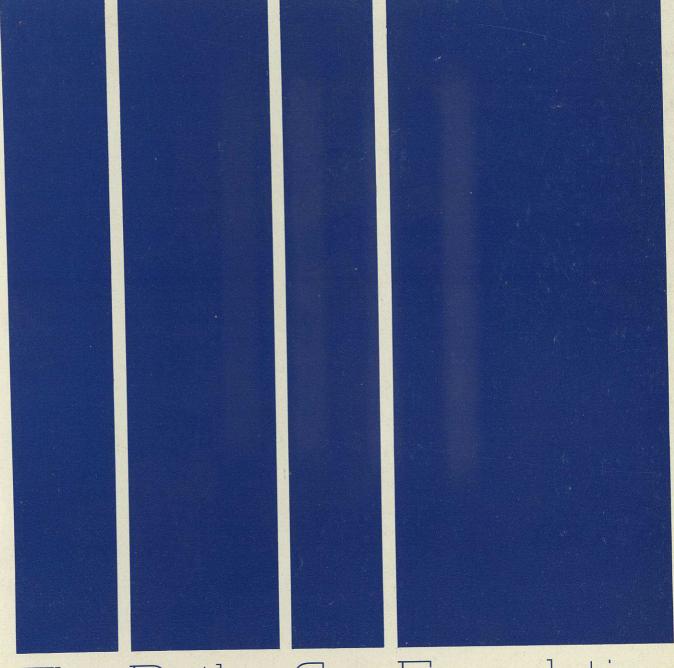
Report Series No 14 The Changing
Equipment Market

MR JOHN KINNEAR

September 1979



The Butler Cox Foundation

Abstract

Report Series No 14 The Changing Equipment Market

by Tony Gunton September 1979

IBM has dominated the data processing market almost since its beginnings. The drastic price cuts introduced on the company's newest ranges of equipment will therefore affect, directly or indirectly, all major users of data processing systems.

These cuts have been attributed by many commentators to the growing success of IBM's plug-compatible competitors. The PCMs, as they are generally known, base their strategy on displacing one or more components in the IBM total systems package, and the scope of their activities has grown steadily to embrace all the main hardware components. However, there are also other competitive threats which may have influenced IBM, such as the mini and micro computer suppliers and the formidable Japanese electronics industry.

This report describes the events leading up to IBM's recent round of price cuts and assesses their impact on the data processing industry as a whole. It then suggests how management services managers may need to adjust their thinking and their policy in the light of the changes in market structure and in cost ratios that are taking place.

The Butler Cox Foundation is a research group which examines major developments in its field — computers, telecommunications, and office automation — on behalf of subscribing members. It provides a set of 'eyes and ears' on the world for the systems departments of some of Europe's largest concerns.

The Foundation collects its information in Europe and the US, where it has offices through its associated company. It transmits its findings to members in three main ways:

- As regular written reports, giving detailed findings and substantiating evidence.
- Through management conferences, stressing the policy implications of the subjects studied for management services directors and their senior colleagues.
- Through professional and technical seminars, where the members' own specialist managers and technicians can meet with the Foundation research teams to review their findings in depth.

The Foundation is controlled by a Management Board upon which the members are represented. Its responsibilities include the selection of topics for research, and approval of the Foundation's annual report and accounts, showing how the subscribed research funds have been employed.

Report Series No. 14

THE CHANGING EQUIPMENT MARKET

September 1979

CONTENTS

| 1 | INT | RODUCTION | 1 |
|---|------------------|---|----------------------------------|
| | A B | Background Purpose of this report | 1 1 |
| 2 | THE | SIGNIFICANCE OF PLUG COMPATIBILITY | 3 |
| | ABCDEFG | Plug compatibility — an expanding concept History of the PCM movement The IBM price umbrella What the PCMs offer User experience summarised IBM versus the PCMs The PCM prospects now | 3 4 5 6 8 9 11 |
| 3 | THE | E EQUIPMENT MARKET | 12 |
| | A B C D | IBM's position re-defined The impact on the mainframe suppliers The role of the minicomputer The shape of the future market | 12 14 15 17 |
| 4 | MA | NAGEMENT IMPLICATIONS | 21 |
| | A B C | Taking advantage of PCM The possibility of an all-IBM future | 21 22 22 |

CHAPTER 1

INTRODUCTION

A BACKGROUND

Price degradation (the continuing reduction in the prices charged for products) has been a feature of the computer industry since its beginnings. For some time, IBM has controlled the rate of price degradation to enable it to implement policies of technological stability and planned obsolescence. This, the aptly-named IBM 'umbrella', has enabled IBM to maintain both its high level of customer support and its customary high profit margins. IBM's umbrella has, however, also been a convenient shelter for IBM's competitors. It enabled them to achieve high margins of price over manufacturing cost in the same way as IBM, even if not to the same extent. IBM, of course, always used the umbrella to produce the maximum advantage, by keeping factories fully loaded and giving salesmen a strategic advantage where they needed it most to meet a particular competitive threat. Nonetheless, IBM's approach, until recently, has been relatively benign. The umbrella protected its major competitors from a soaking, even if it did not keep all the rain off them.

Recently, the position has changed dramatically. IBM, apparently motivated by the success some plug-compatible manufacturers, such as Itel, Memorex and Amdahl, had had in taking away its business, has made drastic cuts in hardware prices. This example has been followed, although no doubt reluctantly by some of them, by all IBM's major competitors, both those who offer plug-compatible equipment and those who offer their own non-IBM designs. Public comment on the future prospects of these competitors, even allowing for journalistic overstatement, must have alarmed many, both inside and outside the industry, who do not look forward to a world computer industry that is totally dominated by one US company, however capable that company may be. The editor of *Datamation*, for example, wrote:

"In a decade or two, if things continue as they are, we may be looking at a world that is exclusively IBM."

The umbrella has in fact shrunk so much that it now covers IBM alone.

IBM users, who are in the majority in every major market except the UK, would, of course, find it easier to come to terms with an IBM-dominated future than would those users whose valuable applications systems run on incompatible equipment. But all users, including IBM's most loyal adherents, are currently afflicted by the general air of uncertainty and doubt which these changes have introduced into the equipment market. To some extent, IBM itself has fostered this uncertainty because it represents an important weapon poised over IBM's competitors. The uncertainty also arises, however, from the drastic nature of the changes. Effectively, users have seen a fourfold improvement in price/performance take place virtually overnight (although many will wait perhaps for years to obtain the proof of this). Because of this improvement, any procurement decision that is taken on a long-term basis faces the real risk that it will soon look ill-considered or even downright foolish. The drastic changes in cost ratios should also encourage managers in management services organisations to re-examine their equipment policy. It is to these managers that the report is addressed.

