

SOUTH-WESTERN PROGRAMMING LANGUAGE SERIES

PROGRAMMING BUSINESS SYSTEMS WITH BASIC

ADAMS

LEIGH

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PREFACE

COMPUTER PROGRAMS AND PROGRAMMING

Computers are a fact of life. Wherever you go, whatever you do, you will encounter a computer or computer-produced goods and services—every day. Although computers affect people in ways that were unimaginable only a few decades ago, people themselves still retain final control over computers. People are the designers, builders, and operators of computers. People employ computers and bring them into service to fulfill human needs. Thus, the need for people to understand and use computers has become almost as important as the need for people to read and write.

One of the main ways in which people control computers is through computer *programs*. Programs are sets of instructions that operate computers and control their processing activities. Programs tell the computer the steps to follow in carrying out the work required. Computer programs, or *software*, control the operations of devices as complex as satellites, as mundane as home appliances, and as entertaining as video games.

Computer programming, or the process of developing computer programs, is an industry in itself. Today, you can purchase computer software to design buildings, to conduct geological surveys, to maintain complete sets of accounting records for a business, to diagnose illnesses, to play games with you, and even to teach you how to program a computer. Computer programming has become an important and rapidly growing occupational area as well as a popular pastime for the hundreds of thousands of people who own personal computers.

COMPUTER INFORMATION SYSTEMS

This book is about computer programs, programming, and the effective use of computers in business-type organizations. More specifically, the

text explains the development of computer software as the basis for a *computer information system (CIS)*. Computer information systems provide administrative and management information required for the successful operation of businesses. A CIS facilitates the flow of work through a company and provides decision-making information for managers and top-level executives. Thus, the kinds of programs and programming activities discussed in this text are applicable to computer-based systems in business, government, education, and most manufacturing and service organizations.

This book presents a programming approach based on the most current research and practices in software design and development. Programming is treated as a rigorous, systematic process worthy of a disciplined approach similar to that used in the engineering disciplines. However, this approach does not discount that programming can be rewarding and enjoyable.

THE BASIC LANGUAGE

Computer programs are written in special *programming languages* that computers can understand and execute. BASIC is one of the most popular of these languages and is the language used throughout this book. BASIC (an acronym for Beginner's All-purpose Symbolic Instruction Code) was developed by professors John Kemeny and Thomas Kurtz at Dartmouth College as a vehicle for teaching computer programming.

Although the BASIC language is easy to learn, its commands are powerful and versatile. Thus, BASIC has become the most popular language used on most minicomputers and microcomputers. With the rising popularity of these types of small computer systems in business, BASIC also has become an important business applications programming language. In fact, virtually all microcomputers now being delivered and installed for business applications are supported by some variety of BASIC.

ORGANIZATION OF THIS BOOK

Chapter 1 contains a brief review of computer software and hardware components. Also discussed are the types of files encountered by programmers and the elements of information systems that require programs or *systems of programs*.

In Chapter 2, a framework for program development is presented. This five-step development process is provided as a guide for you to

follow in working through every program and programming assignment in this book. The discussion of these steps stresses the importance of programming as a mental, problem-solving process that you work through independent of computer languages and hardware considerations.

In Chapters 3 through 8, you use the five-step process described in Chapter 2 to design, write, and operate programs that are integrated to implement a computer system. These chapters present programming techniques and programs that are used to create and operate a hypothetical business system. *Master* and *transaction* files are discussed as the bases of most computer information systems.

Chapter 3 explains procedures for creating master files, which serve as the foundation upon which all other computer files are built.

Chapters 4 and 5 discuss the production of computer-generated reports used by business managers to guide a company's operations effectively and efficiently. Information contained in computer files is provided to management primarily through the printing of reports that either detail or summarize file content.

Chapters 6, 7, and 8 explain the creation of transaction files and ways in which these files are used to keep master file information accurate and up-to-date.

Chapters 9, 10, and 11 augment the first two sections of the book with presentations on file processing techniques used in actual businesses. Due to the large sizes of computer files within a business system and the special, tailored needs of businesses themselves, real-world systems design requires programmers to challenge their creative abilities and technical skills in solving unique problems.

Appendixes A and B contain the case study material that you use to create your own information system.

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I PROGRAMMING STRATEGIES AND TECHNIQUES

Part I of this text has two chapters that lay a foundation upon which computer programming skills can be built. Topics covered include basic strategies for analyzing problems and developing computer-based solutions, as well as techniques for implementing these solutions as computer programs.

The first chapter serves as a review, an introduction, or both—depending upon your own situation. This chapter includes a brief survey of computer devices and their functions. Programs are explained within a context of systems. That is, programs do not exist for their own sake, but implement systems. Systems, in turn, solve problems or meet needs.

Because programs do not exist on their own as independent entities, care and thought must go into their development. Chapter 2 outlines a process, or set of orderly procedures, that will help you to use your own time efficiently and will help you to develop programs of high quality that are produced at a reasonable cost.

