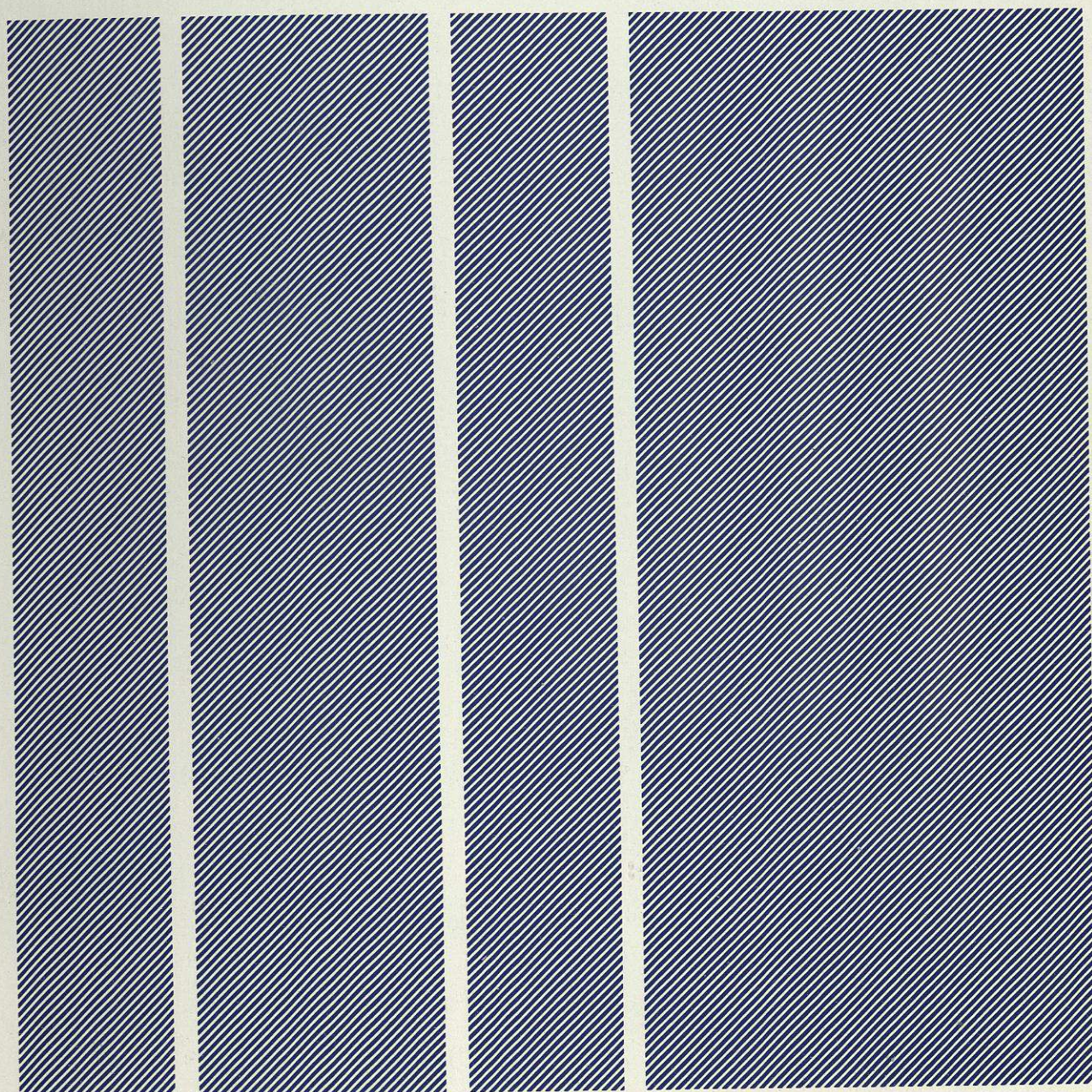Report Series
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Office Systems:
Applications and
Organisational Impact

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OFFICE SYSTEMS: APPLICATIONS AND ORGANISATIONAL IMPACT

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Abstract

As we enter the second half of the 1980s, many of the naive assumptions and vague ideas associated with early thinking about office systems have been replaced by a much clearer understanding of the real limitations and opportunities.

This report concentrates on examining the experiences of leading-edge users of office systems, drawing out the key lessons from their experiences, and advising Foundation members on the alternative approaches that are available. We conclude that the vision of the 'electronic office' will remain illusive unless organisations carefully plan to achieve the very different potential benefits of different types of office system.

The report is aimed primarily at the executives responsible for defining an organisation's office systems strategy, but it will also be of value to all executives who are concerned about the potential benefits of office systems.

OFFICE SYSTEMS: APPLICATIONS AND ORGANISATIONAL IMPACT

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REPORT SYNOPSIS

The next five years will be a crucial period in office systems development and use. Realistic plans can now be made to exploit the real potential of such systems, but the key to this potential lies in a fundamental change in the way office work is organised. To achieve this change, organisations must plan not only for individual system applications but also for a fundamental reorganisation of company structures. Reductions of over 20 per cent in managerial and professional costs may be possible for most large organisations.

The alternative to this radical approach is a drift towards the increasing use of office systems in an ad hoc way, using only a few control rules and guidelines. This may be an easy option, but is a very short-sighted approach.

For most large organisations, progress with office systems has been disappointing. With the exception of simple word processing and a few strategically important applications, the benefits of office systems have not, so far, justified their costs. Our research found no evidence that the use of office systems by managers and professionals generally leads to quantifiable benefits; nor that such systems have any real impact on organisational structures.

Based on the experiences of 25 advanced users of office systems in six countries we identified two general classes of office systems: general-purpose systems (such as word processing, electronic mail, voice messaging and telex interfaces) and specific applications designed to meet specialised requirements. We found that specific applications designed to improve operational performance are being used extensively. Specific applications that are strategically important to the organisation are also beginning to appear. General-purpose systems have usually been added as new facilities to a large existing user base of data processing terminals.

Office systems affect different categories of users in different ways. For typists, productivity gains are highly dependent on the type of work. Multifunction systems lead to major changes in the organisation of clerical tasks. Secretaries adapt well to electronic technology applied to their traditional work; less well to unfamiliar analytical work. Professional staff and middle managers are the main users of the personal microcomputers that have proliferated in business in recent years, and they tend to adapt well to general-purpose office systems. Sales staff find messaging systems extremely useful. But executives will normally use general-purpose systems only after these systems are widely used by the rest of the organisation.

We believe that the real cost-benefits from general-purpose office systems will appear only when organisations change the ways in which managers and professionals are organised. Despite the obstacles to this course, the potential benefits are substantial.

These and other lessons from current practice are detailed in Chapters 2, 3 and 4 of the report. The specific experiences of nine organisations are recounted as individual case histories in the appendix.

Chapter 5 addresses future developments in the office systems field. Hardware costs will continue to fall over the next five years, as (to a lesser extent) will general-purpose software costs. Other major developments will include the introduction of natural language interfaces, automatic handwriting recognition, greater use of images, content-addressable memory for textual databases, and a greater integration of general-purpose office systems software.

The ways in which large organisations use office systems will change significantly, as the ratio of terminals to office staff grows to about 1:2 by about 1990. Many of the new users will be non-technical professionals and managers. Overall, it is now clear that the business microcomputer is the main driving force behind new developments in office systems.

In planning to move from today's systems to those of the future, four major issues need to be tackled. Policies for information storage, processing and communications must be formulated. The respective roles of office system users, user support groups and central service providers must be clarified. The criteria for implementing new systems must be determined. And different approaches for different types of system — special-purpose systems to improve perfor-

mance, strategically important systems, and general-purpose systems — must be considered. Chapter 6 of the report provides the following management guidelines.

In assessing special-purpose systems to improve performance, managers should:

—Identify quantifiable benefits to create a successful atmosphere and ensure senior management support.

—Use combinations of office systems and main-stream computer systems, where appropriate.

—Look beyond the automation of existing procedures for opportunities to change the way office work is organised.

—Where possible, use common general-purpose office system facilities.

In formulating an approach to strategically important applications, an organisation must choose between being a technology leader (pioneering new systems), or a technology follower. Investments and timescales will vary accordingly. The technological maturity of different systems, and the readiness of business partners to accept change, will affect this decision.

Planning for general-purpose office systems should form part of an overall rationalisation scheme for the organisation, following these guidelines:

—Install obvious applicatons at an early stage.

—Encourage the use of multifunction devices such as personal computers, within appropriate guidelines.

—Build-up an early infrastructure of multifunction devices for secretaries and typists, so that important documents are captured electronically.

—Establish common systems before they are needed, to avoid delays and user frustration later on.

—When applications require a 'critical mass' of users, begin with existing terminal users and communicating groups.

—Keep office system implementations in phase with technological developments.

—Carry out the rationalisation plan in logical steps.

THE DEVELOPING INTEREST IN OFFICE SYSTEMS

For over five years, office systems and, in particular, the concept of 'the electronic office' have been pursued both by information technology suppliers and by some pioneering user organisations. In most organisations, however, 'the electronic office' has been viewed with a combination of interest, concern and caution.

When 'the electronic office' emerged as a fashionable idea, several arguments were advanced for implementing the concept:

—The significant increases in productivity that had been achieved through automation on the factory floor had not been matched by improvements in office productivity. This was particularly important because a large, and growing, percentage of staff worked in offices.

—The need to improve office productivity had been heightened by a sharp increase in labour costs, and by increasing competitive pressures.

—The quality and timeliness of management information was highly variable, leading to doubts about the quality of decision making. Better office systems were seen as a means of overcoming these limitations.

—The concept of automating the office had been made feasible by the convergence of office, computer and communications technologies, and by the ever-decreasing costs of electronic components.

In the early enthusiasm for 'the electronic office', however, the practical problems involved in creating such an environment were often overlooked. In particular, the immaturity of the available products and the benefits that could be achieved from an electronic office environment were not clearly understood.

This uncertainty made it difficult to define the electronic office for planning purposes. In this confused environment, it was also difficult to guide the introduction of office systems in a far-sighted, strategic way. Suppliers claimed to have produced 'integrated' office systems, but these products usually provided only a limited range of applications, such as word

processing, electronic mail, spreadsheets and basic information storage and retrieval facilities. The vision of a highly flexible electronic office, with multifunction terminals providing access to both specific and general-purpose systems in a dynamic and responsive way, has proved to be elusive.

If integrated and flexible office system products have been slow to materialise, a clear understanding of how to install and benefit from office systems has been even slower to appear. Early predictions of significant increases in managerial and professional productivity, of reductions in the numbers of middle managers, of increases in the span of management control, and of the elimination of the secretary have all proved to be premature, if not incorrect. Benefits such as these are certainly not commonplace as we enter the second half of the 1980s. Indeed, many organisations have shelved their early plans for ambitious electronic office projects after experiencing disappointment, or only limited successes, with office system pilot projects. Despite these setbacks, most people who are involved with office systems are reluctant to dismiss completely the 'electronic office' concept. They have a very real feeling that "there must be a better way to run the office".

In Foundation Report No. 19, Office Systems Strategy, we advised caution because of the confused office system environment in 1980. Our general message was: "If you want to try it, be cautious — but do not expect immediate benefits".

In Foundation Report No. 29, Implementing Office Systems, we advised Foundation members on how to approach the installation of office systems. In that report we predicted that the benefits of general-purpose office systems (such as word processing, electronic mail and information storage and retrieval) would follow a cyclical pattern, as the penetration of office systems within an organisation increased. Early obvious benefits would be achieved, but a period of substantial net expenditure would follow as the penetration of systems was built up to overcome 'critical-mass' and user-education problems. ('Critical mass' refers to the minimum number of people who must use a system before it becomes of real benefit to the users. It also relates to the minimum

level of functionality of an office system, below which it is not worthwhile for an individual user to overcome the difficulties associated with using the system.)

Finally, Report No. 29 predicted that as electronic facilities gradually replace traditional office procedures, major benefits in terms both of business performance and managerial/professional productivity would be achieved as a result of integrated electronic systems and staff reorganisations.

Foundation Report No. 29 was published in 1982, and since then the use of personal microcomputers has become widespread. It is now clear that the business microcomputer is the main driving force behind new developments in office systems. Indeed, the use of the microcomputer promises to overcome many of the critical-mass problems, although not necessarily the justification problems, that were described in Report No. 29.

SCOPE OF THIS REPORT

In this report we distinguish between two types of office systems:

—General-purpose office systems that use computer-based technology to improve general-purpose office activities. These systems may be used either to improve staff productivity or as a convenient means of carrying out office activities.

—Specific office system applications that are designed to meet the requirements of particular office or business functions. These systems are developed either to improve specific aspects of operational performance or to exploit strategically important opportunities.

Examples of general-purpose office systems include word processing, electronic mail, information storage and retrieval, voice messaging, phototypesetting and videoconferencing. By contrast, systems that have been designed to prepare engineering estimates, to provide reminders about contract renewal dates, or to act as sales aids are all examples of specific office system applications. Clearly, a particular office worker may use both general-purpose and specific office systems, perhaps through one multifunction terminal. Also, general-purpose office systems may well form part of a specific office system application.

As we enter the second half of the 1980s, many of the naive assumptions and vague ideas associated with early thinking about office systems have been replaced by a much clearer understanding of limitations and opportunities. The different ways in which general-purpose and specific office systems can be used, and the respective benefits that can be derived, are fundamental to this understanding.

The research for this report was carried out during the third quarter of 1984. It focused on those organisations that now have substantial experience of installing and using office systems. We identified 25 leading-edge user organisations in the field of office systems and interviewed the managers responsible for their office systems efforts. Eleven of the organisations were in the United States, five in the United Kingdom, three each in France and the Netherlands, two in Sweden and one in Italy. To supplement these user-oriented interviews, we also drew on the findings of several published studies of the uses of office systems in the United States and Europe. A bibliography is included at the end of the report.

PURPOSE OF THIS REPORT

The purpose of this report is to establish:

—The level and manner of use of office systems by large organisations in the United States and Western Europe. (These findings are described in Chapter 2.)

—Whether or not the leading-edge users of office systems are achieving major benefits from their significant investments in these systems. (These findings are discussed in Chapter 4 and detailed in the case histories described in the appendix.)

In Chapter 3, we describe the main users and applications of office systems. We draw out the main lessons from our research in Chapter 4, placing them in the context of office systems limitations and opportunities. In Chapter 5, we describe the ways in which office systems may evolve and be used in the future, extrapolating from the experience to date. Management guidelines to assist Foundation members in their office systems strategies are presented in Chapter 6.

In this chapter, we present some of the key findings both from Butler Cox's ongoing research into the uses of office systems and from a selection of authoritative studies that have been published during the last two years (see the bibliography). Our purpose is to present an informative 'snapshot' of how large organisations in Europe and the United States are currently using office systems.

The growth in the use of office systems in both the United States and Europe over the last five years has been slower than might have been expected, given the increasing numbers and costs of office workers and the decreasing costs of office system products. We believe that this slow uptake is due to three main factors:

—The difficulty in quantifying the benefits of using office systems to improve the productivity of managerial and professional staff. (Secretarial and typing productivity gains are very small in terms of the overall financial performance of large organisations.)

—The inadequacy of many office system products (such as word processors and early microcomputers) for tackling the variety of tasks required by

many (but not all) managers and professional staff. The high cost of many office systems has also been a deterrent to their widespread use.

—A great deal of confusion about the future evolution of office system products and, particularly, their compatibility both with existing and future computers, and with other office systems. Speculation about the likely integration of data, text, voice and image media has added to this confusion.

NATIONAL VARIATIONS

Measured in terms of the level of penetration and the types of application, our research indicates that, as a rule of thumb, the United States is about one year ahead of the United Kingdom in the use of office systems, and the United Kingdom is about one year ahead of the rest of Europe. These differences are shown in Figure 2.1, which indicates the percentage of the total information technology markets represented by personal computers, word processors and local area networks in the United States and Europe. For example, in 1982 word processors represented three per cent of the total information technology market in the United States, but less than two per

Figure 2.1 A comparative analysis of information technology expenditure in Europe and the United States for 1982

Country	Total information technology market	Personal computers		Word processors		LANs	
	$m	$m	Percentage of IT spend	$m	Percentage of IT spend	$m	Percentage of IT spend
United Kingdom	12,000	580	4.8	195	1.6	45.0	0.03
France	9,700	170	1.8	165	1.7	10.0	0.01
West Germany	14,500	255	1.8	310	2.1	7.5	0.005
Scandinavia	3,800	65	1.7	50	1.3	3.5	0.009
Other Europe	19,700	400	2.0	330	1.7	11.0	0.005
United States	85,500	4,200	4.9	2,200	3.0	150.0	0.1

(Source: Butler Cox)

cent of the total European information technology market. Personal computers represented almost five per cent of the total market in the United States and the United Kingdom, but accounted for less than two per cent of the information technology market in the other European countries.