B PURPOSE OF THIS REPORT

This report assesses the dramatic changes that have taken place, and it looks at the chances

that IBM plug-compatibles and also IBM's other mainframe competitors – ICL, Burroughs, Honeywell, Univac, NCR – have of a place in the equipment market of the 1980s. It also examines user experience with PCM equipment. The purpose of the report is to explain the implications of recent events for those managers who are responsible for procuring computer equipment. It sets those events in the context of the equipment market as a whole, and it looks at the broader implications of those changes that have been taking place over a period of time, and for which the PCMs appear to have acted as a catalyst.

The report concludes with recommendations on the approach that companies should adopt to this market, a market which has taken on a new face almost overnight.

CHAPTER 2

THE SIGNIFICANCE OF PLUG COMPATIBILITY

A PLUG COMPATIBILITY - AN EXPANDING CONCEPT

The term 'plug compatible' was originally coined to describe those peripheral devices that were plug-for-plug replacements for the devices supplied by a major manufacturer as part of a complete computer system. The term has since been extended to cover not only devices, such as disc units or main memory, that can be plugged into the interface sockets of a processor, but also terminal devices attached via a telecommunications line and, indeed, the processors themselves. In fact, the term is now used for any component of a computer system that can either replace, or else simulate the operation of, a component originally designed by the system supplier.

Naturally enough, the initial target for the plug-compatible manufacturers (PCMs) was the market leader, IBM, and, as we describe below, IBM remains the focus of their attention. However, few manufacturers who have attained any real stature in the computer systems market have remained immune from the attentions of the PCMs for very long. For example, specialist manufacturers now supply terminals in general, and remote job entry terminals in particular, that can be used with one or several of the mainframe manufacturers' systems.

The minicomputer suppliers have traditionally gained their revenue from straight hardware sales. They have, therefore, been less vulnerable to the tactic that relies on displacing a lucrative segment of an overall system that is normally supplied as a complete hardware/software package. Increasingly, they have attempted to parcel up their hardware into systems, and they have added more and more systems software to their product range. This changing approach has meant that they too have become vulnerable to PCM competition. According to *Datamation's* estimates, both Digital Equipment Corporation and Data General now obtain more of their revenue from sales of peripherals and terminals than they do from sales of the minicomputer processors which have made the companies' reputations and which form the vehicle for their sales of peripherals and terminals.

The tactics that the PCMs use against IBM, and the changing market position of the minicomputer suppliers both have a single underlying cause – the continuing reduction in the cost of electronic hardware. This trend has led IBM to adopt pricing and marketing mechanisms that are designed to maintain overall revenue despite falling hardware costs, and these, in their turn, have provided those openings that the PCMs have exploited. The trend has also led to a shift in revenue from processors and memory (both of which have been in the forefront of the microelectronics revolution) to electro-mechanical devices (which are not losing value so quickly), and also to software and services. For example, Digital Equipment Corporation's revenue from software and services is now estimated to be around 20% of total revenue.

This development points to the next stage in the expansion of the PCM concept – the move into software and services. PCM software, if it can be called that, is already widely available in the form of various application-oriented or function-oriented packages. Database management software is a prime example of the latter. As our recent DBMS survey showed, DBMS packages from independent software suppliers are now used widely and successfully, despite the marketing advantage enjoyed by the systems suppliers, all of whom offer a DBMS as part of their standard product range. So far, system software (operating systems, compilers, etc.)

has not suffered serious competition because it is normally sold bundled with the hardware. Conceivably, however, the position might change.

Like system software, the cost of many services has been hidden in the hardware prices, but maintenance has not. Out of this, and also out of the problems of maintaining mixed systems comprising equipment supplied by both a PCM and a systems supplier, have come the third-party maintenance companies, who compete directly with the maintenance services the manufacturers offer for their own equipment.

B HISTORY OF THE PCM MOVEMENT

'Movement' is perhaps something of a misnomer when applied to the PCMs, since their motives were undoubtedly purely commercial and their actions were, for the most part, opportunistic.

Oddly enough, it was IBM's marketing and pricing policies (referred to on page 3) which, because they had a unifying influence on the PCMs, were a major factor in giving the PCMs' successful progress the appearance of a movement. Those policies, defensive though they primarily were, did not prevent the PCM movement from gaining steadily in momentum from its early beginnings (in the late 1960s in the US and in the early 1970s in Europe) until recently. The momentum was slowed only by IBM's announcements, first of the 303X and then of the 4300 series of machines.

The first PCM equipment (tape and disc drives and line printers) was supplied by leasing companies with either second-hand or third-hand S/360s and, as a result, their systems were more cost-effective than the new systems that IBM was offering at that time. Soon these same devices were being sold direct to users both by the leasing companies and by the specialist manufacturers themselves. The range of equipment was also widened to include memory, terminals, and communications processors. In 1975, the final step took place. PCM processors became available, and this meant that a user could, if he so chose, configure a complete system from PCM equipment, using only IBM software to hold it all together.

The manufacturers of this equipment often began as suppliers on an OEM basis to IBM's mainframe competitors. (IBM alone was, and still is, fully vertically integrated, manufacturing all the components and devices which make up its systems.) There was intense competition for contracts in this market. Both this, and the fact that the manufacturers each tended to specialise in just one product, or at most only a few products, led to those manufacturers achieving a higher rate of innovation than existed within IBM's plants, which were supplying what was essentially a captive market.

At present, the PCM market for central site equipment consists of a rather confusing mixture of marketing companies supplying other manufacturers' equipment (Itel, CIG), manufacturers selling direct (Amdahl) and combinations of the two approaches (Memorex, Control Data). Figure 1 on the opposite page shows the major suppliers operating in Europe, and a host of other companies supply terminals and communications equipment.

As mentioned on page 3, the market leader, IBM, has taken the main brunt of the PCMs' success to date. But no major manufacturer has been immune from their attentions, and ICL, for example, beat off attempts by Plessey and others to sell add-on memory to its customers of its 1900 series by levying special additional charges on the remainder of the equipment. (Had IBM made such a move it would have provoked instant retribution under anti-trust legislation.)

The effect that the PCMs have had on IBM is illustrated in the charts in figures 2 and 3. Figure 2 on page 6 shows the inroads made into IBM's market in two key sectors, disc drives and processors. The chart in figure 3 on page 7, compiled by S.J. Ippolito of IPL Systems Inc. (who make plug-compatible processors for CDC and are now to supply Itel also) shows the impact in

a different way, in terms of prices. It demonstrates clearly how competition in different sectors has forced IBM to reduce prices for the equipment concerned, first by moving revenue from memory into processors, and then by cutting processor prices also.

