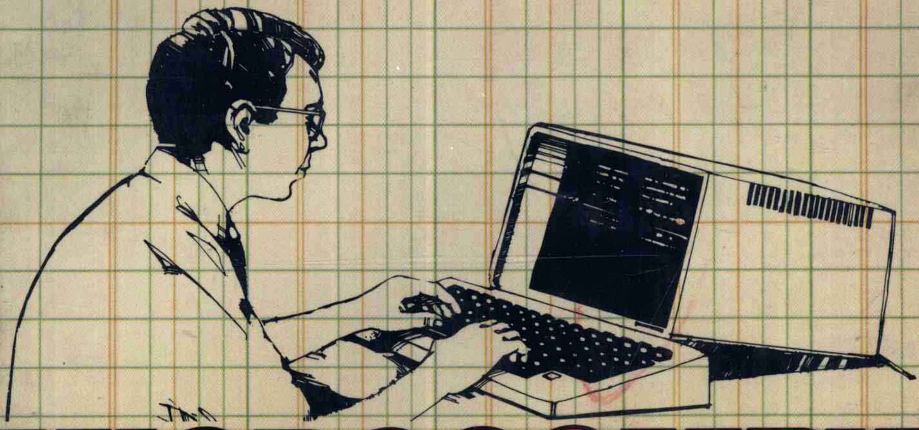

Theodore Needleman

MICROCOMPUTERS FOR ACCOUNTANTS

How to use microcomputers for:
better practice management
improved client support
new services (tax modeling, budgeting, forecasting)

A SPECTRUM BOOK

Theodore Needleman

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PREFACE

Theodore Needleman, *a specialist in the financial applications of microcomputers and a practicing accountant, is president of his own consulting firm and has written numerous articles for microcomputer magazines.*

There is an old Chinese curse that goes, "May you live in interesting times." The times we live in are, certainly, interesting. The field of accounting has, like most disciplines these days, expanded at an incredible rate. Although the types of tasks that accountants perform have increased so, luckily, have the tools that accountants have available.

When the electronic calculator became widely available in the 1960s, accountants were quick to trade in their old mechanical adding machines and gear-driven calculators. Now that small, personal-size computers are becoming common, it is hardly surprising that accountants are lining up to purchase them. With the many brands and differing models of computers and associated software, the choice of what will work best in your practice is sometimes difficult.

This book will not make you a computer expert overnight. It will give you enough of a background to feel comfortable in making your choice, as well as providing a gameplan for getting a personal computer into your office and providing the assistance so many of our small practices can use.

I would like to thank some of the people who made this book possible: Dave Heinemann, my editor at Prentice-Hall, for his assistance and patience; Barry Leibowicz, friend and attorney for his contributions to some of the legal aspects involved in obtaining a computer; John Moss of BPI Systems, Inc. for his insight over the years as to the producer's side of the software game; and, of course, my wife Lynn, without whose encouragement and assistance this book probably never would have been written.

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THE MICRO REVOLUTION: A NEW APPROACH TO COMPUTING

A SHORT HISTORY LESSON

In the thousands of years since humans first realized that they could express amounts other than "one" or "many," there have been several generations of computation aids. One of the first counting aids came about with the realization that one could keep track of amounts greater than one by using fingers and toes. The next great leap in computational ability took place with the development of formal numbering systems and the idea of positional notation. The concept of the same digit representing different values depending on where it appears (in the ones' column, tens' column, etc.) is something most adults take for granted, but it probably ranks high on the list of humankind's greatest ideas.

Once the idea of positional notation became known, development of calculating aids quickly followed. This early generation of calculating "hardware" includes devices such as counting sticks, Napier's bones, and the abacus.

Further major developments in calculating aids have taken place in relatively recent times. The first mechanical calculators, such as Babage's "analytical engine," could not be invented until the principles of mechanics and gearing had been developed.

