

BUSINESS DATA PROCESS- ING

FOURTH EDITION



ELIAS M. AWAD

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DATA PROCESSING

FOURTH EDITION

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Elias M. Awad

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**BUSINESS
DATA
PROCESSING**

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The maintenance, stability, and growth of today's business organization depend largely upon the quality of its information and the effectiveness of its data processing system. The advent of the electronic computer has projected the manager into the role of a full-time decision maker by freeing him from the drudgery of routine processing tasks. This "Second Industrial Revolution" is now an integral part of every field—business and scientific—and affects the lives of millions. With this orientation, the study of business data processing becomes increasingly important, especially to students majoring in business management, business organizations, accounting, data-processing systems, or business economics.

This new edition follows a pattern similar to the previous three in terms of lucidity, consistency, and currency of the subject areas appropriate for a basic text in business data processing. Some of the major features or changes are as follows:

1. Each chapter begins with a general outline and ends with a summary, a glossary of basic terms, questions for discussion, and suggested readings.
2. Problems and exercises underscoring key features of each chapter are available in *Concepts in Business Data Processing: Student Guide*, which accompanies this text and contains solutions to even-numbered items.
3. *Issues in Business Data Processing: A Reader* is a new addition, designed to supplement the text with readings and issues related to key aspects of computer processing and management.
4. Major reorganization of the sequence and content of the text. Punched card data processing devices are deleted except for the keypunch, which is still in use as a computer input preparation device.

4. **PART ONE, COMPUTER PROCESSING—AN OVERVIEW**, includes a major revision of Chapter 1 with emphasis on the growing importance of management information systems and a discussion of computer growth. Chapter 2 clarifies the systems concept as it relates to business organizations and shows how information flows throughout the system for effective decision making. Chapter 4 includes a section on developments of computer languages.
 5. **PART TWO, CHARACTERISTICS AND INTERNAL OPERATION OF A COMPUTER SYSTEM**, includes updated presentation of the makeup and characteristics of today's business-oriented, digital computers (Chapter 5). Chapter 6 describes and illustrates the concept and structure of *virtual memory*. Chapter 7 is a summary of computer number systems and arithmetic. It can be deleted without sacrificing the continuity of the text matter.
 6. **PART THREE, COMPUTER SYSTEMS AND DEVICES**, includes major emphasis upon direct data-entry devices in Chapter 8, with a section on *intelligent terminals* and an illustration of the use and importance of POS systems in retailing. Chapter 9 discusses the latest input/output devices available for computer processing. Chapter 10 explains the *microfiche concept*—a new technique in microfilm. Chapter 12 includes a new section on *virtual time sharing* and another section on the structure and design of the *computer data base*. Finally, Chapter 13 presents an overview of the IBM system 3/15.
- PART FOUR, COMPUTER APPLICATIONS DEVELOPMENT AND PROGRAMMING**, begins with a new chapter (14) which explains the stages involved in designing and developing systems projects. Once learned, the succeeding chapters (15–20), related to tools for program planning and the use of various languages, begin to make sense. Chapter 19 is a new chapter introducing BASIC. The use of this language is gaining in importance among time-sharing users, especially in schools that maintain an ongoing time-sharing facility.
8. **PART FIVE, DATA PROCESSING MANAGEMENT**, presents principles applicable to the planning, organization, and management of a data-processing department.

This edition is dedicated to Frederic K. Easter, Jr., Assistant Vice President of Prentice-Hall, Inc., whose foresight of the need to introduce basic data processing to the academic business program was reflected in his publication of the first edition of this text in 1964. His continued support and dedication to advancing the cause of data processing made the succeeding publications possible.

Special thanks go to Burt Gabriel, the text editor, whose creative talent and wealth of pertinent information, as well as the many hours he devoted in guiding my thoughts through the preparation of this edition, shall always be appreciated. I also appreciate the interest and dedication of Fred Dahl, production editor, whose professional touch in coordinating the various aspects of the manuscript are reflected in the finished product.

I am indebted to many individuals and organizations whose cooperation helped in the preparation of this edition — Professor William C. Akin, Southwest Texas State University; Professor Joel Darrow, Pace University Graduate School; Professor Thomas G. DeLutis, Ohio State University; Professor Elmer C. Laedtke, Northern Virginia Community College; and Dr. Melvin Morganstein, Nassau Community College. My thanks go to IBM and other computer manufacturers for permission to use and adapt the copyrighted photographs of the equipment and schematics presented in the text; to Marjorie Homan for typing the final draft from a virtually handwritten copy; and to Rita Putko of Burroughs Corporation for expediting the availability of technical information against a tight deadline.

I am personally indebted to Mr. Arthur M. Wirtz for providing use of the library facilities and privacy of the Ivanhoe Farms where the bulk of this edition was written. His special interest in my work was a strong motivator behind each publication. My wife, Sandy, deserves most credit for her patience, constant encouragement, and for the many family hours sacrificed in the revision process.

ELIAS M. AWAD

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**COMPUTER
PROCESSING —
AN OVERVIEW**

0215

management information and data processing



MANAGEMENT INFORMATION VERSUS DATA PROCESSING

Data Processing

Pressures for Management Information

environmental and organizational factors

accuracy factor

timeliness and speed factors

cost factor

METHODS OF DATA HANDLING

Electronic Data Processing

COMPUTER APPLICATIONS

Basic Applications

record keeping

payroll

production scheduling

order writing

customer billing

financial accounting

inventory control

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Management Decision Making

linear programming

simulation

project management (CPM and PERT)

management games

*computer-assisted information storage
and retrieval*

management information system (MIS)

Real-Time Applications

Some Areas of Computer Use

education (computer-assisted instruction)

medicine

*government of the people, for the people,
by the computer*

THE COMPUTER INDUSTRY

Computer Growth

Bridging the Generation Gap

The Seething Seventies—An Outlook

Since the beginning of time, man has manipulated data, and by using the communication methods and devices available to him, has passed useful information to other men. In ancient caves we find carved wood pictures, hieroglyphics on stone tables, and maps of battles. All illustrate man's early efforts to process and transmit information. Man recognized early the value of developing tools to help in physical and mental work. Thus, the axe became an extension of the hand by increasing the effective force of the hand; the telescope, an extension of the eye in identifying faraway objects; the bicycle, an extension of the leg; and the telephone, an extension of the ear.