The reasons why the United States is ahead of the United Kingdom in the use of office systems include the following:

—Most of the major office system suppliers (such as IBM, DEC and Wang) are US companies. These companies usually introduce new products into the United States before entering other markets.

—There is a greater difference between labour costs and office system costs in the United States. In other words, labour costs are higher in the United States than in the United Kingdom, and office system costs are lower.

—The US office system suppliers have a large, stable home market for their products. In comparison, the European market is diverse and more difficult to enter.

The United Kingdom leads other European countries in the use of office systems for the following main reasons:

—The popularity of home computers in the United Kingdom (one in ten homes now has one) has increased management awareness of information technology.

—British companies can use US office systems software and manuals without translation.

—US office system suppliers tend to use the United Kingdom as the entry point into the European market.

Nevertheless, different European countries display different levels of loyalty to their national office system suppliers. But, as IBM has strengthened its position in national office systems markets, so the pressure on large organisations to 'run with the market leader' has increased. The effect can be seen in the high percentage of large European companies that have now specified IBM as their preferred microcomputer supplier (as we reported in Foundation Report No. 43, Managing the Microcomputer in Business).

USE BY SECRETARIAL AND TYPING STAFF

There are about 10 million secretaries and typists in Western Europe, representing a very large market for word processors and other office systems. According to Keith Wharton's OASIS study published in late 1983, the use of word processors has remained at a very low level. The study showed that, in round figures, the 10 million secretaries and typists in Europe used:

—Three million manual typewriters.

—Six million electromechanical typewriters.

—One million electronic typewriters.

—A quarter of a million word processors.

Even allowing for the likelihood that most of these word processors are installed in large organisations, the penetration of word processors into the secretarial and typing market in large organisations is unlikely to exceed 10 per cent of the total potential market by the end of 1984. Even so, word processors are, at present, the dominant form of screen-based office system used by secretaries and typists. However, microcomputers running word processing packages are becoming more popular. According to the OASIS study, nearly 40 per cent of the money spent on word processing equipment in Europe during 1983 was for microprocessors dedicated to word processing.

Findings from the Omni Catalysis study, which analysed the use of office systems in late 1983 by 'Fortune 500' companies in the United States, confirmed the trend towards a sharp increase in the use of microcomputers with word processing packages. The Omni survey predicted that, while the number of secretaries and typists using word processing would increase by more than 50 per cent between 1983 and 1985, the use of microcomputers by this same group of office staff would treble over the same period. The Omni findings are illustrated in Figure 2.2.

Estimates of secretarial and typing productivity gains resulting from the use of word processors vary considerably from study to study, depending on the type of work involved and the determination of the organisation to achieve measurable benefits. For a typical mix of work found in the typing pools of large organisations, real productivity gains of between 20 per cent and 50 per cent are usually achieved. Interestingly, although text processing predominates in the secretarial environment, the Omni study shows that more than 20 per cent of the secretaries surveyed also carry out data processing applications that are, or could be, based on a microcomputer.

USE BY MANAGERS AND PROFESSIONALS

Omni has estimated that in the United States at the end of 1984, about one in ten managers and professionals will be using some form of screen-based terminal, mostly personal microcomputers. In Europe, the figure is somewhat lower, but the use of personal microcomputers is expanding rapidly. During 1985

Figure 2.2   Use of word processors and microcomputers by secretaries and typists in Fortune 500 companies

Percentage of sample using equipment

Percentage of sample using equipment

Word processors   Microcomputers
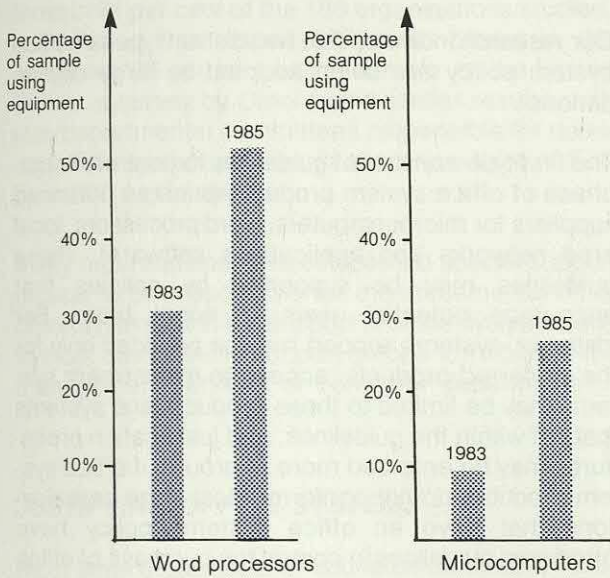
Note: The figures given relate to secretaries and typists who use the equipment. This use is sometimes on a shared basis.

(Source: The Omni Group)

Figure 2.3   The growth of the microcomputer market in Western Europe

Number of microcomputers shipped

1982   1983   1984   1985

Figures relate to units costing more than $1,000 sold in Western Europe

(Source: IDC-Europe and Butler Cox)

more than 800,000 units are expected to be installed in Europe, which will roughly double the installed base. Nearly three times as many managers and professionals are expected to be using microcomputers by the end of 1985 as were using these machines in 1983. The growth of the microcomputer market in Europe is illustrated in Figure 2.3.
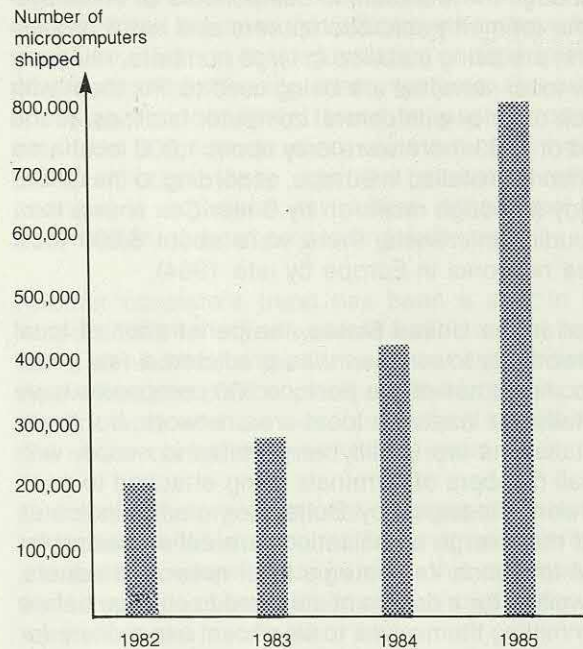
Research carried out by Butler Cox into the use of personal microcomputers in Europe shows that penetration is highest where managers and professionals have a high degree of discretion in the work that is carried out. For this reason, head office departments are more likely to use microcomputers than are departments in operating companies where the proportion of discretionary work is less. This research also shows that professional staff are more likely to use personal computers than are managers. Thus microcomputers are likely to be concentrated in departments such as accounts and engineering, where the concentration of professional staff is highest.

Not surprisingly, most of the office system applications used by managers and professionals are associated with data analysis (budgeting, statistical manipulation, modelling and other spreadsheet applications). One of the most comprehensive studies in this area is the Omni Catalysis study. This study showed that data analysis was by far the most com-

mon application in both industrial and service companies. These particular Catalysis findings are illustrated in Figure 2.4.

Figure 2.4   Office system applications used by managers and professionals

Fortune 500 industrial companies

Application	Percentage
Text processing	31%
Data analysis	89%
Data processing	27%
Communications	20%
Adm. management	15%
Graphics	17%
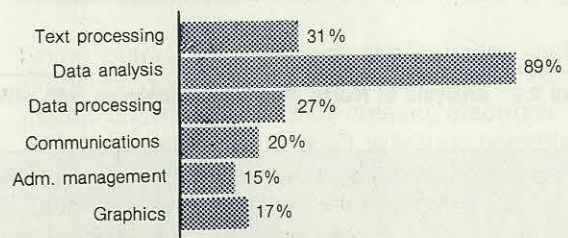
Fortune 500 service companies

Application	Percentage
Text processing	26%
Data analysis	88%
Data processing	37%
Communications	17%
Adm. management	16%
Graphics	11%
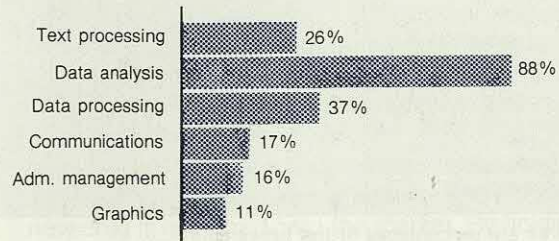
(Source: The Omni Group)

USE OF COMMUNICATION FACILITIES

Although the workstation components of office systems (primarily microcomputers and word processors) are being installed in large numbers, relatively few local networks are being used to link them with each other or with central computer facilities. At the end of 1983 there were only about 1,000 local area networks installed in Europe, according to the OASIS study (although research by Butler Cox shows that, including micronets, there were about 5,000 local area networks in Europe by late 1984).

Even in the United States, the penetration of local networks is lower than was predicted a few years ago. About half of the Fortune 500 companies have installed at least one local area network, but these installations are usually very limited in scope, with small numbers of terminals being attached to each network. Research by Butler Cox clearly indicates that many large organisations are either waiting for IBM to launch its strategic local network products, or waiting for a dominant standard to emerge before committing themselves to significant expenditure for local networks.

POLICIES AND PLANS

Studies carried out by the Policy Studies Institute in the United Kingdom and by Omni in the United States indicate that large organisations are more likely to have a coherent office systems policy than smaller organisations. In Europe, the formulation of office system policies, particularly personal microcomputer policies, has enabled management services departments to control the introduction of office systems, and to avoid the piecemeal proliferation of incompatible products. There is considerable evidence to suggest that many North American organisations

have, until quite recently, failed to exercise this degree of control. An analysis of the percentage of North American companies that had office system policies by late 1983 is given in Figure 2.5.

Our research indicates that two distinct types of office system policy are being adopted by large organisations.

The first type consists of guidelines to control the purchase of office system products (such as preferred suppliers for microcomputers, word processors, local area networks and applications software). These guidelines may be supported by policies that encourage potential users to adopt them. For instance, systems support may be provided only for the preferred products; access to mainstream systems may be limited to those products and systems that fall within the guidelines; and justification procedures may be enforced more rigorously if office system products do not conform. Most large organisations that have an office systems policy have introduced guidelines to control the purchase of office systems.

The second type of policy is based on the active promotion of office systems through the creation of office system plans, pilot trials and large-scale implementations. Only a small minority of large organisations have adopted this second type of policy to any significant degree, although many organisations have experimented with small-scale office system plans and pilot trials. (According to one survey in the United Kingdom, 32 per cent of the organisations studied had carried out at least one office system pilot trial.)

In most large organisations in Europe, management services staff are responsible for the introduction of office systems, although other staff may be involved in this process to a smaller extent — for example,

Figure 2.5   Analysis of North American companies with office system policies

| Type of company | Percentage of companies with policy | Scope of the policy | | | Percentage of companies with no policy | Percentage of companies expecting to have policy by 1985 |
		Percentage binding on all levels	Percentage binding on corporate group with guidelines to other levels	Percentage binding on corporate group only		
Fortune 500						
Industrials	59	18	24	9	40	82
Services	58	26	19	3	39	86
Medium-sized companies						
(over 100 staff)	35	14	9	2	65	65
Small companies						
(10-100 staff)	23	23	0	0	75	48

All figures are percentages of the full sample

(Source: The Omni Group)

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as members of an office systems steering committee. A survey carried out by the Policy Studies Institute in the United Kingdom found that management services staff were solely responsible for office systems in 61 per cent of the 189 organisations studied, and shared this responsibility with others in the remaining 39 per cent of the sample. In the United States, a survey by Omni found similar results, with interdepartmental committees responsible for defining office system policies in about one-third of Fortune 500 organisations.

Many organisations have established special support groups to be responsible for the implementation of office systems and the support of office system users. In most cases, these support groups form part of the management services or computer department.

JUSTIFYING OFFICE SYSTEMS

Most large organisations require office system installations to be formally cost-justified. Studies in Europe and the United States indicate that more than 75 per cent of large organisations carry out cost-justification exercises for all major office systems. By contrast, most organisations do not carry out cost-justification exercises before installing office system pilot trials.

Despite the many surveys indicating that office system cost-justification exercises are usually carried out, the suspicion remains that these may often be meaningless exercises, carried out more in hope than in the expectation of achieving real and quantified benefits. Our research confirms that the rules for cost-justifying office systems are generally less stringent than those applied to traditional data processing systems.

Where relatively inexpensive office system products, such as microcomputers or word processors, are being considered, it is the low level of expenditure involved that often leads to a lack of concern for a quantified justification. Where large-scale and expensive office systems are being contemplated, the inability to anticipate and quantify the potential benefits often leads to a theoretical, rather than a practical, cost-justification exercise.

With a small number of notable exceptions, organisations that have invested large sums of money in office systems have done so as 'an act of faith', rather than as a result of any objective cost-justification exercise. In particular, we have been unable to find hard evidence to support the view that office systems improve the productivity of managers and professionals in any quantifiable way, although claims of qualitative benefits abound.

THE ORGANISATIONAL IMPACT

Research by Butler Cox both in Europe and in the United States indicates that office systems have had very little effect on the organisation of departments or groups of staff using these systems. Generally speaking, the consistent trend in most European countries is to decentralise secretarial and typing staff, although these changes probably reflect changes in organisational culture rather than the introduction of word processing systems.

Another consistent trend has been a shift in the responsibility for office systems away from the traditional administrative departments that used to select typewriters and photocopiers, and towards computer departments who are more competent to deal with the newer computer-based office systems.

Some specific organisational changes, such as the reduction or elimination of regional sales offices caused by improvements in electronic communications, have also been carried out, although these are very much the exception.

In recent years, however, some organisations have begun to use office systems as a key element in their business strategies. These strategic applications, which normally have a direct impact on the organisation's customers, include:

— Providing customers with microcomputer systems on attractive terms in order to facilitate electronic ordering, thereby making it more difficult for the customers to change to another supplier.

— Using videodisc-based terminals in a retail outlet to sell products that are not held in stock.

— Supplying sales staff with sophisticated microcomputer-based sales aids.

Some other office system applications, such as preparing quotations by microcomputer or facilitating the ordering process by creating electronic links with the sales force through videotex, portable terminals or voice-response systems, can have an indirect strategic impact by improving the service provided to customers.

In some industries, quite simple office system applications can have a disproportionate impact on business performance. For instance, a pharmaceuticals company that uses word processing systems over a period of years to document its research and development results may be in a position to produce very quickly the regulatory documents that must be approved by the relevant statutory bodies before a new drug is launched onto the market. By holding the information in electronic form rather than on paper, the company may be able to save one or two months

in the document-preparation process, so launching a drug onto the market one or two months sooner than would otherwise have been possible. In the competitive pharmaceuticals industry, this quite modest achievement might be worth millions of dollars in extra profits. Not surprisingly, the strategic use of office systems is now under active consideration by many large organisations.

SUMMARY OF THE CURRENT OFFICE SYSTEMS ENVIRONMENT

The current office systems environment falls a long way short of the idealised concept of 'the electronic office'. Most organisations have made only modest investments in office systems, at least until the recent widespread introduction of personal microcomputers. Most large organisations now have an office systems policy, although this policy usually consists of guidelines rather than comprehensive plans.

Management services managers have consolidated their responsibility for office systems at the expense of administrative managers, who have progressively become less influential. Generally speaking, management services managers in Europe have also con-

tained the threatened proliferation of incompatible microcomputer and word processor products by adopting suitable guidelines and control policies.