In less than 100 years not only have we gone from strictly mechanical devices to sophisticated electronic marvels, but the use that these devices are put to has also changed. No longer are we concerned only with counting numbers; our concern is now to process data of all types. This ability to process large amounts of many types of data has developed along with the development of the stored-program digital computer.

The earliest electronic computers, developed in the 1920s and during World War II, were *analog* devices. These used the way that certain electronic circuits react to changes in voltage or current to model complex real-world (physical) systems. (For example, analog computers were used extensively during World War II to model and solve ballistics problems, such as artillery and bomb trajectories.) Analog computers were (and to a lesser extent still are) used to perform complex mathematical computations such as integration.

During the 1940s a change in direction took place in the development of computers. Rather then using approximate analog quantities to approximate numerical values, development efforts concentrated on the *digital* computer, which uses binary (on–off/yes–no) logic. Using the binary (base 2) numbering system and later the octal (base 8) and hexidecimal (base 16) systems, it was now possible to express exact numerical values. The use of the binary system gave the digital computer one additional capability that brought the equipment far beyond being just a souped-up adding machine. This additional capability was the internal ability to express a logical decision (a yes–no). This capability is greatly used in computers to perform different actions depending on the result of a prior action.

With the development of the capability of the equipment to store not only the numbers being manipulated but also the sequence of operations that are to be performed (called a *program*), the first *stored-program digital computers* came into being.

Since those early electromechanical computers, we have gone through several generations of both hardware and software. The first generation of electronic digital computers used glass vacuum tubes as logic elements. These early computers were huge devices that took up one or more rooms, used enormous amounts of power, and required special air conditioning to deal with the large amounts of heat produced. These vacuum-tube-based machines also tended to be unreliable and usually required a full-time engineering crew just to keep them operating. They also required a good deal of technical training and expertise on the part of their operators. For a'l of these inconveniences, they represented a tremendous increase in data handling capability over what had been available before.

The second generation of computers came about with the use of *transistors* instead of vacuum tubes and the development of mass storage devices such as tape units (and later magnetic disk units). The advent of transistors greatly reduced both physical size and power requirements. The development of mass storage devices permitted the system to store large amounts of data to be accessed at a later time. These machines, although still requiring a fair amount of technical expertise to use, do not require a full-time engineering staff just to keep them running. They are much faster than their tube-based predecessors and can handle much greater amounts of data.

The business world was quick to see the advantages of *electronic data processing* (EDP), and during the late 1950s and

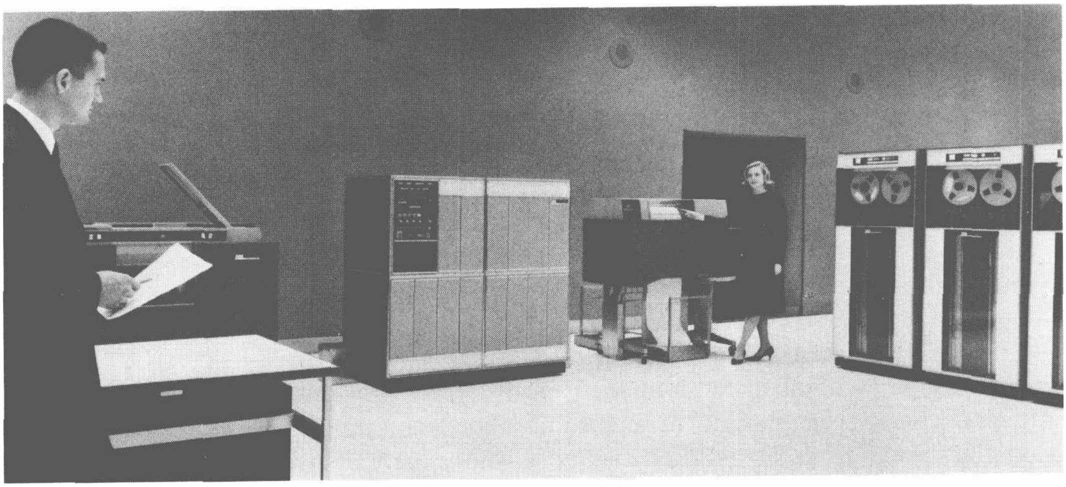

FIGURE 1-1 A Second Generation (transistor) Computer System: the IBM 1401. Photo courtesy of IBM.

early 1960s business rather than scientific use became the predominant use for computing equipment.

