

SMALL COMPUTERS FOR BUSINESS AND INDUSTRY

DERMOT H McKEONE

Gower

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Preface

There seems little point in developing a technology unless the people for whom it is intended can appreciate and to a certain extent understand what is happening. This is one of the reasons why this book was written: in little more than two decades the computer has become one of the main influences on the way businesses are run, yet businessmen often fail to appreciate what computers are and what they can and cannot be used for.

In the days when all computers required a department of several people, the manager could insulate himself from the computer by employing programmers and technical staff. Now, however, computers are much smaller and much less expensive, and the upper and middle echelons of general and technical management - especially in smaller firms meeting computers for the first time - are having to reconcile themselves to the need to learn something about computers themselves. In a way the recent developments which make the computer easy to use - conversational computing, data base management systems, automatic form-filling, etc. - only serve to make the potential user even more confused. Faced with two computers, each of which appears to be able to meet his business needs, the potential user often feels he ought to start somewhere further back. When he asks questions like 'How does a computer make a decision?', 'Is it best to go for a small computer system or employ the services of a bureau?' or 'Who can help me choose a computer?' there are few people to help him who have not strong interests in pushing him in a particular direction.

This book is intended to help three categories of people. Firstly, it is for the manager or industrialist who feels that he might be able to use a computer to help him do his job a little better. Second, it is for those people who suddenly find that they have to learn to live with a computer and who feel that without a certain level of knowledge they are at a disadvantage. Finally, it is for the general reader who simply wants to know more about small computers.

The book is not intended as a textbook on computer methods and specification. Many books of this nature try to frogmarch the manager into rigid procedures - perhaps borrowed from an earlier period - without explaining the relevance of those procedures to the reader's own application.

The book is divided into three parts. The first deals with the computer in general terms, its applications, and the principles which govern its operation. The different types of peripherals are described in some detail and different uses are indicated. In this part, I have gone into some detail about how the computer carries out its own mathematical work and the electronic circuits used in its construction: just as a good manager likes to know what makes his business colleagues 'tick', the same type of knowledge about computers is likely to interest those who need to work with them. I believe very strongly that the general reader of books about computers ought not to be deprived of this basic knowledge.

The second part outlines some of the basic functions within industry and business where the computer has proved itself to be of assistance. I have deliberately avoided writing chapters on each particular industry - e.g., one on construction, another on engineering, another on insurance and so on - both because the book would have become impossibly long and because a large amount of repetition would have been necessary. It is hoped that the reader will find something or relevance and interest in each of the chapters.

The final part deals with the process of acquiring, specifying and using a computer system. The emphasis here is not on specific courses of action which must be followed; instead I have tried to indicate areas where a decision needs to be taken. Wherever possible, I have identified problem areas and indicated how a manager might go about finding answers.

The present decade is seeing a complete turnaround in the way computers are being specified and used, and the transition period is not without dangers for the unwary. The days of the rigidly centralised computer system run by a hierarchical department of data processing staff may indeed be numbered, but the way of life and the associated approach to business problems remains a strong force in commercial life. With the availability of very cheap second-hand peripherals and the £5 microprocessor, it becomes perfectly-possible to purchase all the hardware required for a powerful computer system out of departmental petty cash. At the same time, more and more people are learning the techniques of programming and systems analysis, and the possibility of systems proliferating casually carries its own crop of threats to an organisation.

If there is a central theme to this work it is that the hard-learned lessons of the earlier years of the computer age are worth adapting for the present and future generation of small computers. Even though

computers are less expensive than previously, the acquisition of the computer, and the specification of its job, must be treated with the utmost seriousness and care. The benefits which a computer can bring to an organisation - and indeed the harm it can do when things go wrong - far outweigh the actual cost in cash terms of the hardware and software.

Dermot H. McKeone
October 1978

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D.H. McK.

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PART I

1 Micros, minis and mainframes

For the businessman, engineer or industrialist new to computers, entering the world of computing for the first time is rather like plunging head-first into a mountain stream. In the case of the stream, not only can the experience be both shocking and exhilarating, but as the seasons move forward, the nature and character of the stream are changing all the time.

Buying, leasing or using a computer can also be shocking and exhilarating. Like the stream, the computer world is also continuously changing, but whereas the seasonal changes of nature are moderately predictable, movements within the computer industry are not. As time goes on, the technology of the computers themselves, the ways in which they can be used and the skills required of the people who operate them are all developing at a headlong rate; it is almost as though our mountain stream were a torrent of liquid which might suddenly turn from chilly water to freezing paraffin and thence to hot mercury.

The main function of this book is to give the manager or businessman a basis for sensible decisions about his projected computer installation, bearing in mind the many advances in computer technology.

It is also intended to give the reader enough information about how computers work to give him some appreciation of the changes which are taking place.

Another purpose of the book is to help the manager to decide if and why he needs a computer. Often the reason for failure in computer installations is that a single manager within an organisation suddenly decides he needs a computer without really analysing his need; it is highly likely that if the executive's motives had been examined rationally a very different choice would have been made.

The reasons for acquiring a computer system are many and varied. Sometimes a computer is installed when some existing manual procedure has been expanded to the point where it is no longer suitable for the task for which it is being used. For instance, if a hand-kept ledger system is growing to the extent that the number of accounts and clerical staff has had to be doubled just to keep up with new business, this might well justify looking at a computer-based accounts system. Alternatively, it might be the case that a number of key accounts

staff who have the complete invoicing and purchasing procedures at their fingertips are about to reach retirement age, and the company must somehow replace them: should the existing system be kept going at all costs or are the impending departures an opportunity for a radical change?