Figure 1 Major PCM Suppliers in Europe (Central Site Equipment)

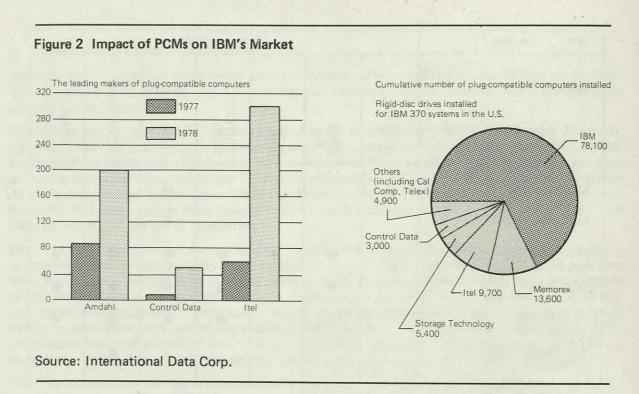
| Devices | Manufacturers | | | | | | |
|------------------------------|---------------|------|---------|-----------------|------|---------|-----------------------|
| | AMDAHL | BASF | CIG | CONTROL DATA | ITEL | MEMOREX | STORAGE TECHNOLOGY |
| Large-scale CPUs | • | | | | • | | |
| Medium-scale CPUs | | | | | • | | |
| Main Memory | | • | • | • | • | • | • |
| Disc Drives | | • | | • | • | • | • |
| Tape Drives | | • | Spail 1 | • | • | • | • |
| Communications Processors | | | | | | • | a year |

C THE IBM PRICE UMBRELLA

What IBM's marketing policy attempts to do is to reconcile two conflicting factors, which may be called respectively the no change factor and the continuing change factor. The no change factor is represented by the users' understandable desire to preserve their investments in applications software. The continuing change factor is represented by IBM's desire (equally understandable) to maintain its revenues and profits.

Reconciling these two conflicting factors is not too difficult a task in a market where product prices are continually rising (as, for example, in vehicle manufacturing). But it is much more difficult in a market like the computer market, where technology is bringing down the price of hardware at a steady rate. Essentially, IBM has always reconciled these two conflicting factors by a process of evolutionary change, in which each new version of the equipment offers compatibility with the previous version, plus additional functions and/or improved price/performance. By this approach, users can be persuaded to replace their old equipment at regular intervals.

This approach can only be successful, however, if the process of evolutionary change is carefully controlled. This means that enhancements should be introduced only at those times that IBM chooses, and they should not be available on those previous generations of systems that the new model makes obsolete. In implementing this process, IBM has sometimes artificially constrained what it has supplied with a particular system below the limits set by either its architecture or its technology. By these methods IBM has ensured that the pace of change was just right to encourage IBM's users to migrate to the new systems at a rate that best suited IBM's revenue targets and production plans.



Additionally, because of the dominant market position it holds, IBM could set prices at the highest level it believed the market would bear. This price-setting policy had a twofold purpose – it kept IBM's profit margins high, and it enabled IBM to give its customers the high level of support to which they have become accustomed. This meant that IBM's price umbrella shielded both IBM itself and its customers from the disruptive winds of free market competition, and it enabled supplier and customers alike to develop in an atmosphere of relative technological stability. It also created an environment within which IBM's mainframe competitors were able to consolidate their own product ranges and customer support organisations.

D WHAT THE PCMs OFFER

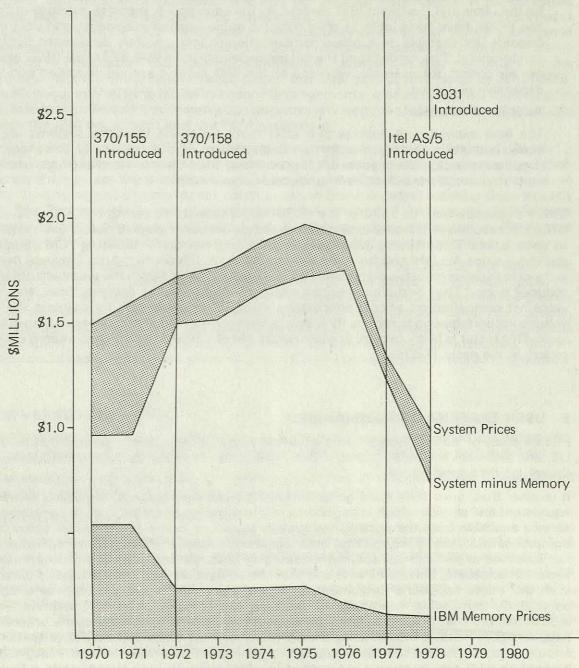
IBM's price umbrella and marketing tactics of planned obsolescence created the opportunities that the PCMs have exploited. The PCMs offer the user one or more of the following benefits:

1. A longer useful life for obsolete IBM systems

The PCMs do this by offering more advanced technology or more capability on these older

systems than IBM, for reasons of its marketing policy, is prepared to do. Prime examples are the larger (3330-type) disc drives the PCMs offered for S/360 systems when IBM was supplying these only on the S/370, and the additional main memory the PCMs offer on many of the models in both the S/360 and the S/370 ranges, and even on the more recently announced 3030 range.

Figure 3 The Effect of PCM Competition on IBM prices



Source: S. J. Ippolito in Datamation Feb '79

In this way the PCMs enable users to stay with an 'obsolete' system (without incurring serious performance penalties) if a move to the new range is either financially or operationally inconvenient. (Operational inconvenience would arise if the move to the new system also necessitated upgrading to a different operating system, as it sometimes would, or if it meant implementing changes to specially-tailored applications software whose peculiarities were not catered for on the new model.)

2. More advanced technology

The faster rate of innovation prevalent amongst the specialist PCM suppliers, and IBM's deliberate pacing of the rate of technology release, has meant that the PCMs have often brought advanced technology to the market sooner than IBM, and they have offered it both on the older and the latest IBM models. By introducing advanced technology in this way the PCMs have been able to offer direct cost/performance benefits and also indirect benefits (for example, less power consumption or less ancillary equipment, such as air conditioning). The Amdahl and the Itel equivalents for the IBM 370/168, 3032 and 3033 are air cooled, for example, whereas all the IBM models are water cooled and require expensive plumbing.

3. Additional function

The best examples of devices that offer more functions than the systems supplier's equivalent are remote job entry terminals. Many of the devices of the independent suppliers are capable of more local processing than the standard product, or else can emulate several manufacturers' protocols concurrently.

IBM's announcement in 1978 of the 3030 series models replacing the 370/158 and the 370/168 resulted in a flood of orders that stretched delivery delays to two, or even three years in some cases. This delivery delay gave users a new reason for ordering PCM equipment – delivery - since Amdahl and Itel were able to deliver much sooner. Also, because the PCMs were able to deliver much earlier than IBM, they were shielded from the worst effects of IBM's reduced prices. They had a competitive edge with their shorter delivery times and so they were not competing on price/performance alone. They were able to maintain their sales volume without having to reduce their prices as much as they would otherwise have needed to do. This factor is likely to be only a temporary benefit, as IBM will begin to catch up with its orders in the early 1980s.

