

The Analysis and Design of Computer-Based Information Systems

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To Svein

Preface

The number of computer-based information systems (CBIS) in use has increased dramatically. This is due to the rapid growth in the number of computers available for all sizes of business and levels of government, and also to managers' increased awareness of the potentials for gaining access to increased volumes of data to provide improved support for decision making.

It remains true that if a CBIS is to be useful, it must fill some real information-processing need. Too many CBISs have been failures; they have not provided the information services that the organization needed. In many cases these systems have been technically well designed. The only real protection against system failure is to pay more attention to the analysis of information-system requirements and to the development of a system that meets these requirements.

The development of an information system consists of a series of possibly repeating tasks that generally follow the natural system life cycle. That is, the process of system analysis, design, and implementation begins at system inception with the realization that an information system is required, continues through system development, and follows through with system use, maintenance, and growth. It is not necessary for an information system to use computers for its data processing. However, for the purposes of this book, we will assume that the information system being developed will be at least partly automated.

This book is an introduction to the rather broad field of system analysis, design, and implementation for computer-based information systems. Each chapter contains a list of references to books and papers that provide further information on the chapter topic. Generally, the sequence of chapters follows the task sequence required for the development of a CBIS.

Part I provides a background for the book. Chapter 1 introduces concepts from general systems theory that are fundamental to the approach to systems analysis and design that this book takes. Chapter 2 describes a class of information systems that are especially suited to this approach to analysis and design. Chapter 3 introduces system analysis and design and discusses alternative approaches and methodologies.

Part II covers the basic tasks of information-system analysis and design and gives a methodology and tools for their execution. Chapter 4 presents problem analysis (sometimes called requirement analysis or change analysis), which is the real start of a systems development project. Chapter 5 discusses system analysis, an analysis of the current information system compared with the requirements determined in the preceding problem analysis. Chapter 6 presents the problem area of

system evaluation. Evaluation techniques are needed at various stages in the system development cycle. Finally, Chapter 7 discusses information-system design, including design of the user interface and the security control system.

Information-system analysis and design is fundamentally:

- A gathering of facts and requirements
- Structuring of these facts and requirements
- An evaluation of these facts and requirements
- Finally, the design of a new or modified system

Tools that information-system analysis and design methodologies require include a graphic technique for presenting components and relationships, dictionaries for maintaining descriptions and definitions of components and relationships, and some form of analytic tool. We have chosen the graph technique presented in Lundeborg's ISAC methodology (Lundeborg et al., 1981). The proposed dictionaries closely follow ideas that are being implemented in data dictionary systems, and thus are amenable to automation. We have chosen matrices as an analytic tool, again because these can be (and have been) used as a basis for automated analysis tools.

Part III covers data-system design, including data modeling, data and file structures, and process and program specification. The emphasis in data-system design is on selecting general data processing techniques that will support the requirements of the information-system design. The data-system design should be, as far as possible, machine-independent so that it can survive changes in the available computers. Computer adaptation is viewed here as an implementation task.

Part IV discusses implementation tasks, including selection of computer support for the system, implementation planning, and system maintenance and growth. These tasks are often not included in the systems analysis and design framework; however, decisions made in this realm will often affect design parameters determined earlier in the system development cycle. Therefore we feel that these activities should be included in system analysis and design.

Part V steps back and reviews the approach to system analysis and design the book has presented. Chapter 14 discusses the users who are affected by CBISs and thus by the system analysis and design activity. These users are to be found in many different application areas, also briefly presented in Chapter 14. Chapter 15 reviews system analysis and design in general and this approach in particular.

This book has been written as a textbook for an introductory course in system analysis and design. No specific prerequisites are assumed. However, students who have an introductory-level background in computer science and knowledge of business applications will find a number of the topics easier to understand.

Each chapter includes a list of the important terms presented in the chapter, a list of references for those who are interested in further information on the topics of the chapter, and discussion questions for self-study, class discussion, or project assignments. In addition, the appendix includes an extensive bibliography, a glossary of terms, and a presentation of the model information system that is used throughout the text. It is hoped that, in addition to being useful as a classroom text, the book can be used for self-study.

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J.C.N.

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