The third generation of EDP equipment, using *integrated circuits* rather than transistors, made even further inroads into the business world. Although second- and third-generation equipment brought the many benefits of computerized data processing to a large number of businesses, they were (and still are) relatively expensive. While a large or mid-size business may be able to rent a computer for $1000 a month or more, or purchase one for $30,000 or more, few smaller businesses could justify that kind of outlay, regardless of the many benefits such a computer might provide.

In 1976, two articles appeared in different electronic hobbyist magazines. *Radio-Electronics* published build-it-yourself

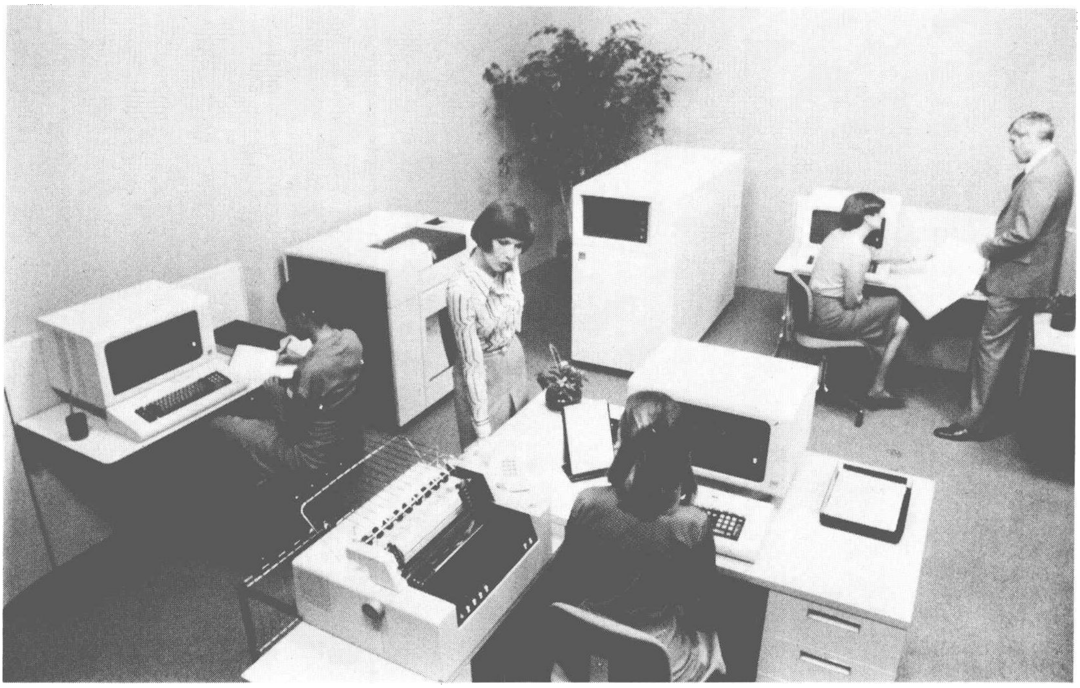

FIGURE 1–2 A Multi-user Minicomputer: the IBM System/34. Photo courtesy of IBM.

plans for the MARK 8 computer using newly developed "computer-on-a-chip" *microprocessor* integrated circuits. This was followed several months later by *Popular Electronics'* construction articles on the Altair 8080. While these early *microcomputers* required a great deal of technical sophistication to assemble, use, and keep working, they provided the basis and breeding ground for our current crop of personal and "small business" computers. The microprocessor-based computer also instigated a shift in the way people use computing power.

The second- and third-generation *mainframes* and *minicomputers* provided an enormous amount of computing and data handling capacity. Access to this capacity was restricted. A centralized approach was (and still is) used. The individual user submitted his "job," which was then put together with other users' jobs and processed by the computer system in batches.