E USER EXPERIENCE SUMMARISED

From a study of the experience users have had with PCM equipment, both in Europe and the US, and also with both IBM and non-IBM systems, a number of general conclusions can be drawn, as discussed below.

It is clear that, once they have gone through the learning process, the PCMs can provide equipment and service which is as good as, and in some cases better than, the equipment and service available from the established system suppliers. Some of the earlier users of PCM equipment found that although they both tested and phased in that equipment carefully, it did not continue to perform adequately, presumably because the supplier's maintenance staff were not adequate. Others have found that the equipment was not completely compatible with the major supplier's equipment, and that it did not handle correctly or adequately particularly demanding conditions of multiple use or complex error conditions. Present indications are that these problems are now occurring less frequently as the present PCM suppliers gain maturity. Experience shows, however, that it is important that potential users should assess the PCM's local support organisation and also should recognise that pioneering with any supplier's equipment involves risks. In both these matters European users are better placed than US users, because many PCMs tend to get themselves established in the US first before taking on Europe perhaps a year to 18 months later.

Before IBM's round of price cuts, announced with the 303X and the 4300 series, PCMs generally were able to count on price advantages of 30% to 40% on purchased equipment, 20% to 25% on leased equipment, and 10% to 20% (depending on the term) on rented equipment. These margins have now been cut severely, but the PCMs still appear, in most cases, to have large enough margins to allow them to maintain the advantage they feel they need in order to achieve their desired level of sales. The PCM industry is working hard to exude an air of confidence while it evaluates the impact of the recent 4300 announcement, but it appears, at the moment, to be suffering more from the present air of uncertainty than from a direct lack of competitive advantage. We discuss its prospects in more detail on page 11.

Third-party maintenance companies have not yet become established in all European countries, but, where they are operating, experience has been good. In the UK, the concept of third-party maintenance received its seal of respectability when British Airways entrusted the maintenance of its IBM-based systems to Data Processing Customer Engineering. Peter Hermon, at a Foundation Management Conference, commented that not only was the performance of third-party maintenance better, but also its cost was lower by about 30%. British Airways, in changing its maintenance arrangements, also obtained the indirect gain that it no longer suffered from demarcation disputes between the different teams that used to maintain the IBM equipment and the PCM equipment.

The experience of users of PCM equipment presents some valuable lessons. Clearly, a potential user should make a detailed evaluation of the equipment at the outset, and then should carefully phase the introduction of the equipment. Also, it is important for the user to monitor the equipment's performance continuously, in order to detect warning signs as early as possible. This monitoring will also ensure that the user has all the facts should it become necessary to bring the supplier to book on his maintenance performance. (The same procedures will not, of course, be out of place applied to the system supplier.)

Finally, as already suggested, claims of compatibility should not be taken at face value. This becomes more of a problem as the software content of a product increases. Software specification, being less of an exact science than hardware specification, leaves greater scope for interpretation, and hence increased chances of misunderstandings. For example, not so long ago many terminals that nominally were compatible with an IBM bisynchronous protocol, spent years at users' sites before they actually achieved compatibility. Similar problems could easily arise as a new generation of SNA – compatible terminals is introduced.

F IBM VERSUS THE PCMs

It is useful at this point to review briefly the weapons that IBM has at its disposal for dealing with PCM competition, and also to consider the implications for users sitting in the battlefield.

IBM has several tactical options open to it, each of which involves a degree of risk. These, but not necessarily in the order of importance of the enumeration below, are:

1. To move more revenue into software

This move would cut the margins available to the PCMs from hardware sales and would also ensure that IBM gets more revenue from PCM sites. But it would make users even more reluctant to move on to the latest version of the software and it would stimulate competition from another direction — the software houses. Revenue from software is growing quickly, but it still represents a small proportion of IBM's total revenue. No doubt it will continue to grow, but IBM would meet immense practical difficulties in trying to achieve a major shift in revenue from hardware to software. IBM would also face a serious risk that one of its major strategic advantages, its vast library of software, would start to be eroded.

2. To distort the boundary between hardware and software

IBM could do this by implementing some systems software routines in microcode (or

firmware) as it has already hinted it will do. This would mean that those PCM processors that do not have the same microcode routines will either lose compatibility or lose performance. The PCMs might then need to extend their support organisations to keep their users up-to-date with the latest IBM microcode releases. However, IBM will pay a similar price to keep its older models in line. In fact, as figure 4 shows, microcode is really a half-way stage between hardware and software (hence the term firmware, which it is sometimes given). Decisions on whether to implement logic in hardware, or in firmware, or in software involve a trade-off between performance and ease of amendment. Suppliers will decide which path to take according to their target market. Amdahl, for example, has opted for performance by implementing much of the processor logic in hardware. Others have opted for microcode and flexibility, so that they can follow IBM as closely as possible. Even if IBM start to ring the changes, no users of the PCM processor will be worse off than the users of 'obsolete' IBM systems, no matter which path the PCM has chosen to follow.

Figure 4 The Hardware/Firmware/Software Division

| /O Channels | Disc Control Logic | Operating System |
|---------------------------|-------------------------------|---------------------|
| ogic & Arithmetic Jnit | Instruction Set | Applications |
| | | |
| | | |
| HARDWARE | FIRMWARE (MICROCODE) | SOFTWARE |
| | Increasing Speed of Execution | Carl S. S. Sowers w |
| | | |

3. To bundle peripherals with processors

IBM has already used this tactic with S/370 models. By supplying the adapter for an attractive new peripheral integrated with the processor, IBM can give its users an incentive to use its processors and/or can compel its PCM competitors to invest in developing their own equivalent alternative.

All in all, IBM has to walk a very tight line, keeping one eye on its installed base and one on its competitors.

IBM will need to calculate each move carefully and precisely so that it enables users to develop at a pace they can maintain. If the pace is too fast, more backsliders will dig in their heels and refuse to upgrade, or more renegades will desert to Itel. If, on the other hand, the pace is too slow, IBM's shareholders will undoubtedly become restive.

IBM's position is, of course, crucial not only to its users but also to the data processing industry as a whole, since it sets the standards against which all tend to be measured. The PCMs have probably crystallised out the contradictions inherent in the position IBM has maintained so successfully since it launched the series 360 in 1964. We discuss the implications for the equipment market in general in the next chapter but first we summarise our conclusions on the future prospects of the PCMs.

G. THE PCM PROSPECTS NOW

Undoubtedly, one of IBM's objectives in implementing the savage price cuts reflected in the announcements of the 303X and the 4300 series was to contain the success of the PCMs. IBM's strategy has indeed hurt the PCMs, and their disappointing results and falling share prices confirm this. Despite their setback, the PCMs continue to show a confident public face. For example, Gene Amdahl, speaking of IBM's rumoured new H-series of machines, said:

"The only changes which it can include which would be reasonable from the point of view of the user are well within the capabilities of Amdahl Corporation."

