



Systems Analysis and Design

A Case Study Approach

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systems analysis and design: a case study approach

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preface

This book proposes a new thrust in teaching the traditional systems analysis and design course by stressing an interactive and distributed data processing approach to systems. The concepts presented here enable a systems analyst to operate successfully in the 80s and beyond: a comprehensive treatment of design theory and principles, and great emphasis on the application of systems design to the real world. More specifically, several chapters of the text are devoted to a typical systems design case study—namely, the ABC Company—whereby students are shown how to design an order-entry system. Based upon this illustrated case, they are then required to design a finished product inventory system or an accounts receivable system that complements the one presented. Thus, students are exposed to the underlying principles and practices of systems analysis and design, as well as given an opportunity to design an interactive computerized (management information) system in a distributed processing environment, currently operated in a batch processing mode.

Additionally, emphasis is placed on relating the human factor to the new systems design. Such a presentation helps alleviate students' fear that computer systems are impersonal and insensitive to the human element in business, government, and education today. Consideration for the human element goes a long way toward resolving the problem that people are just numbers; the focus in this book is on utilizing the vast capabilities of personnel at all levels in an organization.

Within the foregoing framework of principles and practices in systems analysis and design, the book contains certain student-oriented learning features. These include

chapter objectives and outlines to help students place each chapter in its proper perspective.

listing of design principles to give students a handle on the important design principles in a typical system project.

master case study to bridge the gap between principles and practices.

summaries of important subjects to help students bring together the important material in the chapter.

self-study exercises consisting of true-false questions, fill-ins, and problems, to help students evaluate their comprehension of the chapter.

answers to self-study exercises in the Appendix for students' convenience.

The structure of the book follows a logical sequence to insure a comprehensive treatment of systems analysis and design. The major areas covered are described below.

Part I: An overview of systems analysis and design Chapter 1 provides an introduction to systems analysis and design, and chapter 2 discusses the standard tools employed by system personnel. In chapter 3, an overview of the major subsystems of the ABC Company (the text's master case study) is presented.

Part II: Systems analysis of present business information system The introductory investigation of a system project is the subject matter of chapter 4. In chapter 5, the detailed investigation of the present system, or systems analysis, is examined, along with the concluding investigation phase of a system project, resulting in an exploratory survey report to top management. Chapter 6 focuses on analyzing the present order-entry system of the ABC Company.

Part III: Systems design of new management information system An overview of systems design is treated in chapter 7. In contrast, chapters 8 and 9 center on the design of system output and data files, respectively. This material provides the background necessary to design the required output reports and data base (chapter 10) for the order-entry system of the ABC Company. Similarly, chapters 11 and 12 set forth the important design criteria for input and procedures, respectively, and chapter 13 applies these criteria to the ABC Company. Lastly, chapter 14 examines the design of system controls, and chapter 15 relates this area to the ABC Company. Hence, all important design criteria from theoretical and practical viewpoints have been presented in sufficient detail to give the student a link between system theory and practice.

Part IV: Beyond systems analysis and design In chapters 16 and 17, equipment selection and system implementation are presented, respectively. These areas complete the essential parts of a typical system project.

The text is appropriate for any course covering the fundamentals of systems analysis and design, whether taught over a quarter or semester. It can be helpful in company training programs where an understanding of the design efforts involved in a system project is desired. Also, it can be supplemented with other material as deemed important by the instructor. Thus, the text is flexible enough to accommodate most learning experiences related to systems analysis and design.

In an undertaking of such magnitude, we are deeply indebted to the many people who have contributed their time and effort to make this publication possible. We are grateful

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part one

an overview of systems analysis and design

chapter

1

introduction to systems analysis and design

OBJECTIVES:

- To distinguish between systems analysis and design—the subject matter of this text.
- To demonstrate the relationship of systems analysis to systems design in a typical system project.
- To examine the basic types of management information systems that can be designed.
- To set forth the underlying concepts of current management information systems.

IN THIS CHAPTER:

The Challenge of the Computer World for Systems Analysts

INTRODUCTION TO SYSTEMS ANALYSIS AND DESIGN

What Is Systems Analysis?

What Is Systems Design?

Relationship of Systems Analysis to Systems Design

CURRENT MANAGEMENT INFORMATION SYSTEMS

Batch MIS

Batch Processing Mode

Interactive MIS

Interactive Processing Mode

Relationship of Systems Design to Management Information Systems

UNDERLYING CONCEPTS OF MANAGEMENT INFORMATION SYSTEMS

The Management Information System Concept

The Distributed Processing System Concept

The Modular System Concept

CHAPTER SUMMARY

QUESTIONS

SELF-STUDY EXERCISE

The analysis, design, and implementation of a new system, no matter what type, is not a simple task. In order to install the new system effectively, a detailed and carefully devised plan must be initiated by management and followed by all personnel. The large outlays for equipment, programming, conversion, and related activities require systematic procedures for implementation. Otherwise, vast sums of money can be wasted. From this perspective, the purpose of this and succeeding chapters is to explore the steps from a feasibility study through system implementation for a typical system project. The end result of these systematic steps is an effective system that both conforms with organization objectives and lies within the time and budget constraints of the system project.

Initially, the chapter examines the challenging world of computers and defines the terms **systems analysis** and **systems design**. Because the text will center on the analysis and design of management information systems (MIS), current computer approaches within an MIS environment will be investigated. The main emphasis today is on computer systems having the capability to interact with the user, that is, an interactive MIS mode. Additionally, emphasis in the chapter is placed on the underlying concepts of management information systems. These provide a basis for placing current and future MIS trends in their proper perspective. As in all chapters of the text, important material is summarized periodically throughout the chapter.