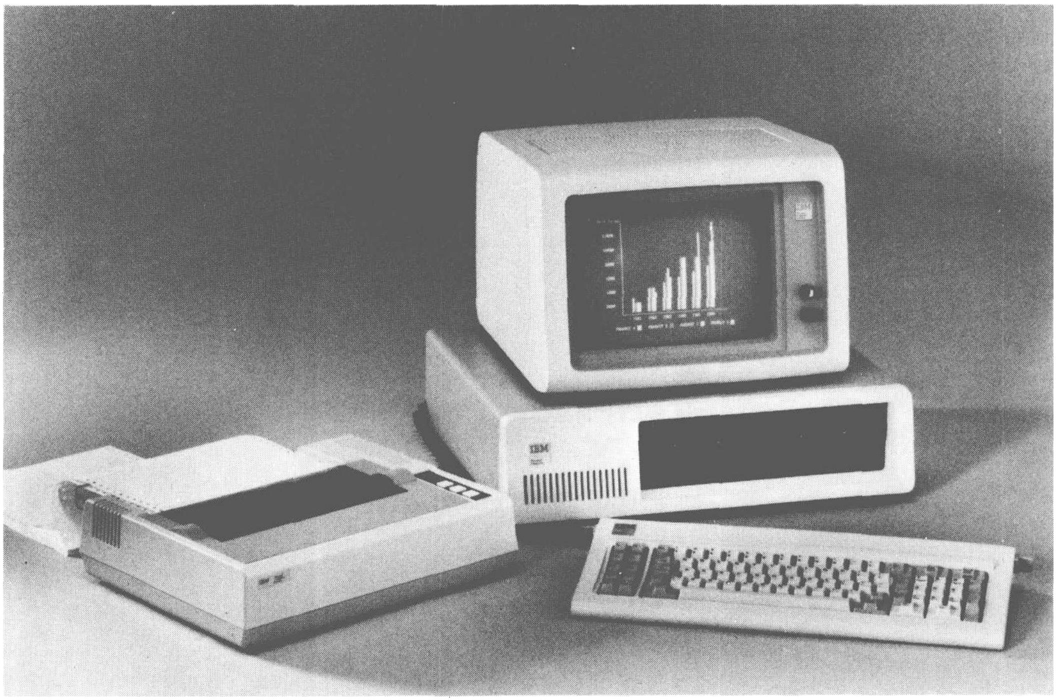

FIGURE 1–3 A Microprocessor-based Computer System: the IBM Personal Computer. Photo courtesy of IBM.

The major concern was to make the best use of limited computer resources. As computers became more powerful, emphasis shifted to their becoming more user-oriented. Techniques such as *time-sharing* (where a user directly accesses the computer through a terminal) and *remote job entry* (RJE) terminals were developed to provide users less restricted access to computing resources. These concepts eventually led to today's distributed data processing where smaller computers in several locations in a company are used to *preprocess* or half-digest data generated at different locations which is then sent to a larger central computer to be processed further. All these developments have come about because of advances in computer *hardware* (the actual equipment) and computer *software* (the instructions which tell the equipment what to do).

As computer power has grown, computer resources have become much more accessible to the user. In addition, the emphasis has shifted to making these resources easily usable. The recent development of computer systems based on the microprocessor ("computer on a chip") has made it possible for a person with no great technical skills to avail himself of the great benefits of electronic data processing.

THE TWENTY-FIVE-CENT COMPUTER TOUR

Every professional discipline, accounting included, has its set of technical terms or buzzwords. While a glossary is included at the end of this book, it is helpful to introduce some concepts at this point. That way, when you start looking at computer literature or visit a computer store, you will at least be familiar with most of the terms thrown at you.

