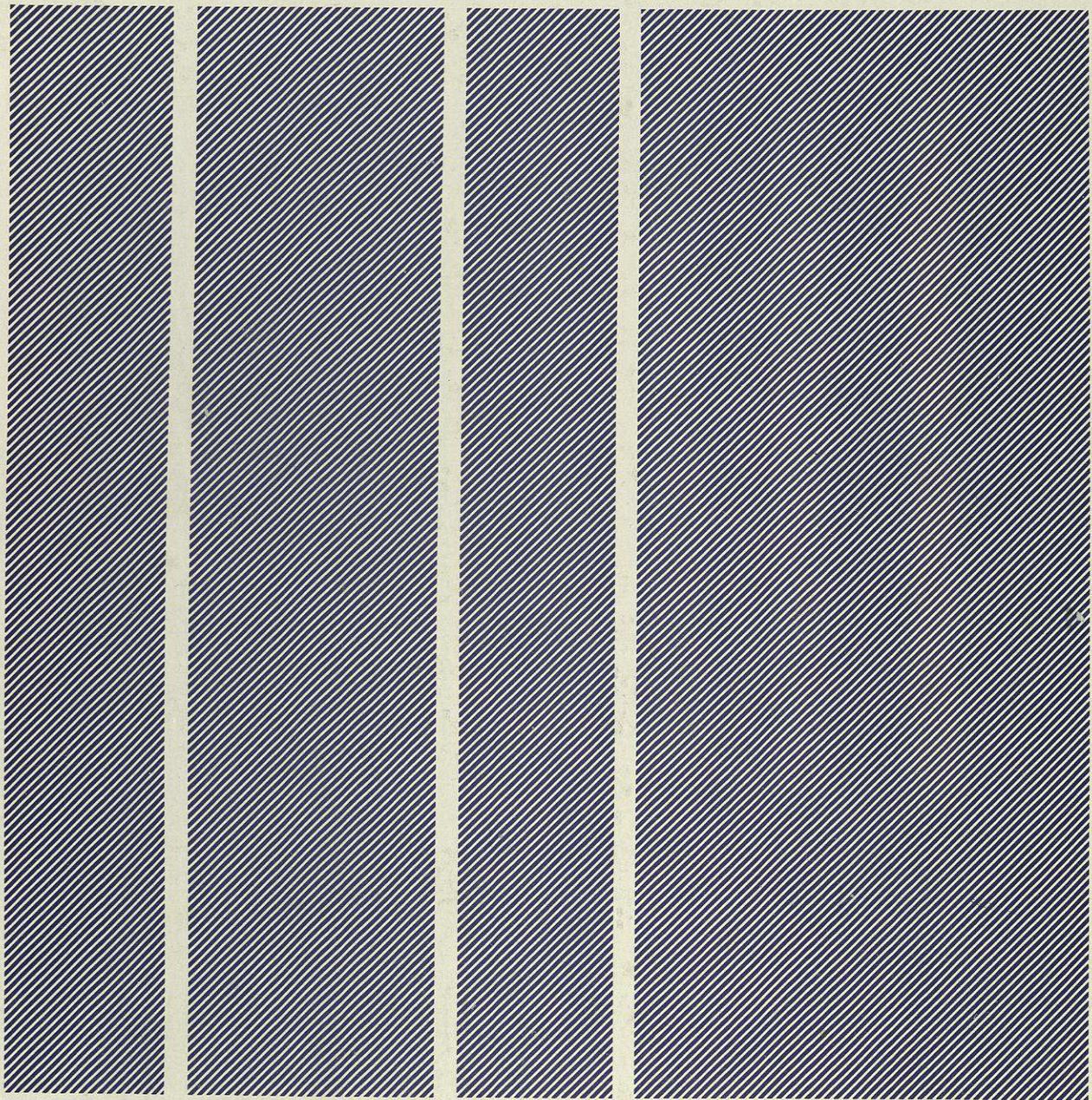


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Implementing Office  
Systems

May 1982



The Butler Cox Foundation

# IMPLEMENTING OFFICE SYSTEMS

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## *Abstract*

The topic of office automation has generated intense interest during the past few years, but the installation of advanced computer-based office systems has been slower than many people expected. Many of the early ambitious office system ideas have been shelved because of the uncertainties and the lack of clear future direction, and many organisations are uncertain how to evolve towards the 'automated office'.

The purpose of this report is to provide Foundation members with practical advice on the installation of computer-based office systems. The report identifies the key factors that are likely to influence the success or failure of office systems. It also reviews users' experiences with installing and using office systems and it presents a practical approach for planning and installing such systems. The report concludes with a series of guidelines that organisations can use as they plan and install their office systems.

## *Research team*

This report was researched and written by:

- *Neil Farmer*: a consultant with Butler Cox specialising in office automation studies. He has practical experience of installing office systems, and has worked on a major office systems multi-client project as well as carrying out several other studies in the office systems field.
- *Tony Gunton*: Butler Cox's partner with overall responsibility for office systems and telecommunications consultancy. He has contributed to and supervised several studies in both areas, and led the Butler Cox investigation into the market for office technology.

# THE BUTLER COX FOUNDATION

## *Butler Cox & Partners*

Butler Cox is an independent management consultancy and research organisation, specialising in the application of information technology within commerce, government and industry. The company offers a wide range of services both to suppliers and users of this technology. The Butler Cox Foundation is a service operated by Butler Cox on behalf of subscribing members.

## *Objectives of The Foundation*

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.

New developments in technology offer exciting opportunities — and also pose certain threats — for all organisations, whether in industry, commerce or government. New types of systems, combining computers, telecommunications and automated office equipment, are becoming not only possible, but also economically feasible.

As a result, any manager who is responsible for introducing new systems is confronted with the crucial question of how best to fit these elements together in ways that are effective, practical and economic.

While the equipment is becoming cheaper, the reverse is true of people — and this applies both to the people who design systems and those who make use of them. At the same time, human considerations become even more important as people's attitudes towards their working environment change.

These developments raise new questions for the manager of the information systems function as he seeks to determine and achieve the best economic mix from this technology.

## *Membership of The Foundation*

The majority of organisations participating in the Butler Cox Foundation are large organisations seek-

ing to exploit to the full the most recent developments in information systems technology. An important minority of the membership is formed by suppliers of the technology. The membership is international with participants from the United Kingdom, France, Sweden, Switzerland, Denmark, the Netherlands, Belgium, Italy and the United States.

## *The Foundation research programme*

The research programme is planned jointly by Butler Cox and by the member organisations. Each year Butler Cox draws up a short-list of topics that reflects the Foundation's view of the important issues in information systems technology and its application. Member organisations rank the topics according to their own requirements and as a result of this process a mix of topics is determined that the members as a whole wish the research to address.

Before each research project starts there is a further opportunity for members to influence the direction of the research. A detailed description of the project defining its scope and the issues to be addressed is sent to all members for comment.

## *The report series*

The Foundation publishes six reports each year. The reports are intended to be read primarily by senior and middle managers who are concerned with the planning of information systems. They are, however, written in a style that makes them suitable to be read both by line managers and functional managers. The reports concentrate on defining key management issues and on offering advice and guidance on how and when to address those issues.

## *Follow-up to this report*

The research team who prepared this report would welcome the opportunity of discussing its findings with member organisations. If you would like to participate in such a discussion, please let us know the points on which you would like the researchers to expand. We will then contact you to arrange an appropriate time and place for the discussion to take place.

**IMPLEMENTING OFFICE SYSTEMS****CONTENTS**

<b>PREFACE</b>	i
<b>1 FACTORS TO CONSIDER WHEN DEFINING OFFICE SYSTEM REQUIREMENTS</b>	1
Objectives, planning and authorisation factors	1
Staff factors	2
Technology factors	5
Summary	10
<b>2 COST-JUSTIFICATION FACTORS</b>	11
Hypothetical cost-justification example	11
Approaches for cost-justifying the benefits	13
Cumulative cost-benefit patterns	13
<b>3 EXPERIENCE WITH IMPLEMENTING OFFICE SYSTEMS</b>	15
Research summary	15
Equipment and suppliers	19
End-user experiences	19
Planning and installation issues	20
Benefits realised	21
Summary	21
<b>4 DEFINING THE OBJECTIVES AND THE APPROACH</b>	22
Defining the objectives	22
Identifying potential applications and users	23
Selecting applications and users	26
Preparing the overall plan	28
<b>5 PLANNING THE IMPLEMENTATION PROJECT</b>	29
Allocating project responsibilities	29
Selecting equipment and facilities	30
Planning the physical environment	31
Training and education	32
Summary	33
<b>6 INSTALLATION AND POST-IMPLEMENTATION ACTIVITIES</b>	34
Installation	34
Monitoring	34
Post-installation training and education	35
Enhancements and future developments	35
<b>7 MANAGEMENT GUIDELINES</b>	37
Determine the pace of the office systems effort	37
Determine the scope of the office systems effort	37
Recognise the differing requirements	37
Monitor developments in office system technology	37
Adopt a planning approach	37
Review progress	38
<b>CONCLUSION</b>	39

Falling technology costs and rising administration and overhead costs provide persuasive arguments for organisations to move towards the automation of their office activities. The rate of introduction of office systems, however, has been slower than many people expected. Those organisations that have already introduced office systems have concentrated mainly on applications such as word processing, or simple local data processing, or various forms of electronic messaging. These applications have been used mainly by typists, secretaries and clerical staff. Managers and professional staff have, so far, made little use of office systems. This situation contrasts strongly with the popular vision of 'office automation' where managers sit in paperless offices and use management workstations for many of their activities. At present, most organisations are uncertain how to evolve towards this vision of the future, and equally uncertain how this process will be justified.

In Foundation Report No. 19 — Office Systems Strategy — we gave two definitions of office automation. First, we proposed a broad and non-specific definition, namely:

"Office automation comprises the application of modern technology to improve the performance of office activities."

Because this definition covered all modern technology (including traditional data processing applications), we adopted the following more sharply focused working definition for the purposes of that report:

"Office automation is the application of computer-based technology in the form of standard products, to improve general-purpose office activities."

In this report we continue to use this more sharply focused definition, although we also discuss standard utilities that can be 'tailored' to meet individual requirements. The term 'office automation' can be misleading, however, because it can be interpreted as meaning fully automated systems. Because of this we use the term 'office systems' throughout this report to represent the variety of systems that may be used in offices and that are included within the above definition.

### ***The purpose and scope of the report***

This report provides practical guidance to those organisations that wish to implement office systems. As well as providing guidelines on methods for investigating, planning and installing office systems, the report also reviews the factors (including developments in technology) that are likely to influence the success or failure of office systems.

The research material for this report was obtained mainly from the following four sources:

- Interviews with managers responsible for installing office systems in 27 organisations. These organisations are in various industrial sectors and they use a variety of office equipment. Interviews were carried out in France, Holland, Sweden, the United Kingdom and the United States.
- An analysis of the experiences of 18 Swedish organisations.
- Discussions at the working party held after the publication of Report No. 19. Ten Foundation members participated in these discussions.
- Findings from a recent large multiclient study on the market for office systems carried out by Butler Cox & Partners. The methodology put forward in this report for investigating the requirements for office systems is based on the methodology used in this study.

Chapter 1 of the report reviews the main factors that are likely to influence office system requirements, and chapter 2 discusses the different approaches to cost-justifying office systems. Chapter 3 documents and analyses our findings on user experiences to date, and chapters 4, 5 and 6 then provide practical advice on planning and installing office systems. The report concludes by summarising in chapter 7 the main conclusions that can be drawn from our research. These conclusions are presented as a series of guidelines that can be used by organisations as they plan and install their office systems.

### ***Intended readership***

In Foundation Report No. 19 we described three possible approaches that organisations can take towards office systems:

- Wait and watch developments.

- Respond pragmatically to opportunities, gradually building up experience of office systems.
- Force the pace.

In that report we noted that, if an organisation makes a major effort now to automate the office, it risks paying the penalty of being a pioneer. This report is aimed primarily at managers responsible for installing office systems in those organisations

which are prepared to accept the risks associated with the latter two approaches. Although the risks are considerable, the potential benefits also are substantial. Office systems will have a widespread impact within organisations, and so this report will also be of value to those responsible for authorising expenditure on office systems, and to any other staff whose jobs could be affected by office system developments.

## FACTORS TO CONSIDER WHEN DEFINING OFFICE SYSTEM REQUIREMENTS

Before an organisation sets about implementing office systems it needs first to define clearly what its requirements are. Many organisations already have an established data processing facility, a conventional (or computer-based) telephone exchange, various items of office equipment such as telephones, typewriters, photocopiers, facsimile transceivers and telex machines and, more recently, microcomputers and word processors. From this starting point organisations often feel that they should be moving towards much greater use of office systems. These systems are viewed usually as a collection of tools such as word processing systems, electronic messaging systems, electronic filing and retrieval systems, voice messaging systems, videoconferencing systems, etc., which together constitute 'the office of the future'. Organisations often are not sure how they should develop office systems, nor are they sure what impact these developments will have on costs, jobs and business performance.

In this chapter we examine the main factors that need to be considered by an organisation before it can define clearly its office system requirements. The factors to be considered fall into three main categories:

- Objectives, planning and authorisation factors.
- Staff factors.
- Technology factors.

The factors that we identify in each of these categories provide a framework against which the user experience reported in chapter 3 can be evaluated. They also provide the basis for discussing office system investigation and implementation methods in chapters 4, 5 and 6. In addition, cost-justification factors will be a major consideration; these are considered separately in chapter 2.

### **OBJECTIVES, PLANNING AND AUTHORISATION FACTORS**

The first factors to be considered when an organisation is defining its office system requirements are related to the objectives of installing the systems. These objectives generally fall into one or more of the following categories:

- To reduce staff numbers (at various staff levels).
- To handle more work with existing staff numbers.
- To improve management control.
- To respond to changes more rapidly.
- To improve the 'quality' of performance in areas that are important to the organisation.
- To save office space and office costs.
- To improve job satisfaction.
- To retain staff or attract additional staff.

The office system objectives are sometimes set by relating them to overall company objectives and strategy. But some office system installations are carried out with only very general objectives, such as 'to gain experience of office systems'.

The objectives of office systems (and the subsequent plans for installing them) may need to be reconciled and co-ordinated with the objectives and plans for data processing and communication facilities. This co-ordination may be particularly important when office system developments could have significant impacts on the capacity and other requirements of computers and communication systems, including telephone exchanges.

These factors will determine the level of management authorisation that is sought for office system installations. For example, the organisation has to decide whether the equipment will be purchased, leased or rented, and whether it will be accounted for centrally or on departmental budgets. It also has to decide if the office systems plan should be short-term, or for a longer period (for example, for five years). If the organisation decides on a longer-term plan, it must consider also whether the office systems plan should be co-ordinated with data processing and communications plans as part of a central management services budget.

The decisions both on the objectives of implementing office systems and on planning and authorising them need to be made with care and at the most appropriate level in the organisation. Sometimes these decisions are made by default, but however they are made they can influence significantly the success or failure of the implementation project.

