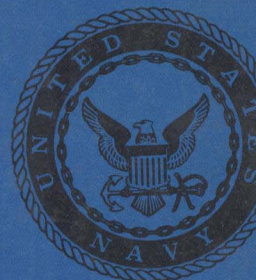
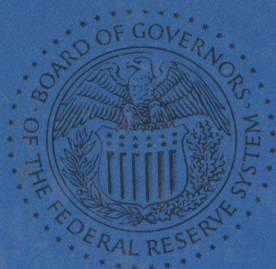


COMPUTERS AND DATA PROCESSING

concepts and applications

STEVEN L. MANDELL



COMPUTERS AND DATA PROCESSING

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STEVEN L. MANDELL

MIS Institute
Bowling Green State University

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A study guide has been developed to assist you in mastering concepts presented in this text. The study guide reinforces concepts by presenting them in condensed, concise form. Additional illustrations and examples are also included. The study guide is available from your local bookstore under the title, *Study Guide to Accompany Computers and Data Processing: Concepts and Applications*, prepared by Steven L. Mandell.

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PREFACE

The term *data processing* is widely accepted as a reference to the major use of computers in organizations. The objective of this book is to present introductory material that is in keeping with the spirit of this orientation. The book is extremely unique in its approach and contains a variety of teaching vehicles.

The most inspiring lectures on computers that I have had the fortune to attend were presented by Captain Grace Hopper, a legend in her own time. In analyzing her material, which always seemed so interesting, it became apparent to me that no new concept was permitted to remain abstract. Rather, actual examples were described, encouraging the listener to visualize its application. In like manner, each chapter in this book is followed by an application that shows how a corporation or government agency implements the concepts presented.

Several other important features are included within each chapter. An opening article invokes attention and acts as a motivator. A meaningful outline of the subject matter follows. The introductory section serves a dual purpose: transition between chapters and preview of material. A chapter summary and review questions are also provided. At the end of the text is a comprehensive, combined glossary and index.

I have had one paramount objective throughout the development of this book: The material is designed to be student-oriented, and all incorporated approaches are designed to assist students in the learning process. Important concepts are never avoided, regardless of their complexity. Many books on data processing emphasize one of two aspects of data processing—informational relationships or computer capabilities. This text attempts to balance and blend both subjects.

The material is structured according to an approach used successfully by several thousand business and computer science students in a course entitled "Introduction to Computers" at Bowling Green State University. The book is divided into five parts: Information Processing, Technology, Programming, Systems, and Issues of Individual Concern. The Information Processing section presents an introduction to the basic concepts of data processing and a historical perspective. The Technology section concentrates on computer hardware, including internal storage and input/output devices. System and applications software, program development, languages, and structural approaches constitute the Programming section. The System section provides a discussion of the methods and approaches to designing information systems. Finally, the Issues of Individual Concern section includes material for career planning and a look at some aspects of the impact of computers on society.

The study guide for this text includes numerous materials for student reinforcement. The instructor material is designed to reduce administrative efforts. A second version of the text that includes extensive coverage of the BASIC programming language is also available.

Many individuals and companies have been involved in the development of the material for this book. The corporations and government agencies whose applications appear in this book have provided invaluable assistance. Captain Grace Hopper has managed to sustain a watchful eye over this project. Faculty and staff of the Management Information Systems Institute at Bowling Green provided the assistance required for the completion of a text of this magnitude: James Bernot and Devendra Gulati on student material; Michael Heim and Becky Nicholas with corporate research; Norma Morris and Terrye Gregory in manuscript preparation; and Barbara Wensel with typing. Comments by reviewers Peter L. Irwin, Ronald S. Lemos, Peter Simis, and R. Fedrick were greatly appreciated. The rough material was again transformed into a polished book through the efforts of a remarkable editor, Marilyn Bohl. The design of the book is a tribute to the many talents of Janet Bollow.