With the exception of simple word processor applications and a limited number of strategically important installations, office systems have not been cost-justified. In particular, we found no evidence that the use of office systems by managers and professionals generally leads to quantifiable benefits, and office systems have so far had very little impact on the organisational structures of the departments using these systems.

The year 1979 can be regarded as the first year in which office systems became an important issue for most large organisations, and there is no doubt that the first five years' experience has been disappointing. Although some significant qualitative benefits have beeen realised, the important, and difficult, issues associated with achieving significant quantifiable benefits from the widespread introduction of office systems have still to be addressed. If current experiences are extrapolated into the future, most large organisations will have invested a significant amount of money in office systems by 1990, but the cost-benefits will still be very elusive.

OFFICE SYSTEM APPLICATIONS AND USERS

During the research for this report we examined the office system activities of 25 organisations in six countries. These organisations were selected because, in our view, they formed a representative sample of advanced users of office systems. The experiences of nine of them are described as case histories in the appendix; in this chapter we identify the main lessons that emerge from their experiences. The issues are discussed first in terms of the different types of office system applications, and then in terms of the different types of staff who may use office systems. Finally, we discuss the experiences in terms of training requirements.

OFFICE SYSTEM APPLICATIONS

We noted in Chapter 1 that there are two distinct types of office systems — specific applications and general-purpose systems. The main factors that influence the installation of these two types of office systems can vary considerably. During our research, it became clear that advanced users of office systems often adopted a different approach when installing specific applications from that used when installing general-purpose office systems. Indeed, some organisations had established corporate office systems groups that were concerned only with general-purpose systems, such as electronic mail, voice-messaging systems and electronic information storage and retrieval facilities, leaving the specific applications to decentralised management services groups at various locations.

Specific office system applications

The installation of specific office system applications is in many ways similar to the installation of traditional data processing systems, except that the applications normally include text manipulation as well as, or instead of, data manipulation. Also, the systems usually involve significant additions to standard general-purpose office systems. For example, an advanced office system might enable buyers to interrogate text and data information held on a supplier file, incorporate relevant information into purchase orders and supplier correspondence, and transmit this information electronically to a supplier using a telex switch or a direct link to the supplier's computer. It might also allow them to input data into the mainstream data processing systems of the organisation for stock record adjustment, invoicing and financial reporting.

A more modest specific application might be an office system designed to produce proposals and quotations, or a system used to demonstrate the merits of alternative products to prospective customers. (Such systems were being used by some of the organisations in the study.)

The nature of specific office system applications means that they require more development effort and training than general-purpose office systems, which usually are standard products, possibly needing a very limited degree of tailoring to meet user requirements. Specific applications are installed to perform particular business functions and are therefore normally identified with specific business or operational benefits. The organisations in the survey reported that most specific office system applications had been cost-justified, whereas very few organisations had attempted to quantify the benefits provided by general-purpose office systems.

Specific office system applications are generally used by clerks or professional staff, who usually adapt readily to office systems. Although organisations in the study reported a high level of success with specific office systems, a few failures due to poor systems design were also acknowledged. The quality of these systems depends heavily on the abilities of the development staff.

General-purpose office systems

General-purpose office systems include word processing, store-and-forward electronic mail, voice-messaging facilities, electronic information storage and retrieval, electronic administrative facilities (such as diaries and reminder files), local networks, and specialised systems (such as phototypesetting and videoconferencing). We now discuss users' experiences of each of these types of systems.

Word processors

Word processors were installed in all the organisations in the study. In general, they provide measurable cost-benefits in centralised typing groups, but not in other parts of the organisation. Although some resistance was experienced initially, there is now widespread acceptance of, and even a growing demand for, word processors by typists and secretaries. Clerks and professionals who use terminals for other applications are also beginning to use word processing facilities to do their own typing.

Electronic mail systems

Electronic mail (and messaging) systems were usually provided to give additional communication facilities to a large base of existing terminal users. Because of this, very few critical-mass problems were experienced, particularly since organisations usually installed electronic mail facilities progressively for groups of staff who needed to communicate with each other. Also, because most users were familiar with terminals, user acceptance of the facilities was quite rapid.

Most organisations used local managers who were keen on the idea of electronic messaging to act as intermediaries during the installation of the system, so encouraging user acceptance. Some organisations started by using an electronic mail bureau and then brought the system in-house once it became accepted by a large number of users.

In the large organisations using electronic messaging systems, terminal penetration was quite high — typically about one terminal for every four or five office staff. Once about 10 per cent of terminal users were successfully using electronic messaging, there was a large increase in demand from the other terminal users to use the system. Later, when between one-third and one-half of the terminal users had access to electronic messaging (typically about two years after the first facilities became available), the system and its rules and traditions became established as part of the corporate culture. This usually meant that short cryptic messages were an acceptable form of communication, even in organisations where internal memos had traditionally been rather formal. It also meant that staff who broke the unwritten rules, such as making a telephone call where an electronic message was sufficient, experienced pressure from their peers to conform to the new informal rules.

Most electronic messaging system users spent less than 10 minutes a day on the system, although some field sales staff and sales managers often used the system for more than 30 minutes each day. (Because of time-zone differences in the United States, field sales staff in that country often became the leading champions of store-and-forward electronic messaging systems.)

Typically, fewer than 10 per cent of initial users of such systems subsequently refused to use electronic messaging. Nevertheless, some resistance to certain aspects of electronic messaging systems was experienced. In particular, users were concerned that the controls in the system meant that they could no longer avoid difficult or untimely actions by claiming that a message had been "lost in the post" and so avoid difficult or untimely actions.

Most organisations in the sample that used electronic messaging did not have an up-to-date justification for the cost incurred by installing such systems. Early efforts to quantify postal or telephone cost-savings had typically been forgotten as user demand built up.

Voice-messaging systems

Those organisations that used voice-messaging systems had found that the base of users could be built up very quickly (one organisation had installed facilities for over 1,000 users in the first year), so avoiding any initial critical-mass problems.

Field sales staff were enthusiastic users of voice messaging, because it helped them to overcome 'telephone tag' and (in the United States) time-zone difficulties. Other office-based users, however, were less convinced of the benefits, with between 15 and 20 per cent of the initial users ceasing to use the system after a period of experimentation. Typically, voice-messaging systems were used by each user for less than 10 minutes per day, mainly for short and succinct messages. In much the same way as some electronic messaging system users had reacted against the disciplines imposed by the system, some voice-messaging users were concerned that they could not avoid receiving certain messages. Some organisations admitted that on certain critical occasions, telephones were reported as being "out of order" — a clear human reaction to the controls inherent in many of these systems.

Up-to-date cost-justification figures for voice-messaging systems were not available from the user organisations. Typically, after an initial monitoring exercise during which the expenditure was said to be justified, no further evaluation had been carried out.

Information storage and retrieval systems

Organisations that used electronic information storage and retrieval usually had installed them as additional facilities for an existing large base of terminal users. The retrieval applications were all based on keyword or file-identification retrieval, rather than on the more complex content-addressable methods (where each word in a document can be used as a keyword).

Although these facilities were of value to almost all the potential users (in one organisation only 15 out of a total of over 2,000 stopped using the system), very few filing cabinets were discarded. Most users stored only key reports and other important documents on the electronic system, and retained most of their day-to-day files in paper form. The reasons for this were that users believed that:

—They could not cope with electronic indexing for large numbers of documents.

—The keyword-based indexing systems were inadequate for large-scale document storage.

—The electronic system could not cope with external correspondence or documents incorporating images.

In some cases, strict controls on the amount of disc space used by each person also discouraged large-scale use of the system.

Some specialised groups (such as public relations staff at different company locations) used electronic storage systems to maintain a consistent record that could be used by several individuals. The group use of information storage was expected to become an increasingly important application during the next few years. For example, several organisations were actively considering electronic storage and retrieval as a key element in future application systems to handle business transactions.

None of the leading-edge organisations in the study had specifically cost-justified electronic storage and retrieval, although a few had included the costs of these systems in an overall justification for electronic mail and information retrieval systems. (For example, see the Massey-Ferguson case history in the appendix.)

Electronic administrative facilities
Although some of these facilities, such as reminder (or 'tickler') files, were used quite extensively (without being rated as particularly important), diary management facilities used to check individual diaries to determine possible appointment dates were regarded as a failure in nearly all of the organisations that had used them. The main reason for this failure was that people regarded their diaries as 'personal', and were reluctant to allow others to have access to the diary, or to allow others to book appointments without some form of agreement in advance. Although many of the more recent diary management systems have been designed to overcome most of the stated objections, the uptake of these systems is still very slow, with a great deal of caution being exercised by most potential users.

Local networks
Most of the organisations in the sample had installed some form of local network, based either on a local area network or on an advanced data-switching PABX system. None of the organisations, however, had made a major commitment to these systems, typically regarding them as experiments in limited areas at one or two locations only. Generally speaking, these local networks were justified on the basis of cost savings compared with the costs of traditional wiring that would have had to be installed to cope with increased demands over the next few years. The increased flexibility provided by advanced local networks was also given as one of the main reasons for experimenting with this approach.

Specialised systems
Specialised systems, such as phototypesetters, telex interfaces and protocol converters, were being used in office systems installations by several organisations in the sample. In some cases, these systems were very important — for example, a telex interface system was used as part of a worldwide store-and-forward electronic mail system by one large multinational company. In other cases, however, specialised systems were regarded very much as useful incidentals to the main office system applications of word processing, electronic mail and electronic information storage and retrieval.

OFFICE SYSTEM USERS

From the variety of sometimes contradictory experiences with using office systems, we have extracted some key lessons about the impact of office systems on different types of office staff — typists, clerks, secretaries, professionals and middle managers, executives and sales staff.

Typists
Many studies have shown that the average improvement in typing productivity as a result of using word processors in typing pools is usually between 20 per cent and 50 per cent. But productivity improvements are highly dependent on the type of work involved — productivity gains of more than 200 per cent have been obtained by using word processors to prepare standard letters and large reports requiring many amendments, but memo or short-letter typing productivity gains are usually less than 10 per cent, if they can be measured at all.

Productivity improvements resulting from the introduction of word processors are also very dependent on the determination of the organisation to achieve the benefits. For example, one large chemicals company set out to achieve a 100 per cent improvement in word processing productivity and

achieved this goal by a carefully planned programme of natural wastage of typing staff. By contrast, several organisations who had not planned for productivity improvements reported no measurable productivity gains, despite spending large sums of money on word processors.

Personnel problems have been experienced both when secretaries and typists are reorganised into central typing pools and, perhaps more surprisingly, when existing typing pools are decentralised to increase the number of departmental or personal secretaries. In general, secretaries suffer a loss of status when they are reorganised into secretarial groups or typing pools. When the reverse process is carried out, a combination of the loss of contact with friends during the working day and an increased variety of work demands can lead to considerable anxiety.

In most of the organisations studied there was a clear trend for the overall typing load to shift away from typists and secretaries. Increasingly, typing is being carried out by clerks and professional staff as these groups begin to use terminals for a variety of applications.

Clerks

Most of the organisations had installed multifunction facilities that enable clerks to carry out both data processing and word processing through the same terminal. These facilities had generally been installed with few problems, and the systems had quickly become established as part of the routine day-to-day activities.

The introduction of multifunction systems for clerical staff had led to considerable changes in the organisation of clerical tasks. Clerks who used to deal with specialised activities, such as typing correspondence or filing documents, were beginning to be replaced by clerks who carried out a much wider range of activities, using specially designed office systems. In some cases, this had led to clerks, or even professional staff, becoming involved in all stages of clerical activities (such as order receipt, stock record enquiries, customer credit status review, order processing, and customer correspondence) rather than only a few of these activities.

Three of the organisations had definite plans to use office systems to reduce significantly their numbers of clerical and typing staff. They plan to provide professional staff with specific office systems designed to carry out almost all the activities involved in the main business transactions. In this way, these organisations expect to eliminate the considerable duplication in effort inherent in the existing specialised division of activities. These three organisations were also

considering the use of electronic-image documents to reduce much of the paper handling involved in processing their mainstream business transactions.

Secretaries

None of the 25 organisations had measured the direct productivity gains achieved by installing word processors for secretaries. Those organisations that had increased secretarial productivity had done so by reorganising to reduce the number of secretaries employed.

Several organisations had linked secretarial word processors to word processors in central typing pools where bulk typing was carried out. This arrangement had proved to be quite successful, because it maximised the productivity of bulk typing by using a typing pool. In addition, it reduced the typing errors seen by authors because the secretaries would correct the electronic documents before printing final copies for the authors.

Only three organisations had carried out experiments which provided secretaries with multifunction office systems having more than basic word processing facilities. Nevertheless, almost half of the organisations regarded the use of multifunction office systems by secretaries as a transitional step to the use of these systems by senior managers. The results of the experiments indicated that most secretaries adapted well to traditional secretarial activities (such as word processing, keeping a diary, and maintaining document indexes) when these facilities were provided in electronic form. But secretaries were reluctant to use some of the more sophisticated applications, particularly where these involved the analysis of unfamiliar information. The three organisations believed that the installation of multifunction systems on secretaries' desks had encouraged managers to use office systems although, as we discuss below, other factors may be more important in determining whether or not office systems are accepted by managers and executives.

Professionals and middle managers

Professional staff and middle managers are the main users of the personal microcomputers that have been installed in large organisations in recent years. They are also the main users of end-user computing facilities provided by in-house timesharing services. Technically oriented professionals and middle managers readily accept systems that meet a real need (such as spreadsheets for budgets, systems to carry out technical calculations, and access to technical databases), even though these systems may be quite difficult to use. Once they are used to carrying out some of their work on terminals, these staff usually adapt easily to general-purpose office systems. Professionals and middle managers who are regular termi-

nal users are usually prepared to carry out quite a lot of their own typing, for example, with the exception of large reports.

Some professionals and middle managers whose activities are document-oriented (such as patent officers, copywriters, and public relations staff) will accept and use general-purpose office systems, since these systems are very relevant to their jobs. In general, however, professionals and middle managers make only limited use of general-purpose office systems if they are provided in isolation, without specific job-related applications also being available. Our research indicates that, if job-related applications are installed first, general-purpose office systems will be more readily accepted as 'add-ons' at a later date.

None of the organisations we examined could demonstrate quantified improvements in the productivity of professional staff or middle managers as a direct result of the introduction of office systems.

Executives

A few of the organisations in the study had successfully installed quite sophisticated office systems for executives. These systems were based on facilities developed to meet specific executive needs, and they required a high level of personalised systems training and support to ensure that all applications were used and worked well. Generally, the systems used a simple menu interface to computer-based reports that had been specially re-formatted to meet executive requirements.

In those organisations where pilot trials of general-purpose office systems had been installed for use by executives, the results were usually disappointing. In two cases, office systems for use by executives were removed at the end of a pilot trial period. However, where general-purpose office systems were introduced as additional facilities to an existing high level of terminal penetration in the organisation, most executives did use the facilities. Our research indicates that executives will normally use general-purpose office systems only when these systems have become part of the corporate culture, and when many other managers and professionals are using the facilities regularly.

Sales staff

Office systems that improve communications with field sales staff were being used by ten of the organisations we interviewed. Electronic mail systems, voice-messaging systems, videotex and voice-response systems were used by different organisations to reduce delivery lead times, improve the timeliness of sales management information, and save in-house administration costs by capturing order information at an earlier stage.

Direct cost savings (such as reduced telephone and postal costs and reduced in-house clerical costs) attributable to these types of office systems were measured by fewer than half of the organisations, however. Where these measurements were made, the installations were always cost-justified.

Two organisations in the study were using office systems as sales aids. One vehicle manufacturer used interactive videodisc systems to promote car sales in distributor showrooms (without a great deal of success). And an insurance company used a sophisticated portable computer system to illustrate different insurance options to potential customers (with considerable success). Six other organisations were actively considering the use of terminal-based systems as sales aids, indicating a growing interest in the use of office systems at the 'sharp end' of business operations.

TRAINING AND SUPPORT

In recent years, a great deal of importance has been attached to providing adequate training for office system users. In general, however, the organisations we examined had not invested in very high levels of training and support. Typically, after an initial training and education effort during which large general-purpose office systems were installed, the training and support effort fell to quite low levels.