## **STAFF FACTORS**

User reaction to the introduction of office systems is likely to be the most important factor in any office systems project. There are several staff factors that an organisation needs to consider in formulating its office system requirements, and we now discuss these factors under the headings of human factors, trade unions, organisation, differing staff requirements and critical mass.

### **Human factors**

The implementation of an office system will not be successful unless it is accepted with enthusiasm by those who will actually use the system. The project will be a failure in the eyes of the user community if they are not committed to it, or if it does not meet their real needs. The needs of the users and the degree of user commitment are both influenced by the existing organisational 'culture', which in turn influences the speed at which office systems can be implemented. The user experiences reported in chapter 3 suggest that the cultural differences between organisations (and in particular their past experiences with computer-based technology) can influence greatly the chances of an office systems implementation succeeding or failing.

When an organisation considers the requirements for office systems from a user's point of view, it should try to distinguish between office systems and traditional data processing systems. The differences can be thought of as the differences between formal and informal systems. That is:

- Formal systems normally are used for routine, repetitive applications and they require (for control purposes) a relatively rigid and formal interface with the user.
- Informal systems normally are used for non-routine, variable applications that require a high degree of flexibility because each user may use the system in a unique way.

Although the degree of formality will differ in various situations, office systems are likely to be considerably less formal than data processing systems. Nevertheless, different office system tools may be used to record and communicate both formal and informal information. For example, voice messages may be used for informal communication, word processing may be used for formal communication, and electronic messages may be used for both formal and informal communication. Office system tools therefore provide opportunities to change some traditionally formal and informal office practices, such as those associated with internal memoranda, reports and telephone calls.

These differences in the degree of formality between data processing and office systems also have implications both for the qualities required by office systems support staff and for the level of user involvement required when office systems are installed.

New technology has often generated fear in potential users, particularly in lower-level staff. The two main components of this fear are:

- Fear of redundancy, or lower status due to a re-organisation caused by the introduction of office systems.
- Fear of being unable to master sophisticated equipment.

In more senior staff, fear of new technology is reflected in a traditional resistance to the use of keyboards. These attitudes may be changing significantly, however, as interest in office systems increases and, particularly, as management workstations are accepted as a status symbol.

### **Trade union factors**

Users' fears of new technology will also influence trade union attitudes to office systems. Although there have been several well-publicised cases of union resistance to new technology, our research shows that union attitudes have not been a major constraint in any of the organisations that we interviewed. (Because our sample consisted of organisations which had already installed office systems, the constraints caused by trade unions attitudes may be understated in this report.) Union attitudes to new technology, and the degree of office staff unionisation, vary between industrial sectors and between countries. In general, European offices are more unionised than offices in the United States, and within Europe there is also considerable variation between countries.

Those organisations with significant office unionisation will clearly have the additional factor of union involvement to consider when they examine their office system requirements.

### **Organisational factors**

One of the fears mentioned above is the fear of lower status due to a re-organisation brought about by installing an office system. Because the office support function is often re-organised when office systems are introduced, it is worth considering the impact that various types of support organisation might have in a highly developed office systems environment. The four main types of office support organisation are:

- Typing centres, typically with between six and 20 centrally located typists.
- Typing groups, typically with between two and five typists, located near to those who generate their workload.
- Secretaries (administrative secretaries or personal assistants).
- Administrative support groups, typically with between two and six staff, located near to their users. Such groups perform several activities which might include secretarial work, accessing and interrogating computer systems, filing, answering the telephone, running errands and performing specific clerical activities.

Although the quality and effectiveness of each of these types of office support will vary considerably between organisations, the two following characteristics generally apply:

- Productivity associated with routine tasks (such as typing) normally declines as office support activities are decentralised.
- User satisfaction, flexibility and operator responsiveness normally increase as office support activities are decentralised. (User productivity may also increase, although this is not often measured.)

A highly developed office systems environment is one where managers and professionals, as well as office support staff, make regular use of the facilities provided by office systems. In such an environment secretaries and administrative support groups may take on important extra duties. These duties are associated primarily with providing an interface between office system facilities and 'keyboard-resistant' managers and professionals. (For example, to carry out the keyboarding tasks associated with electronic messaging or personal computing.) Although the percentage of managers and professionals who are reluctant to use a keyboard will almost certainly decline in successful office system installations, most ambitious projects are likely to experience this resistance. The use of secretaries or administrative support groups as interfaces to office systems will depend both on the facilities required and on the attitude of the managers and professionals concerned.

The organisational factors associated with office support staff should be considered carefully when an office system installation is planned. A re-organisation that is carried out to cost-justify early office system installations may well lead to problems later unless possible future requirements are considered carefully.

In addition to re-organising the office support functions, an office system implementation may also demand a redefinition of the responsibilities of data processing and communications staff. The development of office systems could have significant impacts on the capacity and other requirements of computers and communication systems, and the staff responsible for office systems will have to work closely with those responsible for data processing and communications.

Also, the number of support and planning staff required for an effective office system installation needs to be determined. This number will depend on the size and complexity of the installation, and on the amount of systems development that is needed. Software for office systems is being enhanced continually by the suppliers, and so major in-house software development projects are not likely to be necessary in most organisations. Nevertheless, organisations should expect to carry out some 'tailoring' of the standard facilities offered in order to meet their individual user requirements. (Many suppliers now provide standard utilities that allow this simple 'tailoring' to be carried out, either by support staff or by the users themselves.)

The introduction of office systems may also make possible other types of re-organisation. Such a re-organisation might occur because of changes in work patterns brought about by office systems, or because positions have been eliminated by mechanisation. Changes such as these are likely to occur particularly where significant elements of a business function have been transferred to an office system, leading to a reduction in the activities required to perform that function. For example, the installation of a videotex system that permits customers to input orders directly to the organisation's computer may eliminate the need for many order clerks.

Re-organising staff responsibilities is a sensitive topic and it should be considered carefully both before and after office systems are installed.

### **Differing staff requirements**

Different departments and different levels of staff within an organisation have differing requirements for information and office system facilities. For example, the information required by a marketing director will differ from that needed by a finance director; and the facilities he requires will differ from those needed by a clerk in the marketing department.

In Foundation Report No. 19, we classified office workers into five broad categories. In the context of office system installations it is useful to recognise the general differences between these categories,

even though in practice the categories often overlap. Rigidly partitioning office workers into these categories can be misleading, however. As an illustration of the difficulties, figures 1 and 2 summarise two different classifications. The first classification analyses the likely requirements of different levels of staff, whereas the second classification analyses the requirements within the operational, functional and general management levels of an organisation.

In addition to the types of employees included in these classifications, external groups such as customers and suppliers may also communicate electronically with an organisation (for example to place orders or to obtain information).

Although the two classifications are not completely consistent with each other, they help to emphasise the point that different types and levels of staff will have differing requirements, and that office systems will need to be flexible to meet individual user needs. Classifications of office staff may be useful as a guide to the likely requirements, but they should be treated with caution.

**Critical mass requirements**

Two different types of 'critical mass' effect are likely to influence the users of office systems. First, there is the need to achieve a certain number (a critical mass) of users before applications such as electronic messaging or diary management can be effective. If the number of users of an electronic messaging system is less than the critical mass, users may find that it is not worth using the system once the initial novelty has worn off. Similarly, a sophisticated information retrieval system is not really effective until it holds a certain critical volume of information.

Second, an individual needs to achieve a certain level of usage of office systems before the facilities can be really useful. If, for example, a manager is provided with an electronic messaging facility that he needs to use for, say, only five minutes per day, he is likely to lose interest (unless the application is important and he has no convenient alternative). The facilities provided must therefore be sufficiently important and convenient (and easy to use) for them to form part of the manager's daily routine.

**Figure 1 Staff requirements analysis**

Staff category	Typical activities	Possible office system requirements																
Managers	60 per cent of time spent at meetings, on the telephone or travelling; 40 per cent of time spent handling documents or data. Work is varied with frequent interruptions. Managers often have direct access to secretarial and/or administrative support.	Voice messaging, electronic messaging, diary management, limited information storage and retrieval facilities, word processing facilities, some personal computing, some computer modelling, decision support systems.																
Professionals	40 per cent of time spent at meetings, on the telephone or travelling; 60 per cent of time spent handling documents or data. Professionals often have no direct secretarial and/or administrative support. Their workload is more predictable than managers.	Voice messaging, electronic messaging, information storage and retrieval facilities, personal computing, diary management, word processing, access to computers, specialist facilities.																
Clerks	Activities are difficult to classify, but they consist typically of one or more major routines that form the bulk of their work. Detailed tasks may involve document and/or data handling and voice communications.	Bespoke data processing and personal computing facilities, some word processing facilities and some electronic messaging facilities.																
Secretaries	Secretaries typically spend their time as follows <sup>1</sup> : <table border="0" style="margin-left: 20px;"> <tr> <td>Administration</td> <td>27 per cent</td> </tr> <tr> <td>Telephone</td> <td>8 per cent</td> </tr> <tr> <td>Typing</td> <td>15 per cent</td> </tr> <tr> <td>Maintenance</td> <td>5 per cent</td> </tr> <tr> <td>Errands</td> <td>19 per cent</td> </tr> <tr> <td>Filing</td> <td>4 per cent</td> </tr> <tr> <td>Unassigned</td> <td>21 per cent</td> </tr> <tr> <td>Miscellaneous</td> <td>1 per cent</td> </tr> </table>	Administration	27 per cent	Telephone	8 per cent	Typing	15 per cent	Maintenance	5 per cent	Errands	19 per cent	Filing	4 per cent	Unassigned	21 per cent	Miscellaneous	1 per cent	Word processing, diary management, electronic messaging, information storage and retrieval facilities, access to voice messaging, telex/teletex links, limited personal computing, intelligent copier links, phototypesetter links.
Administration	27 per cent																	
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Errands	19 per cent																	
Filing	4 per cent																	
Unassigned	21 per cent																	
Miscellaneous	1 per cent																	
Typists	Mostly typing and associated activities performed in typing centres or small typing groups.	Word processing, electronic messaging, telex/teletex links, intelligent copier links.																
Sales representatives and regional managers	Not strictly office workers, but their activities impact on office work. They can spend up to 25 per cent of their time on administrative tasks.	Electronic messaging, access to computers, some personal computing.																

Note: 1. The breakdown of secretarial time is taken from material published by Frost & Sullivan, Inc.

Figure 2 Organisation requirements analysis

Organisation level	Type of work	Staff categories	Possible office system requirements
Operational	Mainly routine, operational work	Clerks, typists, local managers, some secretaries	Traditional data processing applications and word processing facilities.
Functional	A significant element of planning and control in addition to operational functions.	Mainly middle managers and professionals; also some secretaries and senior clerks	This organisational level has the greatest mix of requirements and, therefore, the greatest potential need for multifunction workstations.
General management	Mainly planning and control activities with some operational elements	Senior managers	This level has fewer office system requirements than the other levels. Office systems will be tailor made for planning and control purposes. Limited requirements for general purpose office systems.

As well as the 'user friendly' nature of the system, the active or passive nature of the facilities are likely to affect the individual user's 'critical' level of usage. Active systems notify the user that messages have been received, for example, or correlate automatically vacant diary positions. Such systems are likely to be more useful than passive systems where the user has to check continually whether he has any messages, or where a semi-manual step-by-step correlation is necessary.

One way to minimise the problems associated with these critical mass effects might be to identify groups of office staff (work groups) who work together, share information resources, and communicate mainly with each other. (Research findings by Frost & Sullivan, Inc. indicate that typically between 40 per cent and 85 per cent of all paper communication is between members of identifiable work groups.) Work groups may cross departmental boundaries and staff levels, but identifying work-group members and their requirements can reduce the critical mass effects. (For example, if an office worker uses an electronic messaging facility to communicate with four colleagues for 15 minutes per day each, this facility is likely to be more valuable than if the office worker were connected to 100 people with whom he rarely communicates.) Also, where an office system is intended for use by members of an identifiable group, individuals in that group will experience pressures to conform and use the system.

**TECHNOLOGY FACTORS**

The burgeoning interest in office systems has been brought about by advances in computer-based technology. As organisations define their requirements for office systems they will need to consider technology factors at several levels. For many organisations, a factor of concern is the fear of technological

obsolescence; thus we begin this section with a review of the main technology trends that are likely to occur during the next five years. We then assess the probable impact of these trends both on suppliers and on users of office system products. Next, we consider the technology factors involved in integrating office systems with data processing and communication systems. Finally, we discuss the technology factors that are relevant when an organisation is deciding whether to use dedicated or shared equipment, either of which may provide multifunction or stand-alone facilities.

**Office system technology trends 1982 to 1986**

We review below the main office system technology developments that are likely to occur between now and 1986, and which organisations should take into account as they define their requirements. The estimated dates (which are, of necessity, approximate) are intended to give general guides as to when particular facilities are likely to be available for use in office systems.

**Software and multifunction terminals**

Throughout the period 1982 to 1986 new software functions will be added to standard office system products and, sometimes, they will be accompanied by limited hardware upgrades. These functions will often be accessed by limited multifunction terminals that will evolve from today's word processors, microcomputers, computers or enhanced telephones. The facilities offered by these terminals will include word processing, personal computing, communications to computers, information retrieval, videotex links, telex and teletex links, electronic messaging, diary management and spelling error detection. Some multifunction terminals will provide advanced features such as digitised dictation, voice recognition (although limited in its scope) and voice annotation of text. All of these advanced features require speech to be coded and stored in a digitised

form. Some of them are discussed in more detail below.

### **Graphics technology**

Improved graphics based on raster-scan technology will be incorporated increasingly into office system products from 1983 onwards. These products will offer quite advanced graphics as well as multi-font and multi-size characters for output to phototypesetters or graphics printers. Touch-sensitive screens will have relatively high manufacturing costs and therefore will be introduced only on relatively expensive and sophisticated management or professional workstations.

### **Disc technology**

The falling cost of disc storage will make it increasingly attractive to hold text permanently on-line. At current prices the cost of holding 1,000 words of text on-line for one year is about \$2 (compared with 2 cents on slow-access mass storage) and the cost has been declining at about 30 per cent per annum for the last 20 years. This trend, together with advances in disc technology, will lead to more local storage in the workstation, so that by 1986 much of the floppy disc storage used today will have been replaced by rigid discs. Also, in a few years' time, many of the current problems associated with managing storage hierarchies (discs, mass storage, etc.) will have been overcome.

As more information is stored on-line, sophisticated information retrieval systems will be developed for use in offices. The retrieval systems may be derived from free text retrieval systems such as the Status and Assassin systems or IBM's Stairs, or from developments of specialised hardware units such as Datafusion's Associative File Processor (AFP). The typical disc storage overhead of between 50 per cent and 350 per cent associated with free text retrieval systems will become more tolerable as disc storage costs continue to fall.