S. J. Ippolito of IPL Systems Inc. put the same point another way when he said:

"There is no overall strategy IBM can adopt which will prevent the (PCM) industry from growing. Knowing this, IBM will react tactically, rather than strategically."

If the PCMs were competing on price alone, it would be difficult to see what grounds they have for being optimistic. But because, as mentioned earlier, they offer more than price alone, the best of them will probably continue to prosper. IBM's price cutting will make life harder for the PCMs, it will probably weed out the stragglers, and it may force some consolidation. Itel's link-up with the software house MRI (who sell the System 2000 DBMS) is perhaps an indication of the direction that consolidation will take. The importance of having a software and support capability has escaped few who operate in the computer equipment market today.

It is tempting to draw a parallel between the PCMs and those of IBM's erstwhile competitors (such as RCA, GE and Xerox) who also offered IBM-compatible equipment. The difference in the situation is that the PCMs have deliberately specialised in particular items of hardware, rather than offering a full systems capability and, in this way, have limited both their initial investment and their expenditure on R & D and support. Nevertheless, the example of those earlier IBM imitators should serve to warn the PCMs of the fate they may suffer if they extend their product range or capability too quickly.

CHAPTER 3

THE EQUIPMENT MARKET

A IBM'S POSITION RE-DEFINED

Even for an industry that has always delighted in examining minutely every move the market leader makes or, more frequently, is rumoured to be planning, IBM's recent drastic price cuts have given rise to an inordinate quantity of melodramatic prose. People are asking whether the 4300 Series is another step on IBM's road to total domination of the world computer market, or whether, alternatively, it is a sign that competitive pressures are forcing IBM to run faster and faster to maintain its position.

One could find doctrinaire reasons for preferring either of those possibilities. Our own view is that the latter is the closer to the truth. IBM is under pressure from several directions apart from the PCMs, and the following, among others, pose a threat to IBM:

- The concept of distributed data processing is showing signs of gathering momentum, and
 it now threatens IBM's traditional centralised approach. At the same time, Systems
 Network Architecture, IBM's antidote for the perils of distributed processing, which
 should have guided users down an evolutionary path from centralised to distributed, has
 had only a limited impact.
- 2. Minicomputer suppliers are threatening IBM's medium-scale systems. They have achieved this by building up their software capability. They have also demonstrated that it is possible to create a market through aggressive pricing. (This is possibly beginning to look like an attractive route for IBM also.)
- 3. The Japanese might enter the market as systems suppliers. They now supply hardware to some of the PCM suppliers, and they will certainly be looking for opportunities to gain the strategic advantage that a total systems capability confers. IBM's price umbrella may have helped them to carry out the necessary massive R & D effort.

These potential threats all demand that IBM should adopt a more directly competitive posture. We believe that IBM is intending to adopt a policy that relates prices much more closely to average costs, and that increasingly unbundles products. The limits to which IBM will take their policy will be set by two important considerations, which we discuss below.

Firstly, IBM will wish to thin out the ranks of the competition, not to destroy it entirely. If IBM destroyed all the competition it would undoubtedly stoke up the fires of IBM's long-running anti-trust dispute with the US Department of Justice. The absence of competition might also create a vacuum, which the Japanese would rush in eagerly to fill. The long delivery times for IBM's new models have already shown that IBM cannot meet all the demands on its own. Secondly, IBM will not wish to destroy the strategic advantage it enjoys through its enormous customer base. Despite the activities both of the PCMs and IBM's other competitors, most of IBM's customers depend, to a greater or a lesser extent, on IBM to preserve their investment in applications systems. The value of this investment must exceed by at least an order of magnitude the value of their investment in IBM equipment and software. IBM customers, in determining the path they will take in the future, are more likely to be influenced by their investment in applications systems than they are by the price/performance characteristics of an exciting new processor. For them, and so for IBM too, revolution is not a practical option.

This market position presents a problem only for a company that has been as successful as

IBM in the past and that wishes to continue to maintain that success. The dilemma that faces IBM now is that it can no longer maintain its rate of growth without also accelerating the rate at which the market is expanding. Hence the price cuts and the increased range of products, some mutually competitive, that IBM has put forward to tempt the user. The uncertainty that this change of direction has generated amongst IBM's customers, shown in a reluctance to buy, perhaps reflects IBM's own uncertainty as to its best course. We illustrate IBM's profound marketing dilemma in figure 5 below.

Figure 5 IBM's Marketing Dilemma Other Suppiers **OEM Now** Software Houses Minis **PCMs** Japanese Suppliers Systems in Early 80s Distributed Processing **IBM Customer Base** Open System Networking **IBM Marketing Options** More Charges Frequent Price Tactical Cuts Software Architecture Moves Competitors Increased Reluctance Users Destroyed Competition Uncertainty to Upgrade Gains for PCMs Lease not Buy

Loss of

Revenue

Opening for

Japanese

Anti-Trust

Action

B THE IMPACT ON THE MAINFRAME SUPPLIERS

Some commentators have interpreted the sharpened competition between IBM and the PCMs as meaning that IBM's mainframe competitors are now redundant. This interpretation is based on a belief that users, given a choice of options *within* the IBM computing standard, will regard it as too great a risk to go outside it. No doubt there is also a feeling that the mainframe manufacturers, who have lived for so long under the shelter of the IBM price umbrella, will not be able to survive without it.

In some respects this is the reverse of the truth. The existence of the IBM umbrella has in fact enabled IBM's competitors to build up their support organisations and their software capability as the computer market has expanded. ICL is a good case in point. Despite its limited resources, ICL has effectively transferred its customer base from an ageing range of machines onto a new range, which should carry it well into the 1980s. In today's more competitive market, ICL would, in our opinion, have found it far more difficult to commit the resources necessary to achieve this difficult transition without suffering serious losses from its customer base.

Paradoxically, the reduction in hardware costs has also made it more difficult for a supplier to displace customers from a competitor's base. Conversion costs, which are essentially people costs, will bulk much larger in a balance sheet of costs and benefits, and so will deter users from changing horses in mid-stream. Essentially, the mainframe market is becoming a replacement market. Only those users that are contemplating a major shift in the direction of their computing effort are likely to be able to justify both the costs and the risks involved in changing supplier.

Even though it is a replacement market, this does not necessarily spell a lingering death for IBM's competitors. Their present share of the world computer market may well be small, but the potential market is vast. The favourable response IBM has received to its price cuts has demonstrated the enormous elasticity of demand, which IBM appears to have underestimated. The budget plans of European users, surveyed by *Datamation* recently, show that they, like the Americans before them, are beginning to treat processing power as a cheap resource and to use it accordingly. Forecasts for medium-scale to large-scale general-purpose computers over the next five years show a rate of growth of around 10% compound, compared with 6% for the period 1973 to 1978. Outside this section of the market, on which all the mainframe suppliers have relied heavily, there are virtually limitless opportunities: in the small business systems, in teleprocessing and in office automation. The profit margins in those areas are less reliable, however, and medium-scale and large-scale systems are likely to remain the key to profitability for some time.

