Analysis & Design of Information Systems

James A. Senn

Second Edition

ANALYSIS and DESIGN of INFORMATION SYSTEMS

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McGRAW-HILL PUBLISHING COMPANY
New York • St. Louis • San Francisco • Auckland • Bogotá • Caracas • Hamburg
Lisbon • London • Madrid • Mexico • Milan • Montreal • New Delhi • Oklahoma City
Paris • San Juan • São Paulo • Singapore • Sydney • Tokyo • Toronto

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2 3 4 5 6 7 8 9 0 H A L H A L 8 9 4 3 2 1 0 9

ISBN 0-07-056236-9

This book was set in Palatino and Helvetica by Jonathan Peck Typographers.
The editors were Karen M. Jackson and Terrence P. McGillen; the cover designer was Sallie Stanton Keyser.
Development and production management services were provided by Cole and Associates.
Arcata Graphics/Halliday was the printer and binder.

Library of Congress Cataloging-in-Publication Data

Senn, James A.
Analysis and design of information systems–2nd ed.

Includes bibliographies and index.
1. System design. 2. System analysis. 3. Management information systems. I. Title.
QA76.9.S88S46 1989 88-39023
003—dc19
ISBN 0-07-056236-9

Preface

TO THE STUDENT

For many organizations, computer information systems are now at the heart of daily activities and a major consideration in corporate decision making. Businesses consider carefully their information systems capabilities when deciding whether or not to enter new markets or when planning a response to competition. Without automated assistance, government organizations would grind to a halt for the sheer volume of activities would overwhelm workers and managers. Also, data communications capabilities determine where and when information will flow.

The development of information systems involves both systems analysts and those who will use the applications that emerge—end-users. The analysis and design of information systems involve many parts of the organization and are not limited to the domain of computer specialists. We will emphasize this theme—user-driven applications—throughout this book.

We will discuss each of the activities associated with developing a computer-based information system. You will learn how to identify system requirements, including methods of collecting requirements data, how to interact with managers and users, and how to document system details through various methods. We will discuss the design of such new system features as reports and displays, including the use of color and graphics. Together, we will examine methods for detecting errors in input data and for preventing unexpected user activities from producing unintentional results.

It is not necessary for you to have an extensive business background or even an intention of pursuing a career in information systems to benefit from this text. You may be a business person—a user—who expects to interact with systems analysts or computer programmers and wants to have a better understanding of their work so that you can work more effectively with them. Or you may want to collect knowledge so you can manage analysts responsible for a project in your department. In either case, you will benefit from this text.

Some of you might also be computer programmers or computer engineers planning to move into the area of systems analysis in the future. In the latter case, your expertise in computer programming will be a useful supplement to the methods of systems analysis and design as we will discuss them.

This book contains a number of tools to show you the real-world view of systems development. Each chapter features the information

systems experience of a well-known firm or a particularly important issue faced by companies you know well. You will see how such corporations as McDonald's, AT&T, Polaroid, Delta Air Lines, Lockheed Aeronautical Systems Company–Georgia (and more) develop and use information technology effectively.

Each chapter begins with a vignette describing a situation you may encounter in an organization. These situations should make you think about how you would react if you were the one faced with the dilemma. I think you will find them challenging.

Several times in each chapter you will encounter a "benchmark"—a pause from the regular flow of text that is designed to further emphasize the practical perspective of the concepts and techniques being discussed. Each benchmark is my personal assessment of where a particular systems development issue fits in the reality of organizations.

Other study tools available in this book include a set of questions at the beginning of each chapter that addresses the most important issues in the chapter as well as key terms to watch for as you read the chapter. After finishing the chapter, look back and see if you can answer the questions. A summary is included at the end of every chapter to highlight further the main points of the reading and assist you in answering the review questions which follow.

Throughout the book there are many examples and over two hundred illustrations that demonstrate what systems analysts do to determine the feasibility of developing a computer-based system. Sometimes, their decisions are against development altogether. These examples are based on real situations in which I have been involved as a consultant, analyst, or designer of a system.

The concepts and theories underlying systems analysis and design are woven through the book so that you can develop an understanding of why certain questions must be addressed and learn how various decisions are made. Emphasis is placed on practical aspects of system development—decisions that analysts must face every day when working on a project. Through the many examples and illustrations, you will gain a detailed understanding of the work of the systems analyst. If you take the time to work through the application problems at the end of each chapter, you will reinforce principles presented in the chapter and gain experience in making decisions that you may actually face one day in business. Developing the answers to these questions, which are based on real-life problems, will not always be easy and may involve more than just a minute or two of thought. For that there is no apology. The amount of time you invest now will determine your payoff in the future.

TO THE INSTRUCTOR

Systems analysis and design is a challenge to teach to students in a classroom environment because it is out of the context in which applications are generally created. So much of systems analysis and design depends on tools, experiences, and situations that are difficult to recreate in the typical classroom. The course, therefore, frequently consists of a heavy emphasis on theory, and insufficient attention given to applications.

This book goes beyond classroom theory and concepts. It is practice-oriented with examples, applications, and proven techniques that *demonstrate* systems analysis and design. In addition, actual organization and business settings are used in the examples to show how systems concepts can apply to many different types of enterprises.

The text is designed to be used in a semester or quarter course in systems analysis and design. It introduces topics in an order most easily grasped by students: The early chapters focus on feasibility studies and requirements determination, the later chapters are oriented toward design specification and implementation. Software design and testing specification are discussed in detail, with repeated emphasis on maintaining system quality.

Questions in project management and the selection of computer hardware and software, discussed in Chapters 16 and 17, are raised in virtually every aspect of systems development. Students may find it helpful to refer to these chapters repeatedly throughout the course.