### **Voice messaging**

From late 1982 onwards voice messaging systems will become increasingly available in Europe. Speech storage is hampered by the sheer volume of bits of information required. One second of speech occupies about 64k bytes if it is coded so that the stored information can be used to generate the high-quality speech required by the PTTs for transmission over the public networks. If speech quality is not important, one second of speech can be coded in as little as 2.4k bytes. Because of the high storage requirement, all current voice messaging systems are designed to retain messages for short periods only (typically hours to a few days) and they do not provide archival storage. (Voice archiving may become more practical in the future with the advent of products based on videodisc technology.)

### **Data transmission technology**

PABXs capable of switching both voice traffic and data traffic will become available in Europe from 1983 onwards, although the introduction of such equipment to the marketplace is likely to be slow because of the constraints imposed by the European PTTs. At present, data communication is performed either by direct connection, or by the public switched telephone network, or by private networks using enhanced multiplexors, or by packet-switching networks or possibly by one of the recently developed local area networks. (Foundation Report No. 28 contains a comprehensive review of users' experiences with the different types of data network.) Data and voice-switching PABXs will provide an alternative data communication method. Nevertheless, we do not expect the use of such PABXs to become widespread between 1982 and 1986. Instead, we expect that the following pattern will be established:

- Traditional voice-switching requirements will continue to be met best by existing PABX-type technology.
- Low-speed (up to 19k bit/s) data transmission requirements will be met by a variety of technologies including direct wiring, traditional switching technologies, local area networks and data/voice-switching PABXs. For the next few years, direct wiring and traditional switching methods are likely to remain the most economical approach for most applications.
- High-speed data transmission (including that required for advanced graphics applications) is likely to use direct wiring or local area networks.

### **OCR and facsimile technology**

By the mid-1980s, OCR readers and facsimile scanners will have converged to yield an image-data-text input unit that is capable of:

- Recognising text in a wide variety of fonts and several handprint styles.
- Performing various text/data validation routines.
- Storing graphics and/or unrecognised text as images that can be retrieved and displayed together with recognised material.
- Filing or disposing of the document either according to the data that has been recognised or on commands from an operator.

Unstructured facsimile images will be stored in digital form in office system products but, in general, searching and editing such documents will not be possible. Index information added to the document from a keyboard, however, will enable a limited form of search and retrieval to take place.

The developments in OCR and facsimile technology will enable most documents to be captured and stored electronically with an acceptable level of accuracy. For example, the textual part of a letter will be recognised and stored as coded text, and graphics (such as a company logo) will be stored as a facsimile image. Both the text and the logo can then be retrieved for display on a multifunction workstation.

#### **Phototypesetting technology**

The main trend in phototypesetters during the next five years is likely to be a convergence with traditional printing and graphics technologies. In particular, the main advances will include:

- A continued (and substantial) reduction in prices as the present-day minicomputer-based controllers are replaced by microprocessors.
- The simultaneous availability of many more fonts.
- A full graphics capability (at least in the more sophisticated and expensive devices).

#### **Printer technology**

Throughout the 1982 to 1986 period, multi-strike matrix printers, ink-jet printers and laser printers will all compete with daisy wheel printers for low-volume office system printing. (A 30-page per minute laser printer priced at \$4,000 has already been demonstrated.) But impact printers are likely to remain dominant in office system products for most of the period.

#### **Videotex technology**

Single-function videotex terminals will be supplemented by a growing proportion of multifunction terminals with videotex interfaces. Single-function videotex terminals will continue to be used for casual and intermittent work. They will appeal to the user whose job does not require the use of a sophisticated terminal, or for whom specialised training is either irksome or impractical. The early videotex emphasis on information retrieval will give way to transactional applications where information has first to be looked up, then acted upon. (For example, to compare prices and then place an order.)

#### **Personal computer technology**

The main attractions of the personal microcomputer for office systems are its low cost and the large amount of software that is already available. Unfortunately, much of the software is of poor quality and is not portable. Also, service arrangements for personal computers are often fragmented and handled by unskilled staff. Nevertheless, microcomputers will become one of the keystones of office systems during the 1982 to 1986 period, but the need for unified software and reliable service levels will lead inevitably to higher prices.

#### **Terminal technology**

Several devices are currently available that allow modified electric (and electronic) typewriters to act as input stations to office systems. More offerings of this type will become available over the next few years. Also, teletex facilities will become available in Europe during 1983, and various office system products will then offer teletex interfaces.

Portable terminals are currently available, and continuing developments of flat screen visual display units will make this class of terminal more convenient to use. Portable devices are likely to have a limited but important influence on office systems, particularly for managers and professionals.

Handprint devices that capture hand-printed text and data will become available as optional extras for many office systems. They will provide a limited alternative to keyboards that will be useful in some specialised applications.

#### **Microform technology**

Despite new developments and declining prices, COM and other microform technologies are unlikely to become a major factor in office systems, except possibly for large-scale archival and semi-archival storage. The reducing cost of electronic storage will provide an increasingly attractive alternative for archival material as the decade progresses.

#### **Videoconferencing technology**

Videoconferencing may become an attractive option for some organisations with scattered sites and excessive travel bills. In general, videoconferencing will be a centralised facility and will therefore not become a major element of office systems up to 1986. Also, PTT constraints are likely to impede the advance of videoconferencing in Europe.

#### **Impact of the technology trends**

The technology trends reviewed above will have three direct effects:

- The cost of office products will continue to decline in real terms, although this decrease may be slower than the most optimistic forecasts because of high software development costs.
- Office system suppliers will offer less training and applications support in the future in order to maintain competitive equipment prices.
- Organisations installing office systems will be forced to write off equipment over shorter periods than in the past. It may well be prudent to write off most office systems over four years and to write off PABXs over about seven years.

These effects will influence both the rate at which

office systems are installed and the levels of in-house support staff that are needed to implement those systems.

In our view, two of the technology trends reviewed above are more likely than the others to cause an organisation to re-think its office systems equipment policy. The two significant developments are:

- Improved graphics terminals (and associated facsimile displays).
- Data and voice-switching PABXs.

Our assessment of the impact of the technology trends may tempt an organisation to wait a few years rather than to purchase office system products now. But the implications for an organisation which is about to install office system terminals and/or a new PABX during 1982 are rather less than might be expected at first sight.

First, the differing requirements of different types and levels of staff make it probable that any terminals that are replaced by later models with improved graphics features will be able to be used efficiently elsewhere in the organisation. This will be true unless the organisation requires a very large degree of communication between different types of staff, or unless there is already a very high penetration of office systems within the organisation.

Second, the overwhelming requirement for a PABX will be to handle voice traffic. This requirement can be met by currently available PABXs, although these devices are not at present able to switch data traffic. The data switching requirements can be handled by existing data network technologies, although in some circumstances these options may be less convenient than integrated voice/data switching.

Technological advances are not likely to prove catastrophic to organisations that adopt either (or both) of the above courses of action, although some upgrade costs may be incurred.

In practice, the most significant advances are likely to occur in the development of better software tools. Provided that organisations choose equipment wisely and adopt realistic write-off periods, major upheavals will not be caused by sudden technological changes. Nevertheless, in a period of continually improving price performance, the decision on when to buy will not be straightforward.

We conclude our discussion of technology trends and their likely impact by showing in figure 3 the possible components of office systems in 1986.

### **Integration with computers and communication systems**

A key element of the plans of many organisations will

be to integrate their office systems with their data processing and communications systems. The three main benefits of integrating systems in this way are:

- The number of terminals on users' desks can be minimised (one terminal per desk in most instances).
- Data and text can be integrated electronically within documents.
- Data from computers can be manipulated and analysed locally, providing greater flexibility and minimising development effort.

To be successful, an integrated systems approach requires the organisation to formulate clear policies for storing information, processing information and communicating information. The storage policy should encompass both local and central locations, and it should specify the division of stored information between the two.

The processing policy also should specify which types of processing will be carried out centrally and locally. This policy will depend on the volumes and complexity associated with different types of application, as well as on the facilities that are available locally and centrally. The communications policy should be defined so that compatible (and transparent) communications facilities are available in all the devices to be integrated.

An integrated systems policy also requires:

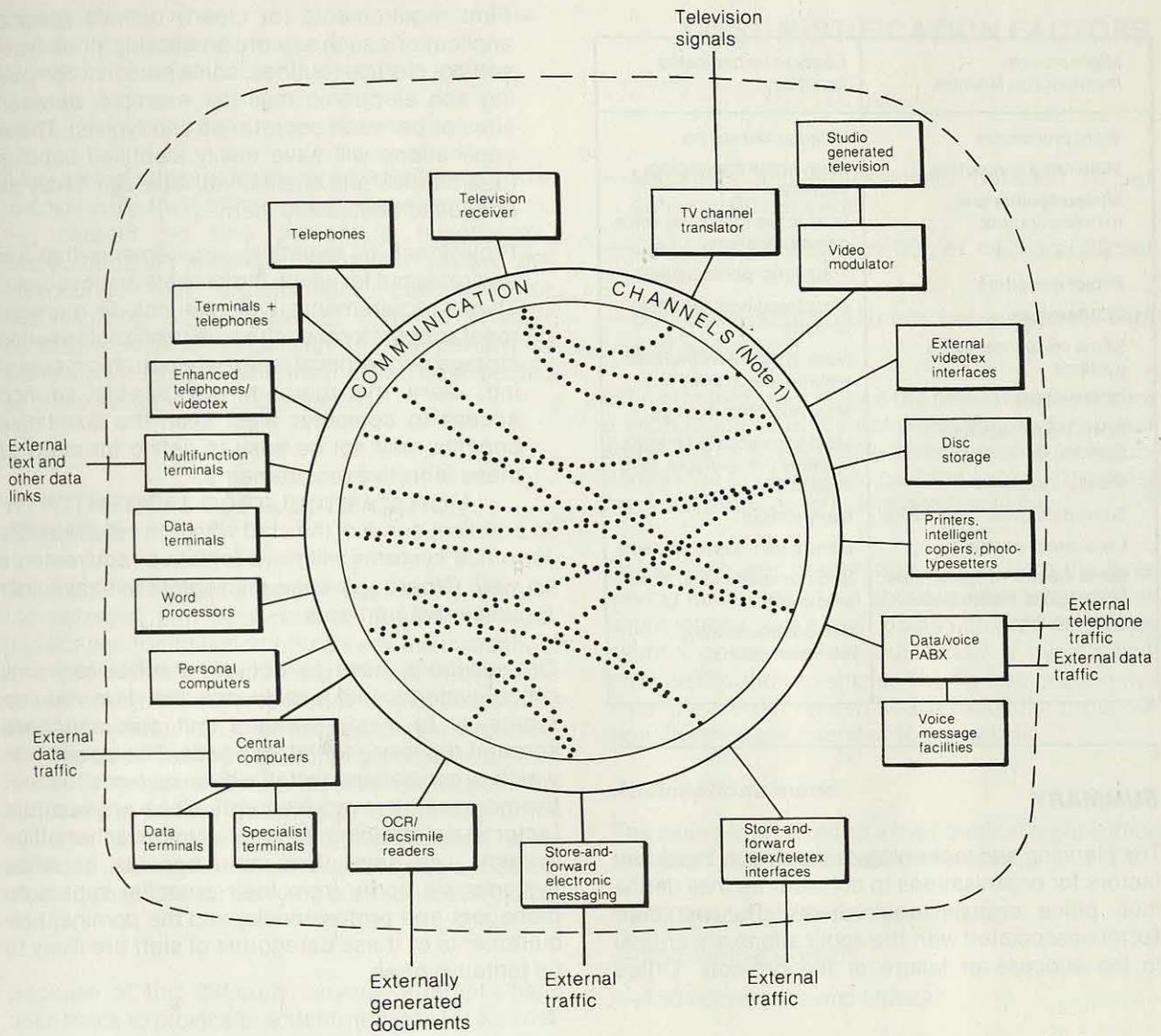
- User-friendly and flexible systems that can be used by technically naive users.
- Advanced software tools and extensive computer capacity to enable the naive users to operate the flexible systems. These requirements are particularly relevant if users are encouraged to browse through the computer files.

In addition, the organisation must decide how to control access to the integrated facilities.

### **Equipment selection factors**

When an organisation is evaluating the many and varied office system products that are now available, one of the factors that will influence the choice is whether or not the product will be dedicated to a single function. At first sight, it may appear to be an easy task to distinguish between multifunction and dedicated facilities, but in reality the distinction is not always clear. The same facilities will be used in different ways by different organisations, and the distinction between multifunction and dedicated facilities will blur with time as different facilities converge. Figure 4 (on page 10) provides representative lists of the facilities that, today, are likely to be used

Figure 3 Possible office system components in 1986



- Notes:
1. The communication channels are shown as a logical ring. They may consist physically of direct wiring, traditional data switching, local area networks, or data/voice PABX switching.
- ..... The lines represent some (but not all) of the logical links provided by the communication channels.
- This line represents a site boundary.

respectively in a multifunction environment and in a dedicated environment.

Another important factor to consider when evaluating office system products is the reliability of the equipment. From this point of view, many organisations are attracted to stand-alone devices (which may or may not share facilities such as large discs and printers). Stand-alone equipment has the advantage that no one device (with the exception of the power supply) can cause a failure that will affect the users of the other devices.

This approach is quite expensive compared with shared-resource systems, however, and it often requires cumbersome manipulation (and indexing) of floppy discs. On the other hand, shared-resource systems (where typically 20 terminals are reliant on a central processor and shared discs) have the disadvantage that a processor or disc failure can cause many terminals to be out of action at the same time. The probability of such a failure occurring can be minimised by duplicating central resources, but some degree of difficulty is often experienced during breakdowns.

**Figure 4 Multifunction and dedicated facilities**

<i>Might provide multifunction facilities</i>	<i>Likely to be dedicated facilities</i>
Word processors	Videoconferencing
Mainframe computers	Many voice messaging systems
Minicomputers and microcomputers	Interactive (dialogue) voice communications
Telex switches	Traditional photocopiers
Phototypesetters	Most traditional facsimile devices
COM devices	Many typewriters (manual, electric, electronic)
Some voice messaging systems	Most microfilm storage
OCR devices	Most sophisticated graphics systems (for example, CAD systems)
Some digital facsimile devices	Many PABXs
Videotex systems	Many paper-based systems
Some data-switching PABXs	Non-communicating word processors
Local area networks	Non-communicating microcomputers
Some electronic typewriters (with OCR or communications facilities)	

**SUMMARY**

The planning and technology aspects are important factors for organisations to consider as they define their office system requirements. But the staff factors associated with the applications are critical to the success or failure of the projects. Office

system requirements fall into two main categories of applications:

- Firm requirements for clearly defined specific applications such as word processing, phototype-setting, clerical routines, some personal computing and electronic mail (for example, between sites or between secretaries and typists). These applications will have easily identified benefits (quantitative and qualitative), although it may be difficult to cost-justify them.
- Provisional (or tentative) requirements that are desirable but for which the benefits are less clear. These requirements typically include management support tools such as electronic information storage and retrieval, internal electronic messaging, diary management and flexible ad hoc access to computer files. Even the qualitative benefits may not be easy to define for many of these tentative requirements.

In practice, some of the staff with firm requirements for office systems will have tentative requirements as well. Others (typically managers) will have only tentative requirements.