Like the PCMs, the mainframe manufacturers are confident that they will be able to match IBM's products and prices. They will, of course, not be able to match IBM's R & D effort, but they do have access to semiconductor manufacturers like Motorola and Intel, and to specialist peripheral manufacturers. Provided that they maintain, in house, the engineering skills necessary to build and maintain operating systems and utilities, their more limited resources need not represent too serious a disadvantage.

It is fairly easy to find examples of the advanced products that IBM's competitors have offered to the market first. For example, Honeywell's IDS (the forerunner of today's database management systems), Burroughs' data communications software, and, more recently, ICL's Data Dictionary System are all significant products within the mainstream of data processing. These companies cannot match the immense range of IBM's systems and applications software library but, given a flexible programme of product introduction, and the intelligent use of their computer and OEM sources, there is no reason why they should not continue to offer a viable alternative to IBM. Moreover, in certain selected areas they have advantages. In this respect, IBM's vast installed base is a limitation, since it makes it more difficult for IBM to concentrate its resources in specialised areas.

Figure 6 compares the R & D expenditure of the mainframe companies. (CPI, whose \$75M is

attributed to NCR, ICL and CDC, is a peripherals company 60% owned by CDC and 20% each by NCR & ICL.) ICL has already demonstrated that it is possible to launch a major new range of equipment and software using only its own internally-generated funds and limited government support. Unless ICL and the other mainframe manufacturers make serious mistakes, there is no reason to believe that they will not be able to maintain a reasonable share of an expanding market.

Figure 6 R & D Expenditures Compared

| R & D Expendi | R & D Expenditure during the last reported financial year | | | | |
|---------------|---|-----|--|--|--|
| IBM | \$1,142m | 6.3 | | | |
| Honeywell | \$125m E | 5.0 | | | |
| Univac | \$115m E | 8.0 | | | |
| Burroughs | \$100m | 5.3 | | | |
| Digital | \$80m | 7.5 | | | |
| NCR | \$118m) | 4.6 | | | |
| ICL | \$70m E) \$75m over and above these figures from CPI | 8.6 | | | |
| CDC | \$73.1m) | 4.8 | | | |
| | E = Estimate | | | | |
| | | | | | |

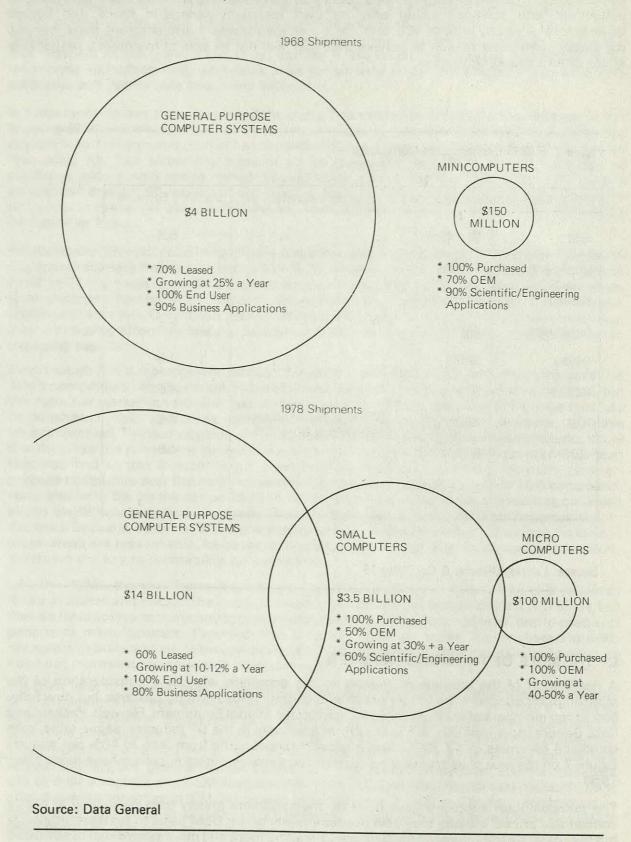
Source: Laurie, Milbank & Co., May 1978

C THE ROLE OF THE MINICOMPUTER

A description of the equipment market is not complete without a consideration of the minicomputer suppliers, no longer brash and slightly offbeat young upstarts, but now fully-accredited members of the data processing industry. Digital Equipment, Hewlett Packard and Data General now rank 6th, 8th and 12th respectively in the DP industry league table, with combined revenues of \$2,700M and a growth rate ranging from 30% to 40% per annum. Figure 7 on the next page shows the progress the minicomputers suppliers have made since 1968.

The minicomputer suppliers have built up their markets mainly through selling at highly competitive prices. Initially they sold predominantly on an OEM basis to systems suppliers, but they have steadily changed the balance by making more and more sales direct to advanced users and software houses.

Figure 7 Development of the Systems Market



To some extent IBM has now stolen their clothes, not only in releasing products such as the Series/1, which they have marketed in the same way as, and in direct competition with the minis, but also in adopting the more aggressive pricing policies of the minicomputer suppliers.

The minicomputer suppliers (as was mentioned above) have changed their spread of customers. They have also changed the control of their sales. Digital Equipment now draws nearly 20% of its revenue from software and services, well over 30% from peripherals and terminals, and only 30% from the processors on which it made its reputation. It can be seen from this example that the minicomputer suppliers are now placing increasing emphasis on systems and on software capability.

However, although IBM's price cuts will make its medium-scale systems more competitive with the minicomputer suppliers' large machines, and although the minicomputer suppliers are increasing their software and systems capability, it is not entirely accurate to suggest that the respective product lines are converging. What sets the mainframe apart from the mini is its origins. The mainframe has been designed to handle a mix of work (initially batch processing and then timesharing and on-line processing), and by and large it is still a general-purpose machine with general-purpose software. It is from this basic nature that the mainframe has derived its complexity and its unfriendly characteristics. Because there has always been the need to preserve the user's investment in applications, it was difficult, as computing developed, to discard all the bad features of the earlier systems, and, consequently, many of the mistakes of the past have been perpetuated.

Minicomputers, by contrast, were initially used as single-function systems. Because they did not have to carry the mainframe's historical burden, and did not handle a mixed workload, their operating software tends to be less cluttered — and this makes them more approachable and easier to use. In particular, many users have found that minis handle on-line applications better then mainframes do. On the other hand, minis are not so good as mainframes in handling a mix of work or coping with very high workloads. In summary, minis have a lower level of all-round capability, but they excel in certain tasks, such as on-line processing. This makes them well suited to a distributed processing environment, and so, not surprisingly, the minicomputer suppliers, such as Hewlett Packard and Digital Equipment are vigorously promoting this concept.