The key staff involved in planning and installing these systems often stressed the need to carry out an initial large-scale education exercise to ensure that the early office system installations were successful. Once any early psychological barriers had been overcome and successful systems installed, user demand for office system facilities, together with assistance from colleagues already using the facilities, typically overcame any limitations in the formal training programmes. One interviewee summarised the views of most organisations when he said: "If the system is accepted by many of the user's colleagues, and if the system provides real benefits, then the user will learn to operate the system, even if the formal training is inadequate".

As an indication of the level of ongoing training and support provided, one organisation employed one person to support more than 1,000 electronic mail users, while another organisation used five staff (but only for part of their time) to support more than 2,000 users of a multifunction general-purpose office system.

In two types of situation, however, a relatively high level of training was often found to be necessary. Specific office systems usually required quite intense training programmes over a short period of time. And

senior managers often demanded, and were given, individual training in the use of office systems.

SUMMARY

In the very diverse and somewhat confused environment of advanced office systems in the organisations we studied, two main types of office systems — specific and general-purpose — are being installed and used. Specific applications designed to improve operational performance are being used extensively. One main trend in the use of specific applications is that multifunction facilities are increasingly being used by professional staff, for clerical and typing activities that were previously carried out by clerks and typists using traditional office procedures. These specialised applications usually result in modest benefits that cost-justify the systems over a period of two or three years.

A small percentage of specially designed office systems are beginning to be used for strategically important applications. These applications usually affect the main activities of the organisation and, if successful, can lead to major strategic benefits (or, if not successful, major strategic problems). We believe that strategically important office system applications are poised for a period of major growth over the next five years.

General-purpose office systems, such as electronic mail and electronic information storage and retrieval, have usually been installed as additional facilities available to a large user base of existing data processing terminals. In this way, many critical-mass problems have been avoided, and office systems have first been installed for use by the most receptive technically oriented staff. In turn, this has created a favourable environment in which to expand the use of these systems to other areas of the business.

Nevertheless, most of the organisations have realised very few cost-benefits from their use of general-purpose office systems.

THE IMPACT AND BENEFITS OF OFFICE SYSTEMS

With the exception of reorganisation affecting secretaries and those responsible for installing office systems, there has been almost no impact on organisational structures in the 25 organisations we studied. Even in groups where there is a very high penetration of office systems, no significant organisational changes have been made. We believe these findings to be true for almost all organisations that have installed office systems.

Any assessment of the impact of office systems must consider both the benefits that will accrue from the use of different types of office systems, and the different approaches to the implementation of office systems. In this chapter, we place the lessons learnt from the experiences of office system users in the context of the benefits that can be achieved both by using different types of office systems, and by adopting different approaches to implementing them.

SPECIALLY DESIGNED OFFICE SYSTEMS

During our research we encountered many specially designed office system applications. Some of these were designed to improve the operational performance of certain functions; others were designed to be strategically important to the organisation concerned.

### Systems designed to improve operational performance

The organisations we studied had installed many different types of specially designed office systems to improve the operational performance of various functions. The applications included:

—A multifunction office system to improve the productivity of clerical activities in insurance broking transactions.

—An information storage and retrieval system to enable public relations staff in an oil company to continually update and access a consistent record of press statements. The use of this system ensured that problems associated with the press receiving different information from different company locations were avoided.

—A combined word processing, document preparation and information storage and retrieval system that gave buyers online access to supplier and product information, and enabled them to produce all the necessary documentation.

—A 'tickler' system for patent officers, to remind them of critical dates in the patent preparation procedure.

Most of the specially designed systems of this type were cost-justified, although some applications, such as the 'tickler' file for patent officers, were justified in qualitative terms only. However, the benefits achieved were usually quite modest, giving a return on investment over a period of about two or three years.

The typical pattern of cumulative cost-benefits derived from the installation of several specially designed office systems to improve operational performance is shown in Figure 4.1. The figure illustrates that as each such system is installed a modest cost-benefit may be achieved, although some systems may cause a decrease in the cumulative benefits because they provide only qualitative

Figure 4.1 Cumulative cost-benefits of office systems designed to improve operational performance
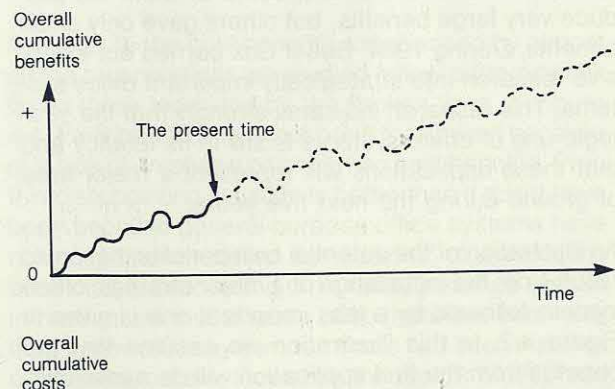
Note: The small decreases in cost-benefits relate to office systems with qualitative benefits that cannot be fully cost-justified.

benefits. We would expect, however, that real cost-benefits will continue to be achieved on an incremental basis as these systems continue to be installed, as illustrated by the dotted line in Figure 4.1.
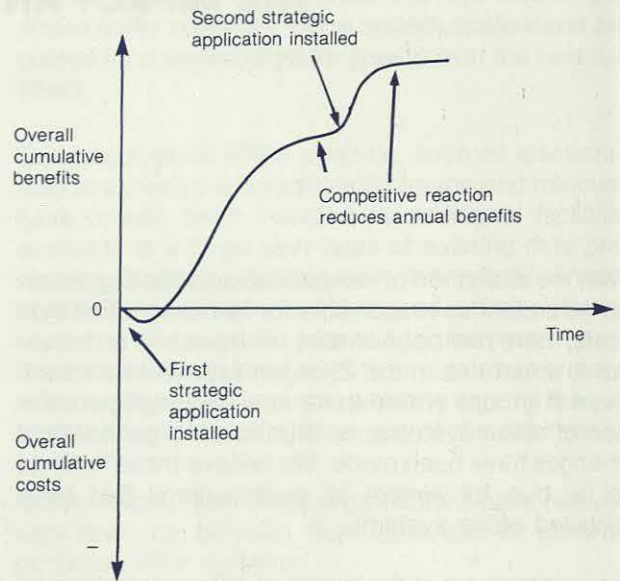
Systems designed to be strategically important

Some of the organisations in our study had installed one or two (but not more) specially designed office systems that were strategically important to the performance of the business. Examples included:

—An insurance company provided terminals to large insurance brokers to encourage the brokers to use that particular company's services, rather than those of a competitor.

—A pharmaceuticals company used word processors to record research and development findings over a period of years. It was able to use this information to prepare quickly the necessary (and very bulky) regulatory paperwork required once a drug was ready to be launched onto the market. In this way, it could launch a new product onto the market one or two months earlier than would otherwise have been possible. This simple application could be worth several million dollars in additional profits for each major drug that is brought to the market.

—An insurance company used portable computers as sales aids, so that alternative insurance schemes could be presented to potential customers.

—An electronic message system was installed to keep farm machinery distributors in North America up to date with special promotions, stock availability, and new product launches. The system also enabled distributors to place orders electronically with the farm machinery supplier.

All of the strategically important systems were installed with the expectation of gaining substantial cost-benefits. In the event, some of them did produce very large benefits, but others gave only small benefits. During 1984, Butler Cox carried out extensive research into strategically important office systems. This research indicates strongly that the strategic use of office systems is still in its infancy and that these applications will represent a major area of growth during the next five years.

An illustration of the potential cost-benefits that could result from the installation of a major strategic office system followed by a less important one is given in Figure 4.2. In this illustration we assume that the benefits from the first application will decrease over time as competitors react to minimise the advantage being achieved. (This will not always be the case, because some applications, such as an early launch of a new pharmaceutical product, will have a large

Figure 4.2   Cost-benefits of two strategically important office systems

once-off short-term benefit.) The figure is drawn to the same scale as Figure 4.1 to illustrate that the potential benefits from strategically important office systems are much greater than from office systems designed to improve operational performance.

GENERAL-PURPOSE OFFICE SYSTEMS

Studies to identify and quantify the theoretical benefits of general-purpose office systems have been carried out by Booz Allen & Hamilton Inc. and other consultancies. These studies were based on an analysis of work patterns for different types of office staff in a limited sample of companies. Assumptions were then made about the likely increases in productivity that would result from the application of office systems to each type of activity. From a knowledge of how office staff spend their time and an estimate of how office systems would increase the productivity of each activity, the likely productivity increase for different types of office staff was estimated.

To illustrate this type of calculation, suppose that a typical manager spends 12 per cent of his time on the telephone. If this time can be reduced by 20 per cent by using electronic mail or voice-messaging facilities, then 2.4 per cent of the typical manager's time will be saved by introducing these systems. The results of one such study on management time are illustrated in Figure 4.3. This particular study predicted that the impact of office systems would be to save 15 per cent of management time. Generally, the results of studies of this kind predict theoretical pro-

Figure 4.3 Impact of integrated office systems on management time

Activity	Average time spent on activity (%)	Estimated % impact	Time saved (%)
Meetings	12	10	1.2
Travel	6	10	0.6
Filing	2	20	0.4
Searching/ retrieving	9	70	6.3
Writing	16	10	1.6
Telephone	12	20	2.4
Reading	7	10	0.7
Planning	4	0	0
Mailhandling	4	20	0.8
Calculating	10	10	1.0
Other	18	0	0
TOTAL	100		15*

*ie integrated office systems have the potential to 'save' 15 per cent of management time.

(Source: Booz Allen & Hamilton)

Figure 4.4 Cost-benefits of general-purpose office systems

—————— Theoretical cost benefit curve.

— — — Cost-benefit experiences of leading-edge users (note that some users may never have been through a period of overall cumulative benefits).

ductivity improvements of between 10 and 20 per cent for managers and professional staff, and improvements of between 20 and 30 per cent for clerical and secretarial staff.

In Foundation Report No. 29 we argued that the cumulative cost-benefits of general-purpose office systems would tend to follow a cyclical pattern, with early net cost-benefits from applications such as word processing in typing pools and inter-site electronic mail being followed by an extended period during which substantial costs would be incurred. In this period of substantial expenditure, the penetration of terminals would be built up and infrastructure investments (such as local networks, store-and-forward electronic mail, electronic information storage and retrieval, and restructuring of databases to meet ad hoc user requirements) would be made. Finally, as organisations adapted to the new electronic environment, significant organisational changes would be made in order to realise the full theoretical productivity benefits of general-purpose office systems. To be significant, these reorganisations would primarily have to affect managers and professional staff. This theory is illustrated by the solid line in Figure 4.4.

Our research for this report suggests that most advanced office system users are still incurring overall cumulative costs, as indicated by the broken lines in Figure 4.4. In turn, this suggests that even the leading-edge organisations have not yet reached the
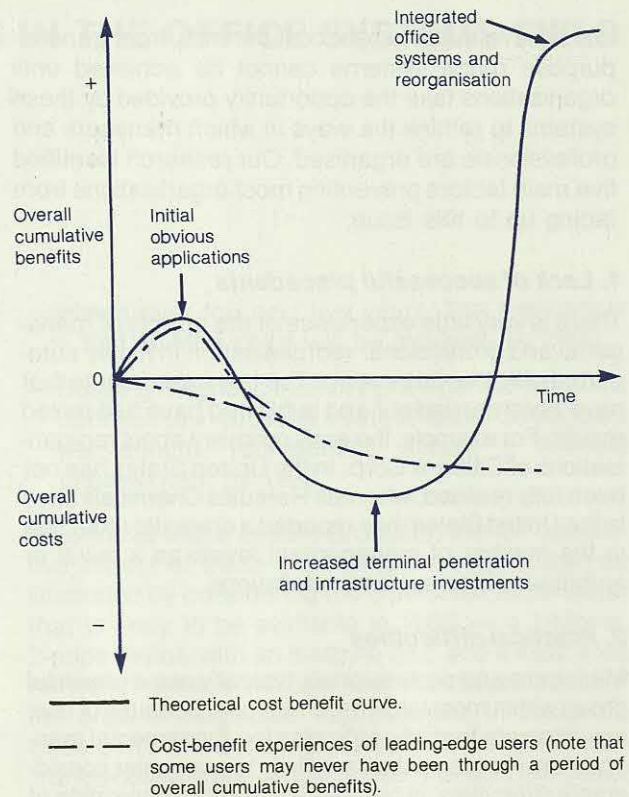
stage where they can achieve significant benefits by major reorganisational changes. A more likely explanation, however, is that these organisations have so far failed to achieve real benefits from general-purpose office systems because they have held back from the challenge of managerial and professional reorganisation. Although clerical and secretarial reorganisations are quite commonplace, most organisations have avoided the much more difficult and fundamental managerial and professional changes that would be needed if the theoretical benefits we have described are to be realised.

As a result, the cost-benefits experienced by almost all the organisations we studied follow patterns similar to those indicated by the broken lines in Figure 4.4. Early benefits have not been maximised because of a lack of emphasis on achieving cost-benefits. Even this disappointing situation is better than it might have been because general-purpose office systems have normally been installed as 'add-ons' to an existing base of data processing terminals. The office system infrastructure investments have therefore been less than if new office system terminals had been installed on the same scale. However, the recent widespread use of personal microcomputers (often without measurable cost-benefits) has contributed to a continuing increase in the overall cumulative costs of general-purpose office systems.

REORGANISING MANAGERS AND PROFESSIONAL STAFF

We believe that the real cost-benefits from general-purpose office systems cannot be achieved until organisations take the opportunity provided by these systems to rethink the ways in which managers and professionals are organised. Our research identified five main factors preventing most organisations from facing up to this issue:

1. Lack of successful precedents

There is very little experience of the effects of managerial and professional reorganisation in highly automated office environments. The few experiments that have been carried out and published have had mixed results. For example, the early optimism about reorganisations at Citibank Corp. in the United States has not been fully realised, whereas Hercules Chemicals (also in the United States) has reported a dramatic reduction in the number of management levels as a result of ambitious office system installations.

2. Practical difficulties

Managers and professionals typically are a powerful group within most large organisations. Because of this, any attempts to study, or to plan for, fundamental management reorganisation are likely to encounter considerable difficulties. In comparison, the reorganisation of clerical or secretarial staff (which itself is often a very traumatic and testing experience) will seem relatively straightforward.

3. Doubts about benefits

The theoretical productivity benefits of office systems are based on a limited sample of organisations and are unlikely to be realistic for many organisational environments. Indeed, the assumptions made by these studies have aroused considerable debate amongst those who specialise in the office systems field.

4. Organisational inefficiencies

Even if the theoretical productivity benefits of office systems have been calculated on a realistic and far-sighted basis, these benefits will almost never be realised in full by a process of reorganisation. The reason for this is that all organisational structures are inevitably inefficient. For example, people must still be employed to manage functional areas, even if office systems have increased the 'spare time' of these managers by one-third or more. And, even where managerial reorganisation seems possible, fundamental human capabilities will usually limit each manager's span of control to no more than about eight staff.

Equally, if a professional has valuable specialised skills that are not available elsewhere in the organisation, this person will still be employed, regardless of how much effort he or she needs to put into a day's work. If two such professionals were employed, a reduction

to only one key person with these skills will often be regarded as, potentially, leaving the company exposed to significant problems if the individual were to leave, or become ill for a lengthy period.

Many other instances of organisational inefficiency are likely to be encountered by organisations that plan carefully for managerial and professional staff reductions on a significant scale.

5. Changing work patterns

The potential improvements in productivity of managers (and even some professional staff) are not influenced only by their own use of office systems. The use of these systems by less senior staff can lead to a reduced number of junior staff being required and to a shift in work patterns, and hence to managerial and supervisory reorganisations.

SIGNIFICANT POTENTIAL BENEFITS

Despite all these complications and difficulties, however, the potential benefits to be gained by fundamentally reorganising an organisation, so that it employs the optimum number of managers and professionals in an efficient organisational structure, can be very significant indeed. Not only may integrated office systems of all types result directly in a 10 or 15 per cent reduction in the numbers of managers and professionals employed, but the reorganisation planning exercise may well identify many existing inefficiencies. Experiences of fundamental reorganisations, usually necessitated by business crises, suggest that a stringent analysis of essential staff requirements can lead to a reduction of 20 per cent or more in the numbers of middle managers, supervisors, and professional staff.