Organisations have to decide whether to install office systems that satisfy only the firm requirements, or to install systems that also anticipate some of the more tentative needs. The speed with which organisations install office systems to meet the more tentative requirements will be an important factor in determining the overall impact that office systems will have. The main benefits of office systems will come from their potential impact on managers and professionals, and the dominant requirements of these categories of staff are likely to be tentative ones.

## COST-JUSTIFICATION FACTORS

A key area of concern for many organisations is how to cost-justify their office system developments. In this chapter we first present a hypothetical cost-justification example. Next we review the approaches that organisations can use for cost-justifying office systems, and the chapter concludes with a discussion of the pattern of cumulative costs and benefits that can be expected as office systems are implemented.

**HYPOTHETICAL COST-JUSTIFICATION EXAMPLE**

Although it is relatively easy to cost-justify many of the potential firm applications, the overall cost-justification for installing office systems throughout an organisation is much more difficult. Indeed, the overall cost-justification criteria may not be clarified until an investigation of all areas within an organisation has been carried out. For large organisations it is clearly not practical to investigate all potential applications before deciding to install any office systems, although a limited investigation often provides useful guidelines. (We describe a methodology in chapter 4 for carrying out such an investigation.)

Because of this difficulty, several attempts have been made to provide practical methods for estimating the overall cost-justification for installing office systems. These rough-and-ready estimates are based on limited information gathered by examining the way that staff allocate their time between various activities. The likely impact of office systems is then estimated in terms of the percentage of time saved on each of these activities. For example, if the average manager spends 12 per cent of his time on the telephone, and if voice messaging and electronic mail systems could reduce this time by a nett 20 per cent, then 2.4 per cent of the manager's overall time would be saved. Thus, the most basic method of estimating the benefits of office systems is to equate the costs of installing and running the systems with the time saved as a result of using the systems.

When this type of analysis is carried out for all activities and for all levels of staff, the overall estimates for time saved by office systems are typically:

- Managers and professionals: between 10 per cent and 20 per cent.
- Clerical staff: between 20 per cent and 30 per cent.
- Secretarial staff and typists: between 20 per cent and 30 per cent.

Office systems can reduce the time taken to perform a wide range of office activities. Figure 5 overleaf shows the most frequently stated reasons for reductions in the time taken to perform some of the most common office (or office-related) activities.

Using the lower percentage figures from the time-saving estimates given above, and making certain assumptions about staff costs, inflation and office system costs, we set out below a hypothetical cost-justification example. The figures used in this example are not related to any particular organisation, but they are intended to be realistic.

**Assumptions made**

The example is based on a hypothetical organisation that has 1,000 office staff, made up of:

- 400 managers and professionals.
- 450 clerical workers.
- 150 secretaries and typists.

The terminal population is assumed to be 575, made up of:

- One terminal for every two managers or professionals (200 terminals).
- One terminal for every two clerical workers (225 terminals).
- One terminal for each secretary and typist (150 terminals).

At present, the cost of each terminal (including the costs for maintenance, shared facilities and internal support) can vary between about \$2,000 per annum and \$12,000 (or more) per annum, depending on the level and sophistication of the facilities provided. For the purposes of this example, the cost of each terminal is assumed to be \$8,000 per annum in 1982. In 1986, the equivalent cost is assumed to be \$6,000 per annum which, at the assumed inflation rate of 10

Figure 5 Reasons for time savings due to office systems

Activity	Reason for time saving
Copying documents	Electronic mail reduces the need to copy documents
Reading proof documents	Word processing and dictionary facilities reduce the time required for proof reading
Generating typed documents	Word processing reduces the time taken both to generate standard text and to re-draft documents
Planning and scheduling	Calendar management facilities reduce the time taken to arrange meetings
Telephone calls	Voice messaging and electronic mail systems save time by reducing the number of times it is necessary to repeat a call
Filing and retrieving information	Information retrieval tools save time when the retrieval requests are complex
Travel	Videoconferencing can sometimes reduce the need to travel
Manipulating data	Computing facilities (such as personal computing) can reduce the time taken to manipulate data
Preparing telexes	Word processors linked to telex machines can save time by removing the need to re-key the message
Phototypesetting	Word processors linked to phototypesetters can save time by removing the need to re-key the document

per cent per annum, is a reduction of about 50 per cent in real terms compared with the 1982 costs.

Salaries in 1982 are assumed to be:

- Managers and professionals: \$20,000 per annum.
- Clerical workers: \$10,000 per annum.
- Secretaries and typists: \$10,000 per annum.

Other employment costs are assumed to add a further 80 per cent to the direct salary costs, and salaries are assumed to rise in line with the inflation rate (10 per cent per annum).

Office systems are assumed to save the following amounts of time:

- Managers and professionals: 10 per cent.
- Clerical staff: 20 per cent.
- Secretaries and typists: 20 per cent.

**Costs and savings in 1982**

If all the office systems were installed in 1982, and all the assumed time savings were realised immediately, the costs and benefits (in terms of time savings) would be:

- Costs: \$4.6 million per annum.
- Benefits: \$3.6 million per annum.

Thus, on the basis of the above assumptions, it is not

possible in 1982 to justify office systems purely in terms of cost-benefits.

**Costs and savings in 1986**

If all the office systems were installed in 1986, and all the assumed time savings were realised immediately, the costs and benefits would be:

- Costs: \$3.6 million per annum.
- Benefits: \$5.8 million per annum.

Thus, between 1982 and 1986, the combination of static salaries and overheads (in real terms) and the continuing decrease in the cost of office system products will reverse the cost-justification equation.

The time-saving assumptions used in the calculations above can be replaced by several combinations of lower time savings to make the costs of installing office systems in 1986 balance the assumed benefits. For example, the costs can be balanced by a five per cent saving in managers and professionals, a 15 per cent saving in clerical staff and a 15 per cent saving in secretaries and typists. Alternatively the same assumed benefits can be achieved by a saving of nine per cent in all three categories of staff. Yet a third way of achieving the same benefits is to assume no saving in managerial and professional staff and a 20 per cent saving in clerical staff and secretaries and typists.

The above examples show that, even in five years' time, quite substantial staff savings will still be required before an organisation can cost-justify the high investment levels required for office systems.

On the other hand, the assumptions made in the foregoing analysis about the cost of terminals in 1986 and the rate of inflation between 1982 and 1986 are conservative. Office systems will obviously be easier to cost-justify if terminal costs are lower than those assumed or if salaries increase in real terms. Also the cost-justification equation will be different in different countries, depending on staff and equipment costs.

### **Limitations of the approach**

The theoretical approach used in the hypothetical cost-justification example has two major limitations:

- The benefits are calculated on the basis of time saved by individual staff, but there is no guarantee that the time saved will be put to practical use. For example, saving 40 minutes per day of a manager's time does not benefit the organisation at all unless the manager can become more effective, or unless the total number of managers can be reduced.
- Although the approach estimates the benefits of office systems in terms of the time saved on various office activities, it does not take account of potential economies that may be obtained by eliminating certain activities altogether as a result of using office systems. Nor does it take account of other potentially important benefits such as an improved competitive position as a result of faster administrative response times.

This type of theoretical cost-justification approach should therefore be treated with caution. It may be a useful guide to the potential 'order of magnitude' savings, however, provided that realistic and conservative assumptions are made.

## **APPROACHES FOR COST-JUSTIFYING THE BENEFITS**

There are four main approaches that an organisation can adopt for cost-justifying the benefits of office systems. We now describe briefly each of these approaches; in practice there is often some overlap between them.

### **Monitor specific jobs**

The first approach is to identify and monitor specific jobs (and other office costs) that will disappear as a direct result of introducing office systems. This approach may result in nett savings due to re-organisations or other changes to existing practices and facilities.

### **Reduce manpower budgets**

Another approach is to reduce manpower budgets

for the departments where office systems will be installed. In addition to any reduction in manpower resulting directly from the introduction of the systems, this approach often focuses attention on unnecessary (and well-established) manpower and other costs. It may also achieve other objectives, such as increasing a manager's span of control or reducing the number of staff required to perform a specific task (in other words increasing staff productivity).

### **Identify qualitative benefits**

The third approach to cost-justifying the benefits of introducing office systems is to identify and monitor qualitative benefits. Such benefits include the speed of response to customers, the response to personalised mailings, the time taken to prepare regulatory applications and so forth. In some organisations these benefits may be the most important of all for the operation of the business, and so may overshadow any direct cost savings.

### **Install experimental systems**

The fourth approach is to install office systems on an experimental basis and measure the savings that result. This approach is the most vulnerable to the effects of Parkinson's Law (which states that the growth in administrative staffs is effectively independent of the activities they administer) and it may often result in very happy users but no measurable benefit. On the other hand, this approach is the least likely to lead to user resistance to the introduction of office systems.

### **Choice of approach**

The approach that an organisation adopts for cost-justifying the benefits of office systems will depend on many factors, including the organisation's culture, its relationship with the trade unions and its previous experience in introducing computer-based technology. The approach (or combination of approaches) adopted will have a major effect on the cost-benefits (and other benefits) actually achieved by office system installations. In particular, the benefits achieved in early installations will often determine the scope of later systems and the rate at which those systems are introduced.

## **CUMULATIVE COST-BENEFIT PATTERNS**

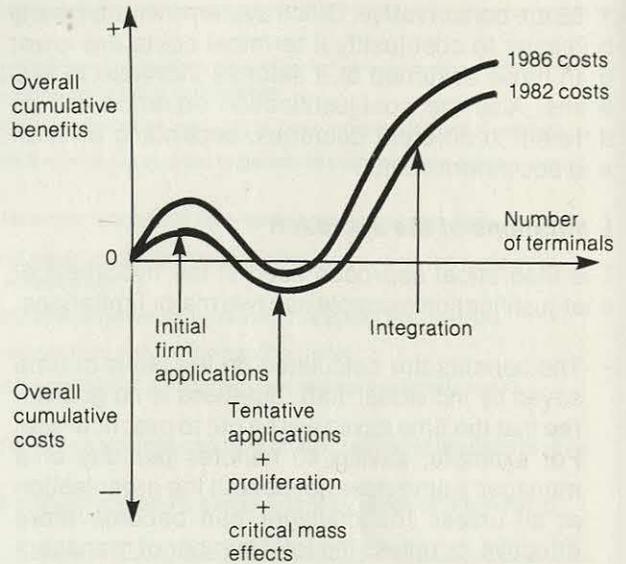
The hypothetical cost-justification example given earlier in this chapter was presented as an example of the way in which organisations can set about calculating the benefits of installing office systems. The accuracy of such a calculation depends on the accuracy of the estimated costs and time savings. For what we have termed 'firm applications', these

quantities can be estimated with a reasonable degree of accuracy, and organisations can expect the initial firm applications to be cost-justified (and therefore provide an immediate positive benefit). Additional tentative applications will be less easy to cost-justify, however, and organisations should be prepared for tentative applications to have a negative effect on the overall justification equation. This negative effect could also be made worse if equipment is allowed to proliferate in an uncontrolled manner.

The introduction of early office systems is therefore likely to produce overall cumulative benefits but, as more tentative applications are introduced, the organisation will experience a nett cumulative cost. A further contribution to this nett cost will come from the cost of overcoming the critical mass effects described earlier. Later, as office systems are integrated both with each other and into the organisational structure, significant cumulative benefits will accrue. These benefits will come about as effective systems cause a fundamental change in the pattern of work activity, which in turn will lead to work re-organisation and fewer staff at all levels.

The likely pattern of cumulative costs and benefits is

Figure 6 Cumulative cost and benefit trends



illustrated in figure 6. The figure assumes that the growth in office systems can be measured in terms of the number of terminals installed.

## EXPERIENCE WITH IMPLEMENTING OFFICE SYSTEMS

In the first two chapters of this report we set out the factors that an organisation needs to take account of when it is considering whether to introduce office systems. In this chapter we examine the experiences in implementing such systems of a wide variety of organisations from five countries. The chapter begins with a summary of the research into user experiences that was carried out, and of the general findings of that research. We then focus on particular aspects of user experiences under the headings of end-user experiences, equipment and suppliers, and planning and installation issues. The chapter concludes with a brief review of the benefits that organisations believe their office systems have realised.

**RESEARCH SUMMARY**

The research for this report was carried out by interviewing representatives from 27 organisations that had implemented some form of office systems. We begin this section by summarising the types of organisation that we interviewed, the types of application that they had implemented and the way in which they had organised the responsibility for installing office systems. We also identify the common factors amongst the more successful office system implementations, and comment on the future plans of the 27 organisations.

In addition, Statskonsult (our Swedish associates) carried out a separate study of 18 organisations in Sweden. The results of this study are also given in this section of the report.

**Interview research**

We interviewed the managers responsible for installing office systems in 27 organisations in five countries (five organisations in France, two in the Netherlands, three in Sweden, 11 in the United Kingdom, and six in the United States). The 27 organisations were from seven different industry sectors:

- Four organisations from the chemical industry.
- Eight from the engineering and construction industry.
- One from the food processing industry.
- Two government departments.
- One organisation from the energy industry.
- Eight from the finance industry.
- Three from the retail and service industry.

Figure 7 overleaf summarises by industry sector the type of office system users in the 27 organisations. It also shows the number of office system terminals in use in each organisation. In most of the organisations, office systems were used mainly by junior staff (typists, secretaries and clerks). The only exceptions were in two American organisations and one French company where managers and professionals made extensive use of electronic messaging systems.

All the organisations used office systems for word processing applications, but other types of application were often used on a smaller scale. Figure 8 (on page 17) summarises the applications and facilities that were regularly used. (One-off trials are not included in the figure.)

**Responsibility and organisation for installing office systems**

The responsibility for installing office systems varied considerably amongst the organisations interviewed. Although responsibilities were not always clear and there was considerable inter-departmental conflict, the departments responsible for installing office systems can be classified as follows:

- The organisation and methods (O&M) department in 12 organisations.
- The systems departments in 11 organisations.
- The administration department in three organisations.
- A user department in one organisation.

Other common factors that emerged from our research were:

- Sixteen of the organisations each had one departmental manager who was responsible for office systems, data processing and telecommunications.
- Sixteen organisations had established steering committees that involved the users, and in eleven organisations the trade unions were involved in their office system developments.

Figure 7 Summary of office system users in 27 organisations grouped by industry sector

Industry sector (number of organisations)	Type of user				Number of terminals
	Typists	Secretaries	Clerks	Managers/ professionals	
Chemical (4)	• •	• • • •	•	• • •	35 52 63 100 +
Engineering and construction (8)	• • • • • • • •	• • • • • • • •		• • • • • • • •	300 90 59 14 700 150 100 + 200 +
Food processing (1)		•		•	20
Government (2)	• •		•		21 12
Oil and energy (1)	•	•		•	62
Finance (8)	• • • • • • • •	• • • • • • • •	• • • • •	• • • • • • • •	130 80 300 700 100 750 46 100 +
Retail and service (3)	• •	• • •	•	• • •	21 16 35
TOTAL (27)	21	22	6	19	4,256 +

—Thirteen organisations relied on the suppliers to meet their training needs, and the other 14 had established significant in-house training resources.