As civilization progressed, man's genius for devising ways of harnessing the forces of nature, thus replacing animal power by engine power, resulted in revolutionary environmental changes, which have molded us into a highly sophisticated and technologically advanced society. During World War II, for example, scientists tested the atomic bomb and developed the ballistic missile, which now act as deterrents to outside attack; breakthroughs in electronics led to the use of radar in airports, on ships, and in advanced weapons. Since then *the electronic computer, an extension of man's brain*, has made possible a multibillion dollar space exploration program that has landed men on the moon. In the words of Whisler, "Older technologies are [an] extension of man's hands and muscles and were his tools and servants while modern information technology is an extension of man's brain and is his partner—or even his master."

One of the "marvels of the age," modern computers work so rapidly that most people are blinded with admiration for their performance; they

really believe that the machines think for themselves and thus will revolutionize in some unexplained way the whole structure of business. Just how a “hunk” of metal encasing electronic circuits can accomplish this is not considered by the uninitiated. One should realize from the beginning that these machines are to be regarded as tools which aid in mental work of a repetitive and decision-making nature. They can do nothing that a human being does not instruct them to do in the first instance.

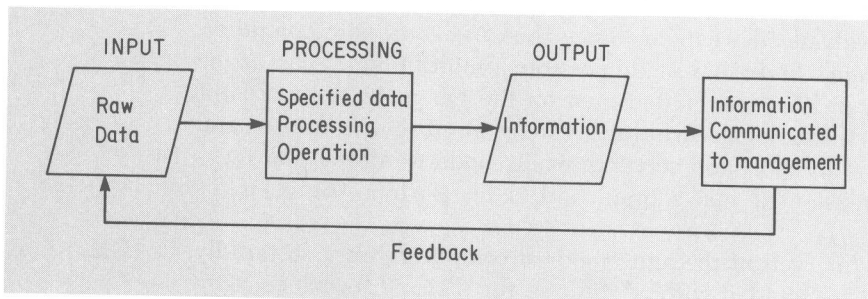
MANAGEMENT INFORMATION VERSUS DATA PROCESSING

Many computer texts loosely interchange the use of terms such as “information processing,” “data processing,” “management information,” and the like. In the interest of clarity, it is important to recognize that the term *data* has to do with facts or informational raw materials which, when put through a specified transformation process, becomes useful information for management. *Management information* is the output of a particular data-processing operation and is intended to serve a specific purpose. In Fig. 1-1, the transformation process begins with informational raw data that are submitted to a specific processing routine, which results in management information ready to be communicated to the user.

Data Processing

Data processing, then, consists of producing and reporting meaningful information. Everybody must process data, whether performing a decision-making function as an individual, a head of a family, a student, a leader of a social or political organization, or an owner of a business—large or small. In most cases, pencil and paper have been and still are used as manual aids in problem solving. In the distant past, under a barter system, the environment in which a businessman operated did not require visual evidence of his work or elaborate mental calculations. Calculations

FIGURE 1-1. Transformation process of data



were so few that he could perform them mentally as quickly as a sophisticated computer performs electronically the greater volume of such calculations today. As communities expanded, and the barter system was replaced with monetary systems, the basis of business relationships changed also from an intimate, personal one to an impersonal one. This change required businessmen to record their activities in writing and to retain records for analysis and for future reference.

Understanding of the past often is a prerequisite to planning future endeavors and guiding men in their present actions. For example, credit buying, with its attendant need for keeping records on accounts receivable and accounts payable, illustrates one reason data processing has become so important in economies where business life is conducted primarily on the basis of "man's faith in man."

Pressures for Management Information

The competitive nature and complexity of today's business make it necessary that executives have access to the right kind of information for effective decision making.¹ Data from within and from without the firm must be processed with emphasis on accuracy, timeliness, speed, and cost. Each of these factors will be discussed briefly.

ENVIRONMENTAL AND ORGANIZATIONAL FACTORS. Pressures exerted from without and from within business firms generate increased paperwork, making the use of data processing a "must." External factors include, among others, billing. Some customers purchase merchandise for cash; most purchase on account. For the latter, billing is required at the end of a specific period after adjustments, returned items, and discounts are taken into consideration. This creates assets in the form of accounts receivable on the seller's books. Suppliers, too, ship merchandise to the seller on account, creating a liability in the form of accounts payable on the books of the seller. Once received, items have to be counted and recorded. They have to be listed and checked (i.e., inventoried). The supplier has to be paid, after allowance for returned or defective merchandise (if any) and cash or quantity discounts are taken into consideration. Owners (stockholders, single proprietors, or partners), on the other hand, require periodic reports of the current status and business activities of their firms. Such information is needed to determine whether a profit is being made, which in turn guides the decision of whether to continue

¹ Managers utilize information differently, depending on their level in the organization and the task they are assigned. Upper management generally needs information for developing policies and working out long-range plans. They have more use for environmental information (about customers, suppliers, etc.), and spend more time in planning than does lower management. Given the time pressures, upper management would more likely require information presented in condensed (summarized) form. Lower management, on the other hand, needs detailed internal information for making day-to-day decisions, and spends more time in organizing and implementing the policies developed by upper management.