A computer system consists of three basic types of devices (Fig. 1-4), although more elaborate systems may have more than one of these device types At the heart of any computing system is the *central processing unit* (or CPU). This "box" contains the electronic circuitry which directs information (data and instructions) to and from other devices in the system such as the computer's memory and/or input/output devices (more on this in a moment). The CPU also contains

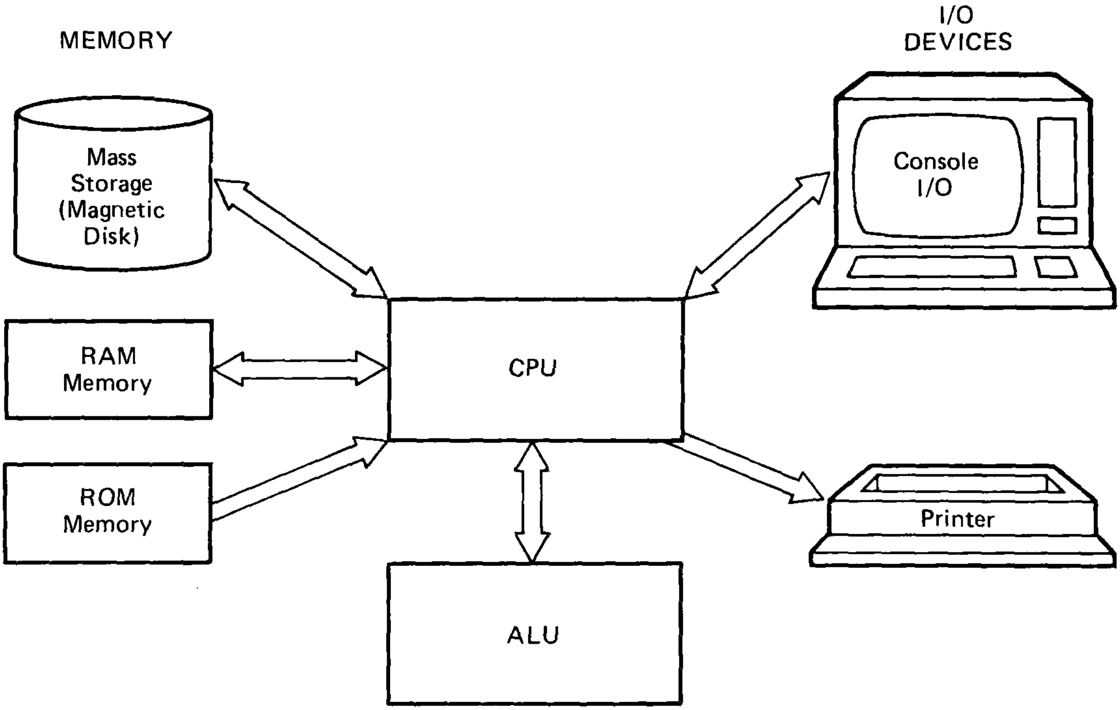

FIGURE 1-4 Computer Organization and Flow

something called the *arithmetic/logical unit* (ALU). This is the electronic circuitry that performs the mathematical operations and, under control of the computer's *program* (list of instructions), makes logical (yes–no) decisions. The actual electronics for both the CPU and ALU may be contained on the same tiny microchip (they usually are in computers of the size we will be concentrating on).

The second basic type of computer device is the computer's memories. There are three basic types of memory in a computer which are used to store (remember) three different types of information. These are *read-only memory* (ROM), *random-access memory* (RAM), and *external mass storage.*

Read-only memory is memory in which information has been entered by the manufacturer before the equipment gets to the user. The computer can read this information but cannot put new information in this area of its memory or change what is there. This type of memory is used for information that, by its nature, does not change, such as a programming language or the computer's operating system (more on this later).

Concerning random-access memory, the computer can both read the information there and also change or write new information into this area (this type of memory is also sometimes called read/write memory). This area of memory is organized into many separate locations each capable of containing one character (which can be a number, letter, or symbol) of information, a byte (Fig. 1-5). This type of memory is called random-access because the computer can go to any one location in this area of memory to read or write a character there, without having to go through all the memory locations preceding it.

