding of organizations, organizational culture, and operations.
- *Systems development is a practical field.* Coverage of current practices as well as accepted concepts and principles is essential for today's systems analyst.
- *Systems development is a profession.* The text presents standards of practice, and fosters a sense of continuing personal development, ethics, and a respect for and collaboration with the work of others.
- *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 taught in a highly coordinated fashion. The Internet has rapidly become a common development platform for database-driven electronic commerce systems.
- *Success in systems analysis and design requires not only skills in methodologies and techniques, but also in the management of time, resources, and risks.* 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, the text emphasizes these approaches:

- 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

Audience

The book assumes 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:

- Part I, "Foundations for Systems Development," gives an overview of systems development and previews the remainder of the book.
- Part II, "Systems Planning and Selection," covers how to assess project feasibility and build the baseline project plan.
- Part III, "Systems Analysis," covers determining system requirements, process modeling, and conceptual data modeling.

- Part IV, "Systems Design," covers how to design the human interface and databases.
- Part V, "Systems Implementation and Operation," covers system implementation, operation, closedown, and system maintenance.
- Appendix A, "Object-Oriented Analysis and Design," and Appendix B, "Agile Methodologies," can be skipped or treated as advanced topics at the end of the course.

Distinctive Features

Here are some of the distinctive features of *Essentials of Systems Analysis and Design, Sixth Edition:*

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 broad coverage is necessary for students to understand the advanced capabilities of many systems development methodologies and tools that automatically generate 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 business process 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, Sixth Edition*, reinforce and apply the key content of the book.

SDLC Framework

Although several conceptual processes can be used for guiding a systems development effort, the systems development life cycle (SDLC) is arguably the most widely applied method for designing contemporary information systems. 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. Most chapters open with an SDLC figure with various parts highlighted to show

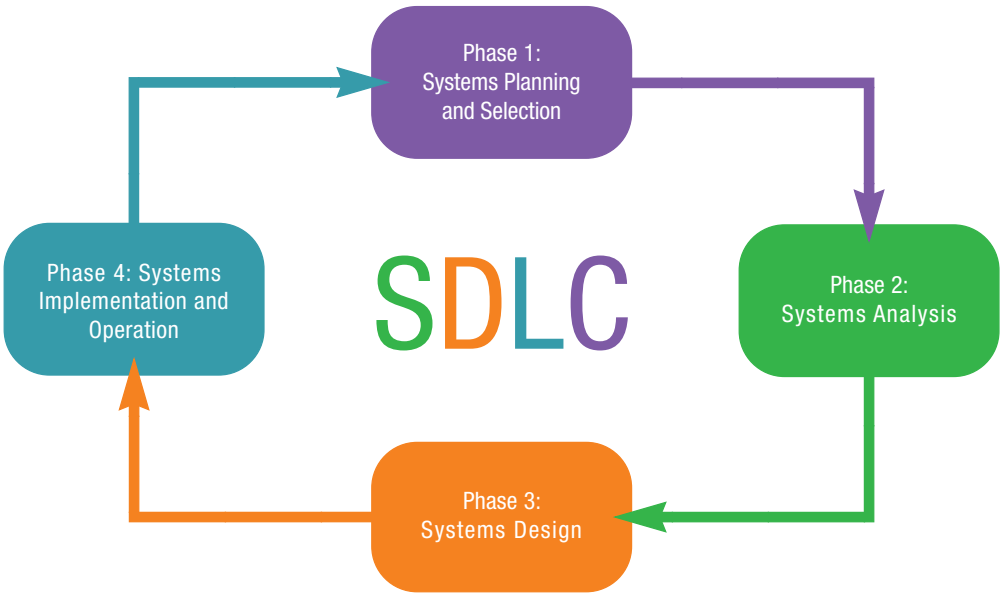

FIGURE P-1
The systems development life cycle (SDLC): management is necessary throughout.

students how these chapters, and each step of the SDLC, systematically build 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 online? Should this system include a custom mobile app? How would a team of analysts work together to develop, propose, and implement a plan? Beginning in Chapter 4, we explore the step-by-step process.

Petrie's Electronics This end-of-chapter fictional case illustrates how a national electronics retailer develops a Web-based customer loyalty program to build and strengthen customer relationships. The case first appears at the end of Chapter 2 and concludes at the end of Chapter 10.

Three Illustrative Fictional Cases

Pine Valley Furniture (PVF) This case is introduced in Chapter 3 and revisited throughout the book. As key systems development life cycle concepts are presented, they are applied and illustrated. For example, in Chapter 3, we explore how PVF implements the purchasing fulfillment system, and in Chapter 4, we explore how PVF implements a customer tracking system. A margin icon identifies the location of the case segments. 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 6 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.

Petrie's Electronics This fictional electronics retailer 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 loyalty program. 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 have developed an extensive selection of end-of-chapter material designed to accommodate various learning and teaching styles.

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

Key Terms Checkpoint In this 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 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 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 in the Instructor's Manual.

Margin Term Definitions

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

References

Located at the end of the text, references are organized by chapter and list more than 200 books and journals that can provide students and faculty with additional coverage of topics.

The Supplement Package: www.pearsonglobaleditions.com/Valacich

A comprehensive and flexible technology support package is available to enhance the teaching and learning experience. Instructor supplements are available at www.pearsonglobaleditions.com/Valacich:

- An *Instructor's Resource Manual* provides chapter-by-chapter instructor objectives, teaching suggestions, and answers to all text review questions, problems, and exercises.
- The *Test Item File* and *TestGen* include a comprehensive set of more than 1,500 test questions in multiple-choice, true-false, and short-answer format; questions are ranked according to level of difficulty and referenced with page numbers and topic headings from the text. The Test Item File is available in Microsoft Word and as a computerized TestGen test bank. The TestGen software is PC-compatible

and preloaded with all of the Test Item File questions. You can manually or randomly view test questions and drag-and-drop to create a test. You can add or modify test-bank questions as needed.