The Challenge of the Computer World for Systems Analysts

Behind the flashing lights, spinning tape reels, and subdued hum of the modern computer lies the story of one of the world's most dynamic fields. Despite its fantastic growth, the computer is still in its infancy; many new and exciting applications are being developed every day. The increasing number of computer applications will result in daily encounters between the computer and the average person. As a computerized approach to daily living continues to develop, there will be an increasing demand for systems analysts. Based upon the user's requirements, **systems analysts** devise efficient patterns of information flow from source to computer. They also define the computer process necessary to turn raw data into useful information, plan the distribution and use of results, and test the working system in operation.

To get a glimpse of the challenging future of computers, consider the following events for one household. It is 8:00 A.M. When the alarm clock goes off, the bedroom curtains

swing apart and the thermostat raises the heat to the desired level. The percolator in the kitchen starts. Even the back door opens to let out the family pets. The television set comes on with the news, including a selective rundown (ordered the night before) of the latest events affecting the economy. After the news, the TV displays the mail from correspondents who have dictated their messages into the computer network. A button on a bedside genie box is pressed that issues a string of personal and business memos. After a shower (which turned itself on at exactly the right temperature), one household member dresses, eats, and goes out to the car—whose engine, naturally, is running.

Meanwhile, another member of the household concentrates on the TV screen for a readout of comparative prices at the local stores. Following visual consultations with the baker and the grocer, he or she presses a button on the kitchen terminal to order supplies for tonight's dinner party. Other keys on the kitchen terminal order favorite recipes from the memory bank, tell the computer to calculate the ingredients for eight servings, and direct the oven to preheat to the correct temperature for each dish, starting at 5:30 P.M.

Overall, the computer has been an integral part of the daily functioning of this family. Although the foregoing scenario may be years away, the basic technology exists to accomplish all of the tasks described above.

For all its amazing capabilities today and tomorrow, the computer still owes its essential power to **people**. These include individuals who design and build these machines (computer scientists), people who analyze problems and devise solutions using computer technology (systems analysts), those who program instructions and change data into a form usable by the computer (computer programmers), and other individuals who provide service in engineering, sales and marketing, customer service, manufacturing, operation of the computer, and in data entry and related clerical jobs.

Of all the foregoing individuals, systems analysts are foremost in computer application since they constitute the human interface between the computer and the application. Hence, they must be able to think logically; to organize, analyze, and handle data and information systematically; to attend closely to detail and accuracy; and to be imaginative in devising new solutions to existing problems. In essence, systems analysts develop the methods and procedures necessary to implement specific computer applications. Since this text provides information on the analysis and design of computer systems, the authors welcome the reader to this challenging world and hope that its rewards are gratifying.

INTRODUCTION TO SYSTEMS ANALYSIS AND DESIGN

Because analyzing, designing, and implementing a new system is a difficult and costly undertaking, there is great need for a highly systematic and analytic approach in a system project, namely, **systems planning**. Systems planning encompasses three objectives: **what** must be done, **how** to do it, and **when** to do it. There are important relationships among these three objectives. For example, we are generally constrained in what we decide to do by limitations in capabilities and/or resources. Often, we simply do those things that we know how to do and ignore other important areas without weighing the alternatives for best results.

In planning for an MIS environment, a patchwork approach to systems development must be avoided. The patchwork approach can result in the development of unrelated and incompatible subsystems. Thoughtful systems planning centers around a total system that provides coherence of architecture design, methods, standards, operating procedures, and other commonalities important for economy in development, implementation, and operation. The overall system should be structured as a set of integrated subsystems and component parts that are flexible enough to accommodate changes of organizational activities.

Inasmuch as systems planning provides an overall framework for implementing any type of MIS project, it is necessary to examine its two essential elements, the **feasibility study** and **system implementation**. Throughout this text, the focus is on the detailed components of the feasibility study, namely,

- introductory investigation
- systems analysis
- systems design
- equipment selection

In part two, an introductory investigation and systems analysis of the present system are presented, followed by part three—systems design of management information systems. Finally in part four, equipment selection is examined. Thus, the main thrust of this text is on systems analysis and design.

Systems implementation, the second phase in a system project, is also covered in the final part (chapter 17). It should be noted that systems planning is not restricted to implementation of the current project; it also includes establishing long-range plans that must be updated continuously. Periodic review of the installed system determines its continuing relevance to the business environment. This area is also covered briefly in the final chapter. An overview of these parts is found in figure 1.1, p. 8.

What Is Systems Analysis?

Systems analysis centers on analyzing the present system and includes two basic steps: detailed investigation, and a concluding investigation. These steps constitute a logical framework for the systems analysis phase of the feasibility study and serve as a basis for preparing an exploratory survey report to top management.

After an **introductory investigation** or orientation where selected committees are formed, the scope of the project is defined, and comparable items are set forth (as in chapter 4), a **detailed investigation** (first step) of the current system in operation is pursued. This allows the study group to comprehend the full scope of their undertaking. Chapter 5 will outline this phase in greater detail, highlighting the areas to be investigated. In a similar manner, systems analysis of the ABC Company (the text's case study) is the subject matter of chapter 6. Thus, the detailed investigation of the present system is the focal point of systems analysis.

In the **concluding investigation** (second step), the study group reaches one of two pivotal conclusions. Either the present system appears better than any one of the new systems conceived, or one or more new systems appear to be superior to the present system. In the second case, the feasibility study proceeds to the next step—systems