A very significant 'prize' therefore awaits many of those organisations with the courage to use modern office systems as the key to a carefully planned reorganisation of managerial and professional staff. Indeed, organisations that adopt this approach may be able to avoid many of the traumas associated with forced reorganisations carried out in the short timescales dictated by a sudden business crisis.

None of the organisations that we examined for this report had carried out the fundamental managerial and professional staff reorganisations that would be necessary to realise the full theoretical cost-benefits of their systems. Indeed, most organisations have not attempted to quantify the benefits of office systems, generally treating them as company overheads in much the same way as they treat the telephone service. As a result, staff numbers have not fallen significantly. The vision of the 'electronic office' in which large businesses are run by relatively few staff equipped with sophisticated office systems remains a long way from being realised.

FUTURE DEVELOPMENTS IN THE OFFICE SYSTEMS FIELD

To date, office systems have been viewed in two distinct ways. In the late 1970s and early 1980s, there was a high level of enthusiasm and optimism about the benefits that would result from the widespread use of electronics in the office. More recently, attitudes have changed, and many now regard the future development of office systems with scepticism. Inadequate products, confusion about standards, and uncertainties about how to achieve real benefits have combined to create a pragmatic and reactive environment, where user demands lead to limited installations of office systems. As a consequence, very few organisations have embarked on ambitious office systems programmes.

Despite the current position, we believe that office systems have an important role to play in modern organisations, and that they will be installed in ever-increasing numbers. In this chapter, we look ahead over the next five years to examine the likely developments both in office system products and in the ways they will be installed and used by large organisations.

OFFICE SYSTEM PRODUCTS

The office system products marketplace is characterised by two main trends — the costs of both hardware and (through the use of packages) software are falling rapidly, and new office system facilities are continually being developed.

Falling costs

Hardware costs will continue to fall rapidly over the next five years, leading to dramatic improvements in the power and capacity of microcomputer-based workstations. There are three main underlying hardware cost trends:

—Processor price-performance will continue to improve at a rate of about 35 per cent per annum. This means that between 1985 and 1990, processor price-performance will improve by a factor of about 10.

—Solid-state memory price-performance will continue to improve at a rate of about 40 per cent per annum over the next five years. The implication is that 16-Mbit chips will be available by 1990.

—Rotating magnetic memory price-performance will continue to improve at a rate of about 30 per cent per annum, representing almost a five-fold improvement by 1990.

In terms of office system products, the full cumulative impact of these underlying cost trends can be illustrated by considering the type of microcomputer that is likely to be available in 1990 — a 1-Mbyte, 2-mips device with an 8-Mbyte disc and a local area network interface will cost less than $2,000. A similar order-of-magnitude improvement in hardware price-performance can be expected for other electronics-based office products over the next five years.

Office system software development costs are falling much more slowly than hardware costs. Nevertheless, where large markets exist for particular software packages (including some very sophisticated, integrated ones), they will continue to be offered for less than $1,000. For example, Lotus's Symphony, which is a fully integrated package that enables data to be switched freely between database, spreadsheet and word processing modules, typically costs less than $700 in Europe. However, where the market for office system software products is relatively small (in specialist rather than general-purpose applications), the high costs of software development will inhibit substantial decreases in price.

New office system facilities

New office system facilities are continually being developed and incorporated in new and improved products. Some very significant developments can be expected over the next five years:

—Natural language interfaces to office system products will become generally available (rather than available from only one or two suppliers) by 1986. Numerous other 'user-friendly' interfaces based on artificial intelligence research may also be incorporated into office system products during the next five years.

—Speech recognition, used both for commands and for data/text input, with extensive vocabularies (but

with limited continuous-speech capability), will become commercially available by 1987.

—Devices that can recognise legible handwriting will become commercially available, at the price of the keyboards of today, by 1990.

—More office systems will offer image in addition to text and data.

—Content-addressable rotating memory that can be used for textual databases will become generally available by 1986. These systems, and other developments in information retrieval software, will lead to significant improvements in 'easy-to-use' products that can be used to extract information (data and text) from large (several gigabytes) databases by 1990.

—Greater integration of general-purpose office systems software will become the norm. This development will gradually overcome some of the user-interface problems associated with today's incompatible office system packages, although integration at the data level will take longer to achieve. Early examples that illustrate this trend include Lotus's Symphony, Ashton Tate's Framework and Peachtree Software's Decision Manager.

—Monochrome flat screens will become generally available during 1985 and 1986 as replacements for traditional cathode ray tubes. Full-colour flat screens will begin to appear by about 1990.

—As far as new products are concerned, the current differences between local area networks (LANs) and private automatic branch exchanges (PABXs) will largely have disappeared through a process of integration by 1990.

—Standards issues will become much clearer over this period as supplier, PTT and ISO conflicts are gradually resolved.

In addition, many of the facilities that have been introduced into office systems over the last few years will mature during the next five years. In particular, developments in the user interface both to office systems and, thereby, to data processing systems will be improved significantly. A much clearer position on de facto standards will also reduce the high level of confusion that has characterised the office systems field in recent years.

But these developments in themselves will not overcome the fundamental cost-benefit problems described in Chapter 4. The ways in which office systems are used, rather than equipment costs or the specific facilities provided, will determine the success or failure of office systems in the period to 1990.

THE USE OF OFFICE SYSTEMS

During the next five years, the ways in which office systems are used in large organisations will change significantly. The main reason for this is the growing penetration of terminals in offices.

High terminal penetration

The substantial increases in the numbers of personal microcomputers in offices is now the major driving force behind the introduction of office systems. The rapidly falling costs of these devices in an environment of high, and often hidden, demand for computer facilities means that microcomputers, together with the more traditional data terminals, will achieve a penetration of about one terminal to every two office staff in most large organisations by 1990, or earlier. (This compares with a typical current penetration of about one terminal for every eight or ten office staff.)

Although personal microcomputers will be used initially for only one or two isolated applications, the number and variety of applications is likely to grow once the initial systems have become established. In particular, a high penetration of microcomputers and data terminals will provide a highly fertile environment for the use both of specially designed and general-purpose office systems.

Human factors

So far, the use of terminals in offices has primarily affected clerks, technically oriented professionals, typists and some secretaries. During the next five years, however, many of the new terminal users will be non-technical professionals and managers. These staff could present different and less tractable types of problems from those encountered with less senior or more technically oriented staff. On the other hand, several factors will assist the acceptance of office systems by non-technical staff:

—Office systems and data processing systems are no longer regarded as being totally new or unknown. After all, it is likely that at least one person in ten in the office is already using a terminal of some sort, and many will be using home computers as well.

—The problems associated with traditional data processing (primarily high costs and long system delivery lead times) are encouraging managers to install microcomputers. Indeed, the momentum behind the move to personal microcomputers is being provided both by technical and non-technical managers. If the users have fought to have an office system installed, then their level of motivation to make the system succeed is likely to be very high, whatever the merits of the system.

—Office system suppliers are putting a lot of effort into the development of 'easy-to-use' system interfaces. By the time large numbers of non-technical staff begin to use office systems, products incorporating some very advanced interfaces are likely to be available.

—Many early office systems incorporated quite strong controls on users (for example, by recording how often each user accessed an electronic mail system, and which messages had been read or not read). We believe that, over the next few years, most office system suppliers will be influenced by the early adverse user reaction to these controls, and will modify their products accordingly.

Evolutionary phases of office systems use

We envisage four main phases in the evolutionary use of office systems. In Phase 1, office systems are installed to provide one or two isolated applications, such as spreadsheet routines or word processing, that are used by individuals, rather than by groups of people working together. (Foundation Report No. 43, Managing the Microcomputer in Business, showed that many Foundation members were at this stage by mid-1984.) In Phase 2, further applications are added for individual use, possibly — but not necessarily — in the form of integrated office system packages such as Symphony or Framework. In Phase 3, specially designed office systems for group or departmental applications will be installed to perform specific functional activities, such as those associated with purchasing, sales aids, or an integrated departmental budget-monitoring system.

Finally, in Phase 4, company-wide general-purpose office systems will be added to provide extra facilities for the large base of terminal users. These facilities will typically include a standard user interface to mainstream computer systems, store-and-forward electronic mail, and content-addressable electronic information retrieval facilities.

The four phases in the evolutionary use of office systems are shown in Figure 5.1. Although an orderly progression through each phase is an appealing concept, it is not necessarily the most appropriate route for all, or even most, large organisations. For example, several of the organisations we interviewed for this report had installed corporate electronic mail and electronic information retrieval facilities (which are Phase 4 activities) without having made significant progress with Phase 2 or Phase 3 activities.

Indeed, since different groups of users will adopt office systems at different times, most progressive organisations are likely to have developments in all four phases taking place at any one time. Over the next five years, however, we expect that most large organisations will be moving away from the current environment, which is predominantly Phase 1, towards a much greater proportion of activities in Phases 2, 3 and 4.
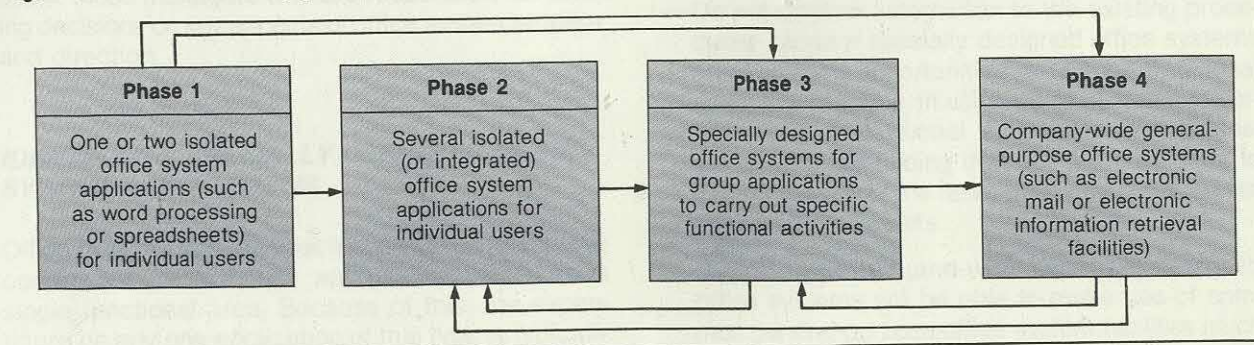
PLANNING THE PHYSICAL OFFICE ENVIRONMENT

The five-fold increase in terminal penetration that we believe will occur in the offices of large organisations over the next five years will lead to cabling and physical environment problems on an unprecedented scale.

The cabling problems will lead to increasing demands for advanced forms of local networks. Towards the end of the 1980s, therefore, the long-predicted 'take-off' of local networks (probably based on a combination of LANs and data-switching PABXs) will begin. The installation of these new networks is, however, likely to lag behind the increase in terminal penetration, since Phase 1 and Phase 2 office system installations will not usually require extensive communications facilities. But as organisations begin to build specially designed group applications and corporate general-purpose office system facilities, a large demand for telecommunication facilities will be experienced.

The high penetration of terminals will also increase the demands made on office planners. Not only must

Figure 5.1   The evolutionary phases in the use of office systems

Phase 1	Phase 2	Phase 3	Phase 4
One or two isolated office system applications (such as word processing or spreadsheets) for individual users	Several isolated (or integrated) office system applications for individual users	Specially designed office systems for group applications to carry out specific functional activities	Company-wide general-purpose office systems (such as electronic mail or electronic information retrieval facilities)

the working environment be created in such a way as to conform with health guidelines on the use of visual displays, but the associated wiring to each desk must also be catered for. In the United States, there is already evidence of an increased interest in the physical consequences of high terminal penetration, particularly amongst those large organisations that already have more than one terminal to every five staff.

JUSTIFYING OFFICE SYSTEMS

There is no evidence from our research to suggest that the justifications given for installing general-purpose office systems will in future become any more firm or quantified. Indeed, the falling costs of office systems in real terms may accelerate the trend towards accepting qualitative justifications for many office systems, rather than attempting to quantify the benefits. In some specially designed office system applications, however, cost-benefits are likely to be measured and achieved. This is particularly likely for strategically important office systems, which will become increasingly important over the next five years.

During this period, most organisations are unlikely to make fundamental changes in managerial and professional organisation, although a small number of pioneers will reorganise as a result of introducing office systems. Some of these will encounter major resistance from the managers and professionals concerned and will scale down or abandon their efforts. But a few will succeed and achieve major efficiency benefits. If these successes occur during the next year or two, and if they are well publicised, a relatively large number of companies may be encouraged to adopt this approach by 1990. If this does not happen, the general realisation of the highly efficient 'electronic office' concept will be delayed even further.

Several fundamentally important issues need to be considered when an organisation is formulating its strategy for office systems. The most important are:

—To formulate policies for information storage, processing and communications. Without clear guidelines about what types of information will be stored or processed (either locally or centrally), and without a clear communications framework, office system installations are likely to be piecemeal and subject to multiple changes. These policies are often closely associated with a shortlist of approved suppliers.

—To understand clearly the respective roles of office system users, user support groups, and central service providers. (For example, will users be allowed to modify standard general-purpose office systems? If so, when? If not, who will develop the specially designed office systems?)

—To determine whether office systems will be strictly controlled and implemented only where clear and quantified benefits exist; whether these systems will be allowed to spread within certain controlling guidelines; or whether implementation will form part of a detailed plan to achieve real benefits.

—To determine whether different approaches should be taken when investigating, justifying and installing different types of office system (namely, specially designed office systems to improve operational performance, strategically important office systems and general-purpose office systems).

In this final chapter of the report we concentrate on the last of these issues, and present guidelines to assist those managers who are responsible for making decisions on key aspects of office system strategy and direction.

IDENTIFYING SPECIALLY DESIGNED OFFICE SYSTEM APPLICATIONS

Office systems that are specially designed to improve operational performance are usually limited to a single functional area. Because of this, the expenditure on any one application of this type is typically modest, and the associated benefits are often identified quite clearly, if not always quantified.

The most important applications of this type can best be identified by using a methodology which concentrates on key business objectives and the activities associated with achieving those objectives. But the danger in using any such methodology is that the investigation can become overwhelmed by excessive detail, and the needs of key functional areas can be obscured as a result. The benefits of office systems designed to improve operational performance are usually modest, thus complex and inherently expensive investigation methodologies cannot be justified. (The outline of an appropriate methodology, used by Butler Cox in some of its consultancy work, is given in Foundation Report No. 29 on page 23.)

When investigating specially designed office system applications, four key areas need to be explored:

—Look for quantifiable benefits, especially from the early applications, to create a successful atmosphere and retain senior management support. Generally speaking, quantifiable benefits are easier to identify and achieve when installing specially designed office systems than when installing general-purpose systems.

—Use modern system development tools, and combinations of office systems and mainstream computer systems, where appropriate. The boundary between traditional data processing systems and office systems is fast disappearing, and there is every reason to use the best features of each type of system to produce the best overall solution.

—Do not confine automation to the existing procedures. Modern specially designed office systems often present opportunities to change traditional roles. For example, in using office systems to perform their professional activities, many professional staff are finding that it is more efficient to carry out some of the tasks traditionally carried out by clerks and typists.

—Examine whether (and when) specially designed office systems will be able to make use of common general-purpose office system facilities (such

as electronic mail) rather than installing specially designed applications on a piecemeal basis.

IDENTIFYING STRATEGICALLY IMPORTANT OFFICE SYSTEM APPLICATIONS

Compared with the potentially large number of specially designed office systems, the number of strategically important ones is very small. For any one type of organisation, there will be typically only a few strategically important office system applications. Identifying these applications is of crucial importance, because they will determine which companies succeed and which fail.

Alternatively, one or two organisations in each business sector may use office systems (and mainstream computer systems) to create a progressive image and to provide high levels of service. In this way, the use of information technology may become strategically important for other companies in the same sector, even though no one application by itself is particularly significant.

Because of the need to identify strategically important applications at an early stage, an investigative approach that is both imaginative and practical is required. In essence, a methodology that focuses on applications that will impact the organisation's 'customers' is the most appropriate choice. Although investigations of such applications can be carried out quite quickly, the potential importance of the applications is such that detailed follow-up trials are often required to confirm that strategic benefits can be achieved in real life. This situation is usually complicated by the need to retain maximum confidentiality, so as to minimise the value of any information that may be obtained by a competitor.