- *PowerPoint Presentation Slides* feature lecture notes that highlight key text terms and concepts. Professors can customize the presentation by adding their own slides or by editing the existing ones.
- The *Image Library* is a collection of the text art organized by chapter. This collection includes all of the figures, tables, and screenshots (as permission allows) from the book. These images can be used to enhance class lectures and PowerPoint slides.

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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, Boeing, Dow Chemical, EDS, Exxon, FedEx, General Motors, Microsoft, and Xerox.

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Dr. George has published dozens of articles in such journals as *Information Systems Research*, *Communications of the ACM*, *MIS Quarterly*, *Journal of*

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Dr. George is coauthor of the textbooks *Modern Systems Analysis and Design*, *Seventh Edition*, published in 2014, and *Object-Oriented Systems Analysis and Design*, *Second Edition*, published in 2007, both from Pearson. He has served as an associate editor and senior editor for both *MIS Quarterly* and *Information Systems Research*. He served three years as the editor-in-chief of the *Communications of the AIS*. Dr. George was the conference co-chair for the 2001 ICIS, held in New Orleans, Louisiana; conference chair for the 2012 ICIS, held in Orlando, Florida; and the doctoral consortium co-chair for the 2003 ICIS, held in Seattle, Washington. He is a Fellow of the Association for Information Systems (AIS) and served as President of AIS in 2010–11.

Jeffrey A. Hoffer is the Sherman–Standard Register Professor of Data Management for 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 BA from Miami University in 1969 and his Ph.D. from Cornell University in 1975.

Dr. Hoffer has coauthored all editions of three college textbooks: *Modern Systems Analysis and Design*, with George and Valacich; *Managing Information Technology: What Managers Need to Know*, with Brown, DeHayes, Martin, and Perkins; and *Modern Database Management*, with Ramesh and Topi, all published by Pearson Prentice Hall. His research articles have appeared in numerous journals, including the *MIS Quarterly–Executive*, *Journal of Database Management*, *Small Group Research*, *Communications of the ACM*, and *Sloan Management Review*. He has received research grants from Teradata (Division of NCR), IBM Corporation, and the U.S. Department of the Navy.

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

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Essentials of Systems Analysis and Design

one

The Systems Development Environment

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Chapter Objectives

After studying this chapter, you should be able to:

- Define information systems analysis and design.
- Describe the role of the systems analyst in information systems development.
- Describe the information systems development life cycle (SDLC).
- List alternatives to the systems development life cycle, including a description of the role of computer-aided software engineering (CASE) tools in systems development.

Chapter Preview . . .

The key to success in business is the ability to gather, organize, and interpret information. Systems analysis and design is a proven methodology that helps both large and small businesses reap the rewards of utilizing information to its full capacity. As a systems analyst—the person in the organization most involved with systems analysis and design—you will enjoy a rich career path that will enhance both your computer and interpersonal skills.

The systems development life cycle (SDLC) is central to the development of an efficient information system. We will highlight four key SDLC steps: (1) planning and selection, (2) analysis, (3) design, and (4) implementation and operation. Be aware that these steps may vary in each organization, depending on its goals. The SDLC is illustrated in Figure 1-1.

This text requires that you have a general understanding of computer-based information systems as provided in an introductory information systems course. This chapter previews systems analysis and lays the groundwork for the rest of the book.

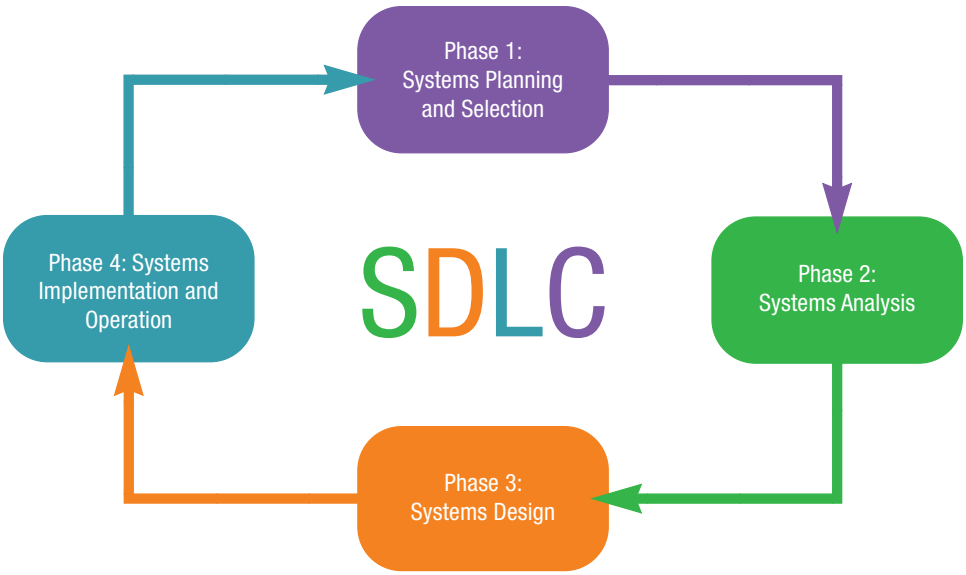

FIGURE 1-1
The four steps of the systems development life cycle (SDLC): (1) planning and selection, (2) analysis, (3) design, and (4) implementation and operation.