1

COMPUTERS, PROGRAMS, AND SYSTEMS

OVERVIEW AND OBJECTIVES

This chapter reviews the basic concepts and components of computers and computer systems. Three types of computer information systems and their common features are discussed. Also, the chapter presents an overview of the principal types of programs that are developed to implement computer information systems and of the general context within which systems of computer programs are developed for business.

When you complete your work in this chapter, you should be able to:

- ☐ Describe what a computer is.
- ☐ List and describe the main components of computer systems.
- ☐ Identify the three types of computer information systems used in business and describe the general functions of each.
- ☐ Name the two types of files that support most computer information systems and describe the functions of each type.
- ☐ Name and describe the basic types of programs from which most computer information systems are built.

COMPUTER PROCESSING

In concept, a computer is a very simple device. Basically, a computer performs arithmetic and logical operations. Whenever it is provided with *data*, or facts and figures, a computer can process them by applying addition, subtraction, multiplication, division, or other kinds of arithmetic. The computer also can perform logical operations on the data and compare two values to determine whether one is greater than, equal

to, or less than the second. Apart from some additional computer operations necessary to get data into and out of the computer and to move them internally, there is little more that a computer can do at an operational level—regardless of its size or its cost.

The simplistic nature of these capabilities is highlighted by the fact that such functions are referred to as *primitives*. These primitive functions represent the total capabilities available on any computer. These limitations, in turn, mean that a computer requires the intelligence of people to select and organize those operations in meaningful ways that cause the computer to carry out demanding tasks.

COMPUTER PROGRAMS

A computer can perform its data processing tasks without human intervention by following the instructions provided to it in a *computer program*. A program is a listing of the operations that the computer carries out to process data. It is a set of detailed instructions establishing the sequence in which processing activities must be performed to produce the desired results. Once this set of instructions has been placed inside the computer, the equipment can execute automatically the processing called for. Computer programs, or *software*, are the primary tools that people use to bring computers into their service.

Computer programs are written by people. The computer is capable of doing no more, nor any less, than it is instructed to do. The people who write these programs and solve the problems are called *computer programmers*. Programmers determine the sequence of separate computer operations required to solve a specific problem.

To use a computer, therefore, people must supply two requirements—programs and data. A program is prepared and placed inside the computer. Then, control is turned over to the computer, which follows the instructions in the program. Under program control, the computer accesses the data that are provided and processes them according to the instructions.

COMPUTER SYSTEM

The computer itself, along with other devices for getting programs and data into and out of the computer, is called the *computer system*. Most

computer systems include four types of *hardware*, or pieces of equipment. These are:

- The *processor unit*, which has two parts—computer *memory*, where programs and data reside temporarily during processing, and the *central processing unit (CPU)*, where the arithmetic and logical operations take place.
- *Input units*, which are used to enter programs and data into memory.
- *Output units*, which print or display programs and the results of processing.
- *Storage units*, which are used as files for long-term retention of programs and data within the computer system.

These four units, represented in Figure 1-1, are present in all computer systems—regardless of size and cost. The major differences among computers are in their processing speeds, their memory capacities, and in the varieties of input, output, and storage devices available.

COMPUTERS AND PROBLEM SOLVING

Computers are general-purpose data processing devices. That is, a computer can perform any type of work and solve any type of problem as long as it is provided with the instructions for performing the task and the needed data. These instructions must be drawn from the limited repertoire of input, arithmetic, logical, output, and storage operations available for any given computer. If people can devise solutions to problems and describe those solutions in terms of basic computer operations, the range of problems to which the computer can be applied is virtually limitless.

In essence, then, computer programming is a mental, problem-solving process. It is the process through which people apply intelligence to problems to evolve computer solutions.

COMPUTERS IN BUSINESS

Most people will encounter computers or work with computers in the business world. As employees or customers of business, government, education, or other kinds of production and service industries, people either will use computers in their jobs or will be affected by computers in some way. Business computer applications are the most pervasive in today's society.