In formulating an approach for the strategic use of office systems, an organisation must decide whether to adopt a 'technology-leader' role, a 'technology-follower' role, or some pragmatic combination of the two. Technology-leader organisations are those that plan to be the first to use office systems that potentially affect customers. Technology-follower organisations do not pioneer these applications, but monitor the activities of the technology leader and plan their own installations in the light of the lessons learnt.

Clearly, technology leaders need to track technological developments much more closely, and from an earlier stage, than technology followers. This means that technology leaders will have to invest in the technical and marketing expertise necessary to identify worthwhile technologies and applications. Technology followers also have to invest in this expertise if they are to evaluate correctly the potential for each relevant office system application, but the investment required is likely to be much lower. .

The maturity of different types of office systems technology is an important consideration both for technology leaders and technology followers. If the technology is not yet fully developed, problems of equipment reliability and functionality are likely to be experienced. On the other hand, if the technology is mature, the 'window of opportunity' during which technology leaders can make innovative moves will have been missed, because other organisations may well have installed (or be about to install) similar applications.

A window of opportunity also exists for technology followers. During this period, they can monitor the trials of the would-be technology leader and react rapidly if new applications threaten their business position. By doing so, the technology follower can try to minimise the benefits of the applications to the technology leader and may even overtake the leader in terms of the impact made on customers.

Technological maturity, however, is not the only important factor to consider when pursuing an apparently worthwhile sales-oriented or marketing-oriented application. The readiness of customers to accept technological changes is also a key consideration. This level of acceptance will vary between industries and between different technologies.

The most important quality necessary in any team of people who have to decide on the strategic use of office systems is an ability to assess technological maturity and the optimum timing of any innovative technology-based moves that affect customers. Indeed, if a would-be technology leader gets either of these factors wrong, an opportunity may well exist for a technology follower to learn from the mistakes made, and so take a decisive initiative.

PLANNING FOR GENERAL-PURPOSE OFFICE SYSTEMS

The widespread use of general-purpose office systems is difficult to cost-justify. However, systems of this type can provide the basis for a fundamental rationalisation programme aimed at both achieving the theoretical benefits of office systems and eliminating long-established inefficiencies.

To achieve these changes, organisations must investigate and plan not only for individual office system applications but also for a fundamental reorganisation of company structures. The methodology that is best suited to these objectives is based on a detailed activity analysis of managers, professionals and support staff, leading to a reorganisation plan. This plan should concentrate on reductions in the numbers of managers and professionals and the resulting reorganisation of work procedures and responsibilities over a three- to five-year period. The plan should

be reviewed and updated annually to make allowances for achievements during the previous year and any important changes in the organisational environment. (Some of the most advanced activity analysis methodologies have been developed and used by the Omni Group in the United States.)

When installing general-purpose office systems as part of an overall rationalisation plan, a pragmatic approach can be used to overcome many of the problems that have been experienced in the past. We recommend the following guidelines:

—Install at an early stage obvious applications (such as word processing) and simple specially designed office systems for use by professionals, in order to obtain early cost-benefits, gain experience and increase terminal penetration, thereby minimising critical-mass problems.

—Encourage the use of multifunction devices, such as personal microcomputers, within guidelines designed to avoid the use of incompatible products. This approach will both increase the level of user understanding of office systems and increase terminal penetration (so minimising possible critical-mass problems).

—Build up an early infrastructure of multifunction devices for secretaries and typists, so that all important documents that may need to be referred to in future are captured in electronic form. This approach can often be cost-justified, at least in part, by reductions in the workload on centralised typing facilities. Although only the word processing facilities may be used initially, the multifunction devices will allow other office systems, such as electronic mail and electronic information retrieval facilities, to be added later without major equipment changes. This approach also will increase terminal penetration, so helping to minimise critical-mass problems.

—Establish common systems before they are needed, to avoid delays and user frustration later on. For instance, inter-site electronic mail facilities, communication interfaces and links to telex, teletex and phototypesetters can all be installed at a very early stage. Some facilities, such as a standard user interface to computer systems, local networks, interpersonal electronic mail and information retrieval facilities, can logically be installed later, but should, nevertheless, be tested and ready for installation as soon as there is a critical mass of potential users.

—When planning installations that require a critical mass of users (such as electronic mail and messaging systems), make use of the existing terminal base by installing these facilities first for existing terminal users; and identify groups of staff who share common information sources and regularly communicate with each other.

—Phase the office system installations to match technological developments. This approach will minimise the likelihood of using underdeveloped or inappropriate technology in trying to achieve desired objectives. For example, the use of microform technology together with electronic information storage in an attempt to eliminate paper from an office environment is likely to be inappropriate and frustrating to use.

—Carry out the rationalisation plan gradually in the form of logical reorganisational steps. This approach should, as far as possible, allow relevant office systems to become established before each reorganisation takes place. Personnel motivation is a key ingredient in these reorganisations, particularly at management levels. For example, if the manager in a department has been promoted as a result of the rationalisation, he or she will usually be highly motivated to make the reorganisation work once new work-patterns have become established. Step-by-step reorganisations also hold the promise of providing an ongoing source of cost-justification, so minimising the cumulative costs of the total office systems programme at any particular time.

Organisations that carefully plan to realise benefits from all types of office systems are much more likely to achieve success than organisations that rely only on guidelines to implement office systems, with little emphasis on real benefits.

SUMMARY OF THE KEY ISSUES

The use of office systems is now well enough established for Foundation members to have a clear understanding of the key issues that will influence this field over the next few years.

Specially designed office systems will be used on an application-by-application basis, with modest cost savings or other benefits being achieved.

A limited number of strategically important office systems will be installed, mainly by companies in highly competitive markets, where these systems will be an important factor in determining which companies succeed and which ones fail.

General-purpose office systems, such as word processing, electronic mail, and electronic information storage and retrieval will become widely used over the next five years, providing additional facilities to a large installed base of personal microcomputers and data terminals. Most of these systems will not be cost-justified but will be regarded as organisational overheads, like telephone systems are today. As the costs of office systems fall in real terms, this

approach will become progressively more attractive and, in reality, it is an obvious 'easy option' that avoids the difficulties associated with achieving quantifiable benefits.

In our view, this approach is misguided. Although the costs even of large office system installations will not be very significant in terms of the total annual expenditure incurred by large organisations, the 'easy option' approach is very short-sighted. In the medium term, competitive pressures from those companies that have achieved major rationalisation using office systems, or from government financial constraints, will often lead to hasty and ill-considered expenditure cuts and organisational changes.

Office systems have now reached a level of both technological and price maturity where realistic plans can be made to exploit their real potential. The key to this potential lies in a fundamental change in the way work is done in offices. To achieve this change, organisations must investigate and plan not only for individual office system applications but also for a fundamental reorganisation of company structures.

In particular, detailed plans must be made to reduce the numbers of managers and professionals and to reorganise work procedures and responsibilities over a three- to five-year period.

By adopting this radical approach, organisations will be able to realise many of the theoretical benefits of an electronic office environment in a controlled way, and at a pace that will avoid most of the traumas associated with rapid change. A reduction of more than 20 per cent in managerial and professional costs will be possible for most large organisations that adopt this approach.

The next five years is a crucial period in the office systems field. Between now and 1990, most organisations will 'drift' towards the widespread use of office systems, relying on a few rules and guidelines to control the installations. But some organisations will investigate and clearly identify key opportunities, and set out boldly to achieve major benefits. Each organisation must choose for itself which approach to follow.

The nine case histories reported in this appendix have been chosen, from the 25 interviews carried out during our research, to illustrate the approaches adopted by some leading users of office systems, both in the United States and in Europe. In carrying out the interviews for these case histories, we used a standard questionnaire guide that included questions on:

— The organisation, its business, the number of employees, and the level of use of information technology.

— The office systems hardware and software being used.

— The users of office systems by type of staff (such as executives, managers, professionals or secretaries).

— The applications for which office systems were being used.

— The reasons for installing office systems.

— Cost-justification and qualitative justification.

— The benefits achieved from office systems.

— Organisational or job changes resulting from office system installations.

— Training and education efforts.

— Problems experienced.

— Office systems strategy.

— Future office system plans, and any constraints on these plans.

— Future plans for organisational change.

In preparing the case histories, we have focused on the use of office systems by managers and professionals and have noted the important messages emerging from each organisation's experiences with these systems. Comments on the impact of office systems on organisational structures have been included, even where the interviewee did not consider this to be significant.

In terms of equipment installed, the scale of office systems in the United States case histories is much larger than those found in the European case histories. This difference reflects the much greater use that is being made of office systems by some organisations in that country. Our research indicates, however, that the types of application being used, and the level of understanding about office systems, are not as advanced in the United States as the difference in the sizes of office system installation might suggest. Indeed, some of the most clear-sighted and knowledgeable comments made during our research came from European managers, rather than from their American counterparts.

AT&T COMMUNICATIONS

This case history highlights some of the difficulties that can be experienced as office systems become widespread and user demands for more facilities increase.

In the United States, AT&T Communications is the AT&T company that handles the supply and sales of long distance international communications services. The company employs more than 100,000 people, some 40,000 of whom are office staff. As is usual with an organisation of this size, it has many computers at various locations, including seven major data centres with large IBM or Amdahl mainframes, 14 DEC VAX 780 machines and over 2,000 microcomputers.

Electronic messaging system

The largest office system application is electronic messaging, for which more than 8,000 terminals are connected on a dial-up basis to an electronic messaging store-and-forward system based on the VAX 780s. About 90 per cent of the electronic message system users are middle managers and professionals (excluding engineers, technicians and supervisors). Of these, more than half are marketing managers and sales staff. This group also constitutes the majority of the 1,000-plus home or portable terminal users of the service.

The sales and marketing staff make extensive use of electronic messaging to improve communications across different time zones and widespread geogra-

phic locations. For example, new product or price announcements and monthly revenue and variance reporting are often sent via electronic messaging. The marketing department was the main advocate of the system in the early days when it was not easy to cost-justify its use. By identifying qualitative benefits, by being prepared to pay for the service, and by pressing hard for its introduction, the marketing department was the driving force behind this very widespread electronic messaging system (which was due to expand to 22,000 users by the end of 1984).

Benefits identified

The qualitative benefits that were identified during appraisal of the system included:

—A reduction in 'telephone tag', the familiar situation where about three out of every four telephone calls failed to reach the intended recipient, who then called back only to find that the original caller was unavailable, and so on.

—The removal of excuses for inaction either because of an inability to contact a person, or of not having received a message. The system reports the receipt of a message, and this factor alone has 'sharpened up' the sales environment.

—Earlier access to information by managers (particularly if they can access the system from home). Managers now have better control because they can sometimes intervene before actions are carried out, rather than complaining afterwards. This is particularly important in the sales area, where special deals often are negotiated with large customers.

—The development of a less formal communications culture. The electronic messaging system saves time when compared with the formality that had become accepted for letters and memos. (A cryptic note is acceptable when sent via electronic messaging, whereas a letter is often sent back to the typist if one or two words are misspelt.)

—A reduction in the number of telephone interruptions. Marketing and sales managers can now deal with their mail at a convenient time. This leads to a significant improvement in time management.

Although the telephone is still the dominant form of communication within AT&T, electronic messaging has become established as the norm for sending short messages that do not require an immediate reply; and also for distributing the same message to several people (for example, to sales staff who are at different locations).

Training and support

A central group of 25 staff has been established to provide training and to develop and administer the electronic messaging system. In addition, user-coordinators have been set up in each of the major user departments (or regions) to provide an ongoing interface between users and the central group. Formal training seminars last half a day and are modular in nature, so that specific requirements for electronic messaging, text editing and other features can be tailored to individual requirements. Videotape is used extensively during this training as well as hands-on experience. Experiments with interactive videodisc training are being carried out.

The early electronic messaging users required considerably more training and encouragement than more recent users. This change is due to the pressure now being exerted on individuals to use the system. As a result, the percentage of infrequent users of the system is now much smaller (less than 10 per cent). The elimination of terminal sharing has also contributed to this improvement.

Problems encountered

The major problem experienced in setting up the electronic messaging system related to the control of user demand once the system had become accepted as a common form of communication. In particular, potential users were obtaining microcomputers and then demanding immediate access to the electronic messaging system. Compatibility became a major strategic problem. In addition, as the number of electronic messaging users increased (and continues to increase rapidly, from 8,000 to 22,000 this year), the demands for a continually improving service have been difficult to meet. Limitations in the text editing facilities on the system have also led to complaints.

The approach adopted is for word processing facilities to be provided on local personal computers or word processors, rather than by the VAX-based electronic mail system. This means that many current users will not have word processing facilities until their regular terminals can be upgraded to personal computers. As this happens, AT&T has recognised the need to tailor applications to meet individual user and user-group requirements, in addition to providing general-purpose facilities such as electronic messaging.

Future developments

Future plans for office systems in AT&T Communications include:

—A one-to-one ratio of terminals to managers and professionals.

—A move away from regular terminals towards microcomputers that provide local processing facilities as well as access to the central electronic messaging systems.

—Use of artificial intelligence techniques both to improve the user interface to office systems and to make the systems more proactive, rather than reactive.

—Further development in business graphics facilities.

—Local slide production and presentation facilities based on personal computers.

All these developments will take place under the overall umbrella of a Unix environment.

Organisational impact

Other than changes in secretarial and typing support, there has so far been no significant organisational change in AT&T Communications as a result of the introduction of office systems.

STANDARD OIL

This case history shows how a major oil company has installed general-purpose office systems, such as information retrieval and electronic messaging, both for established terminal users and for first-time terminal users.

Standard Oil (Amoco) is one of the big international oil companies, employing some 44,000 employees in the United States. The company uses a large and sophisticated range of IBM-compatible computers, including two Amdahl 5680 mainframes, two IBM 3083 machines and two IBM 3033 computers. These machines, and many other smaller computers, which are located at different sites in the United States, are linked together by an SNA network using IBM 3704 and 3705 controllers.

Profs system installed

The company has been using a forerunner of the IBM Profs system in its production research facility in Tulsa since 1977. Until 1981, members of the research staff worked with IBM on the early development of the system, but they now use a slightly modified form of Profs. By mid-1984, there were more than 2,000 users of the system, only 10 per cent of whom had to share a terminal. The users are located at five main sites in the United States, and communication facilities have been established for all authorised users working under VM/CMS on the SNA network. Displaywriters in two word processing centres are also linked into the Profs system to make large documents available to users.

This substantial Profs installation was achieved in two ways:

—By providing Profs facilities (document creation, electronic mail, keyword-based information re-

trieval, calendars, telephone directories, and short message facilities) to existing terminal users. The majority (about 80 per cent) of the users fall into this category.

—By providing Profs facilities to users in specific areas who had not previously used terminals, but who would benefit from the general-purpose facilities. The remainder of the users fall into this category.

The main approach used was to select business areas which corresponded to one or the other of these two categories, and where a relatively senior manager was identified as a 'technology champion'. Using this high-level supporter, the installation process in most cases proceeded smoothly. A clear tendency for 'downward migration' of technological enthusiasm was observed.

Profs users are mainly professional staff (about 60 per cent of the total), with secretarial assistants making up most of the remainder. A small number of middle and senior managers also use the system. Most of the professional users also employ end-user computing facilities on one or more of the mainframe computers. Report generation, financial modelling and spreadsheets are the most frequently used end-user computing facilities.

Training and support

Before a new user is provided with Profs facilities, he or she attends two half-day in-house introductory training courses. Advanced training courses for specific applications are then arranged as necessary. Classroom training sessions and self-study manuals are now being supplemented by an experimental computer-based training facility. Three staff at the Chicago headquarters carry out Profs training, and there is also one trainer available at each of the four largest sites where Profs is used. Six technical staff work on user support and technical enhancements for the system.

Benefits identified

Standard Oil used outside consultants to evaluate the benefits of its Profs installation. The overall findings were that the cost-savings that could be identified (due to staff savings, the ability to cope with an increased workload, and other financial savings) were about equal to the costs of the Profs system. This justification was helped by the fact that, in many cases, the existing 3270-type terminals had already been justified for specific computing applications.

