STRUCTURED TECHNIQUES OF SYSTEM ANALYSIS, DESIGN, AND IMPLEMENTATION

Sitansu S. Mittra

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To the memory of my parents

Satya Charan Mitra
Champak Lata Mittra

neither of whom lived to see this work

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PREFACE

This text provides an in-depth coverage of the structured techniques of system analysis, design, and implementation. The structured method distinguishes between two types of systems—logical and physical. The logical system is a purely conceptual system that provides all the functional capabilities required by the user or customer. The physical system, on the other hand, is the system that implements all these functional capabilities so that the user gets the benefit of them. Accordingly, the structured method insists that the logical system be completely developed before any work on the physical system starts.

The main emphasis of the book is on the structured method and its importance in the development of a system. The philosophy of the structured process is that if the logical system is completely laid out, the physical system becomes quite obvious. Although the layout of the logical system takes a considerable amount of time at the beginning and thereby results in a delay in allowing the user to enjoy the benefits of the proposed system, it saves a considerable amount of time and labor in the long run.

I strongly believe in the structured techniques and use them regularly in my work. I have supervised the design and implementation of several projects, each time supervising a team of six to eight technical staff members. In each case, I used the structured techniques discussed in the book and described in detail in the table of contents. Consequently, I have drawn heavily from my experience in writing this book. In fact, one of the case studies, the on-line financial reporting system, was developed under my direction and supervision and took nearly 15 months. Thus, the book does not describe mere theories, but also illustrates them with real-life examples. A considerable amount of my project management experience has been utilized in preparing this book.

In addition to my industry experience in system analysis, design, and implementation, I have given courses on this subject for the M.S. program in computer science at Boston University and for the B.S. program in computer science at Wentworth Institute of Technology in Boston. In both places, I had to write extensive notes and case study materials in order to teach the subject. I could not find any single book covering the entire subject at an in-depth level. Accordingly, I regard this book as a totally new venture in the field of system analysis, design, and implementation.

The book consists of 15 chapters divided into five parts.

Part I consists of Chapters 1 and 2. Chapter 1 provides the background materials on computer-based information systems and their impact on management. Chapter 2 discusses the system life cycle concept and distinguishes between a logical system and a physical system. The three principal phases of a life cycle—analysis, design, and implementation—are then explored in Parts II, III, and IV.

Part II consists of Chapters 3 through 6. Chapter 3 describes the problem definition and feasibility study for a system, and Chapter 4 illustrates this concept with two case studies: an order processing system and a financial reporting system. This pattern of first introducing the theories and then illustrating them with case studies is carried through Chapter 12. Chapters 5 and 6 introduce the theory and case studies for the system analysis phase.

Part III consists of Chapters 7 through 10. The design phase is divided into two parts: preliminary and detailed. The preliminary system design concentrates on the input and the output of the system along with an overview of the processing. The detailed design elaborates on the latter and concludes with a complete design specification ready to be implemented.

Part IV consists of Chapters 11 and 12. These chapters describe the phase involving the structured programming methodology along with many other related issues, such as preparation of physical site, system conversion, user training, and documentation.

Part V consists of Chapters 13, 14, and 15. Chapters 13 and 14 describe the roles of decision support systems and database systems in the development of computer-based application systems. Chapter 15 addresses a set of heterogeneous topics in system development such as the information center concept, consultant versus in-house expertise in system development, third party leasing, on-line transaction processing, and system development for expert systems.

The overall treatment has been done at a fairly elementary and descriptive level. The reader must be familiar with data processing principles and must have programmed in at least one high-level language such as COBOL, FORTRAN, BASIC, or PASCAL. Some knowledge of college algebra will be helpful in understanding the space estimate techniques discussed in Chapter 9.

The book is intended for *two* types of users:

1. Business or computer science students who want to learn the structured methods of analysis, design, and implementation of information systems
2. Computer system professionals (e.g., systems analysts, information systems specialists) who want to build a system or are involved in the process of building a system

For the first group the book can be used as a text for a one- or two-semester graduate course on system analysis and design. The book contains more materials than can be covered in-depth in a one-semester course. This allows the instructor a considerable amount of choice in selecting topics to teach.

For the second group the book provides instructions on how to build an information system by using structured methods and as such can be used both as a step-by-step procedure manual and as a reference.

Due to the increasing popularity of structured system development techniques among business managers, many colleges and universities are offering courses on these methods. At the same time the number of computer professionals in industry working with structured system development processes is increasing rapidly. Accordingly, the target audience for the book appears to be substantial.

During the time that I was writing the book I received continuous support from my family, my wife Pranati being the cheerleader of the team. My sons, Partha and Ansu, were somewhat appreciative at this time of the continuing pressure of writing a book after having seen me survive the same ordeal while writing my previous book.

I acknowledge the help I received from my former students at Boston University and at Wentworth Institute of Technology in shaping my ideas about structured methodology. I have benefitted from some of the term papers they wrote as part of their course requirements.

It is a pleasure to acknowledge the friendly support of Maria Taylor, and I sincerely thank the staff of John Wiley & Sons for making this production job a success.

SITANSU S. MITTRA

Medfield, Massachusetts
January 1988

ABOUT THE AUTHOR

Sitansu S. Mittra currently works as the Manager of System Planning and Software Maintenance for TRW, Inc. in Lexington, MA. He also holds an appointment as Adjunct Assistant Professor of Computer Science with Boston University.

Dr. Mittra has two master's and a doctorate degree in mathematics from University of Calcutta, India, University of Toronto, and Lehigh University respectively. His areas of interest are: structured system development methodology, database management systems, decision support systems, mathematical modeling, and expert systems. Prior to joining TRW, Inc., he worked as a Senior System Specialist with Unisys Corporation at Cambridge, MA. His previous book, Decision Support Systems: Tools and Techniques, was published by John Wiley. So far he has published over 45 technical papers and reports in computer systems, operations research, mathematics, and artificial intelligence in various professional journals and in-house publications. Currently, he is working on his third book, Principles of Relational Database Systems.

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