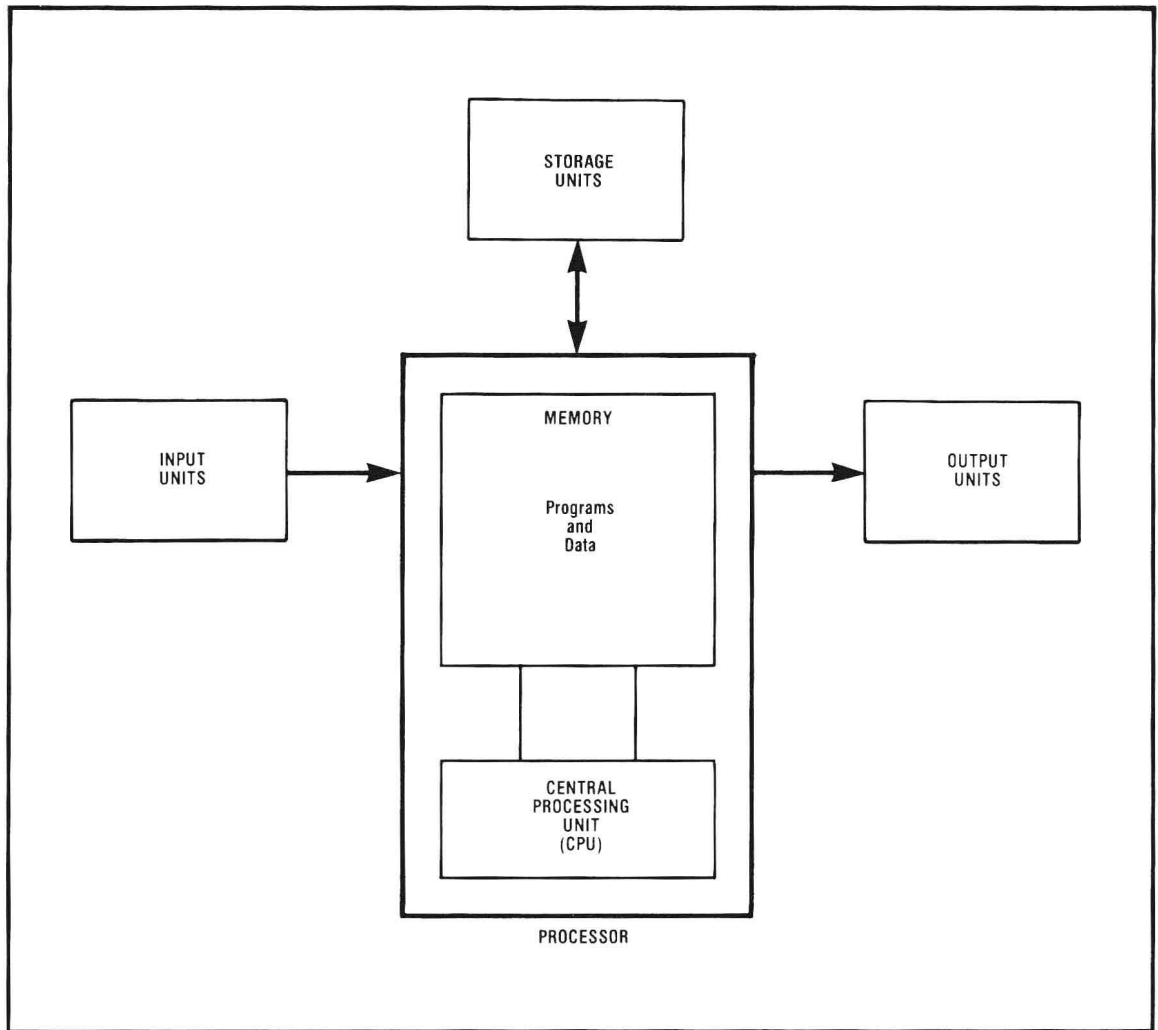


Figure 1-1. A computer system consists of four types of hardware: input units, a processor unit, output units, and storage units.

Computers have been used in business only since the early 1950s. Yet, during this time, the computer has been a vital force in the production and distribution of goods and services. From the time a new product or service is conceived until it is delivered to the consumer, it is likely that a computer was involved in the process.

One of the most important uses of computers in business, and the application area that is emphasized in this book, is as the basis of *information systems*. Information is the life-blood of any organization, the basis on which decisions are made in managing a business enterprise. The right information must be provided to the right people at the right time and in the right form. Only then can effective decisions be made. Without effective decisions, the organization cannot survive. Therefore, the systems of hardware, software, people, and procedures that provide information are fundamental to the success of using organizations.

Today, the computer is playing a vital role in management and decision making. Through *computer information systems (CIS)*, accurate and timely information is being captured, processed, and made available for planning, controlling, and facilitating the administrative activities of business. The three general categories of computer-based systems that are found in business are called *data processing systems (DPS)*, *management information systems (MIS)*, and *decision support systems (DSS)*. Programming in business usually involves producing software for these kinds of systems.

Data Processing Systems

The first applications of computers in business were of a record-keeping or bookkeeping nature. Computers were used to record business transactions and to prepare reports on business activity. The computer was used primarily to automate and facilitate the flow of work through the organization, to account for business transactions, and to maintain company records. These data processing systems are still the workhorses of most computer installations, since the computer can perform these clerical, record-keeping chores much faster, more accurately, and usually at far less expense than people. A data processing system is diagrammed in Figure 1-2.

Management Information Systems

The next step in using computers in business was in assisting managers in making routine decisions. In the 1960s, computers became the basis for management information systems. In an MIS, as shown in Figure 1-3, the computer prepares summary reports to management on business activity. These summaries consist of totals for groups of data items and provide information on trends in operations and on business operations that have veered off course from plans and expected outcomes.