Qualitative benefits were also recognised by many users. These benefits included a reduction in the time required to complete specific projects, an improvement in the quality of written output, an improvement

in the response time to senior management requests, and a decrease in the number of interruptions during the working day.

In some areas, specific and very important qualitative benefits have been achieved. For example, in 1981 Profs facilities were installed in the Public and Government Affairs Department's offices at the Chicago headquarters and eight main field locations in the United States. One of this department's key activities is to gather information, evaluate it and provide a corporate response to questions from the media or legislative bodies. By using Profs, the staff are now able to record responses that can then be accessed by other company locations. In this way, the likelihood of different responses being given to the same question can be reduced significantly. This is particularly important because conflicting answers can create problems out of all proportion to the importance of the original question.

Problems encountered

The Profs installation has had a very high level of acceptance amongst the users. This may be due to the technically experienced user-base, or it may be due to the 'top-down commitment' approach. Both factors probably had a positive impact. The major problem experienced was a lack of enthusiasm among some senior managers for technological developments that did not have a clearly quantified financial pay-off. Another area of concern was doubt about IBM's long-term commitment to Profs. This worry has been reduced by IBM's moves to incorporate Profs in its strategic DIA/DCA architecture.

Future developments

Between 80 and 90 per cent of the electronic mail traffic is between users within the same department or working group, and usually these are on the same site. For this reason, Standard Oil plans to install local area networks with gateways to the inter-site SNA network. This will reduce significantly the volume of wide-area traffic that is currently associated with the Profs electronic mail system (the mainframe is often at a remote location). The company is also carrying out trials by linking Wang office systems into the Profs system. New users are expected to be added at the rate of about 10 per cent of the existing user base each year.

Organisational impact

By mid-1984, Standard Oil had not experienced any significant organisational change as a result of its Profs installation. A reduction in the number (and proportion) of middle managers in the corporation is expected, however, as developments are consolidated over the next few years.

A MULTINATIONAL PHARMACEUTICALS COMPANY

This case history shows how readily a voice-messaging system can be adopted by users who have a real requirement that is met by the system.

A large multinational pharmaceuticals company based in the United States employs some 2,500 office staff at its head office. The penetration of terminals in the head office is modest, consisting of some 400 data processing terminals and about 30 word processors. The major office system application has been the use of a VMX store-and-forward voice-messaging system which is used to improve communications with the sales force.

VMX voice-messaging system installed

The VMX system currently is used by over 1,000 staff, about 800 of whom are in the salesforce or salesforce management. The main rationale for this system is that it enables a consistent message to be delivered quickly to a widely dispersed sales organisation, in an environment where time zones can leave a narrow time-window during which communication is possible (and socially acceptable). Voice messaging has been found to work very well for the sales and marketing functions.

Benefits identified

When the VMX system was first installed in 1981, the savings due to its introduction were evaluated. This study showed significant reductions in sales-related telephone costs, and the number of meetings was also reduced. Since then, no further evaluation has been carried out because the system has become accepted as an effective communications tool.

As the use of the system has matured, several unforeseen benefits have emerged. For example, sales staff can no longer claim that they have not received a message, because the receipt is logged by the VMX system. This has led to a much more responsive mood in the sales force generally. Also, the relative informality of the medium has reduced the need for formal correspondence, and sales staff queries can be handled in a much shorter time. The main limitation of the system is that voice is not a suitable medium for communicating detailed or complex information.

Training

The price of the VMX system (about $300 per user) was considered insignificant when compared with the total cost of the selling function. Training costs also were very low (consisting only of the supplier's standard training). As the use of the system became universal amongst the salesforce, there was a con-

siderable incentive to learn how to use it, and no major user-acceptance problem was experienced.

Future developments

Further improvements in salesforce communications are currently being examined. These studies centre on terminal communications (either portable or home-based) so that the salesperson can at any time interrogate customer or product information bases. This type of facility will also allow answers to urgent queries from doctors (for example, on product safety) to be communicated much more quickly.

The system has been so successful in salesforce applications that the company plans within the next two years to extend the voice-mail facility to all its office staff.

Organisational impact

In summary, the VMX system has been adopted by the sales force with remarkably few problems and has become one of the major tools for communication between the sales force, sales management and head office staff. No organisational change has been made as a result of installing the voice-messaging system.

MANUFACTURERS HANOVER TRUST

This case history illustrates how one large American bank has built electronic messaging and decision support facilities on an established (and growing) base of terminal users.

Manufacturers Hanover Trust (MHT) has some 30,000 employees, 10,000 of whom are professional, front-office staff. At the company's headquarters there are a large number of IBM mainframe computers, including eight 308X machines and many 4300s. In addition, the retail banking operations make extensive use of NCR machines. About 6,000 of the professional population at corporate headquarters have access to the 4,000 terminals that have been installed.

Mainstream computer developments are provided through four independent data processing divisions serving respectively retail banking, wholesale banking, securities and corporate departments. In addition, there are four centralised technology-related divisions that serve the whole of MHT. These divisions are telecommunications, standards (for systems development), architecture and technical staff services (which deals with office automation, decision support and administrative services).

Various office systems installed

The major office systems at MHT are electronic messaging, word processing and timesharing decision support systems. The Multi-Comet electronic messaging system has 5,000 managerial and professional users worldwide (the vast majority of whom are in the United States) and operates via dial-up lines to three PDP 11/70 minicomputers, one of which acts as a standby machine. About two-thirds of the electronic messaging users also use their terminal for some other purpose (mainly decision support or word processing).

There are also approximately 1,000 word processing workstations attached to Wang OIS or VS machines, used mainly by typists and secretaries. (Historically, a 20 per cent productivity increase was achieved by the introduction of word processing.)

In addition, about 1,200 managers and professional staff access decision support facilities provided by three DEC System 20/60 machines. These facilities include financial analysis and modelling, database access and report generation facilities. Some 600 personal computers are also installed, and these are used mainly for running word processing and spreadsheet packages and for accessing electronic messaging and selected other services (such as word processing and decision support) through a proprietary MHT wide-area network called Geonet. Geonet links MHT operations in 16 countries, using packet-switching technology to support both voice and data communications.

The use of end-user computing facilities as an alternative to traditional system development is also quite advanced at MHT, where more than 1,000 users have each developed at least one program using Basic, APL or Focus. Typically, these users are financial analysts, economists and credit officers.

Electronic messaging

Electronic messaging started in late-1979 with a small pilot system of six users within the office automation group. They chose the Comet electronic messaging service at the time because of its ease of use and low entry costs. (See Foundation Report No. 17, Electronic Mail, for a description of Comet.) The pilot system was expanded quickly to a selected group of 30 users at three management levels located in different offices across New York City. For this technology-oriented group, the 30 users represented a critical mass and the system was readily adopted. There was a low drop-out rate even at this early stage, due largely to peer pressure to use the system.

This type of exercise was then repeated using another group of amenable users, again aiming at person-to-person communication for a critical mass of professionals in a working group. By selecting critical-mass groups in this way, the office automation team was able to expand the system in discrete stages before beginning to link the individual groups together to

form a critical mass for the use of electronic messaging by the whole organisation. (Groups who worked together but were separated geographically or by time zones, such as newly formed task forces, typically were selected first.)

By late-1980 more than 500 staff were using the electronic messaging system. The corporate critical mass was reached early in 1981 with about 600 or 700 users. This milestone was recognised by the sudden and heavy 'me too' user demand that was experienced. The demand to use the system was so heavy that it persisted even though the cost of the service was charged back to users, unlike other data processing services, which are treated as corporate overheads.

By mid-1984 more than 5,000 people were using the electronic messaging service (20 per cent of whom were using portable terminals). Some 4,000 users make regular use of the system, logging on twice a day on average for a total of seven minutes, and each sending about seven messages per day. Each message is sent on average to 2.7 people.

The electronic messaging culture at MHT has built up around short, often cryptic messages that are sent as frequently to colleagues within the same building as to colleagues at remote locations. Staff now often resent receiving telephone calls that are not urgent and could have been sent by electronic mail — they have started telling the callers so, thereby reinforcing the new culture. (This phenomenon became widespread at about 2,000 users.)

Benefits of electronic messaging
Early attempts to quantify the benefits of electronic messaging concentrated on asking users how much time (if any) the service saved them. The results showed that the average estimated time-saving was 37 minutes per day per user. This exercise was discontinued because it was overwhelmed by the rapidly expanding user demands. By 1984, the electronic messaging service was regarded as a valuable mode of communication, and qualitative benefits have become by far the most important. These benefits include:

—A reduction in telephone interruptions, leading to more effective work management.

—A reduction in the time wasted because of 'telephone tag'.

—A reduction in the time required to type and check formal internal correspondence. (Electronic messages are usually short and often grammatically incorrect. They are accepted, nevertheless, in a way that an incorrect memo or letter would not be.) MHT estimates that the amount of typing done by secretaries fell by as much as 50 per cent in

some areas as a direct result of the introduction of electronic messaging.

Problems of electronic messaging
The problems associated with the introduction of electronic messaging included:

—There were fears about the security of the Comet bureau service that was initially used. (Comet served many other companies, including competitors, and there was a fear of a security leak — though such a leak was never detected.)

—About $500,000 was spent on the system before formal management approval was obtained. (An "easy thing to do" once demand built up.)

—There were a few drop-outs from the system (five per cent of the total). This was particularly noticeable as the early expansion in numbers (200 to 500 users) began to take place.

—A capacity problem was experienced in late 1983 when another PDP machine had to be installed to meet demand.

—Small pockets of non-standard electronic mail services have developed as non-standard office products have been purchased locally.

Support team
The support team dealing with electronic mail and decision support consists of only five staff. This low level has been maintained by setting Multi-Comet as the corporate electronic mail standard and supporting only DEC, IBM and Wang devices on the system. If users purchase other products, they have to arrange for an interface both to Multi-Comet and to the decision support systems.

Future developments
Several changes are being planned for the future, including:

—Promoting the IBM PC as the first-choice terminal. This will allow the office automation group (and the users) to tailor applications to meet individual or group needs.

—Improvements in the business graphics available on the decision support service.

—Use of in-house videotex to provide a 'bulletin-board' for in-house publishing. This will be accessed both through existing and new terminals.

—Possible developments in image storage and video conferencing.

The continuing expansion of IT installations (as described above) could, however, be inhibited by two main factors:

—Technical integration problems caused by an inability to assimilate new technological changes into existing services.

—Delays in resolving the arguments in favour of central control versus those of free innovation by users. The signs are that the controls will be guidelines rather than detailed constraints, and that MHT will continue to be a pioneer.

Organisational impact

In terms of the impact on the organisational structure, the widespread use of office systems at MHT has not led to significant changes. Other than changes in the organisation of secretarial and typing support, no organisational change in user areas has been attributed to the use of office systems.

ABBEY LIFE

This case history illustrates how an office system, based on portable computers, can be used to complement a mainstream business application based on a mainframe computer.

Abbey Life, a subsidiary of ITT, was formed in 1962 and has since become one of the top ten life assurance companies in the United Kingdom, while remaining a relatively small company with about 4,000 employees. The company's main activities are life assurance and pensions.

A major element in the company's success has been the introduction of unit-linked assurance (life assurance combined with long-term investment funds), a strategy which has been adopted both by more established competitors and by the 20 to 30 assurance companies formed in the United Kingdom during the last 20 years.

A high proportion of Abbey Life's employees (more than 60 per cent) are field staff, with nearly 2,000 being insurance sales staff (called associates). This high proportion of direct selling staff reflects the importance of the selling activity to the company. The main task of the sales staff is to generate new business — only 25 per cent of sales are made to existing clients. The insurance products sold are highly specialised and quite complex. Organisationally, the sales staff are controlled through local branches.

Abbey Life also sells its services through some 1,500 independent brokers in the United Kingdom. These brokers can select from services provided by several insurance companies.

Sales support systems developed

Until 1980, sales information was processed manually. Central computing facilities handled administrative routines, but the majority of procedures at the branches were based on forms and card indexes. Time delays of up to five weeks in processing new policies were normal, with a consequent impact both on management information and control, and on the service to customers. As a consequence, Abbey Life decided to introduce new systems, and the following requirements were established to overcome the problems associated with the manual systems:

—Systems must have capacity for growth and change without organisational expansion.

—More effective management control through improved information flow must be achieved.

—Once-only input and easy access to data are essential.

—An improved service to customers, in terms of both timing and quality of information, must be provided.

Since 1980, two systems (known as Aladin and Lamp) have been developed for use in sales to meet these requirements.

The Aladin system

Aladin (Abbey Life assurance distribution information network) is a mainframe system based on an IBM 3083 and 200 dumb terminals located in the head office in Bournemouth and at 270 branch offices in the United Kingdom. The extensive facilities provided by the system include:

—Customer quotations for different policies.

—Underwriting enquiries (including a special branch enquiry facility for non-standard underwriting risks).

—New policy details.

—Policy surrender details.

—Identification of servicing (repeat) opportunities (such as renewal on the maturity dates of policies).

—Existing policy details (enquiry facilities).

—Details of funds.

—Interface with the billing systems.

—Sales management information which can be analysed by various factors, including product, salesman, branch, and type of customer.

The system is very large and quite complex, with extensive on-line checks and editing facilities. It handles approximately 15,000 new business policies every 20 days, with enquiries for quotations amounting to several times this figure.

The system has proved to be very successful. Since its introduction the company has handled 25 per cent more business without any need to increase head-

quarters staff. A two-day service standard has been introduced, with 75 per cent of business being turned round on the same day (and 90 per cent within two days). The quality of management information has also improved, allowing improved management control.

The Lamp system

The 'Lamp' (life assurance marketing package) system is a stand-alone, portable-microcomputer application based on Epson HX20 devices and specially developed software. The objectives for this application were:

— To complement the information facilities of Aladin, with information produced immediately for the customer.

— To enhance both the status of the sales staff (associates) and their sales presentation to customers.

— To reduce possible errors in calculations provided by associates when making a sales presentation.

— To provide updated product information quickly to sales staff.

A range of programs was developed, covering both 'concept' programs (for example, life cover plans and capital insurance plans) and product quotations (for life, mortgage with life, pensions, etc.). These were tailored so that they provided back-up to the sales presentation as well as hard-copy output tailored for each customer's insurance requirements. They were intended to demonstrate to potential customers the benefits of insurance matched to the individual's requirements.

The cost of development was met by the company. However, the associates themselves were expected to buy the briefcase terminal from the company (at a slight discount from list price). The application was launched with a short video presentation (which was distributed to the branches). More than 25 per cent of the sales staff have bought a microcomputer in the two years since it was introduced. The training needed was minimal. Update information is provided on cassettes when required, and this information is totally compatible with the Aladin system. No organisational change resulted from the use of the Lamp system.

The company's management considers that the introduction of portable terminals has provided a successful presentation aid for sales staff. The results, in terms of new business, have been encouraging.

Future developments

There is still considerable scope for expanding the Abbey Life systems, however, particularly by linking portable terminals to the mainframe and thereby permitting two-way information flow of policy details, quotations and enquiries.

A SENIOR MANAGEMENT OFFICE SYSTEM PILOT TRIAL

This case history is a composite of two organisations we studied during the research for this report. It is presented anonymously so as not to embarrass the organisations concerned, and it highlights some of the dangers associated with installing office systems for use by senior managers. For this reason some of the details have been changed, and the experiences of other organisations we have researched during the past few months have also been incorporated.

In late 1982, the data processing department of this medium-sized organisation in the United Kingdom put forward a proposal to its computer steering committee to carry out an office automation pilot trial. After several months of discussing various alternatives, it was agreed that the facilities provided should be based on 12 multifunction terminals linked by a local area network with the potential to connect into the company's mainframe computer. It was also agreed that six senior managers and their secretaries should take part in the first pilot trial. The equipment chosen was, at the time, one of the leading products on the market. The system facilities included:

— Electronic mail.

— Word processing.

— Electronic diary and appointments scheduling.

— Access to the telex system.

— An electronic spreadsheet.

— Access to the mainframe computer using an enquiry language.

The six senior managers who took part in the pilot trial were selected for two main reasons. First, they were eager to take part (in contrast to some other senior managers who were sceptical). Second, it was believed that a successful pilot trial at a senior level would make subsequent installations more acceptable to all managers who would then understand the issues more clearly. This 'top-down' strategy was seen as the key to a successful step-by-step approach to the 'electronic office of the future'.