Steven L. Mandell

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section **I**

INFORMATION PROCESSING

1

INTRODUCTION TO DATA PROCESSING

2

EVOLUTION OF COMPUTERS

INTRODUCTION TO DATA PROCESSING

1

OUTLINE

- I. Background
 - A. Functions
 - B. Speed
 - C. Accuracy
 - D. Memory
- II. Data Processing
 - A. Evolution
 - B. Data vs. Information
 - C. Processing Functions
 - 1. Classify
 - 2. Sort
 - 3. Calculate
 - 4. Summarize
 - 5. Store
- III. A Data-Processing Application
- IV. Stored-Program Concept
 - A. Development
 - B. Non-Destructive Read, Destructive Write
 - C. Next-Sequential-Instruction Feature
 - D. Program Execution
- V. Computer Impact
 - A. Business Applications
 - B. Government Use
 - C. Education and Health Care Utilization

INTRODUCTION

The computer has become a dominant force in society today. Business corporations, government agencies, and other organizations depend on the computer to process data and make information available for use in decision-making. Computers are responsible, to a large extent, for our present standard of living. As the costs for computer equipment continue to decrease, computers will become an even more integral part of our daily lives. It is therefore essential that people gain a basic understanding of computers—their capabilities, limitations, and applications.

In this chapter, a basic description of the computer and its uses in data processing is given. The distinction between data and information is presented. A computerized example of payroll processing is used to demonstrate how computers can be programmed to provide meaningful information. Finally, some of the major advances and problems resulting from computers are presented as evidence of the growing impact computers have had on all parts of society.

THE GREAT DATA FAMINE

Art Buchwald

Washington Post,
September 28, 1969

One of the major problems we face in the 1970s is that so many computers will be built in the next decade that there will be a shortage of data to feed them.

Prof. Heinrich Applebaum, director of the Computer Proliferation Center at Grogbottom, has voiced concern about the crisis and has urged a crash program to produce enough data to get our computers through the seventies.

"We didn't realize," the professor told me, "that computers would absorb so much information in such a fast period of time. But if our figures are correct, every last bit of data in the world will have been fed into a machine by Jan. 12, 1984, and an information famine will follow, which could spread across the world."

"It sounds serious," I said.

"It is serious," he replied. "Man has created his own monster. He never realized when he invented the computer that there would not be enough statistics to feed it. Even now, there are some computers starving to death because there is no information to put into them. At the same time, the birth rate of computers is increasing by thirty percent a year. Barring some sort of worldwide holocaust, we may soon have to find data for 30,000,000 computers with new ones being born every day."

"You make it sound so frightening."

"It is frightening," Prof. Applebaum said. "The new generation of computers is more sophisticated than the older generation, and the computers will refuse to remain idle just because there is nothing to compute, analyze, or calculate. Left to their own devices, the Lord only knows what they will do."

"New sources of data must be found. The government must expand, and involved studies must be thought up to make use of the computers' talents. The scientific community, instead of trying to solve problems with computers, must work on finding problems for the computers to solve."

"Even if the scientists really don't want the answer?"

"Naturally. The scientific community invented the computer. Now it must find ways of feeding it. I do not want to be an alarmist, but I can see the day coming when millions of computers will be fighting for the same small piece of data, like savages."

"Is there any hope that the government will wake up to the data famine in time?"

"We have a program ready to go as soon as the bureaucrats in Washington give us the word. We are recommending that no computer can be plugged in more than three hours a day.

"We are also asking the government for \$50 billion to set up data manufacturing plants all over the country. This data, mixed with soy beans, could feed hundreds of thousands of computer families for months.

"And finally we are advocating a birth control program for computers. By forcing a computer to swallow a small bit of erroneous information, we could make it sterile forever, and it would be impossible for it to reproduce any more of its kind."

"Would you advocate abortions for computers?" I asked Applebaum.

"Only if the Vatican's computer gives us its blessing."

Buchwald's satirical article is both humorous and instructive. The importance of data and its transformation into information useful for decision-making is the computer's reason for being. The first chapter explains this basic computer process.

THE GREAT DATA
FAMINE