—Twelve of the organisations had active support from top management for their office system development plans. Only 11 of the 27 organisations had produced a formal office systems strategy document.

Frequently, organisational changes were made as office systems were introduced and these changes usually affected office support staff such as secretaries and typists. These changes often were resisted by operators and managers, although none of the organisations we interviewed had experienced outright rejection of office systems. Organi-

sational changes were usually carried out to cost-justify the office system installations. Sometimes the responsibility for installing office systems was re-organised as part of an overall plan to ensure effective co-ordination of all technological developments in the office. Typically, responsibility was shifted from the administration department to the management services department. This process often involved much political in-fighting between the staff in the administration, O&M, systems and telecommunications departments.

Trade union involvement in installing office systems had resulted in some delays, but no major problem was reported by the organisations included in our research. Trade union interest was concentrated mainly in the following areas:

**Figure 8 Summary of office system applications and facilities in 27 organisations**

<i>Application or facility</i>	<i>Number of organisations using application or facility</i>
Word processing	27
Computer links	14
Electronic messaging	12
Local data manipulation	10
Non-trivial information retrieval	8
Telex links	8
Phototypesetter links	7
COM output	5
Administrative/planning aids (e.g. diary management)	3
Videotex links	2
Intelligent copier links	2
Voice messaging	1

- Consultations before office systems are installed.
- Assurances of minimum redundancies as a result of installing office systems.
- Negotiation of additional payments for new skills.
- Consultation about the safety and ergonomics aspects of office systems.

In general, trade union involvement was greater in the European countries (particularly in Sweden — see also page 18) than in the United States.

**Criteria for success**

The organisations that we interviewed had achieved varying levels of success in implementing their office systems. We have attempted to classify the 27 organisations into two categories — the more successful and the less successful. Our criteria for this classification were:

- Whether the defined implementation objectives had been largely achieved.
- Whether there was user acceptance and enthusiasm for the systems.
- Whether significant levels of future expenditure on office systems had been approved.
- Whether the organisation had a clear idea about its future direction as far as office systems were concerned.

On these criteria, 11 of the 27 organisations were judged to have successful office system instal-

lations. These organisations came from various countries and industry sectors, and the department responsible for implementing their systems was not a common factor. However, there were six main common factors across these 11 more successful organisations:

- They all had active support from their top management.
- They all had a formal strategy document.
- Ten of the 11 organisations provided a significant amount of in-house training.
- Nine of the 11 organisations had active user steering committees.
- Nine of the 11 organisations made substantial use of data processing facilities; the remaining two organisations were medium-sized computer users.
- Eight of the 11 organisations had office systems, data processing and telecommunications reporting to one departmental head.

Some of these common factors follow automatically from our success criteria. Nevertheless, most of the common factors are confirmed by the findings of the separate Swedish study (which is reported on page 18), and they provide a useful starting point for considering the elements that are necessary for a sound approach to implementing office systems.

**Future plans**

We asked the 27 organisations about their future plans for office systems. Electronic messaging was mentioned most frequently (by 17 organisations), but several other developments were planned within the next two years, as shown in figure 9 overleaf. Even amongst the 11 more successful organisations, however, future office system plans were regarded as having a high element of pioneering at this time.

The main constraints on future developments were expected to be financial (mentioned by 13 of the organisations), and in particular in cost-justifying the developments. The four other potential constraints mentioned were:

- A lack of user-management awareness (12 organisations).
- A lack of good-quality support staff (nine organisations).
- Inadequate equipment and communications facilities (nine organisations).
- Adverse trade union attitudes (four organisations).

Figure 9 Future office system plans of 27 organisations

Planned application or facility	Number of organisations planning application or facility
Electronic messaging	17
Links to other systems (teletex, telex, phototypesetters, intelligent copiers, etc.)	15
Non-trivial information retrieval	13
Links to computers	13
Voice messaging	10
Personal computing on multifunction terminals	9
Network developments (e.g. local area networks)	9
Linked videotex facilities	7
Administrative support facility (e.g. diary management)	6
Videoconferencing	4
Portable terminals	4
Graphics facilities	4
Digital facsimile via a multifunction terminal	3
Computer-output microfilm (COM)	3
Optical character recognition (OCR)	3

**The Swedish study**

During 1981, our Swedish associates (Statskonsult) carried out a detailed study of 18 Swedish organisations that use office systems. The main findings from that study are summarised below.

The organisations included in the study were from four industry sectors:

- Five organisations from the engineering and construction industry.
- Five from the finance industry.
- Five government departments.
- Three organisations from the retail and service industry.

The user base in these 18 organisations was heavily biased towards typists and secretaries. Office systems were used by typing centres in 13 of the organisations, by smaller typing groups in 11 of the organisations and by secretaries in seven of the organisations. The Swedish study did not include any organisations where clerks made use of office

systems, and managers and professionals used office systems in only two of the organisations.

Not surprisingly, the applications were related mainly to word processing, although a few of the systems were linked to computers, telex facilities and phototypesetters. Two systems also accessed advanced information retrieval facilities.

**Responsibility and organisation for installing office systems**

As with the organisations we interviewed, the responsibility for implementing office systems was found to vary between the O&M department, the systems department, the administration department and the user departments, depending on the individual organisation. In Sweden, however, the user responsibility for office systems was generally higher than that found in the other countries researched. All the Swedish organisations had established user steering committees, and the trade unions were involved in their office systems developments. (The higher degree of user and trade union involvement is a reflection of the Swedish laws that apply to office work.)

Six of the organisations studied had prepared a formal strategy document, although only four of these documents had been accepted by the unions and the senior management of the organisation.

**Criteria for success**

The relative success of the 18 organisations in using office systems was evaluated using the following criteria:

- Productivity gains were obtained.
- The equipment was used intensively.
- The time made available by using word processing was used effectively.
- A detailed office systems plan was followed.
- The attitude of secretaries and managers to office systems was positive.
- The systems chosen were reliable.
- The office systems created a good working environment.

Using these criteria, four of the organisations were more successful than the others. The successful companies had four factors in common:

- They all had top management and union support.
- They all had an agreed formal strategy document.
- They all had mature data processing installations.
- They all took a total view of information handling, including data processing.

**Future plans**

Sixteen of the 18 organisations had plans to develop further office systems. The most frequently mentioned new developments included:

- Links to computers.
- Links to phototypesetters.
- Links to teletex networks.
- Advanced information retrieval applications.
- Optical character recognition (OCR) applications.
- Computer output microfilm (COM) applications.

**EQUIPMENT AND SUPPLIERS**

We turn now from the general points that emerged from our research into organisations' experiences with implementing office systems to particular aspects concerning equipment and suppliers. In the following two sections we focus respectively on the experiences of end users, and on planning and installation issues.

Some office system facilities (such as word processing) have now been available for a few years, but more sophisticated facilities have become available only recently. (For example, tools for electronic messaging, communications facilities and information retrieval.) Many early users of office systems are still suffering from past mistakes made when equipment was selected. Much of the early equipment is still in use, but is being phased out of operation because it is incompatible with equipment selected more recently.

New features are often available in the United States before they become available in Europe. This leads to marginally earlier use of these features in the United States, but creative (and effective) use of the available facilities is often at least as advanced in Europe. Organisations in both the United States and Europe have suffered because suppliers' promises about the timing of new features have been over-optimistic. Frequently, new features become available between six months and two years after the originally promised dates.

Users have found that many of the office systems that are available today are not very easy to use. Some systems are over-technical in that they require the users to become familiar with technical procedures and jargon in order to operate them. Other systems provide inadequate response times. Such systems are not user-friendly, and often they are rejected by the user community.

In general, organisations experienced widespread initial teething problems when office systems were

installed, but once these problems had been overcome the equipment reliability was satisfactory. The most frequent hardware problem encountered was the breakdown of daisy wheel printers. Software problems were usually caused by suppliers launching new products or facilities before they were fully developed or tested. Several organisations became unknowing test sites for a supplier's equipment, although some suppliers were more honest than others in this respect.

The level of service provided varied considerably depending on the particular supplier, and sometimes it depended on the physical location of the organisation or the organisation's importance to the supplier. Most suppliers aim to respond to a service request within four hours, and several achieve a faster average response time.

Many organisations have found that it is not easy to integrate office systems equipment with computers and communications systems, although some of the problems are now less than they were. Several organisations have experienced difficulties in integrating office systems equipment with other equipment and systems because the office equipment suppliers have been in the process of clarifying their communications interfaces.

User experience shows that the most persistent equipment problem experienced in the office environment was caused by the noise of impact printers. This problem was usually solved by using acoustic covers, although some overheating problems were then experienced. In addition, secondary costs associated with installing office systems equipment (such as wiring, supplies and furniture) were generally higher than many organisations expected.

**END-USER EXPERIENCES**

Our research showed that the responses of the end users of office systems varied widely but, typically, end users progressed through the following stages:

- Stage 1: initial apprehension.
- Stage 2: acceptance.
- Stage 3: enthusiasm and a belief that the use of office systems enhanced their status. (This stage followed quickly after Stage 2 had been reached.)

This progression was particularly noticeable with word processor operators. Some typists and secretaries now select potential employers on the basis of the word processing facilities provided. But excessive enthusiasm, particularly from managers, can create difficulties caused by:

- Demands for many secretaries to be trained to use a limited number of terminals, which leads to priority arguments, queuing problems, etc. Such problems generally occurred when the ratio of operators to terminals was more than about four to one.
- Demands for an improved service being made before the operators' learning process was completed.

There was also some evidence of an increase in carelessness both by managers when they were drafting documents and by secretaries when they were typing the documents. This carelessness led to extra work being generated. There was little evidence of managers delegating work to secretaries to fill the time that was saved by word processing.

There was a wide variation in the intensity with which end users utilised their office systems. Equipment utilisation varied between 30 per cent and 100 per cent. In general, managers and professionals used office systems less intensively than other types of staff, but the end-user experience to date is not particularly helpful in identifying the requirements of managers and professionals, because staff in these categories form only a small proportion of the total user population. Nevertheless, 60 per cent of the organisations interviewed now have at least a few professional users of office systems.

A few end users (mainly professionals and senior secretaries) had developed (or tailored) systems to meet their own requirements, and they were usually happy with the results. These users had experienced some duplication of effort, however, and some organisations had established a central library of tailored systems in an attempt to overcome this problem.

Most of the interviewees agreed that better results were obtained if office system facilities were first provided for the more progressive and enthusiastic staff. These staff often adopted unofficial training and support roles to help their colleagues. However, some organisations had first provided the facilities to those staff who were most vociferous in their demands for them, and these facilities were subsequently under-utilised.

In chapter 1 we identified the need to establish a certain critical mass of end users before some office system facilities can become really useful. These critical mass effects have been recognised only by some of the more advanced organisations, particularly in connection with electronic messaging or diary management facilities. These organisations also recognised the importance of identifying work

groups that may be used to overcome the problems associated with critical mass effects. One American organisation believes that electronic messaging cannot be effective until at least 25 people spanning three management levels regularly use the system.

We have already said that none of the organisations interviewed had experienced outright rejection of office systems by end users, but one organisation did experience major problems with an installation because it attempted to impose office systems on apprehensive operators. Our research produced no evidence of significant differences between older and younger staff in adapting to office systems. But some operator reluctance to change from one supplier's equipment to another has been experienced.

### **PLANNING AND INSTALLATION ISSUES**

Our research of organisations' experiences in implementing office systems identified four issues that need to be considered as office systems are planned and installed. The issues concern the planning and installation time scales, the equipment selection stages, training requirements and disc capacity requirements.

#### ***Planning and installation time scales***

The time scales for installing office systems varied considerably between organisations. Often there was a long delay before systems were installed while investigations were carried out and management approval was obtained. Although office systems can be installed relatively quickly throughout an organisation, plans for integrating office systems with computers and communication systems typically were made several years ahead. The larger office system installations that we encountered during the research had therefore been built up over a period ranging from two to five years (or even longer).

#### ***Equipment selection***

Most of the organisations in our sample had adopted the following five stages when they selected office systems equipment:

- Obtain product information from the available literature.
- Visit suppliers for equipment demonstrations.
- Visit existing users of office systems to hear about their experiences.
- Prepare a list of requirements.
- Evaluate supplier proposals against these requirements.

Seven organisations had also carried out in-house

equipment tests (which typically took between two and four weeks) before they made their selection. Three organisations asked suppliers to tailor specific facilities to their particular requirements and then to demonstrate these facilities as part of the selection process.

### **Training requirements**

Most organisations said that the equipment suppliers provided initial training only for the basic facilities available with the systems. Many advanced facilities were under-utilised, and on-the-job experience coupled with follow-up training (usually by in-house staff) was often necessary to encourage the full use of the facilities available. (For example, many word processing operators require between one and six months' experience before they become fully proficient.) On average, there was one in-house training person for every 100 end users and there was one office system analyst for every 30 end users. These ratios should be treated with caution because they are likely to vary considerably depending on the type of application. Also, they will depend on the stage of office systems development that an organisation has reached.

### **Disc capacity requirements**

Several organisations had experienced problems because of an unexpectedly high demand for disc storage. These problems occurred particularly in those organisations that had distributed office systems equipment throughout user departments. The problems were caused in general by users being reluctant to delete or archive information. Some organisations had found that between 5M bytes and 10M bytes of disc storage was required for each terminal, and one large user of office systems is planning to install 20M bytes of disc storage for each terminal.

### **BENEFITS REALISED**

Just over half of the organisations that we examined had measured the cost-benefits associated with

their office system installations, although there was a wide variation in the level of detail that they provided. The most commonly measured benefit was the improvement in typing productivity caused by word processing, but even here there were wide variations. Some organisations reported no improvement at all, although the majority of organisations that measured this benefit reported productivity improvements of up to 50 per cent. A few organisations reported spectacular productivity gains of up to 250 per cent. In general, those organisations that set out to achieve specific benefits (either in terms of savings in individual jobs or in departmental budgets) achieved them, and those organisations that were less specific in their aims were less successful in realising benefits from their office systems.

Experience of using electronic messaging systems (mainly in the United States) indicates that some time savings and cost savings are obtained. The largest benefit attributed to electronic messaging from our limited sample of organisations using this type of system was a saving of seven per cent of managers' and professionals' time. (Foundation Report No. 17 — Electronic Mail — contains a review of users' experiences with electronic messaging systems.)

Most of the organisations told us that their office systems had provided them with qualitative benefits, such as increased speed of operation, improved quality of work and better staff morale.

### **SUMMARY**

In this chapter we have reviewed the experiences of 45 organisations as they implemented office systems. Most of these organisations have installed (or are installing) firm applications, but a few are beginning to experiment on a pilot-trial basis with more tentative applications. We have highlighted the approaches used by the organisations, the problems they encountered and the benefits they realised. In particular we have attempted to identify the common factors among the successful implementations.