Particular emphasis is placed on development methods, tools, and techniques. Prototyping, structured analysis, and the traditional systems development life cycle model are discussed candidly. Both their strengths and their shortcomings are pointed out. Computer-aided systems engineering (CASE) tools are the subject of a full chapter. In addition, specific CASE tools including Excelerator™ are used in applications as they are discussed in other sections of the book. The perspective is pragmatic, pointing out how CASE fits into the development process, emphasizing both strengths and weaknesses of these tools, and exploring the characteristics needed in future generations of CASE tools.

Data communication and networks, increasingly common in information systems of all sizes, distributed or not, are examined in detail. A separate chapter is devoted to the design decisions the analyst must address in developing computer networks, choosing communication links, and acquiring communication facilities.

To provide students with an active learning environment where they can master concepts, several learning aids and special features are found in the book including:

- Key questions at the beginning of each chapter

- Chapter objectives framed around skills to be developed
- Key terms listed in each chapter
- A chapter-opening vignette featuring a lifelike situation which is pertinent to the chapter
- Corporate boxes highlighting information systems experiences of well-known companies
- Professional "toolboxes" stressing career development
- Special pause points in each chapter—benchmarks—that emphasize broad, practical perspectives to the concepts and techniques discussed
- Chapter summaries
- Review questions
- Application problems that apply the concepts, tools, and techniques of the chapter in practical settings

It is important for students to follow the development of lifelike systems as they study different analysis and design concepts. To assist you in achieving this objective, I have captured a live systems project, Sevco Industries, and included portions of it throughout the text. This classroom tested case study involves an order entry/accounts receivable system that is common in many organizations.

After each major topic in the text, the concepts and techniques are applied to the case study, including a feasibility study and a detailed investigation. Data flow diagrams and data dictionary entries are assembled to document the system. In the output and input design areas, reports, display screens, and interactive menus are shown to indicate how the previous user requirements are translated into design specifications and processing methods. Since the system requires data communication facilities, the design that was assembled to provide the necessary transmission capabilities is also shown. By the time the students read Chapter 15 on implementation of the system, they will realize that implementation actually begins during requirements determination and takes place throughout the development process. This chapter will pinpoint additional implementation issues.

To augment the text, *Analysis and Design of Information Systems* is complemented by a full teaching and learning package including:

- *Study Guide.* An all-new study guide has been prepared to accompany the second edition and includes additional self-testing questions and problems, three case studies, and a glossary to assist your students in mastering the material. Worksheets and forms are also included for use in systems development assignments.
- *Instructor's Manual.* A new instructor's manual provides additional support for the text. It includes instructional strategies,

suggested readings, answers to application problems and review questions from the text, a special appendix on cost-benefit analysis, and a set of transparency masters.

- *Test Bank.* A test bank, containing approximately 2,000 questions in both hard copy and computerized format, has been created to accompany the text. There are three types of questions: true-false, multiple choice, and completion. These carefully selected questions emphasize important topics in the text and allow the instructor to prepare a wide range of tests.

The entire text and its accompanying tools have been developed to give the students a practical, applications-oriented understanding of systems analysis and design. It applies equally well to large mainframe and small personal computers. The up-to-date analyst should be familiar with both.

ACKNOWLEDGEMENTS

I would like to thank the following reviewers for their helpful comments and suggestions during the development of this second edition:

Jack Stott, University of Hawaii
Eugene Muscat, University of San Francisco
Andrew Peacock, Digital Equipment Corporation
Edwin Blanks, Virginia Commonwealth University
Constance Knapp, Pace University
Robert Keim, Arizona State University
William Sasso, New York University

The staff at McGraw-Hill Publishing Company was instrumental in the development of this project. Eric Munson and Karen Jackson were actively involved throughout the revision process. Their market sense and willingness to commit resources to the project are greatly appreciated. Elisa Adams worked diligently on the first edition and her efforts continue to be evident. Barbara Pickard, of Cole and Associates, played the key role in preparing and editing the second edition. I particularly enjoyed working with Barbara. Her creative instincts and feel for the student's needs are evident throughout.

Coordination of the production was in the hands of true professionals: Brete Harrison, Lorna Cunkle, Carolyn Chandler and Elizabeth Assefnia, who developed and maintained the schedules and ensured the missing pieces were found and put in place.

My wife, Elaine, was an ardent cheerleader, supporter, and friend throughout the project. Her contributions show in many subtle ways and were indeed instrumental in achieving the final result.

James A. Senn

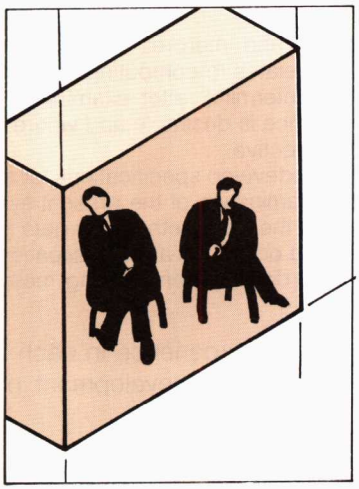
Contents

PART ONE

Introduction to Information Systems Development

Part One comprises two chapters (1 and 2). The purpose of these chapters is to provide an introduction to the process of systems development and to define basic terminology used in systems analysis and design.

Chapter 1 presents an overview of information systems in a global, information-based economy and explores the roles of information system users. It defines systems analysis and design and outlines the responsibilities of systems analysts. This chapter also introduces system concepts and outlines categories of business information systems, concluding with a discussion of strategies and tools used in systems development.



Chapter 2 looks at how systems projects are initiated and describes methods by which projects are reviewed and selected. It also explains the preliminary investigation and the processes of testing the operational, technical, and economic feasibility of a project. This chapter concludes with specific project development strategies for institutional- and user-developed applications.