The lack of all-round capability of the minis probably also explains the limited success the mini suppliers have had in displacing medium-scale mainframe systems with their 'stretched' minis. It demonstrates that it is not power alone that differentiates a mini from a mainframe. Despite the limited success the mini suppliers have had in this area of their activities, some of them have displayed an almost suicidal impulse to take on the mainframe companies on their home ground, by developing multi-programming operating systems and all the paraphernalia of the modern mainframe computer. The latest mainframe price cuts must have severely discouraged them in this tendency.

D THE SHAPE OF THE FUTURE MARKET

In an article in Fortune magazine of 14th August 1978 it was said:

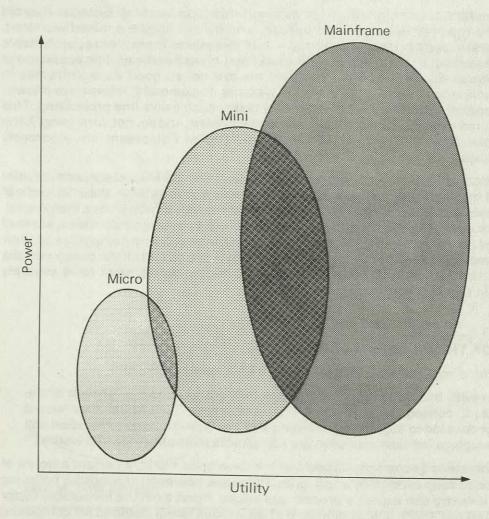
"In common with the US, Europe and Japan face a slow-down in growth of the labour force, a consequence of declining birth rates Capital that would otherwise be devoted to supporting, training and equipping a large population will become available to industry for use in providing more tools per employed worker."

In the face of the threatened economic blizzard in the developed world, a certain amount of whistling is going on to keep everybody's spirits up. There are, however, grounds for believing that the computer industry can expect a prosperous future. Apart from the favourable factor quoted in *Fortune* (above), there is also evidence of enormous latent demand for computing equipment of the right type at the right price. Hardware price barriers are falling fast, and now

the task is to convert the power of the hardware into usable applications (i.e. to provide software, systems and support). All the major computer manufacturers (with the possible exception of some semiconductor companies making single-board micros) recognise that it is their task to build up their software and support capability, and they expect, as a result, to gain a larger proportion of their revenue from this area. This expected gain by the major manufacturers will, in its turn, stimulate competition from the software houses, who have generally competed against the artificially low prices that the hardware suppliers charge for their systems software. This increased competition should bring more and better software packages on to the market.

Following IBM's lead, the mainframe manufacturers are likely to adopt a pricing structure that is related much more closely to the cost of their products – the combined costs of hardware software, maintenance and support. The mini suppliers have always followed this policy. But this change in policy of the mainframe manufacturers will not necessarily mean that the mini suppliers will be squeezed out, because, as we have suggested, the type of systems that they offer and the type of systems that the mainframe suppliers offer have genuine differences. We show our view of the present data processing market in figure 8 below.

Figure 8 Domain of Mainframe, Mini and Micro on Scales of Power and Utility.



The respective zones that the mainframes, minis and micros occupy on scales of power and utility (i.e. how many things you can do with them) overlap, but not to a great enough extent to make the presence of any one group superfluous. The price that users will pay in total for systems (i.e. for hardware, software and support) will depend both on how much power and how much utility they buy.

Several of the forthcoming Foundation reports deal with particular types of equipment (Report No. 15 on micros, Report No. 16 on the role of the mainframe, and Report No. 18 on distributed processing — the move that the mini is spearheading). We will restrict ourselves in this report to the observation that there appears to be a place for all groups and that users will benefit from the variety of choice they have open to them.

We also share the view expressed by several experienced observers of the computing scene, that the market is big enough to hold most of its present incumbents. Figure 9 below and figure 10 on the next page show two projections of the size and composition of the market in the near future.

Figure 9 Distribution of users' EDP Expenditure

Salaries 26.5%

EDP - H & S
46%

Communications 19%

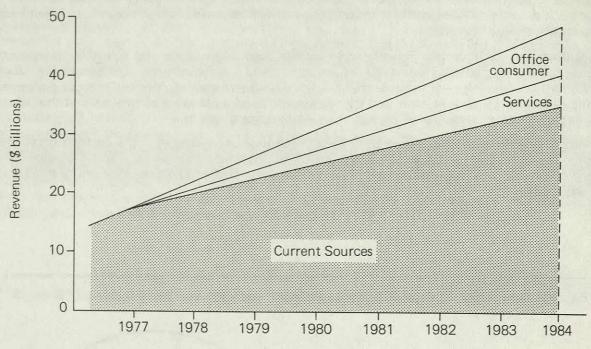
Communications 25.5%

Salaries 26.5%

1978 - \$30 billion

Source: IBM Chief Scientist

Figure 10 Market Opportunities to Support Growth



Source: U. Wail, Morgan Stanley Research

CHAPTER 4

MANAGEMENT IMPLICATIONS

In this chapter we deal first with the way in which the issues arising from the competition that the PCMs pose to IBM, and also IBM's recent round of price cuts, affect both IBM users and the users of non-IBM mainframes. These issues relate specifically to larger systems (which form a major cost item for most Foundation members), but they are also symptomatic of the underlying changes that affect data processing as a whole. We discuss the implications of these changes in the final section of this chapter.

A TAKING ADVANTAGE OF PCM

The points we discuss below are of concern principally to IBM users, who now have available to them in Europe a wide range of equipment from several PCM suppliers. The users of non-IBM equipment have a far more limited range of choice, but this could conceivably widen in the near future.

- 1. It will always be easier, safer, but more expensive to stay with the systems supplier. However, the PCM suppliers now form a legitimate option, since, depending on circumstances, they offer advantages of price, performance, function, and/or delivery. Users should take advantage of the wider range of choice that this gives them.
- 2. There are no certainties in the market, but equally there is no need to heed unfounded warnings about the systems supplier's nameless secret weapons. Users should, of course, listen to the warnings the systems supplier's salesmen will quite properly express, and evaluate those warnings on their merits. Equally, users should listen to the PCM suppliers, evaluate their products and attempt to estimate the quality of the service the PCMs' staff will provide.
- 3. After users have installed PCM products they should monitor the performance of those products in order to obtain early warning of impending problems and to keep the supplier's maintenance team up to scratch. It is also important that users should keep a close eye both on the systems supplier's and the PCM suppliers' product development programmes so as to see how these programmes affect their own systems plans. If users identify any signs of divergence, they need to evaluate the implications promptly and, where necessary, to decide what remedial action they should take. Time will almost certainly compound rather than ease problems of this nature.
- 4. For users who are considering acquiring equipment on a long-term basis (particularly IBM or IBM plug-compatible equipment) price erosion represents the greatest risk. There are no certainties here either. Success requires an accurate forecast of one's own needs, and as much information as possible on the trends of costs and prices within the computer industry. Many suppliers currently are predicting a period of reasonable price stability. It should be remembered that IBM, whose profits have been hit by customers swinging from purchasing to leasing (especially in the UK and France), will benefit from price stability as much as its major competitors will.
- 5. Users need to decide on the amount of business they are prepared to give to PCM suppliers. Some users have set a price differential between IBM equipment and PCM equipment that must be exceeded before they buy PCM equipment. They consider that this is one way they compensate themselves for the extra risk they take in buying PCM equipment. Others restrict themselves to one or two PCM suppliers only. A point users

need to consider is whether they are giving the systems supplier enough incentive to maintain a reasonable level of support. Very large users can adopt the policy of keeping one 'uncontaminated' site, which they can use to try out the systems supplier's most attractive new products and latest software releases.