## CHAPTER 4

### DEFINING THE OBJECTIVES AND THE APPROACH

In the first two chapters of this report we identified the factors that an organisation needs to consider as it defines its requirements for office systems. The first stages in defining the requirements are to establish the overall objectives to be achieved, and to define the approaches that will be used both to identify potential applications and to justify the project. In this chapter we discuss the ways in which organisations can define the objectives and the approaches to be taken. The aim of these first stages is to define an overall office systems plan, and to obtain management approval for the plan and its associated budgets. Once this approval has been obtained, the next stage is to plan the implementation project in detail, as described in the next chapter.

This chapter has four sections. The first section discusses the way in which an organisation should set about defining its objectives for office systems. The second section describes an investigation methodology developed by Butler Cox for identifying potential office system applications and users. The next section shows how the output from the investigation methodology can be used to select the potential office system applications and users, and the final section provides guidance on the preparation of an overall plan for office systems.

#### DEFINING THE OBJECTIVES

The starting point for installing office systems is to establish the overall objectives to be achieved by the systems. In chapter 1 we identified eight possible types of objective:

- To reduce staff numbers (at various staff levels).
- To handle an increased workload with existing staff numbers.
- To improve management control.
- To respond to changes more rapidly.
- To improve the quality of work in areas important to the business.
- To reduce office space requirement and office costs.
- To improve job satisfaction.
- To retain staff or attract new staff.

Organisations typically choose a combination of these objectives. For example, an engineering company may select the following objectives for its office systems plan:

- To reduce the average time taken to respond to a request for quotation from ten working days to five.
- To reduce managerial and/or professional staff levels by five per cent.
- To reduce clerical and secretarial staff levels by 10 per cent.

The clarity with which these objectives are defined and the relative importance attached to each one will affect the likelihood of the objectives being achieved. Clearly defined objectives are more likely to be achieved in practice.

Nevertheless, organisations should be aware of the adverse user reactions that can result from plans to reduce manpower or to reorganise responsibilities. User enthusiasm is very important to the success of office systems, particularly in the early stages of a project. Positive user reactions can have a significant affect on the speed with which office systems are implemented throughout the organisation. The need for enthusiastic users can be a strong argument for not planning to cost-justify office systems on the basis of redundancies or reorganisations. Human factors will have a restraining influence on the cost-benefits that can be obtained from office systems, and this influence should be borne in mind when the justification criteria for office systems are considered.

An underlying assumption when setting objectives for office systems is that the systems will have a positive affect on overall business performance. If this is to happen, the objectives set for office systems should relate to the overall business objectives. In the example of the engineering company given above the relevant business objectives might have been:

- To increase the company's sales by presenting a more efficient image to potential customers.
- To remain price-competitive by reducing overhead costs.

If the objectives set are less specific (for example,

“to gain experience of office systems”), then they might well be achieved with little effect (or even a negative effect) on the overall business performance. This could be true even if the office systems themselves were being operated efficiently. The organisation would then have an efficient but not an effective office systems installation.

The emphasis that an organisation gives to each of the seven types of objective listed at the beginning of this section will vary, depending on the organisational culture and the existing level of office systems. For large-scale implementations we would expect the best results to come from a mixture of these objectives. Specifically, we would expect the main emphasis to be placed on benefits related to business performance, followed by cost savings due to specifically identified or general budget reductions. Experimentation should be limited to specific areas where experience is needed before the objectives can be set.

The need to define objectives clearly applies also to data processing and communication objectives, both of which should of course be compatible with the office system objectives (particularly if the organisation intends to integrate its office system facilities with those for data processing and communications).

### **IDENTIFYING POTENTIAL APPLICATIONS AND USERS**

Once the overall objectives for installing office systems have been established, the next task is to identify the potential applications that will be implemented and the areas of the business that will use those applications. To achieve this, it will be necessary to carry out an investigation of the existing business practices within the organisation.

The data processing community has a long history of developing investigation methods for studying office operations with a view to implementing computer-based systems. Generally, these methods have been developed to investigate problems that, because of their structured nature, can be automated completely. This approach has resulted in a narrow concern with tasks instead of business functions, and has neglected the managerial and behavioural aspects of office work. In turn, this had led to the well-known tendency to produce inflexible systems that fail to meet the perceived needs of users.

We now describe an investigation methodology developed by Butler Cox for identifying potential office system applications and the users of those applications. This methodology differs from the conventional data processing approaches because

it emphasises business functions and resources rather than routine tasks. We believe that this is an important difference when examining the unstructured and semi-structured procedures that form a major part of many office functions.

### **The Butler Cox methodology**

Most investigation methods oriented to data processing require the measurement of operational details. The Butler Cox methodology places little emphasis on capturing the exact details of existing procedures. Instead, it focuses on identifying those business functions that can be supported by the use of technology, resource reorganisation, or changes in procedures.

For the purposes of the methodology we define a business function as comprising the whole range of activities and decisions that, taken together, achieve a particular business goal. One example of a business function defined in these terms is the production of advertising brochures. This function includes several activities and decisions, such as originating the creative ideas, writing the advertisement copy, typing drafts, taking photographs, discussing alternatives, deciding on the content, preparing the artwork and printing the brochures.

The methodology we describe below does not attempt to cater for all possible situations. Instead, it is designed as a guide to the investigation of office functions, rather than as a rigid menu to be followed. Organisations should use the methodology as a basis and adapt it to suit their own unique situations, culture and level of available information about office functions.

The methodology consists of two separate stages. The first stage identifies at a general level the major functions carried out within an organisation. The second stage examines in some detail the functions that have been identified during stage 1 as important likely candidates for office systems. Before describing each of the two stages in some detail we first note the prerequisites that must be satisfied.

### **Prerequisites to the methodology**

The important prerequisites that must be satisfied before our methodology for investigating office system requirements is used are:

- Management support for the investigation must be available, and this support must be based on a sound general understanding of office systems.
- All the staff involved in the investigation should be informed fully of its objectives, scope and methods.
- Company policy as it affects any changes to jobs should be clearly defined and understood.

These prerequisites can be satisfied in several ways — for example by holding meetings, by publishing internal newsletters, and by arranging educational activities such as equipment demonstrations, presentations, etc. In carrying out these activities it is important (and by no means easy) to strike a balance that is acceptable both to those staff who are uninformed (and apprehensive) about office systems and those with unrealistic expectations of 'futuristic' equipment. Because of media coverage of the so-called 'office of the future', this balance will be more difficult to achieve than it was in the past for data processing investigations.

**Stage 1 of the methodology**

Stage 1 of our office system investigation methodology has two parts:

- Interviews with senior and middle managers.
- Data collection.

Interviews are carried out with one senior manager or middle manager in each main function of the organisation to determine:

- The key functions of the business.
- An outline of important information flows within each function.
- The problems currently experienced.
- The views of managers about office system requirements.
- The objectives of managers for office systems.
- The constraints on office system developments.

Managers are selected for inclusion in the study on two criteria:

- The manager should be senior enough to have an understanding of the overall objectives of that functional area.
- The manager should have a reasonable knowledge of current procedures and practices.

Information obtained from the interviews with managers is supplemented by data collected mainly by selected staff in each of the main functional areas. The primary data collection tool is a set of forms, examples of which are shown in figure 10.

The data collected during stage 1 of the investigation comprises:

- The main duties of each section (form 1).
- The number and level of staff in each section (form 1).
- A summary of staff costs by level of staff (form 2).

- A list of all current office equipment by department (form 3).
- Current overall annual expenditure on office facilities and equipment (form 4).
- A summary of the estimated total volumes of information transferred using different types of media (for example, data processing printouts, facsimile, letters, memoranda, telephone calls), and an analysis of the origin and destination of information (form 5).
- A summary of the important inputs to and outputs from each department, showing volumes, sources and destinations, and the actions taken to convert inputs to outputs (form 6).

An important aim of stage 1 of the investigation is to identify the key information that affects the performance of each main business function. The investigation should avoid the temptation of gathering a mass of quantitative data about the key information. All that is required at this stage are estimates of volumes, costs and other details.

Stage 1 of the investigation provides the following information:

- A list of potential office system applications and a basis for setting priorities in relation to key business functions, identified problems and business objectives. (This list will divide into the two categories mentioned in chapter 1; firm applications and tentative applications.)
- An understanding of the management views about office systems and the level of management knowledge about office systems.
- A very approximate estimate of the likely impact of office systems on staff (and other) costs. This estimate is calculated by using the figures for productivity improvements at various staff levels given in chapter 2, together with the estimates of the likely impact of office systems on equipment and facility costs.

A limited number of the potential office system applications identified by the stage 1 investigation are then selected for closer study in stage 2 of the investigation methodology.

**Stage 2 of the methodology**

Stage 2 of the methodology is also based on the principle of identifying the business functions associated with each potential application. Information from stage 1 is used to identify for the study all the staff directly associated with the business functions that include each of the potential applications. For example, if a potential application was to use word processors linked to a phototypesetter for the pro-

Figure 10 Office system investigation methodology — stage 1 forms

**ALLOCATION OF STAFF** Form 1

Department .....

	Section	Main duties
1		
2		
3		
4		
5		
6		
7		
8		

Staff allocation to sections

Staff type	Total number	Section							
		1	2	3	4	5	6	7	8
Typist/secretary									
Clerk									
Supervisory clerk									
Professional									
Junior managers									
Middle managers									
Top managers									

**STAFF COSTS BY TYPE** Form 2

Staff type	Organisation's grades	Median annual salary	Major benefits
Typist/secretary			
Clerk			
Supervisory clerk			
Professional			
Junior manager			
Middle manager			
Top manager			

**OFFICE EQUIPMENT IN DEPT** Form 3

Devices	No. (or % if shared)	Comments
Typewriters		
WP terminals		
WP printers		
DP terminals		
DP printers		
Telex terminals		
Other terminals, e.g. Prestel		
Departmental or personal computers		
Desk calculators		
Micrographic readers		
Micrographic cameras		
Dictating equipment		
Photocopiers		
Printing and duplicating equipment		
Telephones — internal only		
Telephones — other phones		
Facsimile machines		
Filing cabinets — 4 dr. or equiv.		
Intercom stations		
Other*		

\*e.g. Audio visual devices, security systems — please specify

**ANNUAL OFFICE COSTS** Form 4

- If your organisation has calculated some or all of its office or overhead costs as a percentage of salary, please quote that percentage ..... % and indicate the items included in the column labelled 'OV' below.
- Please give the annual expenditure (excluding staff costs) for the following.

OV	Description	Current year		Budget		Area '000 sq. ft.
		Capital Depreciation	Revenue	Capital Depreciation	Revenue	
	Accommodation					
	Energy					
	Telephone — voice					
	Data communications					
	Telex					
	Stationery					
	Printing & copying					
	Postage & mailroom equipment					
	Furniture					
	Office equipment					
	DP equipment					
	Staff welfare					
	(Other)					

**SITE INFORMATION VOLUMES** Form 5

For each site, please give known figures for overall monthly volume of information. If figures are not available, please leave blank.

Type of flow	Volume measurement	Unit of measurement	Proportion of information which is				Peak as multiple of average	Date measured
			Within site	Intra-company	Incoming	Outgoing		
DP print-out								
Facsimile								
Letters								
Memos								
Phone calls								
Pre-printed forms								
Reports								
Telex								

**MAJOR INFORMATION FLOWS FOR ..... DEPT** Form 6

Inputs

	Description	Source	Action	Medium	Annual volume	Comments
1						
2						
3						
4						
5						
6						

Outputs

	Description	Action	Dest'n	Medium	Annual volume	Comments
1						
2						
3						
4						
5						
6						

Key for medium:  
 C Computer/printout R Reports G Graphics O Other  
 P Pre-printed forms Fx Facsimile Tx Telex M Memos  
 F Face to face/meetings T Telephone L Letters

duction of advertising brochures, then marketing staff, copywriters, typists, phototypesetter operators and, perhaps, internal printers would be included in the stage 2 study. Information from these staff would form the raw material for a stage 2 investigation.

Sometimes the number of staff associated with a business function is so large that it would be impractical to investigate each individual. In this situation, it is often possible to categorise the staff into groups and obtain sample information from each group. In the example given above, the groups could be marketing product managers, typists, copywriters and phototypesetter operators.

Interviews, questionnaires and (where appropriate) a limited analysis of activities using activity recording sheets, are then used to obtain the following information about each function:

- A list of all the activities carried out to perform the function.
- An estimate of the time spent on each of these activities by the staff involved. For example, 30 per cent of a product manager's time may be spent preparing advertising brochures (10 per cent on creative thinking, 10 per cent on writing or amending drafts, five per cent on discussing the material on the telephone and five per cent on face-to-face meetings).
- An estimate of the time spent by the staff on other identified activities. The product manager mentioned above, for example, may spend the remaining 70 per cent of his time on preparing market forecasts (20 per cent), preparing budgets (10 per cent), planning promotional campaigns (15 per cent) obtaining market information (20 per cent) and recruiting new staff (five per cent).
- A list of all the facilities used by the staff. (Stage 1 data may need to be sub-divided to provide this information.)
- An estimate of the information flows (including approximate estimates of volumes, frequencies and the media used) both within the group being studied and with any other individuals. This estimate may lead to the study being extended to include some of the other individuals, although boundaries will have to be set to prevent excessive expansion of the study. Thus individuals who do not occupy more than 10 per cent of any one group-member's time might be excluded from the study.

Examples of the forms used in stage 2 of the methodology are given in figure 11.

Stage 2 of the investigation will provide the following information:

- A clear understanding of the potential applications and their effects. This understanding will include the identification of work groups, the likely critical mass constraints, the staff likely to be affected at various levels by office system developments, the reorganisation possibilities and the potential quantitative and qualitative benefits. The applications identified will encompass individuals with firm requirements, individuals with mixed firm and tentative requirements, and individuals with tentative requirements only.
- A reasonable estimate of the existing (and possible future) facilities needed to provide these applications.
- A list of highly structured applications for which a more detailed analysis (using traditional data processing techniques) might be required before detailed installation plans can be formulated.

Varying organisational cultures and information sources make it difficult to give precise estimates of the time needed to carry out the stage 1 and stage 2 studies, but an approximate guide is:

- Stage 1: One to two man months per 1,000 office staff.
- Stage 2: One to two man months per 50 office staff.

### SELECTING APPLICATIONS AND USERS

Stage 2 of the investigation methodology will identify those firm office system applications that should be installed first. By selecting applications in this way an organisation's initial office system implementations will provide it with valuable experience of applications that are relatively easy to cost-justify. In addition, the chosen initial applications will provide a sound base for the future expansion that will be required to satisfy the critical mass requirements of subsequent less-frequent users. Typically, the initial firm applications include:

- Word processing installations for use by typing centres, typing groups or secretaries. These installations might also provide facilities for the electronic transmission of documents between operators.
- Word processing installations that are linked to other information processing facilities. Such links include links to the telex network (by a telex switch or indirectly by paper tape); links to computers for specific applications (such as computerised mailings or information retrieval services); and links to other devices (such as phototypesetters and intelligent copiers).