Both ROM and RAM are usually contained in the same enclosure (box) as the CPU. While RAM is both easily accessible by the computer and can be read and written to with great speed, it is usually of limited capacity. A small computer system of the type we are discussing generally has internal RAM that can hold between 32,000 and 256,000 characters. This may seem to be quite large, but many data files (payroll records, general ledgers, etc.) can contain many more individual numbers and letters than the computer can hold in its RAM.

External mass storage gets around this limitation. The

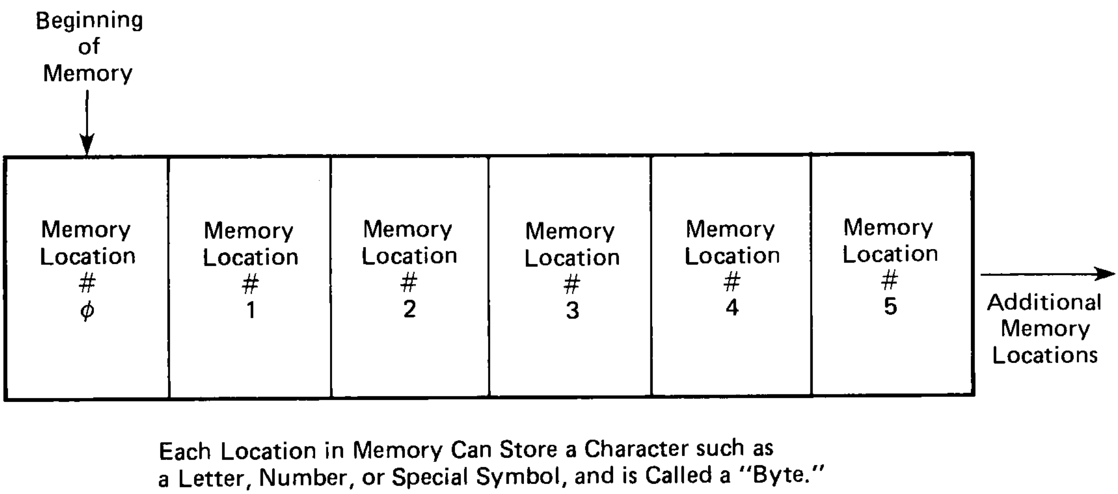

FIGURE 1-5 Memory Organization

most common mass storage devices are *magnetic disk drives* (although earlier personal computers usually used tape cassettes similar or identical to the ones you use with your stereo). There are several types of disk units, and these will be discussed in a later chapter. These disks use a magnetic coating on plastic or metal (similar to a flat, round cassette tape) to store data and programs, and have capacities which range from 100,000 to 80,000,000 characters per unit.

When the computer needs to access data on the disk, it reads data from the disk, stores this data in its fast RAM memory, uses the data if needed, and is able to write the same, or different data back onto the disk. The data stored on the disk takes much longer for the computer to access than data stored in RAM, but the process is still a very rapid one.

The third basic type of computer device, and the last one we will examine, is called an input/output (I/O) device. Before a computer can process data or run a program, the data and/or program must find their way onto the system. After being processed, information must then be presented to human beings. To do this we have input/output devices. Data are input to the computer, processed, and then output to the user. The most common I/O devices used with small computer systems are CRT terminals, printers, and printer/keyboards.

CRT (cathode-ray tube) terminals, sometimes called VDUs and VDTs (video display units/terminals), are made up of a keyboard (to type characters into the system) and a video screen to display both input and output. Instead of the video screen, a similar unit may consist of a keyboard unit combined with a printer to display both the operator's input and the computer's output. This keyboard/printer unit resembles a typewriter. The CRT and keyboard/printer terminal each perform both the input function and the output function. A third type of I/O device, the printer, has only one of these functions, to output information from the computer. Being a single-purpose device, it usually prints at a greater speed than most keyboard/printer terminals.

A computer system may have any or all of these I/O devices attached, but will usually have at least one of these devices capable of both functions (input and output) to be used as the "console I/O device." The console I/O device is used for