A user who makes a wholesale commitment to the PCM concept requires to have a high level of in-house technical capability. This is necessary to evaluate the implications of adopting certain products, particularly those that are software based, to keep abreast of the PCMs' and the systems supplier's moves and counter-moves, and to ensure a safe fall-back position if events take an adverse turn.

6. The heavy use of PCM equipment will lead naturally into the use of third-party maintenance, and vice-versa. Experience with third-party maintenance has been good. All systems suppliers (and particularly IBM, constrained by the 1956 Consent Decree) will cooperate with third parties, because it is in their own interest to ensure that the equipment is kept running and the customer is kept satisfied. Users who may be contemplating making such a move in the future should make sure that their contracts with their equipment suppliers allow them to do so.

B THE POSSIBILITY OF AN ALL-IBM FUTURE

Non-IBM shops have no need to be alarmed by recent events, or by prophecies of doom for their supplier. After all, these prophecies have been heard before, particularly for ICL. IBM-based equipment will undoubtedly become more attractive, because of the wider range of choice available. But the other mainframe manufacturers can probably match IBM prices, if not IBM's profit margins, without jeopardising their long-term prospects. To stay in the race they will need to make intelligent use both of their more limited R & D resources, and of component and OEM suppliers. To do this only requires good management and, therefore, is within the capability of all the mainframe manufacturers.

C DETERMINING EQUIPMENT POLICY

The implications of the competition of the PCMs and of IBM's sudden change of direction go beyond both PCM and the future of ICL, Burroughs, et al. The change of direction has focused attention on the underlying phenomenon of rapidly-falling hardware costs that previously was partially obscured by IBM's umbrella pricing policy. Now is therefore a good time for management services managers to examine their equipment policy to see whether it is appropriate for today's conditions. We put forward below four considerations which should influence such an examination.

- If the management services department or the data processing department depends on high performance either to maintain service levels or to retain customers (for example, in the case of an airline or a service bureau), management time can justifiably be spent on shopping around for equipment in order to obtain maximum value from today's competitive market.
 - If what has just been said does not apply, then there is a need to consider whether the time of managers and technical staff in the department might not be spent in a better way than in trying to get more out of equipment that forms a declining part of the budget. For such a department the simplest and the least demanding line may be the best one to take, even if it means paying out more for the equipment and not having the latest and best.
- 2. For departments which take the line just referred to, this raises the further problem that senior management sometimes view computer equipment as a large and visible single expense. They can easily be misled into believing that their own managers are not taking proper advantage of tumbling hardware costs. If, of course, the overall cost of computing is falling at all, it is certainly not falling at anywhere near the same rate as hardware alone, and the greatest investment, although not so visible, is in existing systems. It is essential that companies should get these matters in perspective. Senior management may need to

- be made aware of the limited contribution that hardware makes to overall system costs, and of the value of a stable environment for applications development.
- 3. The response to IBM's new low-priced equipment shows that there is immense latent demand for processing power. This is demonstrated by the fact that the order book for new systems apparently represents four times the processing power already installed. We believe it is quite legitimate to use processing power as a bludgeon rather than as a rapier while hardware costs continue to fall. However, this can lead to a further trap the temptation to use the excess power of a large-scale system, apparently at zero marginal cost, for applications not really suited to "the mainframe approach". There always will be an opportunity cost in using power that is now not being used, and, additionally, other factors can easily outweigh the straight processing cost. In other words, solutions to applications problems should be evaluated on merit, and should not become distorted by short-term factors such as the availability of excess processing power.
- 4. The shift in pricing of mainframe systems from hardware into software and support, will mean that the so-called service element will become of greater importance in procurement decisions. Companies need to reflect this in their evaluation criteria for equipment. The objective should be to count the full cost of getting systems working on the equipment, not price/performance alone.

Abstract

Report Series
No 14

The Changing
Equipment Market

by Tony Gunton September 1979

IBM has dominated the data processing market almost since its beginnings. The drastic price cuts introduced on the company's newest ranges of equipment will therefore affect, directly or indirectly, all major users of data processing systems.

These cuts have been attributed by many commentators to the growing success of IBM's plug-compatible competitors. The PCMs, as they are generally known, base their strategy on displacing one or more components in the IBM total systems package, and the scope of their activities has grown steadily to embrace all the main hardware components. However, there are also other competitive threats which may have influenced IBM, such as the mini and micro computer suppliers and the formidable Japanese electronics industry.

This report describes the events leading up to IBM's recent round of price cuts and assesses their impact on the data processing industry as a whole. It then suggests how management services managers may need to adjust their thinking and their policy in the light of the changes in market structure and in cost ratios that are taking place.

The Butler Cox Foundation is a research group which examines major developments in its field — computers, telecommunications, and office automation — on behalf of subscribing members. It provides a set of 'eyes and ears' on the world for the systems departments of some of Europe's largest concerns.

The Foundation collects its information in Europe and the US, where it has offices through its associated company. It transmits its findings to members in three main ways:

- As regular written reports, giving detailed findings and substantiating evidence.
- Through management conferences, stressing the policy implications of the subjects studied for management services directors and their senior colleagues.
- Through professional and technical seminars, where the members' own specialist managers and technicians can meet with the Foundation research teams to review their findings in depth.

The Foundation is controlled by a Management Board upon which the members are represented. Its responsibilities include the selection of topics for research, and approval of the Foundation's annual report and accounts, showing how the subscribed research funds have been employed.

The Butler Cox Foundation

Butler Cox & Partners Limited Morley House, 26-30 Holborn Viaduct, London EC1A 2BP Tel 01-583 9381, Telex 8813717-GARFLD

SISDOCONSULT 20123 Milano – Via Caradosso 7 – Italy Tel 86.53.55/87.62.27

Akzo Systems B.V. Velperweg 76, Arnhem, The Netherlands Tel 85-662629

Butler Cox & Partners Limited 216 Cooper Center, Pennsauken, New Jersey 08109, USA Tel (609) 665 3210

Printed in England