- Inter-site electronic messaging facilities. Such facilities are usually operated as a central shared service within each site (in much the same way as telex) but, sometimes, there is a firm requirement for more immediate (and local) access to the facilities. Inter-site electronic messaging will displace some inter-site mail and telex traffic.
- Videotex links between a central computer and the organisation's representatives, agents, suppliers or customers. Videotex links typically will be used for retrieving information and/or placing orders. (Foundation Report No. 27 described the way in which videotex is being used by several different types of organisation.)
- Discrete data processing-type applications (which may be implemented either on stand-alone hardware or by linking a terminal to a computer). Such applications include systems for generating and manipulating export documentation or purchase orders, for preparing quotations and budgets and for accessing library information.

When the initial firm applications are chosen, care should be taken to ensure that they are compatible with the opportunities offered by possible future integration of office systems. In other words, the initial installations should be the first steps towards integrated office systems within each business function. (Indeed, several of the applications described above may be linked together to provide integrated or semi-integrated office systems.)

Once these initial firm applications have been installed, organisations must decide whether to stop at this point or to proceed and install some tentative applications as well.

Tentative applications should initially not be installed widely throughout an organisation. Instead, they should be implemented first of all as pilot installations which include a mixture of firm and tentative applications and which are based on members of identified work groups. This approach usually leads to a mixture of staff levels being involved in each pilot installation.

Each pilot group should be large enough to overcome the critical mass constraints and small enough to be manageable. This means that pilot

groups should contain not less than about eight staff and not more than 50. (The actual size of the groups will depend on the particular applications and on the size of the work groups involved.)

The requirements of individual users should also be borne in mind as the applications are selected. In particular, care should be taken to maintain a balance between providing office systems that fall below the user's useful critical mass and systems that flood the user with too much information. In addition, the applications should be chosen so that new facilities can be added on an open-ended basis in line with the user's enthusiasm and pace of learning.

### **PREPARING THE OVERALL PLAN**

After setting the overall objectives and carrying out the investigations to identify the potential office system applications and users, the next stage is to prepare an overall office systems plan for management approval. This plan should include objectives, costs, benefits, time scales, personnel policy, training policy, implications for existing equipment, and so on, and it should cover a significant period (say five years). This approach will allow senior management to take a high-level view of the likely impact of office systems on the organisation. Check-points should be included in the plan to allow for management review and for changes to be made in the light of experience gained at various stages of development.

Once the overall plan has been agreed by the management responsible for the business operation, budgets can be prepared for equipment, facilities, and support costs. The budgets should also make allowances for any changes to manpower or other cost allocations.

Ideally, the costs of office systems should be accounted for in one central budget, so that control of the project can be exercised in terms both of overall cost and of equipment standards. Normally, this cost would be included in a central management service budget.

The next stage is to plan the detailed implementation project, as we now discuss in chapter 5.

## PLANNING THE IMPLEMENTATION PROJECT

In this chapter we discuss the actions that an organisation needs to take as it carries out the detailed planning of an office systems implementation project. The actions are many and varied, and we describe them under the headings of allocating project responsibilities, selecting equipment and facilities, planning the physical environment, and training and education. The chapter concludes by summarising the major activities that need to be planned in detail.

### **ALLOCATING PROJECT RESPONSIBILITIES**

Office system developments can have significant effects on the requirements for computer and communication systems within an organisation. As a result, data processing staff, O&M staff and telecommunications staff will often need to work together when office systems are being planned. In our view, the efforts of these three groups will be more productive if they all report to the same functional department head who can ensure that their responsibilities are clearly defined and adhered to.

The allocation of responsibilities for implementing office systems will depend on the type, size and geographic characteristics of the organisation. Thus, a large geographically dispersed organisation might establish a central corporate office systems advisory group. Such a group would provide a central pool of high-level expertise that can give guidance to the various business functions. It can ensure that the organisation as a whole approaches the implementation of office systems in a consistent and coherent manner, and can negotiate discounts by ordering equipment in bulk for the whole organisation. But the corporate advisory group should not attempt to usurp the office system responsibilities of local managers.

Even though the specific responsibilities for implementing office systems will vary from one organisation to another, we believe that the guidelines given below provide a sound basis for most organisations. These guidelines apply both to individual business units of large dispersed organisations and to less dispersed organisations.

#### ***Appoint a project leader***

A project leader should be appointed to manage the

office systems implementation project. The ideal project leader will not be easy to find, and he or she will require the following skills:

- Good knowledge of office procedures and office systems.
- Sound background knowledge of computer and communication systems.
- Good planning abilities.

Candidates for the role of project leader may currently be working in data processing, O&M or administration.

#### ***Create a steering committee***

An office systems steering committee should be created. This committee should consist of senior managers and the office systems project leader. Its tasks are to set overall objectives, decide on the speed and the direction of office systems development, agree priorities and expenditure and review progress. Because of the human factors associated with office systems, the personnel director should play a major role in the work of the committee, perhaps as chairman. The committee should meet, on an ad hoc basis, about four to six times a year.

#### ***Establish a co-ordinating group***

An office systems working group should be established consisting of the office systems project leader (as group leader) and senior staff from the O&M, data processing and telecommunications departments. This group will co-ordinate the planning of office systems with the planning of computer and communication facilities. It will establish detailed plans for applications, for installing the systems and for post-implementation activities. In addition, the working group will define the responsibilities of office system analysts and training staff. All major proposals produced by the working group should be passed to the steering committee for approval. The working group will meet frequently during the planning phases of office system projects.

#### ***Appoint office system analysts***

The working group should appoint individual analysts (who typically will be seconded from the O&M and computer systems departments) to be responsible for the implementation of identified office system applications. In larger office system environments these analysts may be employed as

part of a permanent office systems team, reporting to the office systems project leader. The project leader will hold regular review meetings with these analysts.

#### ***Nominate user representatives***

A representative from each installation should be nominated to act as an opinion leader, co-ordinator and reference point for the feedback of information. The representative usually will be a middle manager or a professional who has expressed interest in office systems and who has a good understanding of the relevant business function. He or she should be encouraged to take an active part in stage 2 of the initial investigation (as described in the previous chapter) as well as in subsequent work on changes, new facilities and new applications. The user representative should have the support of the senior management of the business function and should be popular with his or her colleagues. But care should be taken to ensure that the users themselves are not isolated by this approach. The user representative should be a useful (but not the only) means of communication between users and office systems development staff.

#### ***Establish internal training facilities***

An internal training group should be established either by secondment or by full time appointment. For some facilities (such as word processing or electronic messaging) existing secretarial or typing staff with enthusiasm, a knowledge of the facilities and embryonic training skills are usually chosen for this task. For the more specific (and technical) applications, training usually is carried out by a systems trainer or by the relevant analyst. In larger installations, the office system trainers may form part of the permanent office systems team, reporting to the office systems project leader.

#### ***Define routine procedures***

Responsibilities should be defined for routine procedures such as obtaining supplies, reporting breakdowns, controlling passwords, making security copies of disc files, and so forth.

### **SELECTING EQUIPMENT AND FACILITIES**

The next stage in planning the installation project is to select equipment and the facilities available with that equipment. The selection process can itself be subdivided into three main activities, which we now discuss briefly.

#### ***Preparing the request for proposals***

Preliminary information about the available equipment and facilities can be collected from the following sources:

- The analyses of available equipment published in various trade and technical publications.
- Visits to equipment suppliers and to equipment demonstrations.
- Visits to existing users in other installations.
- In-house tests of short-listed equipment. Such tests should be carried out by an analyst and a potential user over a period of about two or three weeks. The tests should be designed to evaluate the general performance of the equipment and its ease of use. In some instances, this type of exercise will require the organisation to pay short-term equipment rental fees.

When the preliminary information has been collected and evaluated, the organisation should then draw up a short-list of potential suppliers.

A detailed 'request-for-a-proposal' document should then be prepared giving details of the organisation and its office system requirements, together with any specific questions that have not already been clearly answered by the suppliers. A section requesting details of all costs to be incurred should be included. For example, potential suppliers should be asked to detail the costs for equipment, software, delivery, wiring, maintenance and training. They should also be asked to specify any discounts given for bulk ordering of equipment. Suppliers should also be asked to state clearly in their proposals the delivery deadlines. When a comprehensive request-for-proposal document has been prepared, it is then sent to the short-listed suppliers. Organisations should allow up to three months for the resulting proposals to be received.

#### ***Evaluating the proposals***

Many organisations already have well-established procedures for evaluating hardware and software proposals, and evaluating office systems equipment proposals is, in principle, no different from evaluating proposals for other types of equipment. Nevertheless, we set out below a detailed methodology that has been found to work well in practice for the evaluation of proposals for office systems equipment.

The first stage in the evaluation process is to prepare a list of essential and desirable characteristics for the office systems equipment. Each desirable characteristic is given a weighting factor ranging between one and ten. (Ten implies that the characteristic is very desirable; one implies that it is not very important.)

Each supplier's proposal is first evaluated by comparing the facilities it offers with the list of essential characteristics. Any proposal that does not meet all of the essential characteristics is immediately rejected. The remaining proposals are then evaluated against

the list of desirable characteristics by allocating a series of weighted scores (again ranging from one to ten) that indicate how well each proposal meets each of the desirable characteristics. The weighted score for each characteristic is then multiplied by the corresponding weighted 'importance' factor to give an overall score for that characteristic and that proposal. The sum of the overall scores for each proposal provides a measure of how well the proposal meets the desirable characteristics.

The total scores for each proposal are then compared, and the relative scores can be used as an aid when the final decision is made.

### **Setting selection criteria**

Once the equipment and facilities for the initial office systems installation have been chosen and ordered, an organisation may decide to set guidelines for future installations. These guidelines may specify that a particular supplier's equipment is used for office systems, or they may be more flexible by stating that all future equipment must conform to a particular communications standard or philosophy.

The key factors to be considered by an organisation in choosing an office systems supplier and equipment include:

- The financial stability of the supplier.
- The future plans of the supplier, and its commitment to office systems.
- The effectiveness of the supplier's maintenance and support organisation.
- The ability of the equipment to communicate with computer systems both inside and outside the organisation.
- The ability of the equipment to cater for user-specific facilities.
- The availability of electronic messaging facilities.
- The ergonomic features of the equipment.

A compromise is often necessary when selecting equipment to meet the needs of individual user applications because the standard range of products available may not match the requirements precisely. In practice a pragmatic approach is often best, even though this may lead to some facilities being under-utilised. For example, a multifunction terminal for use by managers and professionals might have word processing, electronic messaging, data communications and local data manipulation facilities, even though some of these facilities are used only infrequently. Similarly, a typist may be provided with a terminal containing the same facilities, although she may use only word processing and electronic messaging.

Organisations can minimise the constraints imposed by standard products by choosing those products whose standard facilities can be tailored to meet specific needs. In addition, some office system suppliers now offer a range of terminals that are designed to meet the specific needs of different types of staff.

### **PLANNING THE PHYSICAL ENVIRONMENT**

Earlier in this report we emphasised that the successful implementation of office systems depends on paying attention to the associated staff factors. A major concern of office staff is the physical environment in which their office systems will be used. The factors affecting the physical environment were discussed in Foundation Report No. 20 — The Interface between People and Equipment. For the purposes of this report we have selected the relevant factors from Report No. 20 concerning the workplace, the working environment (including lighting and noise) and social and organisational considerations.

#### **The workplace**

There are four main requirements for a comfortable seated working posture. First, some physical movement is essential to maintain or restore proper circulation of the blood. This movement can be provided by installing flexible and adjustable equipment and by ensuring that adequate work surfaces are available for spreading out work. Also, sufficient legroom is required, so that the operator can change posture to avoid fatigue.

Second, the seat should have a back support that maintains the inward curve of the lower spine.

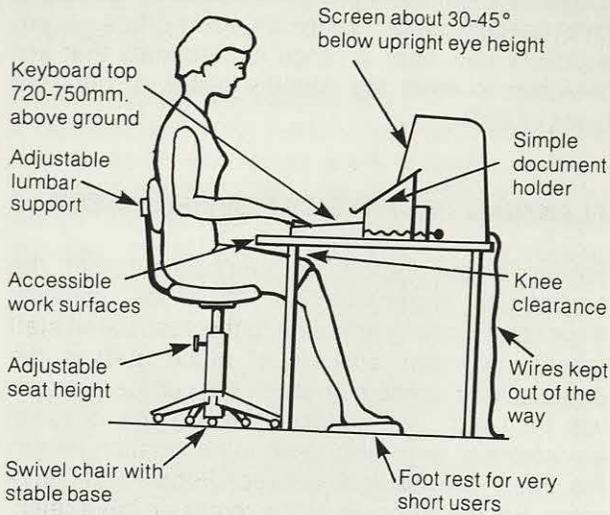
Third, the chair seat should be firm (only slightly padded), angled back a few degrees and curved at the front so that it does not cut into the thighs.

Fourth, the height of the seat should allow the feet to be placed squarely on the floor, with the angles between the spine and the thighs and between the thigh and the lower leg each at approximately 90 degrees, and with the soft tissue under the thigh not crushed.

These four requirements are illustrated in figure 12 overleaf.

Many manufacturers now supply terminals that have desirable ergonomic characteristics such as integrated turntables, screen-tilting mechanisms and thin detachable keyboards, and such terminals can be used on a conventional desk. The ergonomic limitations of earlier terminal designs can be overcome by using adjustable desks. However, many of

**Figure 12 Comfortable seated working position**



the adjustable desks now available provide excessive scope for adjustment that is neither helpful nor usable.

**The working environment**

Apart from overheating and draughts, the most common problem with the working environment in an office concerns the quality and freshness of air. Adequate ventilation is required to overcome this problem. As a guide, an office temperature of between 20°C and 22°C is recommended, together with a maximum humidity of 50 per cent. Other important considerations are the levels of lighting and of noise.

**Lighting**

When people use visual display terminals, they are likely to suffer from glare for two reasons. First, a typical terminal has a dark screen and so the eyes adjust themselves to the low light level. Second, the line of sight is higher than is usual for conventional paperwork, and this means that the sources of light (windows or light fittings) are more likely to be in the terminal user's field of vision.

Both of these causes of glare can be overcome if the terminals are positioned so that the user's line of sight is at right angles to the sources of light, if the light fittings have proper glare shielding, and if an ambient level of illumination of between 300 and 500 lux is provided.

Windows provide visual access to the outside world and are useful when people need a distant view to rest their eyes. When visual display terminals are used near windows, however, some form of control over the amount of daylight that comes through the windows is usually necessary. This may be achieved

by installing solar control films, blinds, curtains or shutters.

The floor, walls and ceiling of an office in which visual display terminals are used should ideally reflect about 30 per cent, 50 per cent and 70 per cent respectively of the light that strikes them.

**Noise**

A frequent problem in offices is the adverse affect that the noise of impact printers has on human communications and concentration. Impact printers typically produce noise levels of between 75 and 80 decibels, and concentration begins to suffer at noise levels between 55 and 65 decibels. Acoustic covers can be effective in reducing the noise of impact printers.