No formal justification exercise was carried out and no organisational change was made, but the data processing manager expected that a saving in managers' time of at least 10 per cent would be possible. This saving would be reflected in the managers having more time to make important decisions, so improving the overall 'quality' of managerial performance. The views of those taking part in the pilot

trial would be obtained by carrying out interviews with them at three-month intervals during the first year.

Early in 1983, two systems analysts were given the responsibility for organising a one-day management training course. In addition, the six secretaries were sent on the supplier's standard two-day training course. This initial training was considered to be quite successful, although some managers and some secretaries found parts of the system difficult to learn. Despite follow-up training during the next few weeks, these difficulties were not entirely resolved.

During the first month of the pilot trial several other problems were experienced. With the exception of two managers who (together with their secretaries) had established text editing and diary routines, the system was not used to any great extent. The equipment had a number of teething problems. And there was a feeling of anticlimax and disappointment amongst the users.

This feeling became increasingly prevalent during the next few months, when delays in providing access to information on the mainframe computer led to increasing frustration. Even when information was transferred, the managers complained of unsuitable formats or incomprehensible listings. Their attempts to use the spreadsheet facility typically were short-lived and short-tempered. Telex was used only by secretaries. A lack of critical mass both for the electronic mail and diary scheduling systems became evident.

Pressure was exerted on the data processing manager to increase the level of support and to provide ad hoc reports on demand. But the system gradually fell into disuse after an initial period of experimentation and increasing disillusion. After six months, four of the managers' terminals were removed, the remaining terminals being used (mainly by secretaries) for word processing and simple selective text retrieval. Alternative equipment and alternative pilot areas are now being considered, but progress is expected to be slow.

STEWART WRIGHTON

This case history provides an example of an organisation with traditional mainframe systems and relatively few word processors that has in the last few years moved towards a decentralised approach with very clear ideas on the development of office systems.

Stewart Wrighton is a large firm of insurance brokers based in the United Kingdom in London and Kingston-upon-Thames. The United Kingdom turnover is approximately £75 million per annum and the company employs some 1,600 office staff and spends about £3.2 million per annum on computer-based systems. The 80-strong computer department (which also has responsibility for office systems) is organised on a central basis reporting to a group systems director. (The staff and equipment are split between the London and Kingston offices.) The current computers include an IBM-compatible NAS Hitachi mainframe running under the VMS operation system, five Wang VS 100 computers supporting about 200 terminals, and about 30 Wang PCs.

Office systems installed

The insurance broking business requires mixed word processing and data processing applications, and the company's approach to office systems reflects this underlying requirement. The mainframe computer (which is being phased out) is now used primarily to run the company's financial systems and, in recent years, the Wang VS computers have increasingly been used to run all the front-end administration systems (risk and claims analyses, quotations, correspondence, etc.). The Wang-based systems are used primarily by clerical staff to perform these specific business-related activities, although secretaries also use the systems for word processing. Professional staff in the finance and systems departments use the Wang PCs for word processing, spreadsheet applications (using Lotus 1-2-3) and (to a lesser extent) diary management systems.

Local communications are based on a Wangnet system (a broadband local area network). A trial system using Wang's wide area system network has been implemented between the offices in London and Kingston-upon-Thames.

Office systems strategy

The key elements of the company's office systems strategy are:

— To develop business-related systems (many of which are integrated data/text systems) using the Wang VS 100 machines. General-purpose office systems such as word processing, electronic messaging, spreadsheets and diary systems will be built to support these business-related systems.

— To transfer clerical activities away from clerks and towards professional staff (brokers) in three stages. In the first stage, clerks who used to serve individual business areas (such as shipping, aviation or construction) were centralised and provided with Wang terminals. This move has provided substantial benefits in terms of staff savings. In the second stage, these staff will revert to serving their individual business areas. In the third stage, brokers increasingly will be encouraged to carry out their administration activities on the system

and to discontinue the use of manual pro forma procedures. (The unwillingness of brokers to do this is seen as a major potential problem.)

—To justify the installation of office systems on two competitive criteria — the service provided to customers and the unit cost of a business transaction. (Although individual benefits and isolated savings may be important, they are evaluated against these two main criteria.)

—To involve users and to gain senior management support. These elements are considered to be of prime importance, as indicated by the significant education and training programme which includes three-day executive familiarisation courses (case studies and hands-on experience); job rotation between junior brokers and the computer department; in-house word processing training; personal computers for any manager (or senior professional) who requests the use of one — regardless of the justification; and a team of up to five staff who currently answer some 200 enquiries and requests for assistance per month.

—To encourage end users to develop many of their own systems using application generators and prototyping where appropriate. As a result of these developments, the number of staff employed in the computer department is expected to fall from the present level of 80 to about 30 by 1990. The pace of system installation in this organisation means that, by 1987, two out of three office staff will have a terminal on their desks.

Future developments

Stewart Wrighton's office system plans also include:

—The use of electronic mail both for inter-office communications (replacing telex) and for inter-personnel messages.

—The development of an integrated spreadsheet system to handle the budgets of all managers with a significant budgeting responsibility.

—The use of local databases for information, manipulation and 'what-if' applications.

NATIONALE-NEDERLANDEN

This case history describes how one large insurance company is adopting a staged approach to the introduction of office systems. In particular, it illustrates how office systems are being used to integrate data and text in clerical activities.

Nationale-Nederlanden is a large Dutch insurance group whose main businesses are in life insurance and general insurance. It employs some 6,000 office staff in three head office locations in The Hague and Rotterdam. The company operates a large computer centre in The Hague (with one IBM 3083, one IBM 3033 and a Siemens 7890 machine) which is used to process most of the routine business transactions. This centralised group also has responsibility for office systems developments.

Office systems installed

The office systems at the head office locations have been developed around:

—Five IBM 5520 shared-resource systems running 65 terminals.

—70 IBM Displaywriters.

—One IBM 8100 DOSF system running 20 terminals.

—APL facilities being used through about 100 terminals on mainframe computers.

—50 IBM PCs.

The IBM Displaywriters and 5520 systems have been installed progressively over the last few years to provide word processing facilities for use by typists and secretaries. Although no quantified cost-justification was carried out, there is general satisfaction with the improved typing service provided, particularly since many authors believe that some of their time has been saved by the new facilities. Interestingly, this improved view of the typing service has coincided with a trend away from traditional typing pools and towards the use of departmental and personal secretaries. And, perhaps surprisingly, the dissolution of the typing pools led to personnel problems because typists feared the move to isolated departments from the more sociable atmosphere of the typing pool.

Another interesting aspect of the introduction of text processing in Nationale-Nederlanden was the rejection by secretaries in one area of an early version of the IBM 8100 DOSF office system. The rejection was diagnosed as being due to a combination of insufficient user training and a fear of screen-based text processing systems. This particular setback was overcome by carefully introducing electronic typewriters, which were accepted by the secretaries. But as the use of screen-based word processing equipment has become accepted by other secretaries in the company, secretaries with electronic typewriters have increasingly demanded screen-based systems.

The IBM 8100 DOSF system has (in the last year) been installed for use by about 60 clerical staff as part of the normal transaction processing routines in the mortgage department. These applications involve access to mainframe computers via CICS as well as text processing carried out on the IBM 8100 machine. Data from an IBM mainframe often is incorporated into customer correspondence in this way. This has resulted in a reduced typing load for the secretaries

and typists who previously had typed the great bulk of customer correspondence. These transactions now contain fewer errors, particularly data errors, since one or, in some cases, two transcriptions have been avoided. The turnround time for correspondence has also been reduced by one day on average.

Nationale-Nederlanden has also been using APL to provide computing facilities to professional staff (actuaries, accountants and others) for about eight years. During the past year, 50 IBM PCs have been installed with spreadsheet, text editing and other packages for use by professional staff. This end-user computing is supported by an information centre staffed by six full-time system professionals.

Training

Training in the use of office systems is organised and carried out by local staff and supplier training as required. Those responsible for the introduction of office systems have, in recent years, devoted much effort to encouraging the exchange of knowledge and experience at all levels about the advantages and limitations of office systems.

Future developments

The next stage in the automation of the company's mainstream transaction processing routines is expected to include the use of image archives, as well as optical storage systems such as Philips Megadoc. IBM's image capture, storage and viewing facilities are actively being considered. A large installation may be about two years away, however, because the company is waiting for costs (of disc storage in particular) to fall. Once this system is installed, turnround times for archive-related correspondence are expected to fall by as much as three or four days, compared with the use of the existing centralised microform facility and paper-based archives.

The use of office systems by managers is regarded as the most difficult area in which to achieve a successful installation because the requirements are often diverse, the benefits are difficult to quantify, and senior managers are often reluctant to devote time to learning how to use the systems. For these reasons, managerial office systems have not yet been installed. The potential use of multifunction facilities by the secretaries of senior managers, however, is being actively investigated. These facilities might include text editing, links to mainframe systems, document archiving and retrieval, calendar management, electronic mail and some personal computing facilities.

All of the company's future plans for office systems are built on a strategy of compatibility with an IBM communications infrastructure. Within this strategy, three levels of processing and storage have been identified. At the lowest, most local level, stand-alone applications will run on communicating personal computers which will gradually replace word processors and dumb terminals. At the next level, departmental storage and some departmental processing will be carried out on departmental computers. At the highest level, corporate (or business-unit) storage and processing will be carried out on centralised mainframe computers.

Organisational impact

As this strategy is implemented, three main trends are expected to become apparent:

—The number of secretaries and typists will decline as more typing is carried out by clerks and professional staff on their own terminals.

—Administrative services such as microform, facsimile transmission, telex, and photocopying will be progressively decentralised, eventually being carried out by the users themselves via electronic media.

—The centralised computer department will gradually become partially decentralised as end-user computing and the decentralised office systems strategy are implemented.

MASSEY-FERGUSON

This case history describes how a multinational company installed and cost-justified an advanced office system during a period of financial stringency.

Massey-Ferguson is a Canada-based multinational corporation that manufactures farm machinery and diesel engines. It has 37 wholly owned factories in nine countries and, together with its associates and licensees, it makes products in 31 countries and sells them in 190 countries. The company employs some 30,000 people worldwide, of whom about 20,000 work in offices. No significant organisational change was made as a direct result of the office system installations, although significant cutbacks throughout the business had been made before the system was installed.

Office systems installed

With this type of international company structure, it was important that information should flow quickly and easily between international operating units and the head office in Toronto. In 1981, work started on developing an advanced in-house office system that would provide text editing, the integration of text and data files, electronic information storage and retrieval (based on keywords) and diary facilities, as well as store-and-forward electronic mail that would make use of the existing telecommunications network for worldwide access. As part of the development process, system demonstrations were developed to

maintain management interest and support. During 1982, the system was installed for use by some 2,200 office staff throughout the world, using about 2,000 IBM 3270-type terminals.

At first, management services staff at various international locations were used to test the facilities provided by the new office systems. This arrangement had the advantage that local management services staff became familiar with the systems, so that they could later install them in other local departments. Next, staff who had a need to carry out significant volumes of international correspondence, and who had access to an existing data processing terminal, were introduced to the system. (Where terminals were not available, electronic messages were printed and distributed to the intended recipient through manual internal post services.)

By adopting this approach, Massey-Ferguson found that the early installations were enthusiastically accepted and used. In turn, this led to an increasing demand from those office staff, particularly managers and professional staff, who had not been provided with the new facilities.

By the end of 1982, about 2,200 staff, including senior managers, middle managers, professionals, clerks and secretaries were using the system. The level of acceptance was very high — only 15 staff stopped using the system — even though strong control was exerted to ensure that electronic storage (which was limited to 500k bytes per user per year) was being used only for important documents that would need to be retrieved at a later date.

Once these general-purpose office system facilities had been installed, some specially designed systems were developed, using the general-purpose systems as a base. For example, the purchasing department can now file orders into a 'bring forward' file which sends them automatically through the telex system to suppliers at the appropriate time. Also, the electronic mail system has been extended to keep farm machinery distributors in North America up to date with special promotions, stock availability, and new product launches. This system also enables distributors to place orders electronically with Massey-Ferguson.

Training

The training for the general-purpose office systems was carried out by five head office staff who visited each division that would be using the facilities. The head office staff trained divisional staff who, in turn, trained other staff at each location.

Problems experienced

Very few serious problems were experienced during the installation of the office systems, although the high transaction rate did cause difficulties. To avoid response-time problems, the computer staff had to ensure that computer applications with low transaction rates and high processing requirements were mixed with the office systems, which had high transaction rates but low processing requirements. Another problem was caused by the initial storage calculations being inaccurate (due to inefficient disc packing routines). This resulted in the need to re-organise the information storage database once a month during the first year of installation.

Cost-justification

Massey-Ferguson was going through a period of financial stringency at the time the new office systems were installed. This meant that the new systems (whose total cost was less than $200,000) had to be clearly cost-justified. The type of cost-justification that was carried out is illustrated by considering a typical A4 document that was typed, duplicated and physically distributed from Canada by post to 100 recipients in Canada, England and Switzerland. The traditional method of doing this was costed at nearly four times the cost of using the new electronic mail system. The details of this cost-benefit calculation are shown in Figure A.1.

Future developments

Massey-Ferguson's future plans for office systems include an increase in the penetration of terminals, facilities to handle business forms and business graphics, and links to a phototypesetting and publishing system that will incorporate graphics information from the company's computer-aided design systems.

Figure A.1 Cost-justification of Massey-Ferguson's office system

Cost of preparing and distributing one A4 document to 100 recipients			
Traditional method		Electronic mail	
Activity/cost item	Cost (£)	Activity/cost item	Cost (£)
Typing (£4 per hour)	6.00	Typing (£4 per hour)	3.00
Typewriter costs	0.09	Screen/printer costs	1.58
Duplicating	18.53	Network time (1 sec.)	0.08
Envelope stuffing	1.66	Retrieval costs	0.08
Postage	11.72	CPU transactions to send document	1.26
Sorting and delivery	2.16	Recipient's transactions to retrieve document	6.00
Filing	3.00	Storage costs	0.01
Total	£43.16	Total	£12.01

During the research for this report we made use of the results of various published studies and articles on the subject of office automation. Those that contributed to our thinking and evidence are listed below:

Data Decisions. Micros at big firms: a survey. Datamation, Volume 29 Number 11, November 1983.

EIU Informatics. Office Automation Pilots. Conference held London, March 21-24 1984.

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Etheridge, J. et al. From here to there. Datamation, Volume 30 Number 3, March 1984.

Eosys Limited. Office Automation Survey. January 1984.

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Hammer, M. The OA mirage. Datamation, Volume 30 Number 2, February 1984.

The Omni Group, Ltd. Office Automation in American Business: Strategies, Trends and the Vendor. Catalysis — Phase 1. Volume 1. January 1984.

Rayfield, D. A. T. The electronic office — a user view. IEE Digest 1983/9, The Properties and Applications of Engineering and Executive Workstations, held March 21 1983.

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Steele, R. and Kalorkoti, G. Measuring the cost effectiveness of office automation. Management Accounting, April 1983.

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Tate, P. Europe at a snail's pace. Datamation, Volume 30 Number 3, March 1984.

Keith Wharton Consultants Ltd. 1983 OASIS Review.

Butler Cox & Partners Limited

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The Butler Cox Foundation sets out to study on behalf of subscribing members the opportunities and possible threats arising from developments in the field of information systems.

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The research programme is planned jointly by Butler Cox and by the member organisations. Half of the research topics are selected by Butler Cox and half by preferences expressed by the membership. Each year a short list of topics is circulated for consideration by the members. Member organisations rank the topics according to their own requirements and as a result of this process, members' preferences are determined.

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No. 38 Selecting Local Network Facilities
No. 39 Trends in Information Technology
No. 40 Presenting Information to Managers
No. 41 Managing the Human Aspects of Change
No. 42 Value Added Network Services
No. 43 Managing the Microcomputer in Business
*These reports have been superseded.

Future reports

No. 45 Quality Assurance for Information Systems
No. 46 Network Architectures for Interconnecting Systems
No. 47 System Development Aids
No. 48 Interlinking Different Types of Information System