A similar dilemma faces the industrialist having to implement a new British or Continental Standard which demands that a type of product be kept to within certain performance criteria. Clearly the experienced eye of the production foreman counts for much, but as the business expands, can similar personnel be found who can ensure high quality at the production rates required? It might be time to look at a process-control computer system.

Naturally, the decision about whether a computer should be installed rests very firmly with the Board of the company or organisation concerned. But to make the decision, the Board must have a number of facts at its disposal. First and foremost the Board members must answer the question 'What is a computer capable of bringing to the organisation?' Part II of this book contains a number of case studies concerning companies who have had success in putting computers to good use, and should help provide at least part of the answer. The second question - which is nearly as important - is 'How does the computer achieve its results?' Understanding roughly how a computer operates will give those who use them an idea of the potential and the limitations of these machines, and the essentials are dealt with in Chapters 2 to 4. The final question which must be faced is 'What procedure must we adopt in order to make sure we have the right system for our needs?' This procedure is dealt with in the final part of the book.

Before considering what is meant by a 'small computer', it is necessary to say something about computers generally. This will help the reader when the terms 'microcomputer' and 'minicomputer' are reached at a later stage. A modern scientific and technical dictionary defines a computer as any apparatus or assembly which performs calculations either simple or complex. A general dictionary prefers to define the computer as a large machine carrying out calculations of several stages automatically. In this book a computer is understood as a relatively large, versatile machine. Many machines and parts of machines can in the course of the work they are designed to do perform simple calculations. These are only discussed in passing. This book does not deal with the smaller calculators which perform simple additions, subtractions and other mathematical functions one at



Fig. 1.1 A large modern minicomputer installation. The processor is contained in the cabinet in the background. To its left are two disc drives; the operator is seated at one of three VDUs and in the foreground is a line printer.

a time. The more powerful programmable calculators, i.e. those hand-held calculators which can store and perform sequences of mathematical steps, and are often referred to as computers with some justification, are dealt with in the Appendix. They are included not just because they help to place their larger relatives in perspective; the reader might decide that a programmable calculator is all he needs to meet all his computing requirements.

What, then, is a small computer as opposed to a large computer? This group may be said to comprise the following categories:

- 1 *The minicomputer.* These (See Fig. 1.1) tend to be small computers which are used, mainly in an 'on-line' mode, i.e. they process data as and when received, but they can also be used in a slower 'batch' mode if required.* They tend to be inexpensive, rugged, easy to use and versatile, and are perhaps the ideal system for a user who wants his computer to do a number of different types of work at a reasonable price. A typical job for a minicomputer might be as the main source of computing power in a large supermarket - accepting data from terminals located at checkouts and in the stores, and at the end of the day or week producing a series of reports for stock control and administration analysis.
- 2 *The small business system.* These are small computers which are often supplied by the hardware manufacturer complete with a suite of business-oriented programs. The great advantage of this type of system is that it requires no programming expertise: the user can go on a simple training course and use it very shortly after installation. Small business systems are usually operated in the so-called 'batch' mode. This means the user accumulates a set of data over a period which might be an hour, a day or a month, and then passes it over to the computer for processing as a block. Most business systems are designed to handle sales, bought and general ledgers as their main functions, and depending upon the software employed can be made to produce a wide variety of management information.

An especially important category within this group is the so-called 'visible record computer'. This is described in more detail later.

- 3 *The desk-top computer.* This term is self-explanatory, but apart

* The 'on-line' and 'batch' concepts are dealt with more fully in later chapters, and in the glossary.

from format this type of computer has tended to attract a particular type of user over the years. Some are used in a 'batch' mode; others are used in an 'on-line' mode. They are found in laboratories and offices, and many first-time computer users have been surprised at how easy they are to operate when the simple characteristic programming language (called BASIC) or a simple machine-oriented language has been grasped. They are the computer equivalent of the stereo music centre: the computer, the keyboard and a display are integrated into a single unit.

- 4 *The microcomputer.* The microcomputer (See Fig. 1.2) is simply a small computer system based on the increasingly popular and much talked-about 'microprocessor'. The microprocessor clearly has a glowing future in the automatic control of complex equipment and industrial processes, but now a number of systems manufacturers including some of the mini manufacturers have built their own microcomputer systems, which can handle much of the business traditionally handled by the other three systems described above.

But where, the reader may ask, do the larger computers (sometimes referred to as 'mainframe' computers) 'start' and the small computers 'stop'? As time goes on, the question becomes more and more difficult to answer. The larger minicomputers are now many times more powerful than some of the early mainframes, so power is not really a sufficient criterion. Until recently, versatility would have been a good way of differentiating between them but as the minis' memories have grown in capacity, so has their ability to hold complex computer programs which help them in their turn to be more versatile. Practically every single function which can be carried out on a mainframe computer can now be handled by a much smaller machine in one way or another and the difference becomes a question of raw power - though the point where one takes over from another is a matter of opinion.

Another useful dividing line between the two types of computer that seems to have stood up well to the test of time has to do with the philosophy of the installation. Where it is decided that large amounts of data must be processed regularly at a central location, or where for security, administrative or other reasons a single computer controlling a large network of smaller computers is needed, then it will probably be best to use a main frame computer for the purpose. If on the other hand it is necessary for a small unit of organisation to