**Social and organisational considerations**

Those who plan office layouts should take account of social and organisational groupings. Workstations that are grouped together to facilitate inter-communication, or partitions that are erected to provide privacy, should reinforce the social and organisational structures, not impede them.

**TRAINING AND EDUCATION**

Planning the training and educational activities associated with an office systems implementation requires the following actions:

- Decide on the amount and type of training that will be provided by in-house staff and by the equipment supplier.
- Select the in-house training staff and train the trainers.
- Design training programmes for the various types of user involved in the implementation. These programmes might include operator training, specific application training, general management education and general staff awareness of office systems.
- Examine the possibility of using equipment-aided training and 'help' facilities on the system. Prepare any required facilities.
- Prepare user manuals and other documentation. Include standards for document lay-outs, indexing, security and communications. User manuals should be tailored as far as possible to individual users or user groups.
- Be ready to recognise users who adapt quickly to the new facilities with a view to encouraging local user 'experts' who can perform unofficial on-the-job advisory work.
- Arrange for training to be carried out as near as

possible to the implementation date.

- Arrange for follow-up training for individual users.
- Encourage 'keyboard-resistant' staff to overcome their fears and prejudices. One organisation we are aware of achieved this by making electronic games available through its office systems (although such an approach does, of course, need to be controlled carefully).
- Arrange for a central advisor to be readily available for advice after the office systems have been installed.
- Arrange for on-going training and reviews of user groups and ensure that training staff are available for future enhancements to the systems.

### SUMMARY

In this chapter we have discussed in some detail the activities involved in planning an office systems implementation project. Detailed implementation planning for office systems is similar to that for traditional data processing projects, and so the advice we provided in Foundation Report No. 8 — Project Management — is, in general, equally applicable.

The detailed plans might be based, for example, on activity bar charts for the overall project together with short-term scheduling of activities with weekly reviews by the project leader. The detailed planning should include a list of all the actions to be carried

out, the timescales for completing each action and the name of the person responsible for that action.

The following major activities should be planned in detail:

- Purchase, delivery and storage of all office systems equipment and facilities.
- Purchase, delivery and storage of all physical environment facilities.
- Purchase, delivery and storage of all other equipment (for example, communications equipment).
- Physical installation of all facilities (wiring, power, desks, terminals, etc.).
- The timescale for installing the equipment.
- Provision of the training and education facilities.
- The timescale for carrying out the training, education and documentation activities.
- Selection of the manpower required for the implementation project and allocation of responsibilities.
- Modification of standard facilities or existing equipment.
- Definition of working procedures.

The detailed planning exercise can involve a large number of individual actions and decisions. In one recent office systems installation a list of no fewer than 126 actions was used.

## CHAPTER 6

### INSTALLATION AND POST-IMPLEMENTATION ACTIVITIES

The flexible nature of most office systems, together with their capacity for continued growth and enhancement, means that the first installation of office system facilities usually represents the initial step of the project and not the end of the exercise.

In this chapter we describe the activities that an organisation can expect to be involved in as office systems are implemented. Many of these activities will be necessary to overcome initial teething problems that occur whilst the users are becoming familiar with the systems. We also describe the monitoring activities that an organisation should undertake so that it can measure the progress of its office systems against the original objectives and plans. Finally, we review the activities that will be necessary to enhance the office systems and to carry out future developments.

#### INSTALLATION

The installation of office systems is likely to be spread over several weeks (or months) for medium-sized or large projects and, as a result, continuous changes to the training programme may be necessary to allow for staff availability or unexpected installation problems. Changes to the training programme should be made as necessary to ensure that:

- All facilities are fully tested before they are implemented.
- Staff are trained to use a facility just before it is implemented.

The number of queries and problems is likely to be highest in the period immediately after an office system has been implemented, and the training staff and analysts should be continuously available to provide help and advice during this period.

It is particularly important to provide prompt and relevant help to those users who are experiencing difficulties. The emphasis should be on a patient and sympathetic understanding of the users' problems, rather than on a compulsory approach that forces users to adopt alien practices. This emphasis may mean, however, that a small number of users are allowed to stop using the office system facilities. A large adverse reaction from the users will indicate

that the earlier stages (investigation, selection of equipment, implementation planning and training) were incomplete or inaccurate, and a major re-think of the overall office systems plan may be necessary.

Some problems may be caused also by users who adapt very quickly to using office systems and demand extra facilities that were planned for a later date. These users are likely to be key individuals in the development of office systems and every effort should be made to meet their justified requirements as soon as possible.

Office systems usually will be introduced in a phased manner, with the number of users increasing steadily with time. Such a phased implementation can cause either an initial lack of the required critical mass to make the systems really useful, or an imbalance between related user groups. These effects should be recognised quickly and suitable action should be taken to overcome the problems. One possibility is to hold a limited amount of equipment and facilities in reserve, so that unexpected imbalances can be overcome quickly. Holding some equipment in reserve may also be advisable in medium-sized or large installations so that a rapid response can be made to any equipment failures, particularly during the early stages of an implementation.

#### MONITORING

Monitoring the effects of an office systems implementation is important because it enables the organisation to compare actual achievements with expected benefits. Effective monitoring means that problems and opportunities for improvement can be dealt with quickly, and that a control mechanism is present to prevent a wasteful use of resources.

Monitoring procedures should be designed to evaluate four key areas:

- User attitudes to the system.
- Whether the objectives set for the system are being achieved. If the objectives are not being achieved then the monitoring should reveal the reasons.
- Whether the facilities and procedures are operating satisfactorily.

—Whether the application requirements are being met effectively or, if they are not, the improvements to the facilities that are necessary.

User reactions to new office systems will be particularly abundant in the period immediately following implementation. It is important, therefore, that during this period the training staff and analysts maintain active (and informal) contact with the users, to supplement the more formal reactions they will receive from the nominated user representatives. User reactions gathered as a result of the informal contact should be translated quickly into appropriate action by the support staff and, if necessary, by the project leader.

In addition to the informal monitoring of user reactions, a formal progress review should take place about three to six months after an office system has been installed. This period of time allows the applications to settle down but does not allow the users time to become over-familiar with the applications, or for the applications to become mundane from the users' point of view.

Formal monitoring methods will vary between organisations but will usually include one or more of the following approaches:

- Activity recording before and after the office systems installation.
- Information produced automatically by the equipment (either on a continuous or a sampled basis).
- User questionnaires.
- Meetings or interviews with users.

User involvement in the monitoring process is critical to its effectiveness and, therefore, monitoring should concentrate particularly on user reaction to the systems. A key element of the monitoring procedures is to help users by identifying any necessary improvements to the facilities. If users view the monitoring process in any other way it is likely to be significantly less effective. In particular the monitoring process will be counter-productive if the users perceive it as a 'spying' exercise.

Formal monitoring exercises should evaluate the performance of equipment, suppliers and procedures and should trigger swift action to overcome any weaknesses that are discovered. In addition, informal monitoring may reveal causes of concern or envy in non-user areas. These reactions should then influence the post-installation training and educational activities (described in the next section) and, to some extent, they should also influence the future office system plans. (For example, the future plan might be modified to delay the implementation

of office systems in those business areas where there is likely to be an adverse user-reaction.)

### **POST-INSTALLATION TRAINING AND EDUCATION**

The early experience with office system applications that we investigated for this report indicated that follow-up user training is often required if full use is to be made of the more powerful facilities available with the systems. This is particularly true for some word processing and local data manipulation facilities, but applies also (to a lesser extent) to other office systems. Follow-up training should be designed both to meet the general needs of the users as a whole and to cater for the requirements of individual users. A combination of informal one-to-one advice and more formal refresher courses is therefore likely to be the best approach. In addition to follow-up training for existing facilities, refresher training courses will be needed as new facilities become operational.

Inevitably, the software facilities provided with products purchased today will, in time, be enhanced and upgraded. Sometimes, these software changes will be fundamental because suppliers have not predicted requirements accurately or because software that is difficult to use is belatedly replaced. If an organisation wishes to use the changed software, a major and disruptive retraining exercise will be necessary.

As an organisation develops its office systems, an on-going programme of general education and appreciation of office systems will be needed if the enthusiasm of potential users is to be established and maintained. This programme should consist of a realistic, balanced approach that will not generate unrealistic expectations or fears.

### **ENHANCEMENTS AND FUTURE DEVELOPMENTS**

Office systems are being continually enhanced, and organisations using these systems must anticipate a steady stream of new facilities and features. Most of the new facilities will be used selectively as and where they are beneficial, although some enhancements will affect all existing users.

As organisations develop office systems they will gradually move beyond the initial firm applications and pilot projects. This movement may be to consolidate their office systems around firm applications only, or it may be towards a general (or selective) introduction of more tentative applications. In addition, as organisations begin to see tangible benefits

from the general use of facilities such as in-house electronic messaging, electronic filing and retrieval, diary management, personal computing, computer enquiry, etc., they will then begin to move towards the integration of the systems that use these facilities.

The integration of office systems is likely to be of most benefit if this evolution follows a logical (rather than a random) pattern based on expanding the facilities to meet business function requirements. As these developments proceed, work practices and the way in which staff are organised will change fundamentally, and the most successful organisations will be those that concentrate on obtaining the cost-benefits of integration.

The functional evolution of office systems therefore begins with traditional data processing systems that 'automate' discrete parts of the office procedures of specific business functions (although a few data

processing applications may automate parts of 'adjacent' functions). The next stage in the evolution is to add the firm office system applications, which again 'automate' parts of functions, some of which may already have been partly automated by data processing applications. The evolution continues with the addition of pilot tentative office system applications which, in turn, identify the next batch of firm applications. This process continues until the majority of business functions are at least partly 'automated', although the office procedures of the business operations as a whole are still far from completely automated. It is only when all the discrete systems and applications are integrated that the majority of the office procedures of the complete business operation are automated.

Eventually, this functional evolution will lead to a high degree of integrated office system facilities. It is at this stage that the popular vision of 'the office of the future' gradually becomes a reality.

### MANAGEMENT GUIDELINES

The research for this report was based largely on the experiences of the pioneer users of office systems, and in the earlier chapters of the report we described their experiences in some detail. In this final chapter of the report we summarise the main lessons that can be learnt from their experiences. These lessons are presented as a series of guidelines that organisations can use as they set about implementing office systems.

#### **DETERMINE THE PACE OF THE OFFICE SYSTEMS EFFORT**

In Foundation Report No. 19 we identified three possible approaches to office automation:

- Wait and watch developments.
- Respond pragmatically to opportunities.
- Force the pace.

This report has provided advice to organisations in the latter two categories. Nevertheless an organisation needs consciously to decide which of these two approaches it will take for its office system developments. Those organisations that choose to respond pragmatically to the opportunities that present themselves will minimise the risks that are still associated with many office system developments. Those organisations that determine to press forward quickly to implement office systems will (as we said in Report No. 19) undoubtedly gain support from the suppliers of equipment. But they will also have to make substantial investments and must accept that some of their early implementations may have to be abandoned in a few years' time. The pioneer organisations must be prepared to employ a significant number of good-quality staff who can overcome the shortcomings of the equipment and the suppliers' lack of expertise.

#### **DETERMINE THE SCOPE OF THE OFFICE SYSTEMS EFFORT**

An organisation also needs to decide whether its office systems effort will encompass only the easily identified (and cost-justified) firm applications, or whether the systems will expand to include the more tentative applications as well. Benefits from firm applications should be fairly easy to obtain but, as

we illustrated in figure 6 (on page 14), a period of nett costs will probably have to be endured if an organisation is to progress successfully from firm applications through tentative applications to integrated office systems. The real benefits from office systems will occur only after an organisation has adjusted its office procedures and organisational structure to make the most effective use of both the firm and the initially tentative applications.

#### **RECOGNISE THE DIFFERING REQUIREMENTS**

The differing office system requirements of various types and levels of office staff should be recognised. These differing requirements can be satisfied only by highly flexible systems that will often be tailored to meet individual requirements by the organisation's analysts or by the users themselves. The traditional data processing approach will often be too inflexible for successful office systems, and careful overall planning will be necessary if the problems associated with critical mass effects, equipment compatibility and resource balancing are to be avoided. User involvement will be needed to a greater degree than for traditional data processing systems.

#### **MONITOR DEVELOPMENTS IN OFFICE SYSTEM TECHNOLOGY**

In the first chapter of this report we identified the main technology factors that are likely to affect office system developments in the next five years. Organisations should monitor these developments as they appear in the marketplace as new products and facilities. Many suppliers of office systems equipment have launched speculative products without really knowing if those products meet a market need. A closer liaison between user organisations and suppliers is bound to lead to products that more closely match the requirements of office system users.

#### **ADOPT A PLANNING APPROACH**

There is, as yet, no universally accepted methodology for implementing office systems. Nevertheless, we recommend that organisations should adopt a soundly based planning approach of the type that we have detailed in this report. This approach

should take account of the lessons learnt from the early office system installations (as related in chapter 3). In formulating their office system plans, organisations should take account of the factors we identified in chapter 1. The key elements of this approach are to:

- Recognise the opportunities, limitations and likely pace of office system developments.
- Set clear objectives and obtain top management support for the office system developments.
- Use a comprehensive and well thought out investigation methodology (of the type we detailed in chapter 4) to identify the potential applications and users.
- Create an effective organisation for implementing office systems, and recruit and train good-quality internal support staff.
- Motivate the potential users of office systems,

and involve them in the implementation project. Provide comprehensive education for the users, both at a general level and in the use of specific facilities.

- Select equipment in an objective manner, and in particular look for equipment and facilities with good ergonomic characteristics.
- Identify the firm applications and tentative pilot applications of office systems.
- Base the office systems implementation on a functional approach to applications.

### REVIEW PROGRESS

The implementation of an office system should not be viewed as complete when the system is operational. Continued support should be available to the users, and users' reactions to the systems should be monitored on a regular basis.

## CONCLUSION

Our purpose in this report was to provide advice to organisations as they set about implementing office systems. We first identified the factors that an organisation needs to consider as it defines its requirements for office systems. Next, the report reviewed the experiences of a wide range of organisations (in several countries) as they implemented office systems, and highlighted the lessons that can be learnt from those experiences. The report continued by presenting the tasks that an organisation needs to undertake in defining its objectives and approach for office system developments; and then discussed the activities involved in planning the implementation project. Finally, the report discussed the activities that need to be carried out both as an office system is installed and on a continuing basis after it has been implemented. The report concluded by presenting a set of guidelines for organisations to use as they implement office systems.

Our research for this report has confirmed that the early euphoria created by visions of 'the office of the future' is now being replaced by a more realistic approach in which all the relevant human, technical and economic factors are considered. This more realistic approach creates problems as well as opportunities, and provides a significant challenge to the ingenuity and determination of pioneering user organisations.

Office systems, as we have defined them in this report, will be implemented in differing ways and over differing timescales by different organisations. The progress towards the 'office of the future' will be evolutionary rather than revolutionary. As organisations make their plans they must remember that, even in the most advanced organisations, paper-based office systems and electronically based office systems are likely to co-exist for several decades to come.



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